JOURNAL OF TURKISH SLEEP MEDICINE

JTSM

Official Publication of the Turkish Sleep Medicine Society

E-ISSN 2757-850X

Cilt / Volume: 10 Sayı / Issue: 3 Eylül / September 2023

Derleme / Review

Meme Kanseri Cerrahisi Sonrası Uyku Kalitesini Etkileyen Faktörler ve Hemşirelik Bakımı
Kıymet Öztepe Yeşilyurt, Neşe Ataman Bor; İstanbul, Hakkari, Türkiye

Özgün Makaleler / Original Articles

Cultural Adaptation of the Infant Sleep Scale for Parents
Turgut Akyol, Arzu Sarıalioğlu; Muş, Erzurum, Turkey

Evaluation of Sleep Quality, Daytime Sleepiness Levels, and Anxiety and Depression Levels of Inpatients with COVID-19 Treatment according to Oxygen Needs: A Case-control Study
Soner Kılıç, Güven Aslan, Büşra Eser, Yunus Hacımusalar; Kayseri, Turkey

Obstrüktif Uyku Apne Sendromunda Otonom Disfonksiyon ve Enflamasyon
Cem Bölük, Gülçin Benbir Şenel, Derya Karadeniz; Şanlıurfa, İstanbul, Türkiye

Non-spesifik Boyun Ağrısı Olan Genç Bireylerde Uyku Pozisyonunun Boyun Yeti Yitimi, Üst Ekstremite Fonksiyonu ve Uyku Kalitesi Üzerine Etkileri
Rumeysa Ateş, Hasan Özbek, Ziya Yıldız, Zeliha Başkurt; Isparta, Burdur, Türkiye

Circadian Rhythm Sleep Disorders in the Young Population and Their Relationship with Psychological Distress and Disability
Habibolah Khazaie, Farid Najafi, Azita Chehri, Afarin Rahimi-Movaghar, Masoumeh Amin-Esmaeili, Mehdi Moradi-Nazar, Ali Zakiei, Yahya Pasdar, Alireza Ahmadi, Reza Mohammadi; Kermanshah, Tehran, Iran; Stockholm, Sweden

Preventive Effect of Cognitive Stimulation and Sleep Hygiene on Delirium in COVID-19 Intensive Care Patients
Döndü Şanlıtürk, Veysel Kaplan, Neslihan Dörtkardeş; Tokat, Şanlıurfa, Turkey

Effect of 24-hour Sleep Deprivation on Visual Reactivity in Healthcare Professionals
Nevroz Ünlü, Çiğdem Deniz, Talip Asil; İstanbul, Tekirdağ, Turkey

Analysis of Nighttime Sleep and the Impact of Selected Predictors (Pain and Delirium) on its Quality in Hospitalized Patients Over Sixty Years of Age
Hana Locihová, Karel Axmann, Pavlina Štěpánová, Bohdana Břegová, Renata Zittová, Jana Hrušková; Ostrava, Třinec, Olomouc, Czech Republic

Relationship Between Chronotype, Social Jetlag, Attention Control, and Academic Achievement in Nursing Students During the COVID-19 Pandemic
Nazmiye Çıray, Meltem Adaiçi, Aybüke Özcan; İzmir, Turkey

Evaluation of Serum Vitamin D Levels in Obstructive Sleep Apnea Syndrome
Utku Oğan Akyıldız, Aslı Akyol Gürses; Aydın, Ankara, Turkey

Factors Affecting Pressure Change Requirement in Obstructive Sleep Apnea Patients Under Positive Airway Pressure Therapy
Ersan Atahan, Ayşegül Gençer, Buket Çalışkaner Öztürk; İstanbul, Turkey

galenos yayınevi

www.tutd.org.tr

JOURNAL OF TURKISH SLEEP MEDICINE | JTSM

Editörler Kurulu / Editorial Board

Danışman Kurulu / Advisory Board

Yayınevi İletişim/Publisher Contact

Adres/Address: Molla Gürani Mah. Kaçamak Sk. No: 21/1 34093 İstanbul, Türkiye
Telefon/Phone: +90 (530) 177 30 97 / +90 (539) 307 32 03
E-posta/E-mail: info@galenos.com.tr/yayin@galenos.com.tr
Web: www.galenos.com.tr **Publisher Certificate Number:** 14521 **E-ISSN:** 2757-850X
Yayın Tarihi/Publishing Date: Eylül 2023/Sebtember 2023

Üç ayda bir yayımlanan süreli yayındır. International scientific journal published quarterly.

Türk Uyku Tıbbı Dergisi, Türk Uyku Tıbbı Derneği'nin resmi yayın organıdır.
Journal of Turkish Sleep Medicine is an official journal of the Turkish Sleep Medicine Society.

JOURNAL OF TURKISH SLEEP MEDICINE | JTSM

Amaç ve Kapsam

Journal of Turkish Sleep Medicine (Türk Uyku Tıbbı Dergisi), Türk Uyku Tıbbı Derneği'nin süreli resmi yayını olarak 2014 yılında yayın hayatına başlamıştır. Dergi türkçe ve/veya ingilizce olarak; uyku tıbbını, uyku ile ilgili temel klinik ve sosyolojik konuları ve uyku ve biyolojik ritimleri işleyen olgu sunumu, araştırma yazısı ve derleme türündeki yazıları kabul etmektedir. Yazarlardan hem türkçe hem de ingilizce özet istenmektedir. Dergide yayımlanacak olan makaleler bağımsız ve önyargısız çift-kör hakemlik ilkeleri ile değerlendirilmektedir. Yılda dört sayı (Mart, Haziran, Eylül sayıları ile Aralık kongre özel sayısı) online olarak yayınlanmaktadır.

Journal of Turkish Sleep Medicine (Türk Uyku Tıbbı Dergisi), Web of Science-Emerging Sources Citation Index (ESCI), EBSCO Database, British Library, CINAHL Complete Database, DOAJ, ProQuest Health & Medical Complete, Gale, J-Gate, IdealOnline, ROOT INDEXING, Türk Medline, Hinari, GOALI, ARDI, OARE ve Türkiye Atıf Dizini ve Türk Tıp Dizini'nde indekslenmektedir.

Açık Erişim Politikası

Dergide "açık erişim politikası" uygulanmaktadır. Açık erişim politikası, Budapest Open Access Initiative (BOAI) http://www.budapestopenaccessinitiative.org kuralları esas alınarak uygulanmaktadır.

Açık erişim; hakem değerlendirmesinden geçmiş bilimsel literatürün; internet aracılığıyla, finansal, yasal veya teknik engeller olmaksızın, serbestçe erişilebilir, okunabilir, indirilebilir, kopyalanabilir, dağıtılabilir, basılabilir, taranabilir, tam metinlere bağlantı verilebilir, dizinlenebilir, yazılıma veri olarak aktarılabilir ve her türlü yasal amaç için kullanılabilir olmasıdır. Çoğaltma ve dağıtım üzerindeki tek kısıtlama yetkisi ve bu alandaki tek telif hakkı; kendi çalışmalarının bütünlüğü üzerinde kontrol sahibi olabilmeleri, gerektiği gibi tanınmalarının ve alıntılanmalarının sağlanabilmesi için yazarlara verilmektedir.

İzinler

Yazarlara Bilgi

"Yazarlara Bilgi" bölümüne derginin http://jtsm.org internet adresinden ulaşılabilir.

Materyal Sorumluluk Reddi

Yayımlanan yazıların bilimsel ve hukuki sorumluluğu yazarlarına aittir. Yazıların içeriğinden ve kaynakların doğruluğundan yazarlar sorumludur. Türk Uyku Tıbbı Derneği (TUTD), editörler kurulu ve yayıncı; dergide yayımlanan eserler için herhangi bir sorumluluk kabul etmez.

Derginin mali giderleri Türk Uyku Tıbbı Derneği (TUTD) tarafından karşılanmaktadır.

Yazışma Adresi

Baş Editör, Gülçin Benbir Şenel

Adres: Kocamustafapaşa Cd. Merih İş Merkezi No:45 D:55 Kocamustafapaşa - Fatih / İstanbul

E-posta: drgulcinbenbir@yahoo.com

Telefon: +90 530 409 82 60

Yayınevi Yazışma Adresi

Galenos Yayınevi

Adres: Molla Gürani Mah. Kaçamak Sok. No: 21 34093 Fındıkzade, İstanbul/ Türkiye

E-posta: info@galenos.com.tr

Telefon: +90 (530) 177 30 97 / +90 (539) 307 32 03

OPEN ACCESS

JOURNAL OF TURKISH SLEEP MEDICINE | JTSM

Aims and Scope

Journal of Turkish Sleep Medicine (Türk Uyku Tıbbı Dergisi) started in 2014 as the official periodic publication of Turkish Sleep Medicine Society. The Journal accepts case reports, research articles and review articles on basic clinical and sociological issues, dealing with sleep medicine in turkish and/or english. The authors are required to provide abstracts in both english and turkish. An independent, unbiased double peer-reviewed principle is used to select manuscripts for publication. Four issues are published online in a year (issues in March, June, September and special congress issue in December).

Journal of Turkish Sleep Medicine is indexed in Web of Science-Emerging Sources Citation Index (ESCI), EBSCO Database, CINAHL Complete Database, DOAJ, Gale, ProQuest Health & Medical Complete, British Library, J-Gate, ROOT INDEXING, IdealOnline, Turk Medline, Hinari, GOALI, ARDI, OARE and Turkiye Citation Index.

Open Access Policy

This journal provides immediate open access to its content on the principle that making research freely available to the public supports a greater global exchange of knowledge.

Open access policy is based on rules of Budapest Open Access Initiative (BOAI) http://www.budapestopenaccessinitiative.org by "open access" to peer-reviewed research literature, we mean its free availability on the public on internet, permitting any users to read, download, copy, distribute, print, search, or link to the full texts of these articles, crawl them for indexing, pass them as data to software, or use them for any other lawful purpose, without financial, legal, or technical barriers other than those inseparable from gaining access to the internet itself. The only constraint on reproduction and distribution, and the only for copyright in this domain, should be to give authors control over the integrity of their work and the right to be properly acknowledged and cited.

Permission Requests

Instructions to Authors

Instructions to authors section can be reached from the journal's website http://jtsm.org

Material Disclaimer

Scientific and legal responsibilities pertaining to the papers belong to the authors. Contents of the manuscripts and accuracy of references are also the author's responsibility. The Turkish Sleep Medicine Society (TSMS), the Editor, the Editorial Board or the publisher do not accept any responsibility for opinions expressed in articles.

Financial expenses of the journal are covered by Turkish Sleep Medicine Society (TSMS).

Correspondence Address

Editor in Chief, Gülçin Benbir Şenel

Address: Kocamustafapaşa Cd. Merih İş Merkezi No:45 D:55 Kocamustafapaşa - Fatih / Istanbul

E-mail: drgulcinbenbir@yahoo.com

Phone: +90 530 409 82 60

Publisher Corresponding Address

Galenos Yayınevi

Address: Molla Gürani Mah. Kaçamak Sok. No: 21 34093 Fındıkzade, İstanbul/ Turkey

E-mail: info@galenos.com.tr

Phone: +90 (530) 177 30 97 / +90 (539) 307 32 03

OPEN ACCESS

JOURNAL OF TURKISH SLEEP MEDICINE | JTSM

Yazarlara Bilgi

Yazar Kılavuzu

Journal of Turkish Sleep Medicine (Türk Uyku Tıbbı Dergisi) için göndereceğiniz eseri hazırlarken; aşağıda yer alan, size yardımcı olacak yönergeleri dikkatle okumanız önerilir. Herhangi bir sorunuz olması durumunda bizimle iletişime geçmekten çekinmeyiniz. Gözden geçirme ve yayımlanma işlemlerini hızlandırmak amacıyla, yönergelere uymayan makaleler gözden geçirme işleminden önce teknik düzeltmelerin yapılması için iletişim kurulacak yazara geri gönderilir.

İçerik

1. Dergi Hakkında
2. Editör İncelemesi ve Yayıma Kabul
3. Makale Kategorileri
4. Makale Gönderimi
5. Makalenin Yapısı
6. Makalenin Biçimi
7. Düzeltmeler
8. Etik Konular
9. Klinik Araştırmaların Kaydedilmesi
10. Telif Hakkı
11. Makalenin Kabulü
12. Erken Çevrimiçi Makaleler
13. Yazı İşleri

1. Dergi Hakkında

Journal of Turkish Sleep Medicine (Türk Uyku Tıbbı Dergisi), Türk Uyku Tıbbı Derneği'nin süreli resmi yayın organıdır. Yayın dili türkçe ve ingilizce olan; uyku ile ilgili temel klinik ve sosyolojik konuları ve uyku ve biyolojik ritimleri işleyen özgün araştırma makalelerini, olgu sunularını ve derleme türündeki yazıları yayımlar. Dergide yayımlanacak eserlerde yazar olmak için TUTD üyesi olma şartı aranmaz.
Dergide makale başvuru ücreti veya makale işlem ücreti uygulanmamaktadır.
Sıklık: Yılda dört sayı (mart, haziran, eylül sayıları ve aralık kongre özel sayısı)
E-ISSN: 2757-850X
Dergi Adı Kısaltması: J Turk Sleep Med
Yayıncı: Galenos Yayınevi

2. Editör İncelemesi ve Yayıma Kabul

→ Makale İnceleme Süreci: Dergiye gönderilen makale; konusuna göre, yardımcı editörlerden birine gönderilir. Sorumlu yardımcı editör, makaleyi incelemesi için en az iki adet hakemi görevlendirir ve hakemlerin yorumlarına göre makalenin yayımlanmasına, revizyonuna veya reddedilmesine 4-6 hafta içinde karar verir.

→ Yayıma Kabul: Tüm eserler için yayıma kabul kriterleri arasında; sunulan araştırmanın kalitesi, özgünlüğü ve derginin okuyucuları için dikkate değer olması yer alır. Tüm makaleler sırasıyla gözden geçirilir. Editör herhangi bir materyali yayımlamayı reddetme hakkına sahiptir. Makalenin kabul olması veya reddedilmesi ile ilgili son karar Yayın Kurulu'na aittir.

→ Makalenin Yayımlanmasından Önce: Tüm makaleler açık, öz ve anlaşılır bir biçimde yazılmalıdır; böylece makalenin yazıldığı alanda uzman olmayan profesyonel okuyucular tarafından da anlaşılabilir olması sağlanmalıdır. İçeriği bakımından yayımlanabilir olduğuna karar verilen eserler için editörler, makaledeki anlam belirsizliklerini ve tekrarları gidermek ve yazar ile okuyucu arasındaki iletişimi geliştirmek amacıyla makalede değişiklik yapabilir. Eğer kapsamlı değişiklik yapılması gerekiyor ise eserler düzeltme için yazarlara geri gönderilir.

3. Makale Kategorileri

→ Özgün Makale: Temel veya klinik konular üzerine güncel araştırmaların ayrıntılı bir biçimde sunulmasıdır.
• Kelime Sınırı: Özet hariç olmak üzere tablo, şekil ve referanslar dahil en fazla 6000 kelime.
• Özet: En fazla 250 kelime, yapılandırılmış (giriş, amaç, gereç yöntem, bulgular, sonuç altbaşlıkları ile).
• Şekiller/Tablolar: En fazla 2 adet.
• Referanslar: En fazla 30 adet.

→ Kısa Yazı: Araştırmaları veya klinik uygulamaları önemli ve hızlı bir şekilde etkileyen yeni buluşları içerir. Olgu sunumlarını içermez.
• Kelime sınırı: Özet hariç olmak üzere tablo, şekil ve referanslar dahil en fazla 1800 kelime.
• Özet: En fazla 100 kelime, yapılandırılmamış (alt başlıklar kullanılmadan).
• Şekiller/Tablolar: En fazla 5 adet.
• Referanslar: En fazla 10 adet.
Kısa yazılar için destekleyici bilgilere izin verilmemektedir.

→ Olgu Sunumu: Ender görülen, ilginç klinik vakalar ve yenilikler yayımlanmak için dikkate alınır. Editör; uygun görmesi durumunda, yazarlardan olgu sunumunu "Editöre Mektup" formatında tekrar yazılmasını isteyebilir.
• Kelime sınırı: Özet hariç olmak üzere tablo, şekil ve referanslar dahil en fazla 1200 kelime.
• Özet: En fazla 100 kelime, yapılandırılmamış (alt başlıklar kullanılmadan).
• Şekiller/Tablolar: En fazla 2 adet.
• Referanslar: En fazla 10 adet.

→ Editöre Mektup: Herhangi bir tartışma konusunda yazılmış mektuplar (klinik gözlemler, son çıkan sayılarda yayımlanan yazılara yapılan yorumlar vb.) editöre gönderilebilir. Bu yazılar da editör incelemesine tabidir. Mektuplarda isteğe bağlı bir başlık kullanılabilir. Yazarların söz konusu mektuplara verdikleri yanıtlarda mektubun başlığı belirtilmelidir (Örn. Makalenin Başlığı'na yanıt olarak). Bu, okuyucuların tartışmanın hatlarını takip edebilmelerini sağlayacaktır.
• Kelime sınırı: En fazla 500 kelime.
• Özet: Özet içermez.
• Şekiller/Tablolar: En fazla 1 adet.
• Referanslar: En fazla 5 adet.

→ Derleme Makalesi: Anket, güncel araştırmaların değerlendirmeleri ve eleştirel yorumlamaları, derginin kapsadığı alanlardaki veri ve kavramları içeren derleme makalelerini içerir.
• Kelime sınırı: Özet hariç olmak üzere tablo, şekil ve referanslar dahil en fazla 8000 kelime.
• Özet: En fazla 250 kelime, yapılandırılmamış (alt başlıklar kullanılmadan).
• Şekiller/Tablolar: Resimler, şekiller veya tablolar başka bir kaynaktan alınarak kullanıldıysa telif hakkı sahibinden (genellikle yayınevi) materyali çoğaltmak için izin verildiğini belirten bir mektubun 'üst yazı' ile birlikte gönderilmesi gerekmektedir.

→ Editör Notu: Bir makale veya bilgi güncellemesi hakkında görüş notu editör tarafından davet edilir.
• Kelime sınırı: En fazla 1500 kelime.
• Özet: Özet içermez.
• Referanslar: En fazla 5 adet.

4. Makale Gönderimi

Makaleler aşağıdaki adresten online olarak gönderilmelidir:
https://www.journalagent.com/jtsm
İnternet sitesini kullanırken veya makale ile ilgili herhangi bir sorun olması durumunda teknik yardım için lütfen Galenos Yayınevi veya Editörler Kurulu ile iletişime geçiniz.
Tüm yazışmalar e-posta yoluyla yapılacağından dolayı yazarlar e-posta adreslerini belirtmelidir.
Makale gönderimi yapılırken sorumlu yazarın ORCID ID (Open Researcher and Contributor ID) numarası belirtilmelidir. ORCID ID edinmek için http://orcid.org adresinden ücretsiz olarak kayıt oluşturulabilir.

→ Dergiye gönderilen tüm makaleler bu kurallara uymalıdır. Aksi takdirde makale yazara geri gönderilir ve yayımlanması gecikir.

JOURNAL OF TURKISH SLEEP MEDICINE | JTSM

Yazarlara Bilgi

• Bir paragraf içinde satırların sonunda "enter" tuşu kullanılmamalıdır.
• Heceleme seçeneği kapalı tutulmalı, sadece anlam için gerekli olan durumlarda "tire" kullanılmalıdır.
• Türkçe veya ingilizce olmayan karakterleri temsil etmek için kullanılan özel karakterler açıkça belirtilmelidir.
• 1 (bir) yerine I (le), 0 (sıfır) yerine O (büyük harf o) veya β (Yunancada beta) yerine ß (Almanca Eszett harfi) kullanılmamalıdır.
• Tablolarda veri göstergelerini ayırmak için boşluk yerine "tab" tuşu kullanılmalıdır. Tablo düzenleme fonksiyonu kullanıldıysa her bir veri göstergesinin tek bir hücrede olduğundan emin olunmalıdır. (örn. Hücreler içinde satırbaşı komutu kullanılmamalıdır)

→ Yazarlar 'üst yazı'yı başlık sayfasından ayrı olarak hazırlamalıdır. Makalenin içeriğinin bilimsel toplantı veya sempozyumda kısa özet şeklinde sunulmanın haricinde; daha önce başka bir yerde yayımlanmamış veya yayımlanmak üzere gönderilmemiş olduğu bu yazıda beyan edilmelidir. Üst yazıda ayrıca tüm yazarların makalenin içeriği hakkında fikir birliği içinde olduklarının belirtilmesi gerekmektedir. Tüm yazarların makale gönderiminden önce Makale Merkezi'ne kaydedilmesi gerekmektedir.

Yazarlar ayrıca araştırma projesinin bir "Etik Komite" tarafından onaylandığını, onay numarası ile birlikte belirtmelidir (bkz. Etik Konular). Bu bilgi, araştırmanın "Gereç ve Yöntem" bölümünde belirtilmelidir. İnsan deneylerinde yazarlar, 1964 yılı Helsinki Bildirgesi (2013 yılı Edinburg'da revize edilmiş hali ile) hükümlerine uymalıdır ve çalışmanın katılımcılarının bilgilendirilmiş olur verdiklerine dair bir ifade eklemelidir. Hasta kimliğinin gizli kalması sağlanmalıdır. Klinik araştırmalarda yazarlar çalışma kaydının adını ve kayıt numarasını üstyazıda bildirmelidir. Kaydedilmemiş bir klinik deneyde neden kayıt yapılmadığı açıklanmalıdır.

5. Makalenin Yapısı

Makalenin uzunluğu "Makale Kategorileri" bölümündeki şartlara uymalıdır. Belirtilen yönergelere uymayan makaleler, incelemeye başlanmadan önce teknik düzeltmelerin yapılması için iletişim kurulacak yazara geri iletilecek ve makale yayım için gönderilmemiş sayılacaktır.

Makaleler belirtilen sırayla sunulmalıdır: Başlık sayfası, özet ve anahtar kelimeler, metin, teşekkür ve beyanlar, referanslar, resim ve şekiller, tablolar, denklemler. Metine dipnot verilmemelidir, bu tür notlar metinde parantez içinde belirtilmelidir.

→ Başlık Sayfası: Şunları içermelidir;
• Makalenin kategorisi
• Makalenin başlığı
• Makalenin kısa başlığı
• Yazarların tam adları ve kurumları
• Çalışmanın yapıldığı kurumun adresi
• İletişim kurulacak yazara ait tam posta ve e-posta adresleri, faks ve telefon numaraları
• Kelime sayısı

Başlık 120 karakterden az olmalıdır. Başlıkta REM, DNA gibi yaygın kullanılan kısaltmalar dışında kısaltma kullanılmamalıdır. Boşluklar dahil 40 karakteri aşmayacak bir kısa başlık da belirtilmelidir.

→ Özet ve Anahtar Kelimeler: "Makale Kategorileri" bölümündeki koşullara uymalıdır. Özette yaygın kullanılan kısaltmalardan başka kısaltma veya referans yer almamalıdır. Anahtar kelimeler özet bölümünün altında yer almalı ve 3-7 adet olmalıdır.

→ Metin: Yazarlar makalenin bölümlerini belirtilen sıra ile oluşturmalıdır: Giriş, Gereç ve Yöntemler, Bulgular, Sonuç. Lütfen bu koşulların makale tipine göre değişiklik gösterdiğini unutmayınız ve "Makale Kategorileri" bölümünü tekrar gözden geçiriniz.

→Teşekkür ve Beyanlar: Yazarlar çıkar çatışması yaratabilecek herhangi bir finansal destek veya ilişkiyi beyan etmelidir. Finansal bağış veya diğer fon yardımlarının kaynağını bildirmelidir. Yazarlar finansal beyanda bulunmak ve olası çıkar ilişkilerini açıklamak için sunulan seçenekleri rehber olarak kullanabilir: İstihdam/liderlik konumu/danışmanlık rolü, hisse sahibi, patent telifleri/lisans ücretleri, honoraryum (örn. ders ücretleri), promosyon malzemeleri ücretleri (örn. makale ücretleri), araştırma fonu veya diğer (örn. araştırma ile ilgili olmayan gezi, seyahat veya hediyeler).

→ Referanslar: Vancouver sistemi kullanılmalıdır: http://barrington.cranfield.ac.uk/help/vancouver-system-for-citing-references. Metin içinde referanslara üst simge normal rakamlar kullanılarak geçiş sırasına göre atıfta bulunulmalıdır. Eğer sadece tablo veya şekil başlıklarında atıfta bulunuluyorsa tablo veya şeklin metinde ilk geçtiği yere göre numaralandırılmalıdır. Referans listesinde referanslar metindeki geçiş sırasına göre numaralandırılmalı ve listelenmedir. Referans listesinde tüm yazar adları yer almalıdır. Yayımlanmamış veri ve kişisel iletişimler listede yer almamalıdır, bunlara sadece metin içinde atıfta bulunulmalıdır (Örn. Smith A, 2000, yayınlanmamış veri).

1) Korkmaz S, Cakir D, Bayram F, Karaca Z, Ismailogullari S, Aksu M. Obstructive Sleep Apnea Syndrome in Acromegaly Before and After Treatment. JTSM 2014;1:22-7.
2) Ernstoff M. Urologic Cancer. Black-well Science, Boston,1997.
3) Gilchrist RK. Further commentary: Continent stroma. In: King LR, Stone AR, Webster GD (eds). Bladder Reconstruction and Continent Urinary Diversion. Year Book Medical, Chicago, 1987;204-5.

DOI kullanan standart dergi makaleleri; cilt, sayı veya sayfa sayısı almadan önce online olarak yayınlanan makaleler (DOI hakkında daha fazla bilgi için: http://www.doi.org/faq.html):

4) Korkmaz S, Cakir D, Bayram F, Karaca Z, Ismailogullari S, Aksu M. Obstructive Sleep Apnea Syndrome in Acromegaly Before and After Treatment. JTSM İnternet ağı üzerinde yayınlandığı tarih 30 Mart 2014; doi: 10.1111/j.1479-8425.2008.00379.x

→ Resim ve Şekiller: Başlıkları resim ve şekilden ayrı olarak belirtilmelidir. El çizimleri ve fotoğraflar dahil tüm çizimler resim veya şekil olarak sınıflandırılır. Resim ve şekillere metinde sırayla atıfta bulunulmalıdır. Her bir resim-şekil ayrı bir dosya olarak hazırlanmalıdır ve resim-şekil numarası dosya adında yer almalıdır. Makale inceleme işlemi sırasında aktarmayı kolaylaştırmak için .jpg veya .bmp olarak kaydedilmiş düşük çözünürlükteki resim-şekillerin gönderilmesi uygundur. Makalenin kabulünden sonra yayın için yazarlardan resim-şekillerin daha yüksek çözünürlüklü halleri talep edilebilir.
• Boyut: Resim-şekil boyutları tek sütuna sığmalı (82 mm), orta boyutta olmalı (118 mm) veya tam metin boyutuna sığmalıdır (173 mm).
• Çözünürlük: Resim-şekiller yüksek çözünürlüklü .eps veya .tif dosyaları olarak hazırlanmalıdır.
• Koşullar: Yarım ton resim-şekiller 300 dpi (dots per inch), renkli resim-şekiller 300 dpi ve RGB (kırmız, yeşil, mavi) modu yerine CMYK (cam göbeği, mor pembe, sarı, siyah) modunda ayarlanmış olarak kaydedilmiş şekilde, yazı içeren resim-şekiller 400 dpi, çizim halindeki şekiller 1000 dpi. şeklinde düzenlenmelidir.
• Çizim şekilleri: Profesyonel olarak veya bir bilgisayar grafik paketi ile çizilmiş keskin siyah veya beyaz grafikler veya diyagramlar şeklinde olmalıdır.
• Resim veya şekillerdeki metin boyutları: Yazı karakteri eklenmelidir. Derginin yazı boyutundan veya 8 puntodan daha büyük olmamalıdır. (Resim-şekillerin indirgenmesinin ardından yazı hala okunabiliyor olmalıdır.)
• Çizgi genişliği: 0,5 ve 1 nokta arasında olmalıdır. (Geniş veya kalın çizgilerden kaçınılmalıdır.)

Çizimlerin hazırlanması ile ilgili daha fazla yardım için link: http://authorservices.wiley.com/bauthor/author.asp

→ Tablolar: Her bir tablo ayrı bir dosya olarak hazırlanmalıdır. Dosya adı tablo numarasını içermelidir. Tablolar; ayrı bir sayfada altyazıları, açıklamaları ve başlıkları ile birlikte belirtilmelidir. Düzenlenebilir metin olarak verilmelidir. Metin içinde normal rakamlar ile numaralandırılmalıdır. PDF halinde sunulmamalıdır. Dikey çizgiler kullanılmamalıdır. Tüm kısaltmalar açıklanmalıdır. Semboller sırasıyla şu şekilde kullanılmalıdır: †, ‡, §, ¶; ve *, **, *** sembolleri p değerleri için kullanılmalıdır. SS ve SEM gibi istatistiksel kısaltmalar açıklama olmadan kullanılabilir.

JOURNAL OF TURKISH SLEEP MEDICINE | JTSM

Yazarlara Bilgi

→ Denklemler: Normal rakamlarla sıralı olarak numaralandırılmalıdır. Bunlar, parantez içinde sağ tarafta verilmelidir. Tüm değişkenler italik olarak belirtilmelidir. Örn.

dx/dt = c (x – x2/3 + y + z) (1)

DY/DT = –(X + BY – A)/C (2)

Ek Bilgi: Bulgular ile yakından ilgili olan destekleyici bilgiler yer alabilir.

6. Makalenin Biçimi

→ İmla: Kimyasal adları gibi yabancı isim ve terimler orijinal dilinde yazılmalıdır.

→ Birimler: Tüm ölçümler SI birimleri veya SI'dan türetilen birimler ile verilmelidir. SI birimleri hakkında daha fazla bilgi için Bureau International des Poids et Mesures (BIPM) internet sayfasını (http://www.bipm.fr) ziyaret ediniz.

→ Kısaltmalar: Kısaltmalar az miktarda kullanılmalıdır. Öncelikle ifadenin açık hali ardından parantez içinde kısaltması belirtilmelidir. DNA gibi yaygın kullanılan kısaltmalar açıklaması olmadan kullanılabilir.

→ Marka İsimleri: İlaçlar ve kimyasallar marka isimleriyle verilmemelidir. Çalışmada tescilli ilaçlar veya kimyasallar kullanıldı ise jenerik isimleriyle belirtilerek parantez içinde marka adı ve tedarikçi firmanın adı ve yeri belirtilmelidir.

Yayın Politikası ve Makale Yazım Kuralları, International Committee of Medical Journal Editors (ICMJE) tarafından sunulan "Recommendations for the Conduct, Reporting, Editing, and Publication of Scholarly Work in Medical Journals (ICMJE Recommendations)" (http://www.icmje.org) temel alınarak hazırlanmıştır.

Araştırma makalelerinin hazırlığı, sistematik derlemeleri, meta-analizleri ve olgu sunumları ise uluslararası kılavuzlara uygun olmalıdır:

• Randomize çalışmalar için; CONSORT (Moher D, Schultz KF, Altman D, for the CONSORT Group. The CONSORT statement revised recommendations for improving the quality of reports of parallel group randomized trials. JAMA 2001; 285:1987-91) (http://www.consort-statement.org).

• Sistematik derleme ve meta-analizlerin raporlamaları için; PRISMA (Moher D, Liberati A, Tetzlaff J, Altman DG, The PRISMA Group. Preferred Reporting Items for Systematic Reviews and Meta-Analyses: The PRISMA Statement. PLoS Med 2009; 6(7): e1000097) (http://www.prisma-statement.org).

• Tanısal değerli çalışmalar için; STARD (Bossuyt PM, Reitsma JB, Bruns DE, Gatsonis CA, Glasziou PP, Irwig LM, et al, for the STARD Group. Towards complete and accurate reporting of studies of diagnostic accuracy: the STARD initiative. Ann Intern Med 2003;138:40-4) (http://www.stard-statement.org).

• Gözlemsel çalışmalar için; STROBE (http://www.strobe-statement.org).

• Meta-analizleri ve gözlemsel çalışmaların sistematik derlemeleri için; MOOSE (Stroup DF, Berlin JA, Morton SC, et al. Meta-analysis of observational studies in epidemiology: a proposal for reporting "Meta-analysis of observational Studies in Epidemiology" (MOOSE) group. JAMA 2000; 283: 2008-12).

• CARE kılavuzları, olgu sunumlarının doğruluğunu, şeffaflığını ve yararlılığını artırmak için tasarlanmıştır. (Gagnier JJ, Kienle G, Altman DG, Moher D, Sox H, Riley D; the CARE Group. The CARE Guidelines: Consensus-based Clinical Case Reporting Guideline Development.) (http://www.care-statement.org)

7. Düzeltmeler

Sayfa dizgi düzeltmelerini içeren PDF (Portable Document Format) dosyasının indirilebileceği linke ait adresin bildirimi, gerekli formlar ve daha fazla açıklamalar iletişim kurulacak yazara e-posta yoluyla gönderilecektir. PDF düzeltmesinin amacı makalenin düzeninin, tabloların ve şekillerin son kontrolünü sağlamaktır. PDF düzeltmesi aşamasında hataların çok gerekli düzeltmeleri dışındaki değişikliklere izin verilmemektedir.

8. Etik Konular

Yazarlar; araştırma projesini, çalışmanın yapıldığı kuruma ait etik komite tarafından onaylandığını belirtmelidir. Yazılı onam gerekli değildir ancak editör bu tür bir belgeyi talep etme hakkını saklı tutar. Hayvan denekleri içeren herhangi bir deney, kurumsal bir etik komite tarafından onaylanmalı ve bu da metin içinde bildirilmelidir.

9. Klinik Araştırmaların Kaydedilmesi

Tüm klinik araştırmalar kayıt edilmelidir. Yazarlar kayıt detaylarını makalede belirtmelidir. Bir klinik araştırma, medikal girişimler ve bunların sağlık açısından sonuçları arasındaki sebep sonuç ilişkilerini araştırmak için prospektif olarak insan deneklerini girişime veya karşılaştırmalı gruplara dahil eden herhangi bir araştırma projesi olarak tanımlanır.

10. Telif Hakkı

Tüm yazarlar 'Özel Lisans Formu'ndaki hususları kabul etmeli ve bu formu imzalamalıdır veya onların adlarına iletişim kurulacak yazarın imzalamasını kabul etmelidir. Bu formu imzalayarak, yazarların telif hakkına tabi veya daha önceden yayımlanmış herhangi bir materyali kullanmak için izin aldıkları kabul edilir. Form buradan indirilebilir.

11. Makale Kabulü

• Kabulden önce yazarlar, makalelerinin değerlendirme sürecinin hangi aşamasında olduğunu https://www.journalagent.com/jtsm adresinden takip edebilirler.

• Kabulden sonra yazarlar, Galenos Yayınevi'nden makalelerinin işleyiş süreci hakkında bilgi edinebilirler. Bu, yazarlara makalelerinin kabul olduktan sonra internette yayınlanmasına kadar olan sürecini takip etmelerini sağlar. Yazarlara işlemlerin kilit noktalarında otomatik olarak e-posta gönderilir; böylece işleyişi kontrol etmek için editörle iletişime geçmelerine gerek kalmaz. İnternet ağı üzerinde işleyiş takibi hakkında daha ayrıntılı bilgi, sıkça sorulan sorular ve makale hazırlamayla ilgili ipuçları dahil bol miktarda kaynak, makale gönderimi ve daha fazlası için http://www.tutd.org.tr adresini ziyaret ediniz.

12. Erken Çevrimiçi Makaleler

Bir "Erken Çevrimiçi Makale" makale, tam metin bir makalenin sayıda yayınlanmadan önce internet ağında elektronik olarak yayınlanmış halidir. Bu sayede makale hazır olur olmaz görünebilir durumdadır. Erken Çevrimiçi Makaleye bir DOI (Digital Object Identifier) numarası verilir; böylece bir sayıda yer almadan önce bu makaleye atıfta bulunulabilir ve makale takip edilebilir. Yayınlanmadan önce DOI geçerli olarak kalır ve makaleye atıfta bulunmak ve erişmek için kullanılmaya devam edilebilir. DOI hakkında daha fazla bilgi için http://www.doi.org/faq.html adresini ziyaret ediniz.

13. Yazı İşleri

Türk Uyku Tıbbı Derneği (TUTD)
Adres: Naci Çakır Mah. 760. Sok. Esenkent Sitesi D Apt. No: 25 D: 17 Çankaya, Ankara/Türkiye
Telefon: +90 530 409 82 60
Faks: +90 312 480 89 58
E-posta: dergi@tutd.org.tr

JOURNAL OF TURKISH SLEEP MEDICINE | JTSM

Instructions to Authors

Author Guide

Please take your time to consult the following instructions to help you prepare your manuscript in the Journal of Turkish Sleep Medicine, and feel free to contact us with any questions. To ensure fast peer review and publication, manuscripts that do not follow the instructions are returned to the corresponding author for technical revision before undergoing peer review.

Contents

1. About the Journal
2. Editorial Review and Acceptance
3. Manuscript Categories
4. Submission of Manuscript
5. Structure of Manuscript
6. Style of Manuscript
7. Proofs
8. Ethical Considerations
9. Clinical Trials Registry
10. Copyright
11. Tracking Manuscript
12. Early View
13. The Journal Online

1. About The Journal

Scope Journal of Turkish Sleep Medicine is the official turkish and english language journal of the Turkish Sleep Medicine Society (TSMS), and publishes original research articles, articles, case reports and review articles on basic clinical and sociological issues, dealing with Journal of sleep medicine. Both members and non-members of the TSMS are welcome to submit papers to the journal.

The journal does not charge any article submission or processing charges.

Frequency: Four issues per year (issues in march, june, september and congress special issue in december)
E-ISSN: 2757-850X
Journal abbreviation: J Turk Sleep Med
Publisher: Galenos Yayınevi

2. Editorial Review And Acceptance

→ Review process: A submitted paper is assigned to one of the associate editors according to the topics of paper. The responsible associate editor appoints more than two reviewers for evaluating the paper and decides whether the paper should be accepted for publication, revised or rejected, according to the reviewers' comments within four to six weeks.

→ Acceptance: The acceptance criteria for all papers are the quality and originality of the research and its significance to our readership. All manuscripts are peer reviewed. The Editor reserves the right to refuse any material for publication. Final acceptance or rejection rests with the Editorial Board.

→ Before publication: All manuscripts should be written in a clear, concise, direct style so that they are intelligible to the professional reader who is not a specialist in the particular field. Where contributions are judged as acceptable for publication on the basis of content, the Editor reserves the right to modify manuscripts to eliminate ambiguity and repetition and improve communication between author and reader. If extensive alterations are required, the manuscript will be returned to the author for revision.

3. Manuscript Categories

→ Original Article: Full-length presentation of current research related to either basic or clinical knowledge.

• Word limit: 6000 words maximum, excluding abstract but including references, tables and figures.
• Abstract: 250 words maximum, structured (introduction/aim, material methods, results, discussion).

→ Short Paper: Short papers cover new findings that could substantially and immediately affect research or clinical practice. Short papers do not include case reports.

• Word limit: 1800 words maximum, excluding abstract but including tables, figures and references,.
• Abstract: 100 words maximum, unstructured (no use of subheadings).
• Figures/ tables: Maximum 5.
• References: Maximum 10.

Supporting information is not allowed for short papers.

→ Case Report: Clinical cases of exceptional interest and novelty are considered for publication. If appropriate, the Editor may ask authors to rewrite case reports as "Letters to the Editor".

• Word limit: 1200 words maximum, excluding abstract but including references, tables and figure legends.
• Abstract: 100 words maximum, unstructured (no use of subheadings).
• Figures/ tables: Maximum 2.
• References: Maximum 10.

→ Letters to the Editor: Letters may be submitted to the Editor on any topic of discussion: clinical observations, as well as comments on papers published in recent issues. Letters to the Editor are subject to peer review. Letters can use an arbitrary title.

The responses to the letter from authors must cite the title of the letter: e.g. Response to [title of letter]. This ensures that readers can track the line of discussion.

• Word limit: 500 words maximum.
• Abstract: No abstract.
• Figures/ tables: Maximum 1.
• References: Maximum 5.

→ Review Article: Survey, evaluation and critical interpretation of recent research, data and concepts in the fields covered by the journal review articles will undergo peer review prior to acceptance.

• Word limit: 8000 words maximum, excluding abstract but including tables, figures and references.
• Abstract: 250 words maximum, unstructured (no use of subheadings).
• Figures/tables: If figures or tables have been reproduced from another source, a letter from the copyright holder (usually the Publisher), stating authorization to reproduce the material, must be attached to the covering letter.

→ Editorial Critical: comments and overview about an article or an updated subject invited by the Editor.

• Word Limit: 1500 words maximum.
• Abstract: No abstract.
• References: Maximum 5.

4. Submission of Manuscript

Manuscripts must be submitted online at: https://www.journalagent.com/jtsm

If there are any problems using the site or managing a manuscript, please contact with Galenos Yayınevi or Editorial Board.

Authors must supply an email address as all correspondence will be by email.

The ORCID ID (Open Researcher and Contributor ID) number of the correspondence author should be provided while sending the manuscript. A free registration can be done at http://orcid.org.

→ General All articles submitted to the Journal should comply with these instructions. Otherwise, the manuscript will be returned to the author and publication may be delayed.

JOURNAL OF TURKISH SLEEP MEDICINE | JTSM

Instructions to Authors

• Do not use 'Enter' at the end of lines within a paragraph.
• Turn the hyphenation option off; includeonly those hyphens that are essential tothe meaning.
• Specify any special characters used to rep-resent non-English characters.
• Do not use l (ell) for 1 (one), O (capital o) for 0 (zero) or ß (German esszett) for β (Greek beta).

5. Structure of the Manuscript

The length of manuscripts must adhere to the specifications under the section "Manuscript Ca-tegories". Manuscripts that do not adhere to the following instructions will be returned to the corresponding author for technical revision before undergoing peer review (unsubmitted). Manuscripts should be presented in the following order: Title page, abstract and key words, text, acknowledgments including disclosure, references, figure legends, tables and figures. Footnotes to the text are not allowed and any such material should be incorporated into the text as parenthetical matter.

→ Title Page: The title page should contain:
• Manuscript category
• The title of the paper
• The running title of the paper
• The full names of the authors and their institutions
• The addresses of the institutions at which the work was carried out together
• The full postal and email address, plus facsimile and telephone numbers, of the corresponding author
• Word count

The title should be less than 120 characters. Do not use abbreviations in the title, other than common abbreviations such as REM, DNA and so on. A short running title (less than 40 char-acters including spaces) should also be provided.

→ Abstract And Keywords: The abstract must adhere to the specifications in "Manuscript Ca-tegories". The abstract should not contain abbreviations other than common abbreviations or references. 3 to 7 key words should be supplied below the abstract in the main text.

→ Text: Authors should set out the sections of the manuscript as follows: Introduction, Materi-als and Methods, Results, Discussion, in this order. Please note that the requirements differ ac-cording to manuscript types. Please refer to "Manuscript Categories".

→ Acknowledgments/ Disclosure: Authors must declare any financial support or relationships that may pose a conflict of interest. The source of financial grants and other funding must be disclosed. Authors may consider, as a guide for financial disclosures, reporting interests as de-scribed in the following list: Employment/ leadership position/advisory role, stock ownership, patent royalties/licensing fees, honoraria (e.g. lecture fees), fees for promotional materials (e.g. manuscript fees), research funding, or other (e.g. trips, travel, or gifts which are not related to research).

→ References: The Vancouver system of referencing should be used:
http:// barrington.cranfield.ac.uk/help/ vancouver-system-for-citing-references. In the text, ref-erences should be cited using superscript Arabic numerals in the order in which they appear. If cited only in tables or figure legends, number them according to the first identification of the table or figure in the text. In the reference list, the references should be numbered and listed in order of appearance in the text. List all authors in the reference list. References to unpublished data and personal communications should not appear in the list but be cited in the text only (e.g. Smith A, 2000, unpublished data).

1) Korkmaz S, Cakir D, Bayram F, Karaca Z, Ismailogullari S, Aksu M. Obstructive Sleep Ap-nea Syndrome in Acromegaly Before and After Treatment. JTSM 2014;1:22-7.
2) Ernstoff M. Urologic Cancer. Black-well Science, Boston.1997.
3) Gilchrist RK. Further commentary: Continent stroma. In: King LR, Stone AR, Webster GD (eds). Bladder Reconstruction and Continent Urinary Diversion. Year Book Medical, Chicago, 1987;204-5.

Standard journal articles using DOI; articlespublished online in advance without volume, issue, or page number (More information about DOIs: http://www.doi.org/faq.html):

4) Korkmaz S, Cakir D, Bayram F, Karaca Z, Ismailogullari S, Aksu M. Obstructive Sleep Ap-nea Syndrome in Acromegaly Before and After Treatment. JTSM Published online 30 March 2014; doi: 10.1111/j.1479-8425.2008.00379.x

→ Figure Legends: Figure legends should be provided separately from the figures. All illustra-tions, including line drawings and photographs, are classified as figures. Figures should be cit-ed in consecutive order in the text. Each figure should be supplied as a separate file, with the figure number incorporated in the file name. For submission, low-resolution figures saved as .jpg or .bmp files are acceptable for ease of transmission during the review process. After ac-ceptance the authors could be asked to provide higher resolution figures for publication.
• Size: Figure sizes should fit within a single column (82 mm), an intermediate size (118 mm), or the full text width (173 mm).
• Resolution: Figures must be supplied as high resolution .eps or .tif files.
• The specifications for the figures are the following: halftone figures 300 dpi (dots per inch); color figures 300 dpi saved as CMYK; figures containing text 400 dpi; line figures 1000 dpi. Figure files should be set up in CMYK (cyan, magenta, yellow, black) mode, not in RGB (red, green, blue) mode.
• Line figures: Line figures must be sharp black and white graphs or diagrams, drawn profes-sionally or with a computer graphics package.
• Text sizing in figures: Lettering must be included and should be sized to be no larger than the journal text or 8 point. (Text should be readable after reduction - avoid large type or thick lines.)
• Line width: Between 0.5 and 1 point. More help on preparation of illustrations can be found here: http://authorservices. wiley.com/bauthor/ author.asp

→ Tables: Each table should be supplied as a separate file with the table number in the file name.

Provide tables on a separate sheet with caption, explanation and the title of the table.

Tables must be supplied as editable text. The tables should be numbered in the text in Arabic numerals.

Vertical lines should not be used. All abbreviations must be defined. Symbols: †, ‡, §, ¶, should be used (in that order) and *, **, *** should be reserved for P-values. Statistical measures such as SD or SEM can be used without definition.

→ Equations: Equations should be numbered sequentially with Arabic numerals; these should be ranged right in parentheses. All variables should appear in italics.

Examples:

$dx/dt = c(x - x3/3 + y + z)$ (1)

$DY/DT = -(X + BY - A)/C$ (2)

Supporting Information: Supporting information closely related to the relevant findings is ac-ceptable.

6. Style of Manuscript

→ Spelling: Foreign names and terms, such as names of chemicals, should be written in the original language. Proper nouns and German nouns should be capitalized.

→ Units: All measurements must be given in SI or SIderived units. For more information about SI units, please go to the Bureau International des Poids et Mesures (BIPM) website at: http://www.bipm.fr

JOURNAL OF TURKISH SLEEP MEDICINE | JTSM

Instructions to Authors

→ Abbreviations: Use abbreviations only sparingly. Initially use the word spelt out in full, followed by the abbreviation in parentheses. Common abbreviations such as DNA are excluded.
→ Trade Names: Drugs and chemicals should not be referred to by their trade names. If proprietary drugs or chemicals have been used in the study, refer to them by their generic name, mentioning the proprietary name and the name and location of the manufacturer in parentheses.
• The Editorial Policies and General Guidelines for manuscript preparation specified below are based on "Recommendations for the Conduct, Reporting, Editing, and Publication of Scholarly Work in Medical Journals (ICMJE Recommendations)" by the International Committee of Medical Journal Editors (ICMJE) (http://www.icmje.org). Preparation of original articles, systematic reviews, meta-analyses, and case reports must comply with study design guidelines:
• CONSORT statement for randomized controlled trials (Moher D, Schultz KF, Altman D, for the CONSORT Group. The CONSORT statement revised recommendations for improving the quality of reports of parallel group randomized trials. JAMA 2001; 285: 1987-91) (http://www.consort-statement.org),
• PRISMA statement of preferred reporting items for systematic reviews and meta-analyses (Moher D, Liberati A, Tetzlaff J, Altman DG, The PRISMA Group. Preferred Reporting Items for Systematic Reviews and Meta-Analyses: The PRISMA Statement. PLoS Med 2009; 6(7): e1000097.) (http://www.prisma-statement.org),
• STARD checklist for the reporting of studies of diagnostic accuracy (Bossuyt PM, Reitsma JB, Bruns DE, Gatsonis CA, Glasziou PP, Irwig LM, et al., for the STARD Group. Towards complete and accurate reporting of studies of diagnostic accuracy: the STARD initiative. Ann Intern Med 2003;138:40-4.) (http://www.stard-statement.org),
STROBE statement, a checklist of items that should be included in reports of observational studies (http://www.strobe-statement.org),
• MOOSE guidelines for meta-analysis and systemic reviews of observational studies (Stroup DF, Berlin JA, Morton SC, et al. Meta-analysis of observational studies in epidemiology: a proposal for reporting Meta-analysis of observational Studies in Epidemiology (MOOSE) group. JAMA 2000; 283: 2008-12),
• CARE guidelines are designed to increase the accuracy, transparency, and usefulness of case reports. (Gagnier JJ, Kienle G, Altman DG, Moher D, Sox H, Riley D; the CARE Group. The CARE Guidelines: Consensus-based Clinical Case Reporting Guideline Development.) (http://www.care-statement.org)

7. Proofs

Notification of the URL from which to download a Portable Document Format (PDF) typeset page proof, associated forms and further instructions will be sent by email to the corresponding author. The purpose of the PDF proof is a final check of the layout, and of tables and figures. Alterations other than essential corrections of errors are unacceptable at PDF proof stage.

8. Ethical Considerations

Authors must state that the research project has been approved by an ethics committee of the institution where the work was undertaken. Written consent is not a requirement, but the Editor retains the right to request such documentation. Any experiments involving animals must be approved by an institutional ethical committee which must be declared in the text.

9. Clinical Trials Registry

All clinical trials must be registered. Authors must include registration details in the manuscript. We define a clinical trial as any research project that prospectively assigns human subjects to intervention or comparison groups to study the cause-and-effect relationship between a medical intervention and a health outcome.

10. Copyright

All authors must agree to the conditions outlined in the Exclusive License Form, and must sign the form or agree that the corresponding author may sign on their behalf. In signing the form it is assumed that authors have obtained permission to use any copyrighted or previously published material. Authors can download the form here.

11. Tracking Manuscript

• Before acceptance authors can track a manuscript's progress through the review process at: https://www.journalagent.com/jtsm
• After acceptance authors can get information about the production process of their paper by registering at Galenos Yayinevi. This enables authors to track their article, once it has been accepted, through the production process to publication online. Authors can receive automated emails at key stages of production so they do not need to contact the Production Editor to check on progress. For more details on online production tracking and for a wealth of resources, including FAQs and tips on article preparation, submission and more, visit: http://www.tutd.org.tr

12. Early View

An Early View article is a complete full-text article published on line in advance of publication in an issue. The article is therefore available as soon as it is ready. The Early View article is given a Digital Object Identifier (DOI), which allows the article to be cited and tracked before it is allocated to an issue. Before online publication, the DOI remains valid and can continue to be used to cite and access the article. More information about DOIs can be found at: http://www.doi.org/faq.html

13. Editorial Office

Turkish Sleep Medicine Society (TSMS)
Address: Naci Çakır Mah. 760. Sok. Esenkent Sitesi D Apt. No: 25 D: 17 Çankaya, Ankara/Türkiye
Phone: 0530 409 82 60
Fax: 0312 480 89 58
E-mail: dergi@tutd.org.tr

JOURNAL OF TURKISH SLEEP MEDICINE | JTSM

İçindekiler / Contents

Derleme / Review

168 Meme Kanseri Cerrahisi Sonrası Uyku Kalitesini Etkileyen Faktörler ve Hemşirelik Bakımı
Factors Affecting Sleep Quality and Nursing Care After Breast Cancer Surgery
Kıymet Öztepe Yeşilyurt, Neşe Ataman Bor; İstanbul, Hakkari, Türkiye

Özgün Makaleler / Original Articles

175 Cultural Adaptation of the Infant Sleep Scale for Parents
Ebeveynler için Bebek Uyku Ölçeği'nin Kültürel Uyarlaması
Turgut Akyol, Arzu Sarıalioğlu; Muş, Erzurum, Turkey

182 Evaluation of Sleep Quality, Daytime Sleepiness Levels, and Anxiety and Depression Levels of Inpatients with COVID-19 Treatment According to Oxygen Needs: A Case-control Study
Yatan COVID-19 Tedavisi Olan Hastaların Uyku Kalitesi, Gündüz Uykululuk Düzeyleri ile Anksiyete ve Depresyon Düzeylerinin Oksijen İhtiyaçlarına Göre Değerlendirilmesi: Bir Olgu Kontrol Çalışması
Soner Kılıç, Güven Aslan, Büşra Eser, Yunus Hacımusalar; Kayseri, Turkey

187 Obstrüktif Uyku Apne Sendromunda Otonom Disfonksiyon ve Enflamasyon
Autonomic Dysfunction and Inflammation in Obstructive Sleep Apnea Syndrome
Cem Bölük, Gülçin Benbir Şenel, Derya Karadeniz; Şanlıurfa, İstanbul, Türkiye

192 Non-spesifik Boyun Ağrısı Olan Genç Bireylerde Uyku Pozisyonunun Boyun Yeti Yitimi, Üst Ekstremite Fonksiyonu ve Uyku Kalitesi Üzerine Etkileri
Effects of Sleep Position on Neck Disability, Upper Extremity Function, and Sleep Quality in Young Individuals with Non-specific Neck Pain
Rümeysa Ateş, Hasan Özbek, Ziya Yıldız, Zeliha Başkurt; Isparta, Burdur, Türkiye

199 Circadian Rhythm Sleep Disorders in the Young Population and Their Relationship with Psychological Distress and Disability
Genç Popülasyonda Sirkadiyen Ritim Uyku Bozuklukları ve Psikolojik Sıkıntı ve Engellilik ile İlişkisi
Habibolah Khazaie, Farid Najafi, Azita Chehri, Afarin Rahimi-Movaghar, Masoumeh Amin-Esmaeili, Mehdi Moradi-Nazar, Ali Zakiei, Yahya Pasdar, Alireza Ahmadi, Reza Mohammadi; Kermanshah, Tehran, Iran; Stockholm, Sweden

206 Preventive Effect of Cognitive Stimulation and Sleep Hygiene on Delirium in COVID-19 Intensive Care Patients
COVID-19 Yoğun Bakım Hastalarında Bilişsel Uyaran ve Uyku Hijyeninin Deliryumu Önleyici Etkisi
Döndü Şanlıtürk, Veysel Kaplan, Neslihan Dörtkardeş; Tokat, Şanlıurfa, Turkey

216 Effect of 24-hour Sleep Deprivation on Visual Reactivity in Healthcare Professionals
Sağlık Çalışanlarında 24 Saatlik Uyku Deprivasyonun Vizüel Reaktivite Üzerine Olan Etkisi
Nevroz Ünlü, Çiğdem Deniz, Talip Asil; İstanbul, Tekirdağ, Turkey

221 Analysis of Nighttime Sleep and the Impact of Selected Predictors (Pain and Delirium) on its Quality in Hospitalized Patients Over Sixty Years of Age
Altmış Yaş Üstü Yatan Hastalarda Gece Uykusunun Analizi ve Seçilmiş Prediktörlerin (Ağrı ve Deliryum) Uykunun Kalitesi Üzerindeki Etkisi
Hana Locihová, Karel Axmann, Pavlina Štěpánová, Bohdana Břegová, Renata Zittová, Jana Hrušková; Ostrava, Třinec, Olomouc, Czech Republic

229 Relationship Between Chronotype, Social Jetlag, Attention Control, and Academic Achievement in Nursing Students During the COVID-19 Pandemic
COVID-19 Pandemisinde Hemşirelik Öğrencilerinde Kronotip, Sosyal Jetlag, Dikkat Kontrolü ve Akademik Başarı İlişkisi
Nazmiye Çıray, Meltem Adaiçi, Aybüke Özcan; İzmir, Turkey

235 Evaluation of Serum Vitamin D Levels in Obstructive Sleep Apnea Syndrome
Obstrüktif Uyku Apne Sendromunda D Vitamini Düzeylerinin Değerlendirilmesi
Utku Oğan Akyıldız, Aslı Akyol Gürses; Aydın, Ankara, Turkey

JOURNAL OF TURKISH SLEEP MEDICINE | JTSM

İçindekiler / Contents

240 Factors Affecting Pressure Change Requirement in Obstructive Sleep Apnea Patients Under Positive Airway Pressure Therapy
Pozitif Hava yolu Basıncı Tedavisi Altındaki Obstrüktif Uyku Apnesi Hastalarında Basınç Değişim İhtiyacını Etkileyen Faktörler
Ersan Atahan, Ayşegül Gençer, Buket Çalışkaner Öztürk; İstanbul, Turkey

Dizin/Index

2023 Hakem Dizini/2023 Referee Index

2023 Yazar Dizini/2023 Author Index

2023 Konu Dizini/2023 Subject Index

Derleme / *Review*

DOI: 10.4274/tjsm.galenos.2023.77699
Journal of Turkish Sleep Medicine 2023;10:168-174

Meme Kanseri Cerrahisi Sonrası Uyku Kalitesini Etkileyen Faktörler ve Hemşirelik Bakımı

Factors Affecting Sleep Quality and Nursing Care After Breast Cancer Surgery

Kıymet Öztepe Yeşilyurt, Neşe Ataman Bor*

İstanbul Üniversitesi, Cerrahpaşa Florance Nightingale Hemşirelik Fakültesi, Lisansüstü Eğitim Enstitüsü, İstanbul, Türkiye
**Hakkari Üniversitesi Sağlık Bilimleri Fakültesi, Hemşirelik Anabilim Dalı, Hakkari, Türkiye*

Öz

Sağlıklı yaşam için gerekli olan temel insan gereksinimleri arasında yer alan uyku, yaşam kalitesini etkileyen vazgeçilmez bir ihtiyaçtır. Bireyler uyku süresi, kalitesi ve düzeninin bozulduğu durumlarda uyku sorunlarıyla karşı karşıya kalmaktadır. Meme kanseri cerrahisi uygulanan bireylerin cerrahi girişim sonrasında uyku düzenleri bozulmakta ve uyku kalitelerinde azalmalar görülmektedir. Bu yönde uyku kalitesinin yönetimi ve kaliteli uyku sürecinin sağlanmasında hemşirelere büyük sorumluluklar düşmektedir. Meme kanseri cerrahisi uygulanan hastaların bakımında kanıta dayalı uygulamaların uyku kalitesini olumlu yönde etkilediği bilinmektedir. Yapılan literatür incelemesi sonucunda meme kanseri cerrahisi geçiren hastaların uyku kalitelerini etkiyen faktörlerin ve hemşirelik girişimlerinin değerlendirildiği çalışmaların sayıca yetersiz olduğu görülmektedir. Bu derlemenin amacı, meme kanseri cerrahisi sonrasında hastaların uyku kalitesini etkiyen faktörlerin literatür doğrultusunda incelenmesi ve bu yönde uygulanan hemşirelik girişimlerine yer verilmesidir.

Anahtar Kelimeler: Cerrahi, hemşirelik, meme kanseri, kanser, uyku

Abstract

Sleep, which is among the basic human needs necessary for a healthy life, is an indispensable need that affects the quality of life. Individuals face sleep problems when sleep duration, quality and regularity are disrupted. In individuals undergoing breast cancer surgery, sleep patterns are disrupted and sleep quality decreases after surgical intervention. In this direction, nurses have great responsibilities in the management of sleep quality and in ensuring the quality sleep process. Evidence-based practices in the care of patients undergoing breast cancer surgery positively affect sleep quality. As a result of the literature review, it is seen that the number of studies examining the factors affecting the sleep quality of patients undergoing breast cancer surgery and evaluating nursing care is insufficient. The aim of this review is to examine the factors affecting the sleep quality of patients after breast cancer surgery in line with the literature and to include nursing interventions applied in this direction.

Keywords: Surgery, nursing, breast cancer, cancer, sleep

Giriş

Kanser, dünyada görülme sıklığı sürekli artış gösteren, ölüme neden olan hastalıklar arasında yer alan ve yaşam kalitesini olumsuz etkileyen bir sağlık sorunudur (1-3). Kanser hastalarında uyku bozuklukları genellikle ağrı, anksiyete, depresyon, yorgunluk ve farklı duygu-durum bozuklukları ile birlikte görülebilmektedir. Bu uyku sorunları hastaların yaşam kalitelerinde kötüleşmeye, yorgunluğa, bilişsel bozukluklara (hafıza, konsantrasyon vb.), duygu durum bozukluklarına ve immünsüpresif sorunlara yol açabilmektedir. Uyku bozuklukları kanserin psikolojik ve psikofizyolojik etkilerinin yanında genellikle hasta ve hekim tarafından göz ardı edilebilen sorunlardır. Uyku problemleri hastalar tarafından kansere ve kanser tedavisine bağlı normal, geçici bir tepki olarak görülmektedir. Bu nedenle bireylerin uyku bozukluklarını hekimlerine bildirmedikleri bilinmektedir (4). Bu bozukluklardan en yaygın olanı insomniadır. İnsomnia; uyku için optimal ortam ve şartlar sağlansa da uykuya dalma sürecinde ve uykunun devamlılığının sürdürülmesi aşamasında zorluklarla karşılaşma, uyku süresinde veya kalitesinde azalma şeklinde tanımlanmaktadır (4). Uyku bozuklukları genel popülasyonda %5-35 arası görülürken, özellikle ileri evrelerdeki kanser hastalarında görülme sıklığı %30 ile %50 arasında değişmektedir (4,5).

Meme kanseri, meme dokusunda anormal ve kontrolsüz hücre bölünmesi sonucu genellikle lobüller ve duktuslarda şişlik veya kitle oluşumu ile fark edilen kadın sağlığını tehdit eden, kadınlarda en sık görülen kanser türüdür (6-8). Toplumlarda kanser türlerinin görülme oranlarının birbirinden farklı olmasında; toplumların gelişmişlik düzeyleri, bireylerin beslenme ve spor alışkanlıkları, yaşam standartları, sağlık hizmetlerinden faydalanabilme

Yazışma Adresi/Address for Correspondence: Asist. Kıymet Öztepe Yeşilyurt, İstanbul Üniversitesi, Cerrahpaşa Florance Nightingale Hemşirelik Fakültesi, Lisansüstü Eğitim Enstitüsü, İstanbul, Türkiye
Tel.: +90 532 683 05 68 **E-posta:** kiymetoztepe@hakkari.edu.tr **ORCID-ID:** orcid.org/0000-0003-4106-8864
Geliş Tarihi/Received: 12.11.2022 **Kabul Tarihi/Accepted:** 21.01.2023

imkanları, eğitim seviyeleri gibi birçok faktör etkilidir (9). Meme kanseri görülme oranı Uluslararası Kanser Araştırmaları Ajansı 2020 verilerinde %11,7, meme kanserinden ölme oranı %6,9, ülkemizde görülme oranı ise %10,7 ve mortalite oranı da %4,7 olarak belirtilmektedir (6,10,11). Meme kanseri, kansere bağlı ölümler arasında akciğer kanserinden sonra ikinci sırada bulunmaktadır (8,12,13). Nedeni tam olarak anlaşılamayan bu kanser türünde tanımlanan bazı risk faktörleri bulunmaktadır (13). Majör risk faktörlerini yaş, kadın cinsiyet, erken menarş, geç menapoz, aile öyküsü, ilk doğum yaşı ve nulliparite oluştururken; hormon tedavisi almak, oral kontraseptif kullanımı, alkol/sigara tüketimi, obezite, yoğun meme dokusunun olması da diğer risk faktörlerini oluşturmaktadır (7,13,14).

Memede oluşan kitle, ağrı, üst kolda anormal şişlik, meme başında akıntı, memede ödem, meme başı ve areolada gelişen anormallikler meme kanserinin fark edilmesini sağlayan belirti bulgulardır (13).

Meme kanserinde bu belirti bulgulardan yola çıkılarak yapılan taramaların sonucunda lokal ve sistemik tedavi yöntemleri uygulanmaktadır (13). Cerrahi yöntemler, radyoterapi, kemoterapi, hormon tedavisi, kök hücre tedavisi, hiperbarik oksijen tedavisi, immünoterapi, gen terapi, kanser aşıları, radyofrekans ablasyon tedavisi gibi hedefe yönelik tedaviler meme kanseri tedavisinde uygulanmaktadır (6,13,15,16).

Tedaviye bağlı ortaya çıkan fiziksel ve ruhsal değişimler, gelecek ile ilgili belirsizlikler, manevi ve psikososyal problemler meme kanserli hastaların yaşam kalitelerini ve iyilik hallerini olumsuz etkileyebilmektedir (17,18). Cerrahi girişimler de hastalarda başta ağrı olmak üzere bulantı-kusma, diyare, konstipasyon, ödem, idrar retansiyonu, stres, korku, anksiyete ve depresyon gibi sorunlara neden olmaktadır (6,19). Hastalarda bu sorunlara ilave olarak yara enfeksiyonu, eklem ağrıları, seroma, hematom, fantom meme ağrısı, etkilenen ekstremitede hareket kısıtlılığı, uyku problemleri, yorgunluk ve lenf ödem gibi fiziksel sorunlar da görülebilmektedir (11). Özellikle uygulanan tedaviler sonucunda gelişen ağrı ve uyku problemleri, hastaların günlük yaşam aktivitelerini olumsuz etkileyebilmektedir (3).

Bu bilgiler doğrultusunda bu çalışmada, meme kanseri cerrahisi sonrasında hastaların uyku kalitesini etkiyen faktörlerin literatür doğrultusunda incelenmesi ve bu yönde uygulanan hemşirelik girişimlerine yer verilmesi amaçlanmaktadır.

Meme Cerrahisi Uygulanan Hastalarda Uyku Kalitesini Etkileyen Faktörler

Bireyin kendini yeni bir güne dinç, dinlenmiş ve hazır hissetmesi uyku kalitesi olarak tanımlanmaktadır (20). Klinik uygulamalarda ve uyku araştırmalarında uyku kalitesinin önemli bir yeri vardır. Bunun nedeni ise düşük ve kötü uyku kalitesine sahip olan bireylerin kaliteli bir uyku uyuyan bireylere göre, fizyolojik ve psikolojik açıdan yaşanan sağlık problemleriyle karşılaşma olasılıklarının fazla olmasıdır (21,22). Uykusuzluğun kanser hastalarında mortaliteyi artırdığı, vücutta sitokin ekspresyonunu değiştirerek immün sistem fonksiyonlarını azalttığı, antitümörol cevapta rol alan norepinefrin düzeyinin yükselmesi ve doğal öldürücü (naturel killer) hücrelerinin azalmasıyla ilişkili olduğu saptanmıştır. Bu nedenle uykusuzluk veya kötü uyku kalitesi immün sistemin baskılanmasına, primer tümörün ilerlemesine ve enfeksiyon gibi komorbid hastalıkların artmasına neden olarak kanser hastalarında prognozu kötüleştirmekte ve mortaliteyi olumsuz etkileyebilmektedir (23).

Uyku, uyku kalitesi ve uyku süresini etkileyen birçok faktör vardır. Çoğu zaman tek bir etkene bağlı olmayan bu faktörler fiziksel, çevresel ve psikolojik olarak birden fazla nedene bağlı olarak uyku problemlerini oluşturabilirler (22,24,25). Bu faktörler;

Yaş: Bireylerin uyku gereksinimlerinin bebeklik ve gençlik yıllarında, yetişkinlik ve yaşlılık dönemlerine göre daha fazla olduğu bilinmektedir. Bebeklik ve çocukluk dönemlerinde vaktin büyük çoğunluğu uykuda geçmektedir. İleri yaşlarda ise uykuya dalma süresinde uzamalar, sık ve çabuk uyanmalar gözlenmektedir (26).

Cinsiyet: Kadınların erkeklere göre daha fazla uyuduğu fakat uyku problemlerinin de en çok kadınlarda görüldüğü bilinmektedir (24).

Beslenme: Uyarıcı bir etkiye sahip olan kafein içerikli; kola, kahve, çay, çikolata gibi bazı içecek ve besinlerin fazla tüketilmesi ile uykuya dalma durumunun zorlaştığı, az miktarda alkol tüketiminin ise (sedatif etkisi sayesinde) uykuya geçişi kolaylaştırdığı bilinmektedir. Ancak tüketilen alkol miktarının artması ile hızlı göz hareketi (REM) uykusu süresinin kısaldığı ve derin uykunun da azaldığı belirtilmektedir (24,25,27,28). Ayrıca protein içerikli gıdaların tüketilmesi ile uyanıklık durumunun arttığı, aşırı karbonhidratlı gıdaların tüketilmesiyle de uykuya dalmanın kolaylaştığı ifade edilmektedir. Bu besinlere ilave olarak süt ürünlerindeki L-triptofanın serotonin öncülü olması nedeniyle uykuyu artırdığı düşünülmektedir (27).

Fiziksel Etkinlik: Gün boyunca yapılan fiziksel aktiviteler, bireylerin yorulmasına neden olduğu için uykuya dalma sürelerinde kısalmalara neden olmaktadır. Çünkü yorgunluk durumunda REM uykusunun ilk evresi kısalır ve dinlenme gerçekleştikçe REM süresi artış gösterir (26). Ayrıca aerobik egzersizlerin uykuya geçişi kolaylaştırarak, toplam süresini ve derin uyku evresini artırdığı bilinmektedir. Harcanan enerji miktarındaki artışın uykuyu olumlu etkilediği, aşırı enerjinin harcandığı egzersizlerin ise uykuyu bozduğu belirtilmektedir. Sabah saatlerinde yapılan fiziksel egzersizlerin uykuyu daha az etkilediği, öğleden sonra ve akşam saatlerine yakın zamanlarda yapılan egzersizlerin ise uyku kalitesini olumlu etkilediği görülmektedir (27).

Sigara: İçinde bulunan nikotinin uyarıcı bir madde olması sebebiyle sigaranın uykuya geçişi zorlaştırdığı ve bireylerde derin uykuya geçememe gibi sorunlara yol açtığı bilinmektedir (24).

İlaçlar: Narkotik ilaçlar, antidepresanlar, beta-bloker ve steroid içerikli ilaçların, kanser tedavisinde uygulanan hormonoterapi ilaçlarının uyku süresini ve kalitesini etkilediği, REM uykusuna geçişi geciktirdiği, gündüz uyuklama durumlarına neden olduğu bilinmektedir (24,29). Özellikle ilaçların uykuya olan etkisine yönelik 2003 yılında meme kanseri hastalarında yapılan çalışmada, adjuvan kemoterapi uygulaması öncesinde ve uygulamanın farklı günlerinde değerlendirilen hastaların, uyku kalitelerinin (%82-92) kötü olduğu saptanmıştır (30).

Yaşam Biçimi: Bireylerin günlük düzenli yaptıkları işler, uygulamalar ve çalışma düzenleri nedeniyle uyku bozuklukları yaşayabildikleri görülmektedir. Özellikle vardiya şeklinde

düzenlenen işlerde çalışan bireylerin kronik olarak uyku yoksunluğu yaşadıkları bilinmektedir (24,25).

Psikolojik Etkenler: Bireylerin karşı karşıya kaldığı anksiyete, depresyon, korku, yas, üzüntü gibi sorunlar uyku düzenini etkilemektedir. Bireyler bu durumlarda zihinlerini uzun süre mutsuz düşüncelerle meşgul ettikleri için uykuya geçiş sorunları yaşayabilmektedir (26,29).

Çevresel Etkenler: Çevre uykuya dalmayı kolaylaştırmanın yanında bazen de bu durumu güçleştirmektedir. Özellikle uyku için kullanılan ortamdaki oda ısısı, havalandırması, gürültülü veya sessiz olma durumu, aydınlık veya karanlık olma hali, uyumak için kullanılan yatağın ölçüleri ve konforu bireylerin uykuya geçişini etkileyebilmektedir (26).

Hastalıklar: Hastalık durumunun fizyolojik ve psikolojik bir stres kaynağı olması uykuyu etkilemektedir. Hastalık süreçlerinde başta ağrı olmak üzere anksiyete, depresyon gibi birçok etken uyku bozukluklarına neden olmaktadır. Hipertiroidili hastalarda uykuya dalma problemleri görülürken, hipotiroidili hastalarda ise uykularının 4. evrelerinde kısalmaların olduğu bilinmektedir. Peptik ülserli hastalarda ise gece mide sekresyonlarının artması nedeniyle sık uyanmaların yaşanabildiği belirtilmektedir (26,29). Sağlıklı bireylere oranla hasta bireylerin uyku ihtiyacının daha fazla olduğu belirtilmektedir (24,26).

Cerrahi girişimler hastalarda korku ve endişe yaratan, ani gelişen beklenmeyen deneyimlerdir (31). Bu nedenle düzenli uyku, cerrahi hastaları için önemli bir gereksinimdir (32). Yeterli ve kaliteli uyku, kanserin sebep olduğu semptomlarla baş etmede rol oynayan önemli faktördür (33). Özellikle hastaların cerrahi sonrası süreçte uyku bozukluğu yaşama sıklıkları artmaktadır. Cerrahi sonrası hastaların yaşadığı ağrı, hastane ortamında bulunma deneyimleri, anestezi sırasında kullanılan ilaçlar, metabolik düzensizlikler ve anksiyete hastalarda uyku bozukluğu oluşturabilir (26,34). Yapılan bir çalışmada postoperatif dönemde uyku bozukluğu yaşayan hastaların ağrıya daha fazla duyarlılık geliştirdiği ve iyileşme hızının kötü yönde etkilendiği ifade edilmiştir (35).

Birey için kanserle mücadelede tedavi yolculuğu, tanı anında başlar ve yaşamının sonuna kadar devam eder. Bu yolculuk, uyku ve diğer aktiviteler üzerinde olumsuz etkiler içerebilir. "Uyku kalitesi" terimi, uyku boyutlarının (örneğin; başlangıç) ve etkilerinin (örneğin; gün içindeki yorgunluk) algılanan ve/veya nesnel ölçümlerini kapsar (36). Azalan uyku kalitesi, meme kanserinden kurtulanlarda yorgunluk, depresyon ve düşük yaşam kalitesi ile ilişkilidir (37). Yapılan çalışmalarda meme kanseri tedavisi alan bireylerin yaşadığı uyku bozukluklarının azalmış fiziksel aktivite, yorgunluk, depresif belirtiler, sıkıntı gibi duygusal durumlar, meme kanseri ağrısı ve enflamasyon ile ilişkili olduğu (38), düşük uyku kalitesinin daha yüksek düzeyde anksiyete, depresyon ve ağrı ile ilişkili olduğu bulunmuştur (39,40). Benzer şekilde meme kanseri cerrahisini takiben hastaların %25 ile %60'ında kalıcı ağrı görüldüğü ve ağrı sorunu yaşayan hastalarda yüksek düzeyde depresyon, anksiyete ve uyku bozukluğu olduğu bildirilmiştir (41).

Alfano ve ark.'nın (42) çalışmasında meme kanserinden kurtulan hastaların %77'sinin tedaviden (30 ay) sonra yetersiz uyuduğu saptanmıştır. Bu yönde yürütülen çalışmalarda kötü uykunun daha çok meme kanseri mortalitesi ile ilişkili olduğu belirtilmiştir (43,44). Meme kanserinde yaşam kalitesinin değerlendirildiği bir diğer çalışmada ise meme kanserinden kurtulan hastaların yaşam kalitelerine yönelik genel, fiziksel, işlevsel, psikososyal ve özetleyici öğeleri içeren 21 konu 5'li Likert anketiyle sorgulanmış ve hastaların %96'sının "uykunun önemli/çok önemli olduğunu" ifade ettiği görülmüştür (45). Uyku süresindeki değişiklikler yorgunluk, anksiyete ve depresyon gibi semptomlarla uyku bozukluklarına ve beraberinde yaşam kalitesinin düşmesine yol açmaktadır (46). Uyku kalitesinin yönetimi, anksiyete ve depresyonun giderilmesi için önemlidir. Çünkü uyku kalitesinin düşük olması nedeniyle istediklerini yapamayan kanser hastaları, uyku kalitelerinin sağlıklarını olumsuz etkileyeceği korkusuyla depresif ve endişeli hale gelebilmektedirler (47). Bu nedenle, meme kanserinden kurtulanlarda anksiyete ve depresyonu yönetmek için uyku yönetimi gereklidir (48).

Meme Cerrahisi Sonrası Uyku

Meme kanserli hastalarla çalışan hemşirelerin bakımın sürekliliğini sağlamaları için hastalığa yönelik yaklaşımları izlemeleri gerekir (18). Bakım sürecinde hasta bireylerde uyku düzeninde bozulma ve uyku kalitesinde düşüş olması bireyin tedavi alma istekliliğini olumsuz etkileyebilmektedir (49). Yapılmış bir çalışmada düşük uyku kalitesine sahip olan meme kanserli hastaların, normal uyku kalitesine sahip meme kanserli hastalara göre fiziksel kısıtlamalar yaşadığı bu nedenle günlük işlerini yerine getirmede daha çok problem yaşadığı tespit edilmiştir (50).

Meme kanseri tanısı ile hastalarda uyku bozuklukları başlayabilmekte, sonraki süreçleri de kapsayacak şekilde devam edebilmekte ve ilerleyen durumlarda kronik bir hal alabilmektedir (51). Hastalığın tanısı, tedavi sürecindeki stres, önceki süreçte yaşanılan psikiyatrik problemlerin meme kanserli hastalarda uyku bozukluklarına neden olduğu saptanmıştır (52). Meme kanseri hastalarının neredeyse 1/3'ü kalıcı uyku bozukluğu yaşamaktadır (51). Beverly ve ark. (53), çalışmasında mastektomi ameliyatı geçirmiş hastaların, en uzun ve en ağır yaşadıkları ilk beş sağlık probleminden birinin düşük uyku kalitesi, verimsiz uyku ve uyku bozuklukları olduğu belirtilmiştir. Kanser olmayan kadınlara oranla meme kanserini yenen kadınların, uyku problemi yaşama olasılıkları %100 oranında daha fazladır. Mastektomi ameliyatı sonrası hastaların yaşadıkları uyku problemleri, yaşam kalitelerini ve sağlık durumları üzerinde olumsuz etki yaratmaktadır (53). Alan yazın çalışmasında meme kanseri hastalarında artmış depresyon, yorgunluk, düşük benlik saygısının düşük uyku kalitesi ve uyku problemleri ile ilişkili olduğu tespit edilmiştir (54). Fortner ve ark. (50), çalışmasında mastektomi ameliyatı sonrası hastalarda yaşanan düşük uyku kalitesinin fiziksel yorgunluk ve günlük aktiviteleri yerine getirecek enerjinin azalmasına neden olduğu belirtilmiştir. Kaliteli ve yeterli bir uyku hastaların iyileşme sürecini hızlandırıcı etkiye sahiptir. Bu sebeple hasta bireylerin sağlıklı bireylere göre daha fazla uyku ve dinlenmeye ihtiyaçları vardır (32). Hasta bireylerin yaşadıkları strese karşı güçlenmeleri, uyku kalitelerinin yeterli olmasıyla sağlanır (55).

Meme Cerrahisi Sonrası Uyku Sorunlarına Yönelik Hemşirelik Bakımı

Sağlığın sürdürülmesinde önemli bir rol oynayan uyku, insan hayatının 1/3'lük bir kısmını kapsamaktadır (56). Hemşire kuramcıları temel insan gereksinimlerini tanımlarken uykunun fizyolojik bir ihtiyaç olduğunu belirtmişlerdir. Virginia Henderson insanların temel gereksinimini tanımladığı kuramında uykuyu "uyku ve dinlenme" olarak ele almıştır (57). Roper, Logan, Tierney ise günlük yaşam aktiviteleri modelinde günlük yaşam stresinden kurtulmada uykudan yararlanıldığı, yetersiz uyku durumunda kişide huzursuzluk, stres olabileceği ve uyku bozuklukları kaynaklı çeşitli hastalıkların ortaya çıkabileceğini ifade etmişlerdir (58). Benzer şekilde North American Nursing Diagnosis Association'ın belirlediği hemşirelik tanıları arasında "uyku dinlenme" başlığı altında "uyku örüntüsünde rahatsızlık" ve "uykusuzluk (insomnia)" yer almaktadır (24,56).

Hemşireler ilk kaynak olarak hastadan aldıkları veriler ile hastanın uyku problemi yaşayıp yaşamadığını tespit edebilir, uyku problemi yaşayan hastalarda bu durumun sıklığı ve süresini değerlendirerek hastanın yaşadığı uyku bozukluğuna yönelik hemşirelik girişimlerini uygulayabilirler. Bu yönde hemşireler hasta ve sağlıklı bireylere bütüncül yaklaşarak, onları etkileyen ve etkileyebilecek uyku problemlerini ve diğer ihtiyaçlarını önceden tanımlayabilmelidirler (26,30,59,60).

Hastaların meme kanseri cerrahisi sonrasında yeterli uyku uyumalarını ve dinlemelerini sağlamak için uygulanabilecek hemşirelik girişimleri şöyledir;

- Her birey uyku alışkanlıkları açısından değerlendirilmelidir (26). Bireyin normal uyku düzeni incelenerek, geçmişte yaşadığı uyku düzensizlikleri, uyku düzenini etkileyen kronik bir hastalığa sahip olup olmadığı, belirli bir ilaç kullanımı açısından değerlendirilmelidir. Birey en az 90 dakika sürmesi gereken uyku döngüsü içerisinde uyandırılmamalıdır ve hemşirelik girişimleri bireyin uykusunu kesintiye uğratmayacak şekilde yapılmalıdır (61). Uyku değerlendirilmesinde 'Uyku Kalitesi Ölçeği' (62), 'Pittsburgh Uyku Kalitesi İndeksi: PUKİ' (63), 'Scopa Uyku Ölçeği' (64), 'Richard-Campbell Uyku Ölçeği'(65) gibi daha birçok uyku değerlendirme ölçekleri kullanılmaktadır. Hemşireler bu ölçeklerle bireyin uyku kalitesi hakkında değerlendirme yapıp, hasta bireyin aldığı puana yönelik uyku düzenini sağlamalıdır.
- Uyku sorunlarına yol açan faktörler tanımlanmalı ve bireye özel uyku planlaması yapılmalıdır (26). Bu yönde özellikle kansere bağlı gelişen uyku problemlerine yol açan faktörleri ortadan kaldırmak için uygulanan bilişsel davranış tedavilerinin kanıt düzeylerinin daha yüksek ve daha etkili olduğu belirtilmektedir (66).
- Bireyin uykuya dalmasına engel olabilecek ağrı ve anksiyete gibi durumlar değerlendirilmeli ve ortadan kaldırılmalıdır (26).
- Bireyin sağlıklı uyuyabilmesi için gerekli fiziksel şartlar sağlanmalıdır. Bunun için odanın yeteri kadar havalandırılması, ısı, ışık ve gürültü kontrolünün sağlanması, yatağın özellikleri gibi çevresel etmenlerin kontrol altına alınması gerekmektedir (26,30). Sağlıklı uyku için bu koşullar sağlanamadığında bireylerin uykuları bölünebilmekte ve uyku kaliteleri de bozulabilmektedir.
- İnsan kulağının duyma frekansları dahilindeki duyulmak istenilen sesi ya da sessizliği bozan, sağlığa zararlı, sıkıntı veren ses olarak tanımlanan gürültü, uyku bozukluğu yaşamaya neden olan önemli faktörlerden biridir. Dünya Sağlık Örgütü (DSÖ) ve Birleşik Devletler Çevre Koruma Kurumu'na göre hastane ortamındaki ses düzeyinin 45 dB ya da daha düşük düzeyde olması gerektiği belirtilmektedir. DSÖ hasta servislerinde gece ses seviyesinin hastaların uyku esnasında 35 dB, gündüz koşullarında ise 40 dB'nin üzerinde olmaması gerektiğini belirtmektedir. Buna bağlı olarak yaşlı bireylerin uykularının gürültüden çok daha kolay etkilendiği belirtilmektedir (67). Uyku ortamındaki gürültünün devamlı olması halinde bireyler bu duruma alışılabilir. Ancak gürültünün neden olduğu uyku bölünmeleri, bireylerin derin uykuya geçişini zorlaştırabilir (27).
- Sağlıklı uyku için oluşturulan ortamda gürültü faktörünün yanında bir diğer önemli faktörün oda ısısı olduğu bilinmektedir. Uyku için tavsiye edilen ortam sıcaklığı 18 °C olarak belirtilmektedir. Ancak herkes için ideal bir ortam sıcaklığı yoktur. 24 °C'nin üzerindeki ortam sıcaklıklarında beden hareketlerinde artış, REM uykusunun süresinde kısalma ve uykuda bölünmeler görülürken, 12 °C'nin altındaki ortam sıcaklığında ise rüyalarda artış ve uyku kalitesinde bozulmalar görülür (27).
- Bu faktörlere ilave olarak ortamın karanlık ve aydınlık dengesinin, insanın uyku sürecini düzenleyen önemli mekanizmalar olduğu ifade edilmektedir. Işık uyaranlarının retinal fotoreseptörler aracılığı ile melatonin sentezine etki ettiği bilinmektedir. Melatonin salgısının ise karanlıkta en üst seviyeye çıktığı ve diğer hormonların salgılamaları ile uykunun kolaylıkla başladığı belirtilmektedir (27). Ayrıca hemşirelerin, görevlerini yerine getirebilmeleri için hasta yüzündeki aydınlık düzeyinin 100lüx'den az olmaması gerektiği de belirtilmektedir. Hasta odalarındaki aydınlatma limitlerinin yatan veya yürüyebilen hastaların ve oda içinde uyumak isteyen hastaların rahatsızlığına sebebiyet vermeyecek özelliklerde olması gerektiği vurgulanmaktadır (68).
- Yoğun bakım ortamlarında yalnızca kardiyak monitörlerin ses seviyelerinin 72-77 dB kadar yükseldiği bilinmektedir. Yoğun bakım ünitelerinde bakım alan hastaların genellikle gürültü nedeniyle sık sık uyandıkları ve gürültü kaynaklarının genellikle cihaz alarmları ve personel konuşmaları olduğu görülmektedir. Bu yönde hemşirelik bakımında; fiziksel donanım ve planlamanın etkin şekilde yapılarak, zorunlu şekilde ortaya çıkan seslerin ve aktivitelerin oluşturduğu gürültünün kontrol altına alınması, alarm seslerinin sağlık personelinin işitebileceği en az ses düzeyine indirilmesi, mümkünse ışık alarmlı monitörlerin tercih edilmesi önerilmektedir (67).
- Hastaya uyumadan önce, masaj uygulaması, ılık duş, süt içmek, kitap okumak gibi uygulamalarla uyku hazırlığı sağlanmalıdır (26).
- Hastanın uyku hijyeni konusunda eğitilmesi gerekir. Bu eğitimin içeriğinde kafein, alkol, nikotin gibi uyarıcı maddelerin tüketiminin azaltılması, uykudan önce baharatlı veya şekerli yiyeceklerin, ağır besinlerin yenmemesi, yatmadan önce sıvı alımının kısıtlanması konularına yer verilmelidir. Ayrıca hastaya, uyku ortamının sıcaklığının ayarlanması, gürültü ve ışığın azaltılmasının gerekliliği anlatılarak, hastanın uyku öncesi rutin uygulamalardan yoga, masaj, meditasyon, kas relaksasyonu ve aromaterapi uygulamalarından herhangi birini uygulayarak sağlıklı uyku hijyeni sağlayabileceği belirtilmelidir (66).

- Kanser hastalarında uyku bozukluklarının tedavisinde farmakolojik ve farmakolojik olmayan yöntemlerden yararlanılmaktadır. Davranış terapileri, stres azaltma yöntemleri, tamamlayıcı terapiler (hipnoz, yoga, relaksasyon, meditasyon vb. uygulamalar), eğitimler ve egzersizler farmakolojik olmayan yöntemler olarak uygulanabilir. Farmakolojik olarak da hekim istemiyle uygulanan benzodiazepin ve hipnotik ajanların etki ve yan etkileri açısından hasta dikkatle izlenmelidir (66).

Meme kanseri hastalarında uykusuzluk birçok nedenden kaynaklandığı için hem farmakolojik hem de non-farmakolojik yöntemlerin bir arada kullanıldığı multidisipliner tedaviler uygulanmalıdır. Fiorentino ve ark. (46), çalışmasında uyku hijyeni eğitimi ve farmakolojik tedavinin birlikte uygulanmasıyla hasta bireyin yaşam kalitesinde artma ve uykusuzluk semptomlarında hafifleme sağlanıldığı bildirilmiştir. Yeterli ve kaliteli uyku süresi hastaları strese karşı korur, benzer şekilde hastaların yaşam kalitesini artırır (55). Tam tersine uyku kalitesindeki düşüş ve uyku düzeninde bozulma hastalara rahatsızlık vererek tedavi alma isteklerini olumsuz etkileyebilir (49). Bu nedenle hastane ortamında uykuya engel olan faktörlerin belirlenmesi ve ortadan kaldırılması, tedavi ve bakım saatlerinin hastalara göre düzenlenmesi hastaların rahat uyku uyumasına ve iyileşme süreçlerinin hızlanmasına katkıda bulunacaktır.

Sonuç

Meme cerrahisinde uygulanan girişimler sonrasında meme kanserine de bağlı olarak hastalarda çeşitli uyku sorunları yaşanabilmektedir. İncelenen çalışmalarda meme kanseri cerrahisinde uyku kalitesini etkileyen faktörlerin genellikle ağrı, anksiyete, depresyon, yorgunluk, düşük benlik saygısı, stres ve psikiyatrik problemler olduğu görülmektedir. Hemşirelerin ise bu süreçte bakım verdiği hastaların uyku kalitelerini değerlendirmesi, kanıta dayalı girişimlerde bulunması gerekmektedir. Hemşirelik bakımında kanıta dayalı uygulamalara yer verilmesiyle bakımın etkinliği artacak ve hastaların uyku kalitesini etkileyen faktörlerin sayısı, süresi ve etkisi azalmış olacaktır. Sonuç olarak meme kanseri cerrahisi geçirmiş hastaların uyku sorunlarını inceleyen çalışmaların sayısının artırılması önerilmektedir.

Etik

Hakem Değerlendirmesi: Editörler kurulu dışında olan kişiler tarafından değerlendirilmiştir.

Yazarlık Katkıları

Cerrahi ve Medikal Uygulama: K.Ö.Y., N.A.B., Konsept: K.Ö.Y., N.A.B., Dizayn: K.Ö.Y., N.A.B., Veri Toplama veya İşleme: K.Ö.Y., N.A.B., Analiz veya Yorumlama: K.Ö.Y., N.A.B., Litaratür Arama: K.Ö.Y., N.A.B., Yazan: K.Ö.Y., N.A.B.

Çıkar Çatışması: Yazarlar tarafından çıkar çatışması bildirilmemiştir.

Finansal Destek: Yazarlar tarafından finansal destek almadıkları bildirilmiştir.

Kaynaklar

1. Yel P, Karadakovan A. Dünyada ve Türkiye'de Meme Kanserli Hastaların Tamamlayıcı ve Alternatif Tedavi Kullanımı. Cumhuriyet Üniversitesi Sağlık Bilimleri Enstitüsü Dergisi 2020;5:36-46.
2. Genç A, Oğuz S. Kanserli Hastalarda Progresif Gevşeme Egzersizlerinin Kemoterapinin Yan Etkileri Üzerine Etkisi. IGUSABDER 2018;5:517-24.
3. Nazik E, Öztunç G, Şahin B. Kemoterapi Alan Meme Kanserli Hastalarda Progresif Gevşeme Egzersizlerinin Uyku Kalitesi ve Ağrıya Etkisi. Anadolu Hemşirelik ve Sağlık Bilimleri Dergisi 2014;17:171-8.
4. Gözükan G. Kanser Hastalarında Psikolojik Faktörlerin Tedavi Uyumuna Etkileri. Uzmanlık Tezi, Kırıkkale Üniversitesi Tıp Fakültesi, İç Hastalıkları ABD, 2021. https://acikerisim.kku.edu.tr/xmlui/handle/20.500.12587/18043
5. Yavuzşen T, Alacacıoğlu A, Çeltik A, Yılmaz U. Kanser ve Uyku Bozuklukları. Türk Onkoloji Dergisi 2014;29:112-9.
6. Maraş G, Ceyhan Ö. Meme Kanserli Hastalarda Ameliyat Sonrası Bulantı Kusma Risk Faktörleri ve Önleme Girişimleri. CUSBED 2021;1:32-40.
7. Kankaya B, Büyükaşık S, Kapan S, Alış H. Meme Kanseri Tedavisinde Güncel Yaklaşım. Tıp Fakültesi Klinikleri 2019;2:7-10.
8. Sarıcı SF. Opere Meme Kanseri Hastalarında Yaşam Kalitesi Düzeyi ve Yaşam Kalitesine Etki Eden Faktörler. Kocatepe Tıp Dergisi 2021;22:387-92.
9. Akyüz E. Meme Kanseri Cerrahisi Geçiren Kadınlarda Kol Aktivite Anketi'nin Türkçe' ye Uyarlanması, Geçerlik-Güvenirliği ve Lenf Ödemin Klinik Özelliklerine Göre Sonuç Ölçümlerinin İncelenmesi. Yüksek Lisans Tezi, Hacettepe Üniversitesi Sağlık Bilimleri Enstitüsü, Ankara, 2020. https://www.openaccess.hacettepe.edu.tr/xmlui/handle/11655/22228?show=full&locale-attribute=en
10. Sung H, Ferlay J, Siegel RL, Laversanne M, Soerjomataram I, Jemal A, Bray F. Global Cancer Statistics 2020: GLOBOCAN Estimates of Incidence and Mortality Worldwide for 36 Cancers in 185 Countries. CA Cancer J Clin 2021;71:209-249.
11. Gül A, Aygin D. Meme Kanseri Cerrahisi Sonrası Lenfödem ve Uçak Seyahati. IGUSABDER 2021;15:669-80.
12. Karahan E, Köstekli S, Çelik S, Yanık Demir T. Meme Cerrahisi Uygulanan Hastalarda Taburculuk Öncesi Bilgi Gereksinimleri. Ankara Sağlık Bilimleri Dergisi 2020;9:230-43.
13. Ateş A, Totur Dikmen B. Meme Kanseri Cerrahisi ve Hemşirelik Bakımı: Bir Derleme. Gevher Nesibe Journal of Medical&Health Sciences 2021;6:10-5.
14. Ünal E, Atik D, Gözüyeşil E. Meme Kanseri ve Aromaterapi. Lokman Hekim Dergisi 2021;11:1-9.
15. Kurt B, Kapucu S. Meme Kanserli Hastalarda Progresif Gevşeme Egzersizlerinin Kemoterapi Semptomlarına Etkisi: Literatür Derlemesi. Mersin Üniversitesi Sağlık Bilimleri Dergisi 2018;11:235-49.
16. Balcı H, Balcı Şener Ş. Meme Kanseri Cerrahisi Geçiren Kadınlarda Psikolojik Dayanıklılık. Akdeniz Tıp Dergisi 2022;8:347-53.
17. Yılmaz E, Coşkun T. Meme Kanserli Hastalarda Üst Ekstremite Sorunları ve Yaşam Kalitesi. Bakırköy Tıp Dergisi 2019;15:29-37.
18. Eti Aslan F, Özdemir Aslan E. Meme Kanserli Hastalarda Psikososyal Sorunlar Ve Hemşirelik Yaklaşımları. Türkiye Klinikleri 2019:51-4.
19. Uraz Ö, Günay U. Cerrahi Kliniklerde Çalışan Hemşirelerin Ameliyat Sonrası Sık Görülen Semptomlara Yönelik Tamamlayıcı ve Alternatif Yöntemlere İlişkin Bilgi ve Uygulamaları. YOBU Sağlık Bilimleri Fakültesi Dergisi 2020;1:1-10.
20. Şenol V, Soyuer F, Akça RP, Argün M. Adölesanlarda Uyku Kalitesi ve Etkileyen Faktörler. Kocatepe Tıp Dergisi 2012:93-102.
21. Saygılı S, Akıncı AÇ, Hülya A, Dereli E. Üniversite Öğrencilerinde Uyku Kalitesi ve Yorgunluk. Electronic Journal of Vocational Colleges 2011:88-94.
22. Günaydın N. Bir Devlet Hastanesinde Çalışan Hemşirelerin Uyku Kalitesi ve Genel Ruhsal Durumlarına Etkisi. Psikiyatri Hemşireliği Dergisi 2014:33-40.

23. Kınacı Gümüşçubuk Y, Hizal M, Akıncı MB, Yalçın B, Gümüşçubuk O, Şendur MAN. Hormon Reseptör Pozitif Erken Evre Meme Kanserinde Adjuvan Hormonal Tedavinin Depresyon, Uyku Kalitesi ve Cinsel Fonksiyon Üzerine Etkinliğinin Araştırılması. Acta Oncologica Turcica 2020. https://actaoncologicaturcica.com/jvi.aspx?pdir=aot&plng=tur&un=AOT-24654&look4=
24. Berman A, Snyder S, Frandsen G. Sleep, (In) Kozier and Erbs Fundamental of Nursing, Concepts, Process, Practice. Pearson 2016:1066-1086. https://core.ac.uk/download/pdf/303737439.pdf
25. Yılmaz H, Tuncel D. Uyku Bozukluklarında Tedavi Rehberi. 2014. https://www.noroloji.org.tr/TNDData/Uploads/files/uyku%20bozukluklar%C4%B1%202014.pdf
26. Kurtar S. Mastektomi Sonrası Hastaların Uyku Kalitesi ve Etkileyen Faktörler. Yüksek Lisans Tezi, Yıldırım Beyazıt Üniversitesi, Sağlık Bilimleri Enstitüsü, Hemşirelik Esasları Ana Bilim Dalı, Ankara, 2021.
27. Eyüpoğlu A, Ünlüoğlu İ, Bilgin M, Bilge U. Eskişehir Osmangazi Üniversitesi Tıp Fakültesi Araştırma Görevlisi Hekimlerin Uyku Kalitelerinin ve Uyku Kalitelerine Etki Edebilecek Faktörlerin Değerlendirilmesi. Osmangazi Tıp Dergisi 2019;41:304-14
28. St-Onge MP, Mikic A, Pietrolungo CE. Effects of Diet on Sleep Quality. Adv Nutr 2016;7:938-49.
29. Yalın H. Yoğun Bakımda Uykusuzluk. Yoğun Bakım Hemşireliği Dergisi 2016:9-15.
30. Berger AM, VonEssen S, Kuhn BR, Piper BF, Agrawal S, Lynch JC, Higginbotham P. Adherence, sleep, and fatigue outcomes after adjuvant breast cancer chemotherapy: results of a feasibility intervention study. Oncol Nurs Forum 2003:513-22.
31. Özkaya BÖ, Yüce Z, Gönenç M, Gül A, Alış H. Ameliyat Sonrası Erken Dönemde Hastanede Yatan Hastaların Uyku Düzenini Etkileyen Etmenler. Bakırköy Tıp Dergisi 2013;9:121-25.
32. Çam Yanık T, Altun Uğraş G. Akupresür Kullanımının Cerrahi Girişim Sonrası Uyku Kalitesine Etkisi. Sağlık Bilimleri Üniversitesi Hemşirelik Dergisi 2020;2:105-12.
33. Lafcı D. Meme Kanseri, Uyku ve Müzik Tedavisi. Uludağ Üniversitesi Tıp Fakültesi Dergisi 2018;44:61-4.
34. Hillman DR. Postoperative Sleep Disturbances: Understanding and Emerging Therapies. Adv Anesth 2017;35:1-24.
35. Su X, Wang DX. Improve postoperative sleep: what can we do? Curr Opin Anaesthesiol 2018;31:83-8.
36. Krystal AD, Edinger JD. Measuring sleep quality. Sleep Med 2008;9(Suppl 1):S10-7.
37. Jones SM, LaCroix AZ, Li W, Zaslavsky O, Wassertheil-Smoller S, Weitlauf J, Brenes GA, Nassir R, Ockene JK, Caire-Juvera G, Danhauer SC. Depression and quality of life before and after breast cancer diagnosis in older women from the Women's Health Initiative. J Cancer Surviv 2015;9:620-9.
38. Carpenter JS, Elam JL, Ridner SH, Carney PH, Cherry GJ, Cucullu HL. Sleep, fatigue, and depressive symptoms in breast cancer survivors and matched healthy women experiencing hot flashes. Oncol Nurs Forum 2004;31:591-8.
39. Inhestern L, Beierlein V, Bultmann JC, Möller B, Romer G, Koch U, Bergelt C. Anxiety and depression in working-age cancer survivors: a register-based study. BMC Cancer 2017;17:347.
40. Starkweather AR, Lyon DE, Schubert CM. Pain and inflammation in women with early-stage breast cancer prior to induction of chemotherapy. Biol Res Nurs 2013;15:234-41.
41. Miaskowski C, Cooper B, Paul SM, West C, Langford D, Levine JD, Abrams G, Hamolsky D, Dunn L, Dodd M, Neuhaus J, Baggott C, Dhruva A, Schmidt B, Cataldo J, Merriman J, Aouizerat BE. Identification of patient subgroups and risk factors for persistent breast pain following breast cancer surgery. J Pain 2012;13:1172-87.
42. Alfano CM, Lichstein KL, Vander Wal GS, Smith AW, Reeve BB, McTiernan A, Bernstein L, Baumgartner KB, Ballard-Barbash R. Sleep duration change across breast cancer survivorship: associations with symptoms and health-related quality of life. Breast Cancer Res Treat 2011;130:243-54.
43. Lehrer S, Green S, Ramanathan L, Rosenzweig KE. Insufficient sleep associated with increased breast cancer mortality. Sleep Med 2013;14:469.
44. Lehrer S, Green S, Ramanathan L, Rosenzweig KE. Obesity and deranged sleep are independently associated with increased cancer mortality in 50 US states and the District of Columbia. Sleep Breath 2013;17:1117-8.
45. Hollen PJ, Msaouel P, Gralla RJ. Determining issues of importance for the evaluation of quality of life and patient-reported outcomes in breast cancer: results of a survey of 1072 patients. Breast Cancer Res Treat 2015;151:679-86.
46. Fiorentino L, Rissling M, Liu L, Ancoli-Israel S. The Symptom Cluster of Sleep, Fatigue and Depressive Symptoms in Breast Cancer Patients: Severity of the Problem and Treatment Options. Drug Discov Today Dis Models 2011;8:167-73.
47. Akechi T, Momino K, Miyashita M, Sakamoto N, Yamashita H, Toyama T. Anxiety in disease-free breast cancer patients might be alleviated by provision of psychological support, not of information. Jpn J Clin Oncol 2015;45:929-33.
48. Vincent AJ, Ranasinha S, Sayakhot P, Mansfield D, Teede HJ. Sleep difficulty mediates effects of vasomotor symptoms on mood in younger breast cancer survivors. Climacteric 2014;17:598-604.
49. Kashani F, Kashani P. The effect of massage therapy on the quality of sleep in breast cancer patients. Iran J Nurs Midwifery Res 2014;19:113-8.
50. Fortner BV, Stepanski EJ, Wang SC, Kasprowicz S, Durrence HH. Sleep and quality of life in breast cancer patients. J Pain Symptom Manage 2002;24:471-80.
51. Rogers LQ, Courneya KS, Oster RA, Anton PM, Robbs RS, Forero A, McAuley E. Physical Activity and Sleep Quality in Breast Cancer Survivors: A Randomized Trial. Med Sci Sports Exerc 2017;49:2009-15.
52. Palesh O, Aldridge-Gerry A, Ulusakarya A, Ortiz-Tudela E, Capuron L, Innominato PF. Sleep disruption in breast cancer patients and survivors. J Natl Compr Canc Netw 2013;11:1523-30.
53. Beverly CM, Naughton MJ, Pennell ML, Foraker RE, Young G, Hale L, Feliciano EMC, Pan K, Crane TE, Danhauer SC, Paskett ED. Change in longitudinal trends in sleep quality and duration following breast cancer diagnosis: results from the Women's Health Initiative. NPJ Breast Cancer 2018;4:15.
54. Mansano-Schlosser TC, Ceolim MF. Factors associated with poor sleep quality in women with cancer. Rev Lat Am Enfermagem 2017;25:e2858.
55. Rao RM, Vadiraja HS, Nagaratna R, Gopinath KS, Patil S, Diwakar RB, Shahsidhara HP, Ajaikumar BS, Nagendra HR. Effect of Yoga on Sleep Quality and Neuroendocrine Immune Response in Metastatic Breast Cancer Patients. Indian J Palliat Care 2017;23:253-60.
56. Erdemir F. Hemşirelik Tanıları El Kitabı. İstanbul: Nobel, 2012:481-69.
57. Akdemir N, Birol L. İç Hastalıkları ve Hemşirelik Bakımı, Ankara: Nobel 2011:240-78.
58. Velioğlu P. Hemşirelikte Kavram ve Kuramlar İstanbul: Akademi 2012:155-195.
59. Aştı TA, Karadağ A. Hemşirelik Esasları, İstanbul, Akademi 2019:942-52.
60. Yazar M, Altuntuğ K. Fizik Tedavi ve Rehabilitasyon Kliniğinde Yatan Kadın Hastalarda Uyku Sorunları. Journal of Turkish Sleep Medicine 2022;9:37-42.

61. Erim H. Yoğun Bakım Ünitesinde Yatan Hastaların Uyku Kalitesinin Belirlenmesi. Yüksek Lisans Tezi, İstanbul Medipol Üniversitesi, Sağlık Bilimleri Enstitüsü, İstanbul 2018.
62. Önder İ, Masal E, Demirhan E, Horzum MB, Beşoluk Ş. Psychometric Properties of Sleep Quality Scale and Sleep Variables Questionnaire in Turkish Student Sample. IJPES 2016;3:9-21.
63. Ağargün MY, Kara H, Anlar O. Pittsburgh Uyku Kalitesi İndeksi'nin Geçerliği ve Güvenirliği. Turk Psikiyatri Dergisi 1996;7:107-11.
64. Sönmez N. Scopa Uyku Ölçeği Türkçe Versiyonunun Geçerliği ve Güvenirliği. Tekirdağ Namık Kemal Üniversitesi 2018.
65. Özlü ZK, Özer N. Richard-Campbell Uyku Ölçeği Geçerlilik ve Güvenilirlik Çalışması. Journal of Turkish Sleep Medicine 2015;2:29-32.
66. Bahar A, Ovayolu Ö, Ovayolu N. Onkoloji Hastalarında Sık Karşılaşılan Semptomlar ve Hemşirelik Yönetimi. ERÜ Sağlık Bilimleri Fakültesi Dergisi 2019;6: 42-58.
67. Demir G, Öztunç G. Gürültünün Gece Uykusu ve Yaşamsal Bulgular Üzerine Etkisi. Turk J Intense Care 2017;15:107-16.
68. Cibse - Code Lighting For Hospitals. Hospitals and Health Care Buildings LG:2 1989, London. Available from: https://www.scribd.com/document/554003120/CIBSE-CODE-LIGHTING-FOR-HOSPITALS-EDITABLE# .

Original Article / *Özgün Makale*

DOI: 10.4274/tjsm.galenos.2022.19971

Journal of Turkish Sleep Medicine 2023;10:175-181

Cultural Adaptation of the Infant Sleep Scale for Parents

Ebeveynler için Bebek Uyku Ölçeği'nin Kültürel Uyarlaması

Turgut Akyol, Arzu Sarıalioğlu*

Muş Alparslan University Bulanık Vocational School, Department of Child Health and Diseases Nursing, Muş, Turkey
**Atatürk University Faculty of Nursing, Department of Child Health and Diseases Nursing, Erzurum, Turkey*

Abstract

Objective: The aim of this study was to conduct a cultural adaptation study of the Infant Sleep Scale for Parents (ISS-P).

Materials and Methods: The research was conducted methodologically at Family Health Centers in Bulanık district of Muş between March and May 2022. The study sample consisted of 352 parents with a 12-month-old infant who met the research criteria and volunteered to participate in the research on the specified dates. The questionnaire form and ISS-P were used in collecting research data.

Results: The scale consisted of 11 items and 3 sub-dimensions: "Sleep routines", "sleep autonomy", and "screen media in the sleep environment". The content validity index of the scale items was 0.97. The Kaiser-Meyer Olkin value of the scale was 0.73, Bartlett's test X^2=754.652. p=0.001. The fit index values for confirmatory factor analysis were found as "X^2/standard deviation 1.435, goodness of fit index (GFI) 0.948, adjusted GFI 0.917, comparative fit index 0.975, root mean square residual (RMR) 0.033 RMSEA 0.048, standardized RMR 0.0423, normed fit index (NFI) 0.924, Tucker-Lewis index 0.967, incremental fit index 0.976, parsimony GFI 0.589, and parsimony NFI 0.689". The total Cronbach alpha coefficient of the scale was found to be 0.73. The mean score of the parents from ISS-P was 2.44±0.47.

Conclusion: The ISS-P Turkish version can be used as a valid and reliable scale.

Keywords: Infant, parents, reliability, sleep, validity

Öz

Amaç: Araştırmanın amacı, Ebeveynler İçin Bebek Uyku Ölçeği'nin (EBUÖ) kültürel uyarlama çalışmasını yapmaktır.

Gereç ve Yöntem: Araştırma, Mart-Mayıs 2022 tarihleri arasında Muş'un Bulanık ilçesine bağlı Aile Sağlığı Merkezleri'nde metodolojik tipte olarak yürütüldü. Araştırmanın örneklemini, belirtilen tarihlerde araştırma kriterlerini taşıyan, araştırmaya katılmaya gönüllü olan, 12 aylık bebeği olan 352 ebeveyn oluşturdu. Araştırma verilerin toplanmasında anket formu ve EBUÖ kullanıldı.

Bulgular: Ölçek 11 madde ve "uyku rutinleri", "uyku özerkliği" ve "uyku ortamında ekran medyası" olmak üzere 3 alt boyuttan oluştu. Ölçek maddelerinin kapsam geçerlilik indeks değeri 0,97'dir. Ölçeğin, Kaiser-Mayer-Olkin değeri 0,73, Bartlett's testi X^2=754.652. p=0,001'dir. Doğrulayıcı faktör analizi için uyum indeks değerleri X^2/standart sapma değeri 1,435, uyum iyiliği indeksi (GFI) 0,948, düzeltilmiş GFI 0,917, karşılaştırmalı uyum indeksi 0,975, kök ortalama kare artığı 0,033, kök ortalama kare yaklaşımı hatası 0,048 ve standartlaştırılmış kök ortalama kare artığı 0,0423, normlaştırılmış uyum indeksi 0.924, Tucker-Lewis indeksi 0,967, artırmalı uyum indeksi 0,976, sıkı iyilik uyum indeksi 0,589, sıkı normlaştırılmış uyum indeksi 0,689 olarak bulundu. Ölçeğin toplam Cronbach alfa katsayısı toplamda 0,73 olarak bulundu. Ebeveynler ölçekten ortalama 2,44±0,47 puan aldı.

Sonuç: EBUÖ Türkçe geçerli ve güvenilir bir ölçme aracı olarak kullanılabilir.

Anahtar Kelimeler: Bebek, ebeveyn, güvenirlik, uyku, geçerlilik

Introduction

Sleep enables individuals to grow, develop, learn and rest. Sleep is a complex process that periodically changes with wakefulness, is the basic need of life, both mentally and physically, and is affected by individual and environmental factors (1). Although sleep is one of the most important needs of life, as stated in Maslow's need pyramid, later needs cannot be reached without fulfilling the need for sleep (2).

Children's sleep time varies according to age periods (3). American Academy of Pediatrics recommends daily sleep time for "0-3 months old babies 16-18 hours, 4-13 months babies 12-16 hours, 1-2 years old babies 11-14 hours, 3-5 years old children 10-13 hours, 6-12 years old school children 9- 12 hours, 8-10 hours for adolescents aged 13-18" (4,5).

Non-repaid eye moment (NREM) phase occurs in infants after 6 months. In stages 3 and 4 of NREM, children spend more time than adults (6-8). It is more difficult to wake up during these phases and some hormones such as growth hormone are released during these phases (9,10).

As the age progresses and awareness increases in children under one year of age, sleep problems, crying and waking up at night become more frequent (11-13). Sleep in infants and children can affected by; sleeping place, heat, light, noise, sound, bed type, sleeping position, sleeping behaviors, attachment to the

Address for Correspondence/Yazışma Adresi: Lec, Arzu Sarıalioğlu MD, Atatürk University Faculty of Nursing, Department of Child Health and Diseases Nursing, Erzurum, Turkey
Phone: +90 442 231 57 95 **E-mail:** arzu.celebi@atauni.edu.tr **ORCID-ID:** orcid.org/0000-0003-3047-8008
Received/Geliş Tarihi: 31.07.2022 **Accepted/Kabul Tarihi:** 17.12.2022

mother, psychosocial status of the mother and health status of the baby (14).

Undernourishment or overfeeding of the baby before bedtime, inappropriate room temperature, separation anxiety, wet diaper, non-routine activities, improper feeding during the transition to complementary feeding, waking the baby occasionally in the night, and the baby's physical growth can cause sleep problems (10).

Interactive behaviors between parents and baby before going to bed play an important role in shaping babies' sleep behaviors. Parents can help shape sleep behaviors by determining a good sleep environment, regular bedtime, sleep time and sleeping places for babies (15).

In the literature review, no specific measurement tool suitable for Turkish culture was found that measures infant sleep behaviors for parents. Therefore, this study was conducted to define the cultural adaptation of Infant Sleep Scale for Parents (ISS-P) developed by Lo et al. (15) to describe infant sleep behaviors for parents and to introduce it to Turkish literature.

Materials and Methods

Type of Study

This study, which was conducted to test cultural adaptation of "ISS-P" has a methodological type.

Population and Sample of the Study

The universe of the research consisted of parents with a 12-month-old infant who came to the Family Health Centers (FHC) in Bulanık district of Muş between March-May 2022. There are three FHC in Bulanık district of Muş and all of them were included in the sample. Random sample selection was used in the study and the research was carried out with 352 parents. Because it is recommended that the sample size should be 5-10 times the number of scale items in the scale validity and reliability analyzes (16,17), the sample number was determined based on the items in the draft scale and considering possible missing data. First, explanatory factor analysis was performed on 120 parents for the 12-item scale, and then confirmatory factor analysis (CFA) was performed on 232 parents for the 11-item scale.

Inclusion criteria;

- Having a 12-month-old infant
- Being literate
- Parents who do not have any communication problems
- Informed consent to participate in the study
- Voluntary participation

Data Collection Instruments

Questionnaire Form and ISS-P were used to collect the study data.

Questionnaire Form: In this form, which was prepared by the researcher by examining the literature (2,15,18) are 13 questions that take into account the sociodemographic characteristics of the parents (age, gender, socioeconomic status, educational status, number of children, gender of the child, etc.) and infant sleep (day and night sleep duration, sleep problem status).

Infant Sleep Scale for Parents (ISS-P): It was developed to assess infant sleep by Lo et al. (15) in 2021. The scale includes 12 items categorized in three factors. Factor 1 consists of 1-4 items for "sleep routines", 5-8 items for factor 2 "sleep autonomy", and 9-12 items for factor 3 "screen media in the sleep environment". Items 5, 6, and 8 are reverse coded. Each item is rated on a 4-point Likert scale as "1 (totally disagree), 2 (disagree), 3 (agree) and 4 (totally agree)". In the evaluation of the scale, "the sub-dimension points were computed by taking the average of the sub-dimension items. Higher sub-dimension points define higher levels of sleep routines, sleep autonomy and screen media in the sleep environment".

Data Collection

The research data were collected by the researcher between March-May 2022, five days a week, between the hours of 08-16, with the volunteer parents, in a separate room and when the babies were calm, the framework of the Coronavirus disease-2019 pandemic process restrictions, paying attention to the social distance and mask rules by face-to-face interview technique. The forms were given to the parents and asked to mark the statements appropriate to them and then withdrawn. It took 10-15 minutes on average to fill in the forms while collecting the research data.

Statistical Analysis

Skewness (0.378) and Kurtosis (0.425) values of the data were found to be within normal ranges. Histogram chart was also reviewed and it was found that the data were normally distributed. The data were analyzed with SPSS for Windows 22 package program and AMOS 20. "Content validity, construct validity and reliability analyses" were used for data assessment. Content validity index (CVI) was conducted for content validity and exploratory factor analysis (EFA) and CFA were conducted for construct validity. "Kaiser-Meyer Olkin (KMO) and Bartlett test's" were used for EFA, while "X^2/SD, root mean square error of approximation (RMSEA), standardized root mean square residual (SRMR), goodness of fit index (GFI), adjusted GFI (AGFI), comparative fit index (CFI), normed fit index (NFI), Tucker-Lewis index (TLI), incremental fit index (IFI), parsimony GFI (PGFI), parsimony NFI (PNFI) fit tests and path diagram" were used for CFA. For reliability analysis, "item-total correlation tests and Cronbach alpha internal consistency coefficient" were used. Demographic features of the parents were analysed by using descriptive statistics.

Ethical Principles

Permission was taken through e-mail from the authors who developed ISS-P to adapt the scale to Turkish society. After obtaining ethical approval, written permission was obtained from the Family Health Centers where the research would be conducted. The purpose of the study was explained to the parents who met the criteria of the research group, their questions were answered, and their verbal and written consents

were obtained. Ethical principles were followed in the research. Ethics approval of the study was taken from Atatürk University Faculty of Medicine Ethics Committee (decision no: 09, date: 27.01.2022).

Results

It was found that 43.5% of the parents who participated in the study were between the ages of 26-30, 81% were mothers, 44.3% lived in the country, 78.7% had a nuclear family, 56.8% had 2-4 children, 51.4% gender of the child was male, 70.5% had social security, 43.5% had income equal to their expenses, 39.2% had university degree, 57.4% were housewives. It was determined that 77.6% of their children had 0-3 hours of sleep during the day, 49.4% of their children had 7-9 hours of sleep at night and 74.7% of the children had no sleep problems (Table 1).

Validity

Language validity: For Turkish validity and reliability of ISS-P, first of all permission was taken from Lo et al. (15) who developed the study to use the scale. The scales were independently translated into Turkish by three researchers who had doctorate degree in nursing and a professional translator and the translations were checked by the researchers and turned into a single form. Later, it was translated into the original language by using the back translation technique by a different language expert who knew about both languages and cultures and sent to the author to assess conformity in terms of original language. Revisions were made and the items were finalized. Then the scales were sent to experts for content validity.

Content validity: Turkish form of the prepared scale was sent to 15 experts in paediatrics via e-mail and their opinions were received. These experts were academicians experienced in paediatric nursing and scale development. The experts were asked to evaluate the cultural relevance of ISS-P and whether the items covered the concepts that were intended to measure. In order to prove content validity with numerical expressions, the experts evaluated the items with CVI as "1=not suitable (1), needs to be adjusted (2), suitable but needs minor changes (3), very suitable (4)" by using Davis technique. After the evaluation, CVI was calculated by dividing the sum of experts' "very suitable" and, "suitable but needs minor changes" evaluations by the total number of experts. The scale was revised and finalized in line with the suggestions of the experts. CVI values of all the items in ISS-P vary between 0.86 and 1.0. CVI value of the scale was found as 0.97. Therefore, no items were deleted from the scale in terms of content validity.

Pilot application: In order to test whether the scale items were understood by the parents, 30 individuals with different levels of education were selected from the target population and a pilot application was conducted. The parents in the pilot application were not included in the sample. The parents were asked to fill in the scale and then to evaluate each item in terms of comprehensibility. No changes were made to the items during the pilot application.

Table 1. Demographic characteristics of the parents (n=352)

Socio-demographic characteristics		n	%
Age	18-25	89	25.3
	26-30	153	43.5
	31-35	67	19.0
	36 and above	43	12.2
Parent	Mother	285	81.0
	Father	67	19.0
Living place	City	153	43.5
	Country	156	44.3
	Village	43	12.2
Family type	Nuklear family	277	78.7
	Large family	75	21.3
Number of children	1	125	35.5
	2-4	200	56.8
	5-7	27	7.7
Child's gender	Girl	171	48.6
	Male	181	51.4
Social security status	Yes	248	70.5
	No	104	29.5
Level of income	Income less than expenses	148	42.0
	Income equivalent to expense	153	43.5
	Income more than expenses	51	14.5
Level of education	Primary education	100	28.5
	Secondary education	114	32.3
	University	138	39.2
Job	Housewife	202	57.4
	Not working	13	3.6
	Civil servant /worker	116	33.0
	Self-employment	21	6.0
Child's daytime sleep time	0-3 hour	273	77.6
	4-6 hour	63	17.9
	7-9 hour	7	2.0
	10-12 hour	9	2.5
Child's nighttime sleep time	0-3 hour	8	2.3
	4-6 hour	32	9.1
	7-9 hour	174	49.4
	10-12 hour	138	39.2
Child's sleep problem status	Yes	89	25.3
	No	263	74.7

Exploratory Factor Analysis

Reliability analysis was conducted to find out whether the items had suitable values. Total correlations of the items were found to vary between 0.263 and 0.575, while total Cronbach alpha value was found as 0.742. Since Cronbach alpha value and total correlation values of the items were found to be good in this

process, no items were removed. The analysis was continued with 12 items.

Factor analysis was conducted to find out the construct validity of ISS-P. Prior to factor analysis, KMO and Barlett's test were used to determine sample adequacy and whether the data were suitable for factor analysis. KMO value of the 12 item scale was found as 0.743. Similarly, Barlett's test results (X^2=785.884, p=0.001) showed that the data were correlated and suitable for factor analysis.

EFA was conducted for construct validity. Twenty five degrees of Promax rotation, which is choosed in scale adaptation researchs, was performed for construct validity. In more than one dimension in which an item gave load, the items with a difference of less than 0.10 between factor load values were considered to be overlapping. For this reason, item 7 was deleted.

In the EFA which was performed with 11 items, KMO value was found as 0.731, while Bartlett's test (X^2=754.652, p=0.001) was found to be significant. These results indicated that the data were appropriate for EFA.

It was found that the scale items gathered under three factors. The fact that there were 3 factors with an eigenvalue above 1 showed that the scale had a 3-factor structure. Scree Plots also showed that the scale had a 3-factor structure (Figure 1).

It was also examined whether the factor structure of the scale matched the original scale. It was found that the scale comprised of 3 factors, as the original scale, and the factors of the items matched the original scale (Table 2).

It was found that the second factor comprised of items 1, 2, 3 and 4. factor loads of the items were found to be between 0.633 and 0.878 and they were found to explain 21.60% of the total variance. This factor was called "sleep routines".

It was found that the third factor comprised of items 5, 6 and 8. factor loads of the items were found to be between 0.670 and 0.777 and they were found to explain 12.436% of the total variance. This factor was called "sleep autonomy".

It was found that the first factor comprised of items 9, 10, 11, and 12. factor loads of the items were found to be between 0.486 and 0.907 and they were found to explain 28.303% of the total variance. This factor was called "screen media in the sleep environment".

When the 11-item scale was analyzed as a whole, it was found that the 3 factors explained 62.344% of the total variance and it was found that the scale explained adequate variance. The values acquired indicated that the scale was adequate for parents to evaluate their infant sleep. After EFA, structural equation modelling was established with CFA.

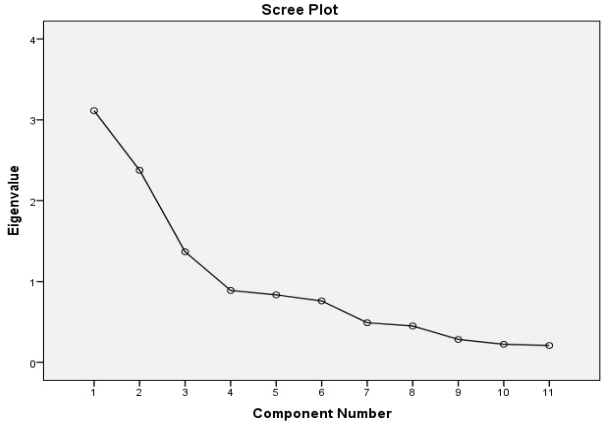


Figure 1. Scree plot factor structure

Confirmatory Factor Analysis

The structure obtained with EFA was tested with CFA. A large number of indices were used to analyze the fit of the model that belonged to ISS-P. The results were found as "X^2/SD 1.435, GFI 0.948, AGFI 0.917, CFI 0.975, RMR 0.033, RMSEA 0.048 and SRMR 0.042, NFI 0.924, TLI 0.967, IFI 0.976, PGFI 0.589, PNFI 0.689" (Table 3).

As a result of the analysis made with CFA, it was found that "4 items in F1 had standard solution varying between 0.32 and 0.89, while 4 items in F2 had standard solution varying between 0.49 and 0.86, 3 items in F3 had standard solution varying between 0.41 and 0.68" (Figure 2). The items were

Table 2. Items and factor loads of ISS-P (11-item)

Pattern matrix

	Factors		
	1	**2**	**3**
i9: My child uses mobile or screen-based devices 1 to 2 hours before they go to bed	0.907	-	-
i10: My child has access to a mobile or screen-based device (such as an iPad or smartphone) while in bed	0.894	-	-
i11: My child falls asleep while using a mobile device	0.885	-	-
i12: A television is usually playing in the room when my child goes to sleep at night	0.486	-	-
i2: My child goes to bed at about the same time each night	-	0.878	-
i1: My child has a bedtime routine	-	0.837	-
i3: My child gets out of bed at about the same time each morning	-	0.800	-
i4: My child sleeps in the same room or location each night	-	0.633	-
i8: I lie with my child until s/he falls asleep	-	-	0.777
i6: My child sleeps at least some part of the night in my bed	-	-	0.765
i5: I put my child to bed after s/he is already asleep	-	-	0.670
Core values	3.113	2.377	1.368
Explained variance	28.303	21.605	12.436
Total eigenvalue	-	-	6.858
Total variance	-	-	62.344

ISS-P: Infant Sleep Scale for Parents

evaluated to be significant for the factors they were in. Path Diagram was analyzed and it was found that the values found were suitable in terms of item-factor agreement.

Table 3. Fit index values, normal and acceptable values for ISS-P

Index	Normal values	Acceptable value	Found value
X^2 "p"	p<0.05	-	0.035
X^2/SD (CMIN/DF)	<2	<5	1.435
GFI	>0.95	>0.90	0.948
AGFI	>0.95	>0.85	0.917
CFI	>0.95	>0.90	0.975
RMSEA	<0.05	<0.08	0.048
RMR	<0.05	<0.08	0.033
SRMR	<0.05	<0.08	0.042
NFI	>0.95	>0.80	0.924
TLI	0.95< TLI <1	0.90< TLI <0.94	0.967
IFI	>0.90	-	0.976
PGFI	>0.89	>0.50	0.589
PNFI	>0.89	>0.50	0.689

GFI: Goodness of fit index, AGFI: Adjusted GFI, CFI: Comparative fit index, RMSEA: Root mean square error of approximation, SRMR: Standardized root mean square residual, NFI: Normed fit index, TLI: Tucker-Lewis index, IFI: Incremental fit index, PNFI: Parsimony NFI, PGFI: Parsimony GFI, SD: Standard deviation, ISS-P: Infant Sleep Scale for Parents

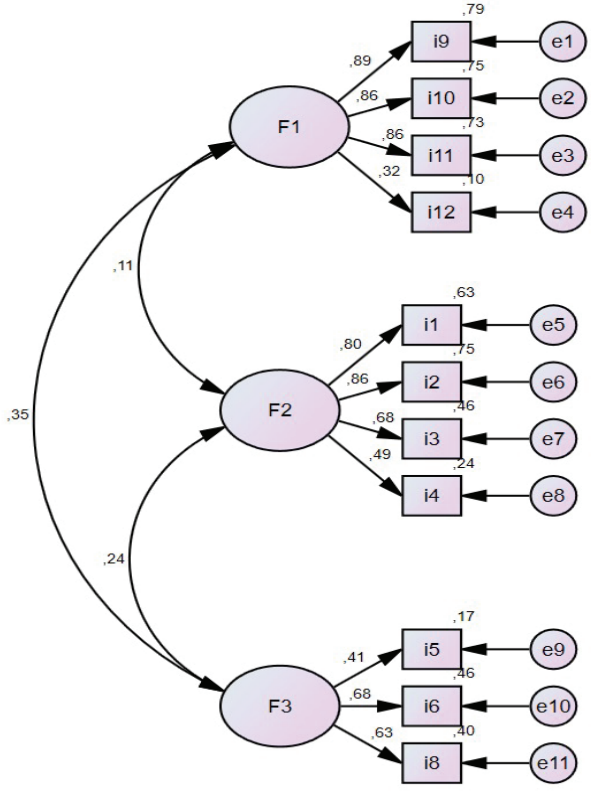


Figure 2. ISS-P confirmatory factor analysis diagram
ISS-P: Infant Sleep Scale for Parents

Reliability

Internal consistency (Cronbach alpha) coefficients

Cronbach alpha values of the scale for mothers were found as as 0.81 for "sleep routines" factor, as 0.51 for "sleep autonomy" factor, as 0.80 for "screen media in the sleep environment" factor, while it was found as 0.73 for the total scale. Cronbach alpha values of the scale for fathers were found as 0.75 for "sleep routines" factor, as 0.81 for "sleep autonomy" factor, as 0.86 for "screen media in the sleep environment" factor, while it was found as 0.79 for the total scale. Cronbach alpha values of the scale were found as 0.80 for "sleep routines" factor, as 0.66 for "sleep autonomy" factor, as 0.81 for "screen media in the sleep environment " factor, while it was found as 0.73 for the total scale (Table 4).

Time invariance

In order to define the stability of the scale opposite time, an appointment was made one month after the first application and 66 parents were retested. Parents who applied this test were excluded from the sample. According to the results of the correlation analysis conducted to find out the correlation between test and retest, a positive significant correlation was found between the two tests (p<0.01, r=0.834).

The parents got a mean score of 3.09±0.64 from "sleep routines" factor, 2.64±0.73 from "sleep autonomy" factor, 1.64±0.77 from "screen media in the sleep environment" factor. Mean score taken from ISS-P is 2.44±0.47 (Table 5).

Table 4. 11-item ISS-P item-total correlations and Cronbach α coefficients

	Mean	SD	Corrected item total correlations	Cronbach's α if item deleted
i1	2.96	0.863	0.418	0.704
i2	3.01	0.813	0.382	0.709
i3	3.06	0.805	0.323	0.717
i4	3.35	0.760	0.274	0.722
i5	2.77	0.992	0.248	0.729
i6	2.38	1.020	0.354	0.713
i8	2.78	0.956	0.355	0.713
i9	1.67	1.013	0.564	0.679
i10	1.56	0.916	0.516	0.689
i11	1.58	0.960	0.493	0.692
i12	1.73	0.974	0.323	0.734

SD: Standard deviation, ISS-P: Infant Sleep Scale for Parents

Table 5. Distribution of scores from ISS-P and its sub-dimensions

	Mother	Fother	Total
Sleep routines	3.10±0.66	3.05±0.55	3.09±0.64
Sleep autonomy	2.63±0.70	2.70±0.85	2.64±0.73
Screen media in sleep environment	1.62±0.76	1.69±0.80	1.64±0.77
Total ISS-P	2.43±0.47	2.46±0.49	2.44±0.47

ISS-P: Infant Sleep Scale for Parents

Discussion

Understanding the parents' sleep practices both in sleep initiation and in response to nocturnal waking is significant both for understanding the infant's sleep problem and for the development of interventions (19). The aim of this study is to determine the cultural adaptation of the ISS-P. Infant sleep behaviors for parents can be evaluated with this scale.

All measurement instruments used in scientific studies should be valid and reliable so that they can be used in future studies (20,21). In the content validity performed with "Davis technique", CVI should be 0.80 and higher (22). CVI value was found as 0.97 in this study. As a result, it was found that ISS-P is a scale that adequately reflects infant sleep behaviors for parents.

KMO value higher than 0.5 is essential for factor analysis (23). KMO values are considered as "perfect between 0.90 and 1.00, as very good between 0.80 and 0.89, as good between 0.70 and 0.79, as moderate between 0.60 and 0.69, as weak between 0.50 and 0.59 and as unacceptable below 0.50". Barlett test result should be significant at $p<0.05$ (24). The result that KMO value of ISS-P was higher than 0.70 shows that the sample adequacy was very good for factor analysis. In addition, Barlett test was found to be very significant and thus a correlation was found between the variables/factors of ISS-P.

Factor loads are expected to be above 0.40 (25,26). In the original scale, factor load values were found to vary between 0.32 and 0.89 (15). In this study, factor load values of ISS-P were found to vary between 0.486 and 0.907. Variance values explained in the original scale were total 51% (15). In this study, variance values explained were 62.344% for the total ISS-P. It is known in the literature that the variance is between 40% and 60% and the variance value explained by the scale is sufficient (24). The values acquired indicated that the scale was adequate to explain infant sleep behaviors for parents.

According to literature, X^2/SD value should be below 5 for the tested model to show a good fit (19,27). In this study, X^2/SD value was found to be perfect with 1.435. GFI was 0.91, AGFI was 0.87, and CFI was 0.96. Indices equal to or higher than 0.90 are acceptable values (28). RMSEA of ISS-P was found as 0.048, while RMR was found as 0.033. RMSEA value should be <0.08 for a good fit. The model shows a good fit in case of 0.05< RMR <0.10 (29). In addition, SRMR was found as 0.042, NFI was found as 0.924, TLI was found as 0.967, IFI was found as 0.976, PGFI was found as 0.589, PNFI was found as 0.689 and these values are acceptable. The fit indices found in the original scale and the fit indices in this study were found to be close values.

"Scales with a coefficient of 1.00-0.80 have high reliability, while scales with a coefficient of 0.60-0.79 are very reliable and scales with a coefficient of 0.40-0.59 have low reliability" (16,30). In the original of the scale, the internal consistency coefficient was found as 0.80 mothers 0.84 fathers for "sleep routines" factor, as 0.80 mothers 0.79 fathers "sleep autonomy" factor, as 0.81 mothers 0.85 fathers "screen media in the sleep environment" factor (15). In the this study, internal consistency coefficient was found as 0.81 mothers 0.75 fathers and 0.80 total for "sleep routines" factor, as 0.51 mothers 0.81 fathers and 0.66 total for "sleep autonomy" factor, as 0.80 mothers 0.86 fathers and 0.81 total for "screen media in the sleep environment" factor and as 0.73 for total ISS-P. ISS-P is a very reliable scale. The items in ISS-P are consistent with each other and ISS-P consists of items which test the elements of the same feature.

It has been stated that items with an item total correlation of 0.20 and higher can be included in the scale and can discriminate between individuals in terms of the related feature (24,31). In the original scale, item total correlations were found to be higher than 0.30. In this study item total correlations were found to be higher than 0.25. This result showed that parents understood the items correctly and answered objectively, while the item discrimination of the scale was found to be high.

"A correlation coefficient of ≥0.80 is interpreted as high correlation, between 0.60 and 0.80 is interpreted as strong correlation, between 0.40 and 0.59 is interpreted as moderate correlation, between 0.20 and 0.39 is interpreted as low correlation and ≤0.20' is interpreted as weak correlation" (22,32). Correlation coefficient of ISS-P was found as 0.834 and these results showed consistent measurements over time.

Sleep routines provide structure (15). In this study, mean score among mothers was found as 3.10±0.66 for "sleep routines" factor. Average score among fathers was found as 3.05±0.55. Lo et al. (15), found as 3.49±0.49 for mothers and 3.60±0.49 for fathers. It seems that this sub-dimesion is similar in our society.

Sleep autonomy or ensuring the opportunity for the infant self soothe and fall asleep unassisted, reflects autonomy support (15). In this study, mean score among mothers was found as 2.63±0.70 for "sleep autonomy" factor. Average score among fathers was found as 2.70±0.85. Lo et al. (15), found as 2.83±0.87 for mothers and 2.96±0.84 for fathers. It seems that this sub-dimesion is similar in our society.

The screen media in the sleep environment subscale, "captures parents" approaches to allowing both passive exposure to (e.g., television playing in the background) and active use of (e.g., direct interaction with mobile devices) screen media in the infants' sleep environment". In this study, mean score among mothers was found as 1.62±0.76 for "screen media in the sleep environment" factor. Average score among fathers was found as 1.69±0.80. Lo et al. (15), found as 1.42±0.54 for mothers and 1.21±0.44 for fathers. It seems that this sub-dimesion is similar in our society. Scores for this subscale seem to be very low in this sample,

Conclusion

As a result of validity and reliability analysis, ISS-P was found to be a valid and reliable measurement tool for parents to determine infant sleep behaviors. ISS-P was adapted into Turkish as a 4-Likert type scale consisting of 11 items and 3 factors such as "sleep routines", "sleep autonomy", "screen media in the sleep environment". Infant sleep behaviors for parents can be evaluated with ISS-P. ISS-P can be retested in babies of different months.

Ethics

Ethics Committee Approval: Ethics approval of the study was taken from Atatürk University Faculty of Medicine Ethics Committee (decision no: 09, date: 27.01.2022).
Informed Consent: Informed consent to participate in the study.
Peer-review: Externally and internally peer-reviewed.

Authorship Contributions

Concept: T.A., A.S., Design: T.A., A.S., Data Collection or Processing: T.A., Analysis or Interpretation: T.A., A.S., Literature Search: T.A., A.S., Writing: T.A., A.S.
Conflict of Interest: No conflict of interest was declared by the authors.
Financial Disclosure: The authors declared that this study received no financial support.

References

1. Akgün KM, Kocaaslan E, Bilsel A, Mutlu A. Determination of Sleeping Habits of Children Aged 3-6 Years Under Hospitalization Treatment. Journal of Health Sciences and Professions 2016;3:123-32.
2. Ayyildiz TK, Özdemir S, Topan A, Cebeci E, Kuzlu N, Toplu M. Estimation of Awareness of Acts and Information on Sleep Safety in Those Parents That Have 0-13-Month-Old Babies. Journal of Turkish Sleep Medicine 2020;7:73-9.
3. Barry ES. What Is "Normal" Infant Sleep? Why We Still Do Not Know. Psychol Rep 2021;124:651-92.
4. Chaput JP, Gray CE, Poitras VJ, Carson V, Gruber R, Olds T, Weiss SK, Connor Gorber S, Kho ME, Sampson M, Belanger K, Eryuzlu S, Callender L, Tremblay MS. Systematic review of the relationships between sleep duration and health indicators in school-aged children and youth. Appl Physiol Nutr Metab 2016;41:S266-82.
5. Paruthi S, Brooks LJ, D'Ambrosio C, Hall WA, Kotagal S, Lloyd RM, Malow BA, Maski K, Nichols C, Quan SF, Rosen CL, Troester MM, Wise MS. Recommended Amount of Sleep for Pediatric Populations: A Consensus Statement of the American Academy of Sleep Medicine. J Clin Sleep Med 2016;12:785-6.
6. Santos IS, Bassani DG, Matijasevich A, Halal CS, Del-Ponte B, da Cruz SH, Anselmi L, Albernaz E, Fernandes M, Tovo-Rodrigues L, Silveira MF, Hallal PC. Infant sleep hygiene counseling (sleep trial): protocol of a randomized controlled trial. BMC Psychiatry 2016;16:307.
7. Rana M, Riffo Allende C, Mesa Latorre T, Rosso Astorga K, Torres AR. Sueño en los ninos: fisiología y actualizacion de los últimos conocimientos [Sleep in children: physiology and update of a literature review]. Medicina (B Aires) 2019;79:25-8.
8. İşsever O, Akçay Didişen N, Bal Yılmaz H. An Important Subject in Child Care: Safe Sleep and Sleep Education. İKÇÜSBFD. 2021;6:157-61.
9. Gürhan G, Yaman SŞ, Polat Ü. Concept Skills and Models Used in Nursing, Ankara, Nobel Medicine Bookstores. 2020.
10. Guyton AC, Hall JE, Çavuşoğlu H, Yeğen BÇ, Aydın Z, Alican İ. Medical Physiology. Ankara, Nobel Medicine Bookstores. 2013.
11. Boran P, Ergin A, Us MC, Dinleyici M, Velipaşaoğlu S, Yalçın SS, Barutçu A, Gökçay G, Gür E, Çamurdan Duyan A, Aydın A, Celep G, Almış H, Savcı G, Kondolot M, Nalbantoğlu B, Ünver Korgalı E, Yendur Ö, Orhon Şimşek F, Kara Uzun A, Bağ Ö, Koç F, Bülbül S. Young children's sleep patterns and problems in paediatric primary healthcare settings: a multicentre cross-sectional study from a nationally representative sample. J Sleep Res 2022;31:e13684.
12. Owens AJ. Sleep medicine. In: Robert MK, Bonita MD, Stanton, JG, Nina FS (eds). Nelson Textbook of Pediatrics, Philadelphia; Elsevier Saunders: 2019. p. 46-55.
13. Boran P. Normal sleep physiology in children and sleep problems in different developmental periods In: Gökçay G, Beyazova U (eds). Child Health Follow-Up in the First Five Years, Istanbul, Nobel Medicine Bookstores, 2020; 331-44.
14. Taşdemir F. Temel AB. Sleep Problems and Effective Sleep Ecology Factors in the First Three Years of Life. Journal of Ege University Faculty of Nursing 2015;31:1-19.
15. Lo BK, McTernan ML, Haines J, Savage JS, Kugler KC, Haneuse S, Redline S, Taveras EM, Davison KK. Development and Psychometric Properties of the Sleep Parenting Scale for Infants. Behav Med 2023;49:151-61.
16. Alpar R. Applied Statistics and Validity-Reliability. Ankara, Detay Publishing. 2020.
17. Seçer İ. Practical Data Analysis with Spss and Lisrel. Ankara, Anı Publishing. 2017.
18. Basınlı KBE, Kahraman ÖG. The Effect of Sleep Training Program on Sleep Habits of Infants. Journal of Early Childhood Studies 2020;4:738-61.
19. Boran P, Ay P, Akbarzade A, Küçük S, Ersu R. Translation into Turkish of the Expanded Version of the "Brief Infant Sleep Questionnaire" and its Application to Infants. Marmara Medical Journal 2014;27:178-83.
20. Esin MN. Data collection methods and tools-reliability and validity of data collection tools. In: Erdoğan S, Nahcivan N, Esin MN (eds). Research, Process Practice and Critical in Nursing. İstanbul, Nobel Medical Bookstores 2021;193-235.
21. Çapık C, Gözüm S. Intercultural Scale Adaptation Stages, Language and Culture Adaptation: Updated Guideline. Florence Nightingale Journal of Nursing 2018;26:199-210.
22. Karasar N. Scientific Research Method Concepts Principles Techniques with Scientific Will Perception Framework. Ankara. Nobel Akademic Publishing. 2018.
23. Ho RC, Hou HA, Nourallah M. Impact of Globalization and Advanced Technologies on Online Business Models. IGI Global. 2021.
24. Büyüköztürk Ş. Manual of data analysis for social sciences. Statistics, Research Design, Spss Applications and Commentary. Ankara Pegem Academy. 2020.
25. Karagöz Y. SPSS-AMOS-META Applied Statistical Analysis, Ankara, Nobel Academic Publishing. 2019.
26. Alavi M, Visentin DC, Thapa DK, Hunt GE, Watson R, Cleary M. Exploratory factor analysis and principal component analysis in clinical studies: Which one should you use? J Adv Nurs 2020;76:1886-9.
27. Alavi M, Visentin DC, Thapa DK, Hunt GE, Watson R, Cleary M. Chi-square for model fit in confirmatory factor analysis. J Adv Nurs 2020;76:2209-11.
28. Tabachnick BG, Fidell LS. Using Multivariate Statistics. Pearson. 2019.
29. Özdamar K. Statistical Data Analysis with Package Programs. Ankara, Nisan Bookstore. 2018.
30. Bujang MA, Omar ED, Baharum NA. A Review on Sample Size Determination for Cronbach's Alpha Test: A Simple Guide for Researchers. Malays J Med Sci 2018;25:85-99.
31. Taber KS. The Use of Cronbach's Alpha When Developing and Reporting Research İnstruments in Science Education. Research in Science Education, 2017;48:1273-96.
32. Polit DF, Beck CT. Nursing Research: Generating and Assessing Evidence for Nursing Practice. Lippincott Williams and Wilkins. 2012.

Original Article / *Özgün Makale*

DOI: 10.4274/tjsm.galenos.2022.93585

Journal of Turkish Sleep Medicine 2023;10:182-186

Evaluation of Sleep Quality, Daytime Sleepiness Levels, and Anxiety and Depression Levels of Inpatients with COVID-19 Treatment According to Oxygen Needs: A Case-control Study

Yatan COVID-19 Tedavisi Olan Hastaların Uyku Kalitesi, Gündüz Uykululuk Düzeyleri ile Anksiyete ve Depresyon Düzeylerinin Oksijen İhtiyaçlarına Göre Değerlendirilmesi: Bir Olgu Kontrol Çalışması

Soner Kılıç, Güven Aslan, Büşra Eser*, Yunus Hacımusalar**

Kayseri City Hospital, Clinic of Neurology, Kayseri, Turkey
**Kayseri City Hospital, Clinic of Psychology, Kayseri, Turkey*
***Kayseri City Hospital, Clinic of Psychiatry, Kayseri, Turkey*

Abstract

Objective: Coronavirus disease-2019 (COVID-19) has detrimental effects on both physical and mental health of patients. Since sleep quality is closely related to the health status of a person, deterioration in sleep is expected in these patients. The aim of this study was to detect sleep problems in 19 consecutive inpatients and compare them with other inpatients with different diagnoses in order to determine whether being a pandemic patient makes a significant difference.

Materials and Methods: Pittsburgh Sleep Quality Index has a value between 0 and 21 points. High values indicate poor sleep quality and a high level of sleep disturbance. If the total score is above 5, it indicates that the sleep quality is clinically poor. The hospital anxiety depression scale is a self-report scale and consists of 14 items, 7 of which investigate depression and 7 anxiety symptoms.

Results: Fifty one inpatients were included in this study as the control group (group 1). Fifty COVID-19 positive patients hospitalized in need of oxygen (group 3) and 50 COVID-19 positive patients hospitalized with no need for oxygen (group 2) were enrolled in the study. The oxygen need of patients was found to be significantly related to the presence of chronic diseases.

Conclusion: Depression rates were found to be significantly higher in COVID-19 patients compared with the control group. Further studies with an increased number of cases are needed to establish a better link between oxygen need and sleep disorders.

Keywords: COVID-19, sleep disorder, insomnia, anxiety, depression

Öz

Amaç: Koronavirüs hastalığı-2019 (COVID-19), hastaların hem fiziksel hem de ruhsal sağlığını olumsuz etkilemektedir. Uyku kalitesi kişinin sağlık durumu ile yakından ilişkili olduğundan bu hastalarda uykuda bozulma beklenir. Bu çalışmanın amacı, yatarak tedavi gören COVID-19 hastalarındaki uyku problemlerini tespit etmek ve farklı tanılara sahip diğer yatan hastalarla karşılaştırmak ve pandemi hastası olmanın anlamlı bir fark yaratıp yaratmadığını anlamaktır.

Gereç ve Yöntem: Sosyo-demografik veri formu, Pitssburgh Uyku Kalitesi İndeksi (PUKİ), hastane anksiyete depresyon ölçeği (HADS) hastanemizde bir psikolog tarafından hastalara yüz yüze uygulandı. PUKİ toplamda 0-21 puan arasında bir değere sahiptir. Yüksek değerler, kötü uyku kalitesini ve yüksek düzeyde uyku bozukluğunu gösterir. Toplam puanın 5'in üzerinde olması uyku kalitesinin klinik olarak kötü olduğunu gösterir. HADS ölçeği bir öz bildirim ölçeğidir ve 7'si depresyon belirtilerini ve 7'si anksiyete belirtilerini araştıran 14 maddeden oluşmaktadır.

Bulgular: Bu çalışmaya 51 yatan hasta kontrol grubu (grup 1) olarak dahil edildi. Hastanede oksijen ihtiyacı olan 50 COVID-19 pozitif hasta (grup 3) ve oksijen ihtiyacı olmadan hastaneye yatırılan COVID-19 pozitif 50 hasta (grup 2) çalışmaya alındı. Hastaların oksijen ihtiyacı, kronik hastalık varlığı ile anlamlı olarak ilişkili bulundu. Oksijen ihtiyacı olan hastalarda anksiyete çok daha baskındı. Ayrıca diğer COVID hastalarına ve farklı tanılı hastalara göre daha fazla uyku bozukluğu ifade ettiler, ancak PUKİ sonuçları açısından aralarında anlamlı bir fark yoktu.

Sonuç: COVID-19 hastalarında depresyon oranları kontrol grubuna göre anlamlı derecede yüksek bulundu. Oksijen ihtiyacı ve uyku bozuklukları arasında daha iyi bir bağlantı kurmak için olgu sayısı artan ileri çalışmalara ihtiyaç vardır.

Anahtar Kelimeler: COVID-19, uyku bozukluğu, uykusuzluk, anksiyete, depresyon

Yazışma Adresi/Address for Correspondence: Soner Kılıç MD, Kayseri City Hospital, Clinic of Neurology, Kayseri, Turkey
Tel.: +90 532 661 41 92 **E-posta:** sonerkilic70@hotmail.com **ORCID-ID:** orcid.org/0000-0003-4529-6944
Geliş Tarihi/Received: 24.03.2022 **Kabul Tarihi/Accepted:** 19.12.2022

Introduction

Sleep may be defined as a state of rest which is essential for organism to replenish its vitality. In this period, whole body systems clear up the residual effects of their previous activities and prepare themselves for the future tasks. Good sleep is necessary for the proper continuation of daily life activities of human beings. It is not surprising that there are numerous studies about sleep and its effects on human health. It is known that a poor-quality sleep may lead to many health problems (1-3). Learning difficulties and memory deficits may result from sleep deprivation. In a well-documented study hippocampal attenuated intracellular cyclic adenosine monophosphate-protein kinase A signalling and glutamate receptor expression was blamed for these disorders (4). On the other hand, acute or chronic many diseases influence sleeping habits and quality. With aging, a decrease in sleep time and an increase in sleep disorder prevalence are expected. Some neurological diseases like Parkinson's disease and Alzheimer's disease may frequently occur due to insomnia and daytime sleepiness. Caffeine, alcohol, and nicotine intake all have detrimental effects on overall quality of sleep (5).

The novel Coronavirus disease-2019 (COVID-19) pandemic has become a major stressor for the whole world. Although it is a physically transmitted disease in its nature, the anxiety and fear of the outbreak have spread rapidly all around the world. Higher depression rates were found during the pandemic (6-9). It is inevitable effects on psychology of human being has been studied widely. On the other hand, there are relatively a few studies focusing on the sleep quality of the hospitalized patients. In a study conducted in a local hospital, worse sleep characteristics in patients compared to the normal group were noted regardless of their clinical diagnosis (10).

At this point, the study hypothesis is to find poorer quality of sleep and higher rates of anxiety and depression in COVID-19 patients who need oxygen treatment compared to the other COVID-19 patients and patients of other diagnosis.

Materials and Methods

The study was approved by the Kayseri City Hospital Ethic Committee (decision no: 465, date: 26.08.2021), and written informed consent was obtained from all participants.

This study followed the tenets of the Declaration of Helsinki. All participants provided informed consent. Name, surname, age, gender, current diagnosis and medical history of patients were noted. Group 1: This group of patients was enrolled from wards other than surgery and oncology wards. COVID-19 patients were divided into two groups according to their oxygen need. Group 2: COVID-19 patients did not need oxygen treatment. Group 3 was named for the COVID-19 patients needed oxygen treatment.

Pittsburgh Sleep Quality Index (PSQI): PSQI was developed by Buysse et al. (11) and the Turkish validity and reliability was made by Agargün and Kara (12) PSQI is a 19-item self-report scale that evaluates sleep quality and disorder over the past month. It consists of 24 questions in total. Nineteen questions included the person's own statement, 5 questions included the questions answered by the spouse or bed mate. The scored 18 questions of the scale consist of 7 components. These subcomponents consist of subjective sleep quality, sleep latency, sleep duration, habitual sleep efficiency, sleep disorder, use of sleeping medication and daytime dysfunction. Each component is evaluated on a score of 0-3. The total score of 7 subcomponents gives the total score of the scale. PSQI has a value between 0-21 points in total. High values indicate poor sleep quality and a high level of sleep disturbance. If the total score is above 5, it indicates that the sleep quality is clinically bad.

Richards Campbell Sleep Questionnaire (RCSQ): RCSQ is a five-item scale measuring the perception of depth of sleep, sleep onset latency, awakenings, time spent awake and sleep quality.

Hospital Anxiety Depression Scale (HADS): HADS was prepared to screen anxiety and depression in people with physical illnesses and was developed by Zigmond and Snaith (13). The Turkish form was developed by Aydemir et al. (14). By adapting it in 1997, its validity-reliability study was carried out. As a result of the receiver operating characteristic analysis, the cut-off points of the Turkish version of the HADS were determined as 10 for the anxiety subscale and 7 for the depression subscale. The scale is a self-report scale and consists of 14 items, 7 of which investigate depression symptoms and 7 anxiety symptoms.

Statistical Analysis

The analysis of the study was done with the SPSS 22.0 statistical software. Histogram, Skewness and Kurtosis values were used as well as the Kolmogorov-Smirnov test for the distribution of normality. Gender, the presence of chronic disease, sleep disorder, poor sleep quality, presence of anxiety and depression, smoking rates are the qualitative data. Age, time spent in bed, sleep duration, percentage of sleep are quantitative data.

Chi-square was applied for the comparison of the categorical groups. Corelation methods were used to model relationships between variables. Pearson correlation analysis was applied for the correlation of values with normal distribution, and Spearman correlation analysis was performed for those not showing normal distribution.

Independent samples t-test was used to compare the means of two normally distributed independent groups, and the Mann-Whitney U test was used to compare the medians of two independent groups not showing normal distribution. one-way ANOVA test was used in 3 independent group comparisons of normally distributed data (age, time spent in bed, sleep duration, percentage of sleep, PSQI, RCSQ, HADS).

H_0 hypothesis: There is no significant difference between the groups in terms of age, time spent in bed, sleep duration, percentage of sleep, PSQI, RCSQ, HADS.

H_1 hypothesis: There is a significant difference between groups in terms of age, time spent in bed, sleep duration, percentage of sleep, PSQI, RCSQ, HADS.

As a post-hoc analysis, Tukey was applied to data where variances were homogeneously distributed (age, time in bed, sleep time, PSQI, RCSQ), and Games-Howell test was applied to data where variances were not homogeneously distributed. The Kruskal-Wallis H Test was used for comparisons of three independent groups of scales that did not show normal distribution.

In cases where there was a significant difference between the groups, two groups were compared, and Bonferroni correction was applied to determine which groups the difference was between. Significance level was accepted as 0.05.

Results

Fifty COVID-19 positive patients hospitalized in need of oxygen (group 3) and 50 COVID-19 positive patients hospitalized with no need for oxygen (group 2) were enrolled in the study as two separate groups. In addition, 51 inpatients with diagnosis other than COVID-19 were included in this study as the control group (group 1). The distribution of patients according to gender, the presence of chronic disease, sleep disorder, poor sleep quality, presence of anxiety and depression, smoking rates are shown in Table 1.

The chronic disease rates of COVID-19 patients who received oxygen therapy were found to be significantly higher ($p<0.001$). While the rate of patients who defined sleep disorder was significantly higher in the group that need oxygen than the other two groups ($p=0.005$), there was no statistically significant difference in terms of the rates of those with poor sleep quality compared to PSQI ($p=0.979$).

Anxiety was significantly higher in COVID-19 patients who received oxygen therapy (60%) compared to the other two groups ($p=0.003$). Regardless of their oxygen need, depression rates were found to be significantly higher in COVID-19 patients compared to the control group ($p=0.001$). Depression ratio was 38% in this study. The comparison of age, body mass index, sleep time, time spent in bed at night, percentage of sleep, PSQI scores, Richards and HAD levels of the study group are shown in Table 2. In the analysis performed, the mean age of COVID-19 positive patients who needed oxygen therapy was found to be significantly higher than the COVID-19 positive patients who did not need oxygen and the control group (Table 2).

In this study, mean age was 66.1±13.1 in the group that needed oxygen treatment. Group 3's time spent in bed and sleep time were significantly higher than the control group. Also, group 3 had higher HAD levels compared to the control group.

Discussion

There is only a little about sleep quality of COVID-19 inpatients in the field literature. This study raises awareness of sleep disorders in hospitalized COVID-19 patients and serves as a mainstay for healthcare workers who may would like to implement some modalities on sleep. In this study, the chronic disease rates of COVID-19 patients who received oxygen therapy were found to be significantly higher. An article published in Italy shows that patients with COVID-19 who were taken into intensive care unit had a much higher rate (72.2%) of their previous chronic diseases compared to those who are not taken to intensive care (37.3%) (15). Likewise, the patients that have high chronic disease rates in our study needed oxygen therapy which was an indicator of severe disease.

Table 1. Distribution of groups by gender, presence of symptoms of sleep disorder, anxiety, depression and smoking rates

	Group 1 (n=51) (Mean ± SD)		**Group 2 (n=50) (Mean ± SD)**		**Group 3 (n=50) (Mean ± SD)**			
Gender	%	n	%	n	%	n	X^2	p
Female	41.2	21	44.0	22	46.0	23	0.241	0.886
Male	58.8	30	56.0	28	54.0	27	-	-
Chronic disease								
Yes	25.5	13	22.0	11	56.0	28	15.530	<0.001*
Sleep disorder								
Yes	51.0	26	50.0	25	78.0	39	10.518	0.005*
Sleep quality								
Poor	60.8	31	60.0	30	62.0	31	0.043	0.979
Anxiety								
Yes	27.5	14	38.0	19	60.0	30	11.427	0.003*
Depression								
Yes	9.8	5	34.0	17	42.0	21	13.969	0.001*
Smoking								
Yes	21.6	11	8.0	4	12.0	6	6.105	0.191

*p<0.05
Group 1: Inpatients with non-COVID diagnosis (control group)
Group 2: Patients who are positive for COVID and do not need oxygen therapy
Group 3: Patients who are positive for COVID and need oxygen therapy
SD: Standard deviation, COVID: Coronavirus disease

Table 2. Comparison of age, BMI, anxiety, depression levels and sleep-related assessments between groups

	Group 1 (n=51) (Mean ± SD)	Group 2 (n=50) (Mean ± SD)	Group 3 (n=50) (Mean ± SD)	Comparison+		Post-hoc test (Tukey or Games-Howell) (p-values)		
				F	p	Group 1-2	Group 1-3	Group 2-3
Age++	56.2±17.9	54.2±16.3	66.1±13.1[a]	8.113	<0.001	0.804	0.006*	0.001*
BMI++	26.1±6.1	28.0±5.1	28.5±5.6	2.645	0.074	-	-	-
Time in bed (minutes)	469.5±97.2	496.8±93.9	544.4±111.2[b]	7.096	0.001	0.366	0.001*	0.051
Sleep time ++ (minutes)	453.3±95.8	475.9±92.7	523.1±116.5	6.116	0.003	0.510	0.002*	0.058
Percentage of sleep (%)+++	96.7±2.4	95.7±2.0	95.6±4.1	1.338	0.226	0.174	0.398	0.993
PSQI++	6.4±2.3	6.4±2.2	6.7±2.3	0.328	0.721	0.993	0.798	0.734
RCSQ++	346.8±105.9	336.0±99.5	323.2±91.5	0.720	0.489	0.846	0.456	0.795
HAD anxiety++	5.9±3.6	6.9±4.4	8.1±3.7	3.989	0.021	0.394	0.015*	0.290
HAD depression+++	5.8±3.5	8.3±5.1	9.3±4.4	8.702	<0.001	0.015*	<0.001*	0.525
HAD total+++	11.6±5.7	15.1±8.9	17.4±7.4[b]	7.644	0.001	0.054	<0.001*	0.368

*p<0.05, +Analysis of Covariance (ANOVA), ++Tukey, +++Games-Howell, [a]Significantly higher than group 1 and group 2, [b]Significantly higher than group 1

Group 1: Inpatients with non-COVID diagnosis (control group)

Group 2: Patients who are positive for COVID and do not need oxygen therapy

Group 3: Patients who are positive for COVID and need oxygen therapy

SD: Standard deviation; n: Number of participants, COVID: Coronavirus disease, BMI: Body mass index, HAD: Hospital anxiety depression, PSQI: Pittsburgh Sleep Quality Index, RCSQ: Richards Campbell Sleep Questionnaire

While the rate of patients who defined sleep disorder was significantly higher, there was no statistically significant difference in terms of the rates of those with poor sleep quality compared to PSQI. This situation may be related to the limited number of case studies. In a review and meta-analysis of studies about sleep disorders during the pandemic revealed increased sleep disorders both in general population and COVID-19 patients especially with active disease (16).

Beside a possible intermingled relation to sleep disorders, anxiety is another emerging health concern during the pandemic. In a meta-analysis of 17 studies about anxiety in general population carried out during the pandemic, one third of participants showed anxiety symptoms (17). Another study documented high levels of anxiety both in COVID-19 patients and their relatives (18). In our study, anxiety was significantly higher in COVID-19 patients who received oxygen therapy (60%) compared to the other two groups. In a molecular basis, increased glutamate N-methyl-D-aspartate (NMDA) receptor subunits 2B (GluN2B) and phosphorylated-ERK1/2 in striatumand hippocampus were blamed foranxious behaviour in hypoxic mouse models (19). In addition to altered proper oxygenation, CO2 retention may be seen in COVID-19 patients. These conditions again elicit anxiety behaviour via stimulating chemosensors located in amygdala (20).

It was found that regardless of their oxygen need, depression rates were significantly higher in COVID-19 patients compared to the control group. In a recent study 32.3% of COVID-19 inpatients diagnosed with depression which confirmed increased prevalence (21). This ratio was 38% in our study. Another study that is composed of COVID patients carried out at the epicentre of the outbreak proved this finding right by confirming more depression cases than usual. In this study, no correlation between disease severity and depression scores were noted (7). The pandemic's physical and mental burden on sleep performance is worth investigating. A study performed via phone-based questionnaires about sleep performance and anxiety of healthy volunteers showed high incidence of impaired sleep and increased anxiety (8).

A comprehensive meta-analysis of 55 studies found 3.36 times increased risk of severe disease in the patients older than 50 years old (22). In our study, mean age was 66.1±13.1 in the group that needed oxygen treatment.

The most important limitation of this study is the insufficient number of cases and the sleep assessment using self-report scales. In such a study, evaluation of sleep with polysomnography (PSG) would give much more meaningful findings. However, during the pandemic period, due to the fact that the hospital where the study was carried out served as a pandemic hospital, the number of non-COVID-19 patients' admissions were low and the sleep laboratory could not be used effectively, so a sufficient number of PSGs could not be applied.

COVID-19 patients were divided into patients using oxygen and not using oxygen according to their need for oxygen, but a correlation assessment between oxygen therapy applied and sleep quality could not be made because the amount of oxygen needed varies. The drug treatments administered to the patients may affect the quality of sleep, but an analysis of the drugs could not be done because the patients used different treatments and doses that could not be grouped.

Conclusion

COVID-19 is an ongoing emergency situation that needs understanding of every aspect. It's impact on sleep and mental health is worth investigating. Increased anxiety, depression and sleep disorder levels are expected both in patients and general population. Alongside the antiviral treatment psychologic

intervention should not be overlooked if needed. Further studies with increased number of cases are needed to establish a better link between oxygen need and sleep disorders.

Ethics

Ethics Committee Approval: The study was approved by the Kayseri City Hospital Ethic Committee (decision no: 465, date: 26.08.2021).
Informed Consent: Written informed consent was obtained from all participants.
Peer-review: Internally peer-reviewed.

Authorship Contributions

Surgical and Medical Practices: S.K., Y.H., Concept: S.K., G.A., B.E., Y.H., Design: S.K., G.A., B.E., Y.H., Data Collection or Processing: S.K., B.E., Y.H., Analysis or Interpretation: S.K., B.E., Literature Search: S.K., G.A., B.E., Y.H., Writing: S.K.,
Conflict of Interest: No conflict of interest was declared by the authors.
Financial Disclosure: The authors declared that this study received no financial support.

References

1. Cooper CB, Neufeld EV, Dolezal BA, Martin JL. Sleep deprivation and obesity in adults: a brief narrative review. BMJ Open Sport Exerc Med 2018;4:e000392.
2. Gottlieb DJ, Punjabi NM, Newman AB, Resnick HE, Redline S, Baldwin CM, Nieto FJ. Association of sleep time with diabetes mellitus and impaired glucose tolerance. Arch Intern Med 2005;165:863-7.
3. Tobaldini E, Costantino G, Solbiati M, Cogliati C, Kara T, Nobili L, Montano N. Sleep, sleep deprivation, autonomic nervous system and cardiovascular diseases. Neurosci Biobehav Rev 2017;74:321-9.
4. Kreutzmann JC, Havekes R, Abel T, Meerlo P. Sleep deprivation and hippocampal vulnerability: changes in neuronal plasticity, neurogenesis and cognitive function. Neuroscience 2015;309:173-90.
5. Zdanys KF, Steffens DC. Sleep Disturbances in the Elderly. Psychiatr Clin North Am. 2015;38:723-41.
6. Bueno-Notivol J, Gracia-García P, Olaya B, Lasheras I, López-Antón R, Santabárbara J. Prevalence of depression during the COVID-19 outbreak: A meta-analysis of community-based studies. Int J Clin Health Psychol 2021;21:100196.
7. Jiang Z, Zhu P, Wang L, Hu Y, Pang M, Ma S, Tang X. Psychological distress and sleep quality of COVID-19 patients in Wuhan, a lockdown city as the epicenter of COVID-19. J Psychiatr Res 2021;136:595-602.
8. Demir ÜF. The effect of COVID-19 pandemic on sleeping status. J Surg Med 2020;4:334-9.
9. Demir A.U, Ardic S, Firat H, Karadeniz D, Aksu M, Ucar ZZ, Sevim S, Ozgen F, Yilmaz H, Itil O, Peker Y, Aygul F, Kiran S, Gelbal S, Cepni Z, Akozer M. Prevalence of sleep disorders in the Turkish adult population epidemiology of sleep study. Sleep Biol Rhythms 2015;13;298-308.
10. Dogan O, Ertekin S, Dogan S. Sleep quality in hospitalized patients. J Clin Nurs 2005;14:107-13.
11. Buysse DJ, Reynolds CF 3rd, Monk TH, Berman SR, Kupfer DJ. The Pittsburgh Sleep Quality Index: a new instrument for psychiatric practice and research. Psychiatry Research 1989;28:193-213.
12. Agargün M, Kara H. Suicidality in patients with panic disorder: the association with comorbidity. Eur Psychiatry 1996;11:209-11.
13. Zigmond AS, Snaith RP. The hospital anxiety and depression scale. Acta Psychiatr Scand 1983;67:361-70.
14. Aydemir Ö, Güvenir T, Küey L, Kültür S. Validity and reliability of Turkish version of hospital anxiety and depression scale. Turkish J Psychiatry 1997;8:280-87.
15. Martini N, Piccinni C, Pedrini A, Maggioni A. CoViD-19 e malattie croniche: conoscenze attuali, passifuturi e il progetto MaCroScopio RecentiProgMed 2020;111:198-201.
16. Jahrami H, BaHammam AS, Bragazzi NL, Saif Z, Faris M, Vitiello MV. Sleep problems during the COVID-19 pandemic by population: a systematic review and meta-analysis. J Clin Sleep Med 2021;17:299-13.
17. Salari N, Hosseinian-Far A, Jalali R, Vaisi-Raygani A, Rasoulpoor S, Mohammadi M, Rasoulpoor S, Khaledi-Paveh B. Prevalence of stress, anxiety, depression among the general population during the COVID-19 pandemic: a systematic review and meta-analysis. Global Health 2020;16:57.
18. Dorman-Ilan S, Hertz-Palmor N, Brand-Gothelf A, Hasson-Ohayon I, Matalon N, Gross R, Chen W, Abramovich A, Afek A, Ziv A, Kreiss Y, Pessach IM, Gothelf D. Anxiety and Depression Symptoms in COVID-19 Isolated Patients and in Their Relatives. Front Psychiatry 2020;11:581598.
19. Fan Y, Chou MC, Liu YC, Liu CK, Chen CH, Chen SL. Intermittent Hypoxia Activates N-Methyl-D-Aspartate Receptors to Induce Anxiety Behaviors in a Mouse Model of Sleep-Associated Apnea. Mol Neurobiol 2021;58:3238-51.
20. Ziemann AE, Allen JE, Dahdaleh NS, Drebot II, Coryell MW, Wunsch AM, Lynch CM, Faraci FM, Howard MA 3rd, Welsh MJ, Wemmie JA. The amygdala is a chemosensor that detects carbon dioxide and acidosis to elicit fear behavior. Cell 2009;139:1012-21.
21. Argüder E, Kılıç H, Civak M, Kacar D, Kaya G, Yılmaz A, Kayaaslan B, Karakaş Uğurlu G, Ateş İ, Güner R, Karalezli A. Anxiety and Depression Levels in Hospitalized Patients due to Covid-19 Infection. Ankara Med J 2020;20:971-81.
22. Barek MA, Aziz MA, Islam MS. Impact of age, sex, comorbidities and clinical symptoms on the severity of COVID-19 cases: A meta-analysis with 55 studies and 10014 cases. Heliyon 2020;6:e05684.

Özgün Makale / *Original Article*

DOI: 10.4274/tjsm.galenos.2023.97268

Journal of Turkish Sleep Medicine 2023;10:187-191

Obstrüktif Uyku Apne Sendromunda Otonom Disfonksiyon ve Enflamasyon

Autonomic Dysfunction and Inflammation in Obstructive Sleep Apnea Syndrome

Cem Bölük, Gülçin Benbir Şenel*, Derya Karadeniz*

Şanlıurfa Eğitim ve Araştırma Hastanesi, Nörofizyoloji Kliniği, Şanlıurfa, Türkiye

**İstanbul Üniversitesi-Cerrahpaşa, Cerrahpaşa Tıp Fakültesi, Nöroloji Anabilim Dalı, İstanbul, Türkiye*

Öz

Amaç: Obstrüktif uyku apne sendromu (OUAS), kardiyovasküler hastalık riskini artırmaktadır. Bu artışta otonom disfonksiyon ve enflamasyonun önemli rol oynadığı düşünülmektedir. Kalp hızı değişkenliği (KHD) analizi ile otonom disfonksiyonun non-invaziv olarak tespiti mümkündür. Kan hücrelerinin sayı ve dağılımı da enflamasyonun önemli belirteçlerinden kabul edilmektedir. Bu çalışmada, OUAS'li hastalarda KHD ile hemogram parametreleri incelenmiş, aralarındaki ilişki araştırılmıştır.

Gereç ve Yöntem: 2019-2021 yılları arasında, bir gece polisomnografi (PSG) kaydı yapılan ve eş zamanlı hemogram parametreleri mevcut olan tüm hastaların verileri gözden geçirildi. Çalışmaya dahil edilen tüm hastalara KHD analizi yapıldı. Hastalarda demografik, klinik ve PSG parametreleri ile KHD ve hemogram parametreleri arasındaki ilişki istatistiksel olarak incelendi. Hastalar apne hipopne indeksi (AHİ) ≥15/sa ve AHİ <15/sa olmak üzere iki gruba ayrıldı ve parametreler karşılaştırıldı.

Bulgular: Toplam 321 hasta (210 erkek, 111 kadın) çalışmamıza dahil edildi. Yaş ortalaması 54,8±16,1 yıl idi. Enflamasyon göstergeleri olarak kabul edilen lökosit sayısı, hemoglobin, hematokrit ve nötrofil sayısı AHİ ≥15/sa grubunda anlamlı olarak daha yüksekti (sırasıyla; p=0,015; p=0,040; p=0,019 ve p=0,012). KHD parametrelerinden düşük frekans gücü/yüksek frekans gücü (LF/HF) oranı, AHİ >15/sa olan hastalarda 3,1 iken, AHİ <15/sa grubunda 2,1 idi ve orta-ağır OUAS grubunda anlamlı olarak yüksekti (p=0,012). LF/HF oranı ile nötrofil sayısı, lökosit sayısı ve nötrofil/lenfosit oranı arasında anlamlı korelasyon tespit edildi (sırasıyla; r=0,201; p=0,005 ve r=0,165; p=0,020 ve r=0,189; p=0,008).

Sonuç: Bu çalışma ile OUAS'li hastalarda enflamasyon artışı ve sempatovagal dengedeki bozulmanın varlığı bir kez daha gösterilmiştir. Çalışmamızda farklı olarak otonom disfonksiyonun, enflamasyon artışı ile korelasyonu dikkati çekmiştir ve bu durum OUAS'nin önemli bir komplikasyonu olan sempatik fonksiyon bozukluğunda, enflamasyonun primer bir rol üstlenmiş olabileceğini düşündürmektedir.

Anahtar Kelimeler: Obstrüktif uyku apne sendromu, kalp hızı değişkenliği, enflamasyon, lökosit, nötrofil

Abstract

Objective: Obstructive sleep apnea syndrome (OSAS) increases the risk of cardiovascular disease. Autonomic dysfunction and inflammation are thought to play an important role in this increase. Heart rate variability (HRV) analysis provides noninvasive detection of autonomic dysfunction. The number and distribution of blood cells are also considered important markers of inflammation. In this study, HRV and hemogram parameters were examined in patients with OSAS, and the relationship between them was investigated.

Materials and Methods: The data of all patients who had overnight polysomnography (PSG) recording and hemogram parameters between 2019 and 2021 were reviewed. HRV analysis was performed on all patients included in the study. Along with demographic and clinical characteristics, the relationship between PSG parameters, HRV, and hemogram parameters was statistically analyzed. The patients were divided into two groups as apnea hypopnea index (AHI) ≥15/hr and AHI<15/hr, and the parameters were compared.

Results: A total of 321 patients (210 men, 111 women) were included in this study. The mean age was 54.8±16.1 years. The white blood cells count, hemoglobin level, hematocrit level, and neutrophil count, which are considered as indicators of inflammation, were significantly higher in the AHI ≥15/hr group (p=0.015; p=0.040; p=0.019 and p=0.012, respectively). Among the HRV parameters, the median low-frequency component power / high-frequency component power (LF/HF) ratio was 3.1 in patients with AHI>15/hr, while it was 2.1 in the AHI<15/hr group and was significantly higher in the moderate-severe OSAS group (p=0.012). A significant correlation was found between the LF/HF ratio and neutrophil count, leukocyte count, and neutrophil/lymphocyte ratio (r=0.201; p=0.005 and r=0.165; p=0.020 and r=0.189; p=0.008).

Conclusion: In this study, the presence of increased inflammation and deterioration in sympathovagal balance in patients with OSAS has been demonstrated once again. The correlation of autonomic dysfunction with increased inflammation has been noted for the first time, suggesting that inflammation may play a primary role in sympathetic dysfunction, which is an important complication of OSAS.

Keywords: Obstructive sleep apnea syndrome, heart rate variability, inflammation, white blood cells, neutrophil

Yazışma Adresi/ Address for Correspondence: Dr. Cem Bölük, Şanlıurfa Eğitim ve Araştırma Hastanesi, Nörofizyoloji Kliniği, Şanlıurfa, Türkiye
Tel.: +90 536 717 29 60 **E-posta:** cem_boluk@hotmail.com **ORCID-ID:** orcid.org/0000-0003-0125-7660
Geliş Tarihi/Received: 07.06.2022 **Kabul Tarihi/Accepted:** 10.01.2023

Giriş

Obstrüktif uyku apne sendromu (OUAS); hipertansiyon, miyokard infarktüsü, inme ve diğer vasküler komplikasyonlarla ilişkisi gösterilmiş olan ve atmış mortalite riskine sebebiyet veren önemli bir hastalıktır (1-5). OUAS'nin kardiyovasküler hastalıklara yol açmasındaki mekanizma tümüyle aydınlatılamamış olsa da, etiyolojide artmış sempatik aktivite, endotel disfonksiyonu, enflamasyon ve artmış oksidatif stres sorumlu tutulmaktadır (6,7). Farklı etiyolojik faktörler için çalışmalar devam etse de, sistemik enflamasyon ve otonom disfonksiyon, etki genişlikleri ve birçok hastalık patogenezinde oynakları roller nedeniyle önemini korumaktadır (8,9). Güncel çalışmalar, lökosit sayısı (WBC) ve nötrofil-lenfosit oranının (NLR), enflamasyonun göstergeleri olarak kullanılabileceğini göstermiştir (10-12). Artmış nötrofil sayısının daha kötü kardiyovasküler sonlanım ile ilişkili olduğu belirtilmiştir (11). WBC her ne kadar enflamasyonu göstermede vazgeçilmez bir parametre olarak kullanılsa da, farklı hastalıklar üzerine yapılan çalışmalar, NLR'nin enflamasyonu göstermede WBC'ye göre daha üstün olduğunu düşündürmektedir (12,13). Öte yandan, artmış sempatik aktiviteyle şekillenen otonom disfonksiyonu göstermede, kolay uygulanabilir ve non-invaziv olması nedeniyle, kalp hızı değişkenliği (KHD) spektral analizi yaygın olarak tercih edilmektedir (14). KHD spektral analizinde iki ayrı yaklaşım bulunmaktadır. İlki "avNN" (normal R-R intervallerinin ortalaması) ve "pNN50" (50 milisaniyeyi aşan ardışık R-R intervallerinin oranı) parametrelerini içeren zaman bazlı analiz, ikincisi ise "LF gücü" (düşük frekans: 0,04-0,15 Hz), "HF gücü" (yüksek frekans: 0,15-0,40 Hz) ve "LF/HF oranı" parametrelerini içeren frekans bazlı analizdir. Bu parametreler arasında LF/HF oranı, sempatovagal dengenin en önemli göstergesi olarak kabul edilmektedir (15). Bu çalışmada OUAS'ıı hastalarda hemogram parametreleri kullanılarak enflamasyon varlığının, KHD analizi kullanılarak otonom disfonksiyon varlığının araştırılması amaçlanmış, birbirleriyle korelasyonu ve OUAS şiddeti ile ilişkileri incelenmiştir.

Gereç ve Yöntemler

Retrospektif ve gözlemsel olarak tasarlanan bu çalışmada, 2019-2021 yılları arasında, uyku laboratuvarımızda KHD verilerini içeren bir gece polisomnografi (PSG) kaydı yapılan ve eş zamanlı hemogram parametreleri mevcut olan tüm hastaların verileri tekrar gözden geçirildi. Çalışmamızda, gözlemsel araştırmalar için rehber olarak önerilen Epidemiyolojide Gözlemsel Çalışmaların Raporlanmasının Güçlendirilmesi Beyanı kriterleri takip edildi (16). Hastaların demografik, klinik ve PSG parametreleri değerlendirildi. Apne hipopne indeksi (AHİ), uyanıklık, hızlı göz hareketleri (rapid eye movements, REM) olan ve olmayan (non-REM, NREM) uyku evresi süre ve yüzdeleri, uykuda periyodik bacak hareketleri indeksi ile atonisiz REM varlığı kayıt edildi. PSG tetkikinin sabahında alınan kan örneklerinde incelenen hemogram parametreleri (lökosit sayısı, eritrosit sayısı, hemoglobin, hematokrit, nötrofil sayısı, lenfosit sayısı, trombosit sayısı) not edildi. Çalışmaya dahil edilen tüm hastalara KHD analizi yapıldı; avNN, pNN50, ortLF, ortHF, LF/HF oranı her uyku evresi için ayrı ayrı hesaplandı. Hastalarda demografik, klinik ve PSG parametreleri ile KHD ve hemogram parametreleri arasındaki ilişki istatistiksel olarak incelendi. Çalışmamız İstanbul Üniversitesi-Cerrahpaşa, Cerrahpaşa Tıp Fakültesi Klinik Araştırmalar Etik Kurulu tarafından onaylandı (karar no: 140513, tarih: 23.10.2020).

İstatistiksel Analiz

Hastalar OUAS şiddetine göre sınıflandırılmak amacıyla AHİ <15/sa ve AHİ >15/sa olmak üzere 2 gruba ayrıldı. Demografik veriler ve laboratuvar bulguları ortalama ± standart sapma şeklinde gösterildi. Kategorik veriler karşılaştırılırken Pearson ki-kare ve Fisher'in kesin testi kullanıldı. Numerik veriler karşılaştırılırken verilerin normal dağıldığı durumlarda bağımsız örneklemlerde t-testi, normal dağılmadığı durumlarda Mann-Whitney U testi kullanıldı. Veriler arasındaki ilişkinin değerlendirilmesinde Spearman korelasyon analizi kullanıldı. P<0,05 değeri istatistiksel olarak anlamlı kabul edildi.

Bulgular

Toplam 321 hasta çalışmamıza dahil edildi. Hastaların %65,4'ü (n=210) erkek, %34,6'sı (n=111) kadındı. Yaş ortalaması 54,8±16,1 yıl idi. PSG sonucunda %40,5 (n=130) hastada ağır OUAS (AHİ ≥30/sa), %31,8 (n=102) hastada orta OUAS (15/sa ≤ AHİ <30/sa), %21,5 (n=69) hastada ise hafif OUAS (AHİ <15/sa) saptandı. Yirmi kişide OUAS saptanmadı. AHİ ≥15/sa grubunda AHİ <15/sa ile kıyaslandığında erkek hakimiyeti mevcuttu (%70 vs %51) (p<0,001) ve AHİ ≥15/sa grubunda yaş ortalaması daha yüksekti (56,6±14,4 vs 50,4±19,1 yıl) (p=0,023). Hastaların gece içi uyku evrelerinin süre dağılımı incelendiğinde; AHİ ≥15/sa grubunda, NREM-1 uyku yüzdesinin anlamlı olarak daha uzun (%7,7 vs %11,7), NREM-3 uyku yüzdesinin ise anlamlı olarak daha kısa olduğu saptandı (%17,9 vs %13,4) (p<0,001). Grupların demografik ve polisomnografik verileri Tablo 1'de karşılaştırılmıştır.

Hemogram Parametreleri

Hemogram parametrelerinden WBC, hemoglobin, hematokrit ve nötrofil sayısı AHİ ≥15/sa grubunda anlamlı olarak daha yüksekti (sırasıyla p=0,015; p=0,040; p=0,019 ve p=0,012). Gruplara göre hemogram parametreleri Tablo 2'de gösterilmiştir.

Tablo 1. Grupların demografik ve polisomnografik verilerinin karşılaştırılması

Parametreler	AHİ ≥15	AHİ <15	p
Cinsiyet (E/K)	164/68	46/43	**<0,001**
Yaş ortalaması	56,6±14,4	50,4±19,1	0,023
%W	20,8±15,3	19,6±14,3	0,531
%NREM-1	11,7±7,5	7,7±4,7	**<0,001**
%NREM-2	41,8±10,9	39,9±11,2	0,186
%NREM-3	13,4±7,1	17,9±9,6	**<0,001**
%REM	14,4±10,9	14,8±10,3	0,761
Min. O_2 satürasyonu	79,9±8,5	87,9±4,9	**<0,001**
Arousal indeksi	1,1±2,4	0,8±1,5	0,211

E: Erkek, K: Kadın, W: Wake (uyanık), NREM: Hızlı göz hareketleri olmayan, REM: Hızlı göz hareketleri, Min: Minimum, AHİ: Apne hipopne indeksi

Nötrofil/lenfosit oranı bu iki grup arasında istatistiksel olarak anlamlı bulunmadı. Gruplar AHİ ≥30 ve AHİ <30 şeklinde ayrıldığında ise nötrofil/lenfosit oranı ağır OUAS grubunda anlamlı şekilde daha yüksekti (2,1±1,1 vs 2,4±1,1-p=0,028).

Kalp Hızı Değişkenliği

KHD parametrelerinden medyan LF/HF oranı, AHİ >15/sa olan hastalarda 3,1 iken, AHİ <15/sa grubunda 2,1 idi ve orta-ağır OUAS grubunda anlamlı olarak yüksekti (p=0,012). İki grup arasında diğer KHD parametreleri açısından anlamlı farklılık saptanmadı. KHD parametreleri Tablo 3'te özetlenmiştir. KHD parametrelerinden LF/HF oranı ile hemogram parametrelerinden nötrofil sayısı, lökosit sayısı ve nötrofil/lenfosit oranı arasında anlamlı korelasyon tespit edildi (sırasıyla r=0,201; p=0,005 ve r=0,165; p=0,020 ve r=0,189; p=0,008). Ayrıca LF/HF oranı ile minimum oksijen (min O_2) satürasyonu arasında da ters korelasyon saptandı (r=0,227; p=0,001)

Tartışma

Çalışmamız KHD parametrelerinden özellikle LF/HF oranının orta-ağır OUAS'lilerde anlamlı olarak yükseldiği gösterilmiştir. Bu bulgu, min O_2 satürasyonu düştükçe LF/HF oranının artmasıyla paraleldir. İkinci önemli sonuç, WBC ve nötrofil sayısının orta-ağır OUAS'li grupta, nötrofil/lenfosit oranının ise ağır OUAS'li grupta anlamlı olarak yüksek saptanmış olmasıdır. Bulgularımız literatürde daha önce bildirilen veriler ile uyumludur.

Çalışmamızda ayrıca OUAS hastalarında bu iki değişken arasındaki ilişki incelenmiştir. OUAS hastalarında sempatovagal dengenin sempatik sistem lehine bozulduğunu gösteren LF/HF oranı ile enflamasyon göstergesi olarak kabul edilen nötrofil/lenfosit oranı, lökosit sayısı ve nötrofil sayısı arasındaki anlamlı korelasyon ilk kez gösterilmiştir. KHD, otonom sinir sistemi tarafından kontrol edilir ve parasempatik (vagal) sistem ile sempatik sistemin dengesinden etkilenmektedir. Otonomik polinöropatiye neden olan diyabet gibi hastalıklarda KHD'nin bozulduğu bilinmektedir (17). Her ne kadar, diyabet, miyokard infarktüsü, hipertansiyon, kalp yetmezliği gibi diğer komorbid durumlarda KHD'nin etkilendiği bilinse de, OUAS'li hastalarda bu etkilenmenin herhangi bir komorbiditenin bulunmadığı durumlarda dahi göründüğü ve hatta KHD'deki bozulmanın OUAS şiddeti ile ilişkili olabileceği raporlanmıştır (18). Ayrıca sürekli pozitif havayolu basıncı tedavisinin otonomik fonksiyonları düzelttiği gösterilmiştir (19). Bu ilişkiden yola çıkılarak yapılan farklı çalışmalarda, OUAS tanısı için yalnızca KHD analizi yapmanın kolay bir tarama testi olarak kullanılabileceği ve PSG'ye çok daha ucuz bir yöntem olduğu vurgulanmıştır (20-22). Diğer bir faktör olan kronik enflamasyon, OUAS seyrinde önemli patolojik mekanizmalardan biridir (23). Henüz tam olarak aydınlatılamamış olsa da, tekrarlayan kısa süreli hipoksinin, çok sayıda enflamatuvar yolağı aktive ettiği düşünülmektedir. WBC, nötrofil sayısı ve nötrofil/lenfosit oranı, enflamasyonun basit göstergeleri olarak kabul edilmektedir (24). Çalışmamızda her 3 parametrenin de OUAS ile ilişkisi gösterilmiştir. Benzer şekilde başka bir çalışmada, lökosit sayısının ve nötrofil lenfosit oranının OUAS'li hastalarda kontrol grubuna kıyasla anlamlı şekilde yüksek olduğu raporlanmıştır (10). OUAS'de, C-reaktif protein, interlökin-6 ve tümör nekroz faktörü-alfanın da diğer faktörlerden bağımsız bir şekilde yüksek olduğunun gösterilmesi enflamasyonun tartışılmaz kanıtlarından biri olmuştur (25,26).

Enflamasyon, başka bir bakış açısıyla, OUAS'deki üst solunum yolu obstrüksiyonunun ve kardiyovasküler komplikasyonların altında yatan faktörlerden biri de olabilir (24). Obstrüksiyona yol açan lateral farengeal duvar kalınlaşmasında en büyük rolün yumuşak dokuların şişmesi olduğu gösterilmiş ve bunun enflamasyonun tetiklediği bir şişme olabileceği yorumu yapılmıştır. Farenks dokusunun histopatolojik bulgularının değerlendirildiği bir çalışmada, OUAS'li hastalarda kontrollere kıyasla çok daha yaygın ödem, vazodilatasyon ve mukus bezi hipertrofisi gösterilmiştir (27). OUAS nedeniyle uvulopalatofaringoplasti yapılan 48 hastanın detaylı histopatolojik analizi de, belirgin subepiteliyal ödemin hastaların %79'unda mevcut olduğunu göstermiştir (28). Bu bulgular üst havayolu daralmasında, enflamasyonun da önemli bir katkısı olduğunu ve OUAS'nin şiddetini artırarak kısır bir döngü oluşturabileceğini telkin etmektedir. Çalışmamızın ek bulgularından biri de, hem çalışmaya alınan hastalar arasında hem de orta-ağır OUAS grubunda erkek hakimiyetinin varlığıdır. Epidemiyolojik çalışmalarda erkeklerde kadınlara kıyasla 2 ila 8 kat risk artışı bildirilmiştir (29,30). Erkek cinsiyetin tartışmasız bir risk faktörü olduğu kabul edilse de, aradaki bu yüksek farkın önemli sebeplerinden bir tanesi de kadınlarda tanının atlanması ve gecikmesidir (31). Her ne kadar yıllar içerisinde kadın popülasyonunda OUAS varlığı açısından farkındalık artışı olsa da halen yeterli seviyede olmadığı düşünülmektedir (32).

Çalışmamızda ayrıca orta-ağır OUAS grubunda yaş ortalamasının daha yüksek olduğu dikkati çekmektedir. Literatürde OUAS

Tablo 2. Gruplara göre hemogram parametreleri

Lab. parametreleri	AHİ <15	AHİ ≥15	p
Lökosit sayısı, 10^3/µL	6,8±1,8	7,4±1,7	**0,015**
Eritrosit sayısı, 10^6/µL	4,8±0,6	4,9±0,5	0,302
Hemoglobin, g/dL	13,6±1,7	14,2±1,6	**0,040**
Hematokrit, %	40,2±4,9	41,9±4,5	**0,019**
Nötrofil sayısı, 10^3/µL	3,9±1,4	4,4±1,4	**0,012**
Lenfosit sayısı, 10^3/µL	2,2±0,8	2,2±0,6	0,941
Trombosit sayısı, 10^3/µL	257,2±65,1	257,8±72,8	0,663
Nötrofil/lenfosit oranı	2,1±1,3	2,2±1,1	0,334

AHİ: Apne hipopne indeksi

Tablo 3. Kalp hızı değişkenliği verileri

KHD parametreleri	AHİ <15	AHİ ≥15	p
avNN, (ms)	921,0	907,5	0,638
pNN50, (%)	9,9	9,3	0,417
ortLF,	9953,5	11843,1	0,124
ortHF	4844,0	4320,5	0,083
LF/HF	2,1	3,1	**0,012**

KHD: Kalp hızı değişkenliği, AHİ: Apne hipopne indeksi, avRR: Normal R-R intervallerinin ortalaması, pNN50: 50 milisaniyeyi aşan ardışık R-R intervallerinin oranı, ortLF: Ortalama düşük frekans gücü, ortHF: Ortalama yüksek frekans gücü, LF/HF: Düşük frekans gücünün yüksek frekans gücüne oranı

prevalansının yaşla arttığı gösterilmiştir. Altmış beş yaş üstünde prevalansın 2 ila 3 kat arttığı bildirilmektedir. Fakat bu artış grafiği daha ileri yaşlarda plato çizmektedir (33,34).

Çalışmanın Kısıtlılıkları

Bu çalışmanın en önemli kısıtlılığı retrospektif olarak yürütülmesidir. OUAS hastalarında tedavi öncesi dönem ile pozitif hava yolu basıncı tedavisi sonrası hemogram ve KHD parametrelerinin karşılaştırılmamış olması bir diğer önemli kısıtlılıktır. Ayrıca veri setinde oksijen desatürasyon indeksi ve satürasyon %90'nın altında geçirilen süre bulunmamaktadır.

Sonuç

Bu çalışma ile OUAS'de enflamasyonun ve otonom disfonksiyonun önemi bir kere daha gösterilmiş ve daha önemlisi, enflamasyon ile otonom disfonksiyonun korele olduğu saptanmıştır. Bu korelasyon, OUAS'nin önemli bir komplikasyonu olan sempatik fonksiyon bozukluğunda, enflamasyonun primer bir rol üstlenmiş olabileceğini düşündürmektedir. Çalışma sonuçlarımızın doğrulanması açısından uzun takipler ile tekrarlayan ölçümlerin yapılması ve OUAS tedavisi sonrasındaki değişimlerin gözlenmesi önemlidir.

Etik

Etik Kurul Onayı: Çalışmamız İstanbul Üniversitesi-Cerrahpaşa, Cerrahpaşa Tıp Fakültesi Klinik Araştırmalar Etik Kurulu tarafından onaylandı (karar no: 140513, tarih: 23.10.2020).
Hasta Onayı: Retrospektif çalışma.
Hakem Değerlendirmesi: Editörler kurulu ve editörler kurulu dışında olan kişiler tarafından değerlendirilmiştir.

Yazarlık Katkıları

Konsept: G.B.Ş., D.K., Dizayn: C.B., G.B.Ş., Veri Toplama veya İşleme: C.B., Analiz veya Yorumlama: C.B., G.B.Ş., D.K., Litaratür Arama: C.B., G.B.Ş., Yazan: C.B., G.B.Ş., D.K.
Çıkar Çatışması: Yazarlar tarafından çıkar çatışması bildirilmemiştir.
Finansal Destek: Yazarlar tarafından finansal destek almadıkları bildirilmiştir.

Kaynaklar

1. Young T, Peppard P, Palta M, Hla KM, Finn L, Morgan B, Skatrud J. Population-based study of sleep-disordered breathing as a risk factor for hypertension. Arch Intern Med 1997;157:1746-52.
2. Dyken ME, Somers VK, Yamada T, Ren ZY, Zimmerman MB. Investigating the relationship between stroke and obstructive sleep apnea. Stroke 1996;2:401-7.
3. Partinen M, Guilleminault C. Daytime sleepiness and vascular morbidity at seven-year follow-up in obstructive sleep apnea patients. Chest 1990;97:27-32.
4. Hung J, Whitford EG, Parsons RW, Hillman DR. Association of sleep apnoea with myocardial infarction in men. Lancet 1990;336:261-4.
5. Bliwise DL, Bliwise NG, Partinen M, Pursley AM, Dement WC. Sleep apnea and mortality in an aged cohort. Am J Public Health 1988;78:544-7.
6. Nicholl DD, Hanly PJ, Poulin MJ, Handley GB, Hemmelgarn BR, Sola DY, Ahmed SB. Evaluation of continuous positive airway pressure therapy on renin-angiotensin system activity in obstructive sleep apnea. Am J Respir Crit Care Med 2014;190:572-80.
7. Ryan S, Taylor CT, McNicholas WT. Selective activation of inflammatory pathways by intermittent hypoxia in obstructive sleep apnea syndrome. Circulation 2005;112:2660-7.
8. Aihara K, Oga T, Chihara Y, Harada Y, Tanizawa K, Handa T, Hitomi T, Uno K, Mishima M, Chin K. Analysis of systemic and airway inflammation in obstructive sleep apnea. Sleep Breath 2013;17:597-604.
9. Lombardi C, Pengo MF, Parati G. Obstructive sleep apnea syndrome and autonomic dysfunction. Auton Neurosci 2019;221:102563.
10. Uygur F, Tanriverdi H, Aktop Z, Erboy F, Altinsoy B, Damar M, Atalay F. The neutrophil-to-lymphocyte ratio in patients with obstructive sleep apnoea syndrome and its relationship with cardiovascular disease. Heart Lung 2016;45:121-5.
11. Kirtane AJ, Bui A, Murphy SA, Barron HV, Gibson CM. Association of peripheral neutrophilia with adverse angiographic outcomes in ST-elevation myocardial infarction. Am J Cardiol 2004;93:532-6.
12. de Jager CP, van Wijk PT, Mathoera RB, de Jongh-Leuvenink J, van der Poll T, Wever PC. Lymphocytopenia and neutrophil-lymphocyte count ratio predict bacteremia better than conventional infection markers in an emergency care unit. Crit Care 2010;14:R192.
13. Turak O, Özcan F, Işleyen A, Başar FN, Gül M, Yilmaz S, Sökmen E, Yüzgeçer H, Lafçi G, Topaloğlu S, Aydoğdu S. Usefulness of neutrophil-to-lymphocyte ratio to predict in-hospital outcomes in infective endocarditis. Can J Cardiol 2013;29:1672-8.
14. Gula LJ, Krahn AD, Skanes A, Ferguson KA, George C, Yee R, Klein GJ. Heart rate variability in obstructive sleep apnea: a prospective study and frequency domain analysis. Ann Noninvasive Electrocardiol 2003;8:144-9.
15. Stein PK, Bosner MS, Kleiger RE, Conger BM. Heart rate variability: a measure of cardiac autonomic tone. Am Heart J 1994;127:1376-81.
16. von Elm E, Altman DG, Egger M, Pocock SJ, Gøtzsche PC, Vandenbroucke JP; STROBE Initiative. The Strengthening the Reporting of Observational Studies in Epidemiology (STROBE) statement: guidelines for reporting observational studies. PLoS Med 2007;4:e296.
17. Ewing DJ, Neilson JM, Shapiro CM, Stewart JA, Reid W. Twenty four hour heart rate variability: effects of posture, sleep, and time of day in healthy controls and comparison with bedside tests of autonomic function in diabetic patients. Br Heart J 1991;65:239-44.
18. Narkiewicz K, Montano N, Cogliati C, van de Borne PJ, Dyken ME, Somers VK. Altered cardiovascular variability in obstructive sleep apnea. Circulation 1998;98:1071-7.
19. Khoo MC, Kim TS, Berry RB. Spectral indices of cardiac autonomic function in obstructive sleep apnea. Sleep 1999;22:443-51.
20. Roche F, Gaspoz JM, Court-Fortune I, Minini P, Pichot V, Duverney D, Costes F, Lacour JR, Barthélémy JC. Screening of obstructive sleep apnea syndrome by heart rate variability analysis. Circulation 1999;100:1411-5.
21. Roche F, Pichot V, Sforza E, Court-Fortune I, Duverney D, Costes F, Garet M, Barthélémy JC. Predicting sleep apnoea syndrome from heart period: a time-frequency wavelet analysis. Eur Respir J 2003;22:937-42.
22. Hilton MF, Bates RA, Godfrey KR, Chappell MJ, Cayton RM. Evaluation of frequency and time-frequency spectral analysis of heart rate variability as a diagnostic marker of the sleep apnoea syndrome. Med Biol Eng Comput 1999;37:760-9.
23. Hatipoğlu U, Rubinstein I. Inflammation and obstructive sleep apnea syndrome pathogenesis: a working hypothesis. Respiration 2003;70:665-71.

24. Zahorec R. Ratio of neutrophil to lymphocyte counts--rapid and simple parameter of systemic inflammation and stress in critically ill. Bratisl Lek Listy 2001;102:5-14.
25. Vgontzas AN, Papanicolaou DA, Bixler EO, Hopper K, Lotsikas A, Lin HM, Kales A, Chrousos GP. Sleep apnea and daytime sleepiness and fatigue: relation to visceral obesity, insulin resistance, and hypercytokinemia. J Clin Endocrinol Metab 2000;85:1151-8.
26. Shamsuzzaman AS, Winnicki M, Lanfranchi P, Wolk R, Kara T, Accurso V, Somers VK. Elevated C-reactive protein in patients with obstructive sleep apnea. Circulation 2002;105:2462-4.
27. Woodson BT, Garancis JC, Toohill RJ. Histopathologic changes in snoring and obstructive sleep apnea syndrome. Laryngoscope 1991;101:1318-22.
28. Sekosan M, Zakkar M, Wenig BL, Olopade CO, Rubinstein I. Inflammation in the uvula mucosa of patients with obstructive sleep apnea. Laryngoscope 1996;106:1018-20.
29. Young T, Peppard PE, Gottlieb DJ. Epidemiology of obstructive sleep apnea: a population health perspective. Am J Respir Crit Care Med 2002;165:1217-39.
30. Bixler EO, Vgontzas AN, Lin HM, Ten Have T, Rein J, Vela-Bueno A, Kales A. Prevalence of sleep-disordered breathing in women: effects of gender. Am J Respir Crit Care Med 2001;163:608-13.
31. Young T, Finn L. Epidemiological insights into the public health burden of sleep disordered breathing: sex differences in survival among sleep clinic patients. Thorax 1998;53(Suppl 3):S16-9.
32. Young T, Skatrud J, Peppard PE. Risk factors for obstructive sleep apnea in adults. JAMA 2004;291:2013-6.
33. Ip MS, Lam B, Tang LC, Lauder IJ, Ip TY, Lam WK. A community study of sleep-disordered breathing in middle-aged Chinese women in Hong Kong: prevalence and gender differences. Chest 2004;125:127-34.
34. Young T, Shahar E, Nieto FJ, Redline S, Newman AB, Gottlieb DJ, Walsleben JA, Finn L, Enright P, Samet JM; Sleep Heart Health Study Research Group. Predictors of sleep-disordered breathing in community-dwelling adults: the Sleep Heart Health Study. Arch Intern Med 2002;162:893-900.

Özgün Makale / *Original Article*

DOI: 10.4274/tjsm.galenos.2023.40427

Journal of Turkish Sleep Medicine 2023;10:192-198

Non-spesifik Boyun Ağrısı Olan Genç Bireylerde Uyku Pozisyonunun Boyun Yeti Yitimi, Üst Ekstremite Fonksiyonu ve Uyku Kalitesi Üzerine Etkileri

Effects of Sleep Position on Neck Disability, Upper Extremity Function, and Sleep Quality in Young Individuals with Non-specific Neck Pain

Rumeysa Ateş, Hasan Özbek*, Ziya Yıldız**, Zeliha Başkurt

Süleyman Demirel Üniversitesi Sağlık Bilimleri Fakültesi, Fizyoterapi ve Rehabilitasyon Anabilim Dalı, Isparta, Türkiye
**Mehmet Akif Ersoy Üniversitesi Sağlık Bilimleri Fakültesi, Fizyoterapi ve Rehabilitasyon Anabilim Dalı, Burdur, Türkiye*
***Isparta Uygulamalı Bilimler Üniversitesi Uluborlu Selahattin Karasoy Meslek Yüksekokulu, Engelli Bakımı ve Rehabilitasyon Anabilim Dalı, Isparta, Türkiye*

Öz

Amaç: Non-spesifik boyun ağrısı herhangi bir belirli sebepten kaynaklanmayan boyun lateral ve posteriorunda bulunan ağrıdır. Boyun ağrılı bireylerde tercih edilen uyku pozisyonu ağrı şiddeti, yeti yitimi, üst ekstremite fonksiyonu ve uyku kalitesine etki edebilir. Bu çalışmada uyku pozisyonlarının non-spesifik boyun ağrılı genç bireylerdeki parametrelere etkisinin incelenmesi amaçlanmıştır.

Gereç ve Yöntem: Çalışma non-spesifik boyun ağrısı olan 18-30 yaşları arasındaki 91 (12 erkek, 79 kadın) üniversite öğrencisiyle gerçekleştirilmiştir. Uyku pozisyonları uyku pozisyon görselleriyle belirlenmiştir. Ağrı "Sayısal Derecelendirme Ölçeğiyle", boyun yeti yitimi "Bournemouth Boyun Anketiyle", üst ekstremite fonksiyonelliği "Üst Ekstremite Fonksiyonel İndeksiyle" ve uyku kalitesi "Pittsburgh Uyku Kalite İndeksiyle" değerlendirilmiştir.

Bulgular: Boyun ağrısı yaşayanların %60,4'ü omuz ağrısı da yaşadığını bildirmiştir. Uyku pozisyonuyla; boyun ağrısı şiddeti, omuz ağrısı şiddeti, boyun yeti yitimi, üst ekstremite fonksiyonu ve uyku kalitesi arasında istatistiksel olarak anlamlı bir ilişki bulunmamıştır ($p<0,05$).

Sonuç: Non-spesifik boyun ağrısı olan genç bireylerin tercih ettiği uyku pozisyonunun ağrı şiddeti, boyun yeti yitimi, üst ekstremite fonksiyonu ve uyku kalitesi üzerinde anlamlı etkisinin olmadığı sonucuna ulaşılmıştır.

Anahtar Kelimeler: Non-spesifik boyun ağrısı, uyku pozisyonu, boyun yeti yitimi, üst ekstremite fonksiyonu, uyku kalitesi

Abstract

Objective: Non-specific neck pain is pain in the lateral and posterior of the neck that is not caused by any specific reason. The preferred sleeping position in individuals with neck pain may affect pain severity, disability, upper extremity function, and sleep quality. In this study, we aimed to examine the effects of sleep positions on the parameters of young individuals with non-specific neck pain.

Materials and Methods: The study was conducted with 91 (12 male, 79 female) university students aged 18-30 years with non-specific neck pain. Sleep positions were determined using sleep position images. Pain was assessed with the "Numerical Rating Scal", neck disability with the "Bournemouth Neck Questionnaire", upper extremity functionality with the "Upper Extremity Functional Index" and sleep quality with the "Pittsburgh Sleep Quality Index".

Results: 60.4% of those who experienced neck pain also reported that they also experienced shoulder pain. With the sleeping position, there was no statistically significant relationship between neck pain severity, shoulder pain severity, neck disability, upper extremity function, and sleep quality ($p<0.05$).

Conclusion: It was concluded that the sleep position preferred by young individuals with non-specific neck pain did not have a significant effect on pain severity, neck disability, upper extremity function, and sleep quality.

Keywords: Non-specific neck pain, sleep position, neck disability, upper extremity function, sleep quality

Yazışma Adresi/Address for Correspondence: Asist. Rumeysa Ateş, Süleyman Demirel Üniversitesi Sağlık Bilimleri Fakültesi, Fizyoterapi ve Rehabilitasyon Anabilim Dalı, Isparta, Türkiye
Tel.: +90 545 571 60 32 **E-posta:** rumeysaates@sdu.edu.tr **ORCID-ID:** orcid.org/0000-0002-8904-1209
Geliş Tarihi/Received: 24.05.2022 **Kabul Tarihi/Accepted:** 13.01.2023

Giriş

Non-spesifik boyun ağrısı (NSBA), nörolojik ve spesifik patolojilerin (kırık, enfeksiyon, enflamasyon, servikal spondilozis vb.) olmadığı üst boyun çizgisiyle 1. torakal vertebra arasında kalan boyun lateral ve posterior bölgesinde bulunan ağrı olarak tanımlanmaktır (1). Boyun ağrısının genç bireylerdeki yıllık prevalansının %42 ile %67 arasında olduğu ve dünya çapında en yaygın kas-iskelet sistemi bozukluklarından biri olduğu bildirilmektedir (2). NSBA risk faktörleri arasında uzun süreli ve/veya yanlış pozisyonda bilgisayar kullanımı, ergonomik olmayan masa ve sandalye kullanımı, fiziksel aktivite, yanlış postür, vücut kütle indeksi (VKİ), kadın cinsiyet, daha uzun çalışma saatleri, daha az uyku saatleri ve stres bulunmaktadır (2,3). NSBA sıklıkla üst ekstremite fonksiyon yetersizliğiyle ilişkilidir (4,5). Üst ekstremite fonksiyon yetersizliği taşıma, kaldırma ve baş üstü aktiviteler gibi üst ekstremitelerin kullanıldığı fiziksel aktiviteler sırasında kısıtlamaların varlığı olarak tanımlanmaktadır (5). NSBA olan bireylerin %80'inin üst ekstremite fonksiyonunu içeren günlük yaşam aktivitelerinde zorluklar yaşadığı bildirilmektedir. NSBA ve üst ekstremite fonksiyon yetersizliği arasındaki ilişkiyi açıklayan net bir mekanizma olmamakla birlikte iki olası mekanizma tanımlanmıştır. Birinci mekanizma üst ekstremitenin mekanik yüklenmesi veya tekrarlayan baş üstü hareketi, boyun eklem ve bağ yapısında mekanik yükü artırarak boyun ağrısını tetikleyebilir veya koruyucu boyun kas spazmı oluşturabilir. Diğer bir olası mekanizma ise NSBA'nın, ağrı korkusu, ağrıdan kaçınma davranışı ve/veya zayıf ağrı öz-yeterliliğine sebep olarak üst ekstremitenin fonksiyonel kullanımını kısıtlamasıdır. Sonuç olarak mekanizmalara bakıldığında boyun ve üst ekstremite kaslarında güç kaybı, enerji ve dayanıklılıkta azalmaya yol açan bir kondisyon kaybı meydana gelebileceği düşünülmektedir (5,6). Bu kayıplar kişinin günlük yaşam aktivitelerini de etkileyecektir. Uyku günün en az üçte birini kaplayan, vücudun toparlanmasını sağlayan bir süreçtir. Boyun ağrısı değerlendirmesinde uyku sırasındaki pozisyon da dikkate alınmalıdır. Uyku kalitesi boyun ağrısı için bağımsız bir risk faktörüdür ve boyun ağrısı olan bireylerde uyku bozuklukları yaygın olarak görülmektedir (7). Düzgün bir uyku pozisyonu benimsenmesi kolumna vertebralisin sağlığını olumlu yönde etkilemektedir. Uyku pozisyonundaki değişikliklerin bireylerin uyku kalitesi ve serviko-torasik semptomlarla ilişkili olduğu bilinmektedir (8).

Boyun ağrısı, ağrı ve özür şiddetine bağlı olarak sadece boyun bölgesini değil üst ekstremite performansı ve fonksiyonunu da etkiler (9). Aynı zamanda üst ekstremite ve boyun ağrısı uyku kalitesini de etkilemektedir. Bu nedenle uyku pozisyonundaki değişimlerle, üst ekstremitedeki problemlerde ağrıyı azaltmak için öneri modeli oluşturulabilir (10). Literatürde; üst ekstremite problemlerinde ağrıyı azaltmak için uyku modelleri önerilirken, boyun ağrısı için öneride bulunan çalışmalar kısıtlıdır.

NSBA olan genç bireylerde uyku pozisyonunun boyun ve omuz ağrısı şiddeti, boyun yeti yitimi, üst ekstremite fonksiyonu ve uyku kalitesi üzerine etkisi az araştırılmış bir konudur. NSBA ile uyku pozisyonunun birbirini döngüsel olarak etkilediği, uyku pozisyonu, uyku kalitesini ve üst ekstremite fonksiyonunu etkileyeceği düşünülmektedir. Bu çalışmada amaç; NSBA olan genç bireylerde uyku pozisyonunun boyun ve omuz ağrısı şiddeti, boyun yeti yitimi, üst ekstremite fonksiyonu ve uyku kalitesi üzerine etkisini incelemektir.

Gereç ve Yöntemler

Çalışmaya Süleyman Demirel Üniversitesi Sağlık Bilimleri Fakültesi, Fizyoterapi ve Rehabilitasyon Bölümü'nde eğitim gören ve NSBA yaşayan, 18-30 yaşları arasındaki, çalışmaya katılmaya gönüllü olan 91 öğrenci dahil edilmiştir. Çalışmanın Etik kurul onayı Süleyman Demirel Üniversitesi Sağlık Bilimleri Etik Kurulu'ndan (karar no: 1, tarih: 21.12.2021) alınmıştır. Veriler Google forms üzerinden doldurulan anketle toplanmıştır.

Dahil Edilme Kriterleri:

- Süleyman Demirel Üniversitesi Sağlık Bilimleri Fakültesi, Fizyoterapi ve Rehabilitasyon Bölümü'nde okuyor olmak.
- Çalışmaya katılmaya gönüllü olmak.
- 18-30 yaşları arasında üniversite öğrencisi olmak.
- NSBA varlığı.

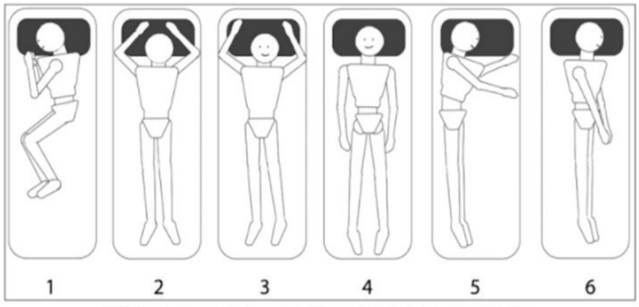
Dışlanma Kriterleri:

- Verilen cevapları etkileyebilecek psikiyatrik hastalığa sahip olmak.
- Kognitif fonksiyonları etkileyebilecek herhangi bir ilaç ve alkol kullanmış olmak.
- Boyun ve omuza yönelik cerrahi geçirmiş ve tanısı konmuş servikal patolojisi olmak.

Çalışma tek değerlendirmeli anket uygulaması şeklinde gerçekleştirilmiştir. Çalışmaya katılmaya gönüllü olan öğrencilerden bilgilendirilmiş gönüllü olur formu aracılığı ile çalışmaya katılmaya gönüllü olduklarına dair onam alınmıştır.

Katılımcılarda demografik bilgiler olarak; yaş, boy, vücut ağırlığı, cinsiyet, sigara ve alkol alışkanlığı sorgulanmıştır. Hissedilen ağrının tipi, süresi, lokalizasyonu kayıt edilmiştir. Boyun ağrısı durasyonu 3 aydan uzun süredir boyun ağrısı olanlar (kronik) ve 1-3 ay arası boyun ağrısı olanlar (subakut) şeklinde gruplandırılmıştır. Uyku pozisyonu popüler uyku pozisyonları görselleriyle, boyun ve omuz ağrısı Sayısal Derecelendirme Ölçeğiyle (SDÖ), boyun yeti yitimi Bournemouth Boyun Anketiyle, üst ekstremite fonksiyonelliği Üst Ekstremite Fonksiyonel Ölçeğiyle ve uyku kalitesi Pittsburgh Uyku Kalite İndeksiyle (PUKİ) değerlendirilmiştir.

Uyku Pozisyonlarının Değerlendirilmesi: Uyku pozisyonlarını değerlendiren bir ölçek bulunmamaktadır. Holdaway ve ark.'nın (11) kullandıkları yaygın uyku pozisyonlarını Karabay ve ark. (12) çalışmalarında Türkçe olarak kullanmışlardır. Uyku pozisyonlarını fetüs, yüz üstü, denizyıldızı, asker, kütük kollar önde, kütük olarak 6 grupta incelemişlerdir. Çalışmamızda uyku pozisyonları bu görsel içerik yoluyla değerlendirilmiştir (12). Uyku pozisyonu ve omuz ağrısı ilişkisinin incelendiği çalışmaların bir meta-analizinde uyku pozisyonunun sözel olarak öz bildirimle veya labaratuvar ortamında değerlendirildiği çalışmalarda uyku pozisyonu tercihlerinin benzer oranlarda olduğu ve anket yöntemiyle yapılan değerlendirmenin güvenilir sonuçlar verdiği bildirilmiştir. Katılımcıların en çok kullandıkları pozisyonu seçmeleri istenmiştir. Söz konusu pozisyonlar Şekil 1'de gösterilmiştir. İkincil analizde değerlendirmede kullandığımız 6 uyku pozisyonu yüzüstü, sırtüstü (deniz yıldızı ve asker) ve yan



ŞEKİL 1: Uyku pozisyonları. 1. Fetüs, 2. Yüzüstü, 3. Deniz yıldızı, 4. Asker, 5. Kütük-kollar önde, 6. Kütük.

- [ ] 1-Fetüs
- [ ] 2-Yüzüstü
- [ ] 3-Deniz Yıldızı
- [ ] 4-Asker
- [ ] 5-Kütük/Kollar önde
- [ ] 6-Kütük

Şekil 1. Gece tercih edilen uyku pozisyonunu gösteren görsel

yatış (fetüs, kütük/kollar önde ve kütük) olarak 3 temel uyku pozisyonu şeklinde gruplandırılmış ve ayrıca analiz edilmiştir.

Sayısal Derecelendirme Ölçeği (SDÖ): Ağrı değerlendirmesi SDÖ ile yapılmıştır. SDÖ ağrının şiddetini belirlemeye yarayan 0'dan 10'a kadar verilerin sorgulandığı bir ölçektir. Ağrının olmaması 0 puanken, dayanılmaz ağrının varlığı 10 puandır. Katılımcılardan hissettikleri ağrının şiddetini ifade eden bir puan vermeleri istenmiştir. İstirahat, aktivite ve gece sırasındaki ağrı şiddeti sorgulanmıştır.

Bournemouth Boyun Ağrısı Anketi (BBAA): Boyun yeti yitimi, BBAA ile değerlendirilmiştir. Yılmaz ve ark. (13) tarafından 2018 yılında Türkçe geçerlilik ve güvenilirlik çalışması yapılmıştır. BBAA toplamda 7 sorudan oluşmaktadır. Her soru 0 ve 10 arasında puan almaktadır ve toplamda en yüksek skor 70'dir. Yüksek skor yeti yitimi seviyesinin ciddiyetini gösterir. Anket ağrı şiddeti, ağrının günlük yaşam aktivitelerine ve sosyal yaşama etkisi, kaygı-depresyon seviyesi, kinezyofobi ve ağrı ile baş edebilme yeteneği gibi parametrelerden oluşmaktadır. BBAA kısa, pratik, çok yönlü değerlendirmeye elverişli bir ankettir (13).

Üst Ekstremite Fonksiyonel İndeksi (ÜEFİ): Üst ekstremitenin fonksiyonel durumunu değerlendirmek için Stratford tarafından geliştirilmiş ve Türkçe geçerlilik ve güvenirlik çalışması yapılmıştır (14). Katılımcıdan son bir haftadaki şikayetlerini göz önüne alması ve kendisine en uygun cevabı vermesi istenmiştir. Üst ekstremiteyi ilgilendiren 15 adet aktivite sorgulanır. Skorlamada ölçek maddelerine 0-4 arasında beşli Likert ölçeğine göre bir puan verilir. Sıfır-yüz puan arasında toplam puan elde edilir ve yüksek puan yüksek aktivite seviyesini gösterir. ÜEFİ'nin yanıtlanması ortalama 5-8 dakika sürmektedir (15).

Pittsburgh Uyku Kalitesi İndeksi (PUKİ): Uyku kalitesi, PUKİ ile değerlendirilmiştir. PUKİ, Buysse ve ark. (16) tarafından kullanılmış, Türkçe geçerlilik güvenilirlik çalışması Agargun ve ark. (17) tarafından 1996 yılında gerçekleştirilmiştir. Yirmi dört sorudan oluşan ankette 19 soru öz bildirimle, 5 soru yatak veya oda arkadaşı tarafından yanıtlanmaktadır. Son 5 soru puanlamaya dahil edilmemektedir. Öz bildirim sorularında öznel uyku kalitesi, uyku latensi, uyku süresi, alışılmış uyku etkinliği, uyku bozukluğu, uyku ilacı kullanımı ve uykusuzluk kaynaklı gündüz işlev bozukluğu parametreleri değerlendirilir. Toplam skor, yedi bileşenin puanlarının toplanmasıyla hesaplanır ve bu skor 0-21 puan arasında değişir. Toplam skorun 5'ten fazla olması kötü uyku kalitesini gösterir. PUKİ'nin yanıtlanması ortalama 5-10 dakika sürer (16).

İstatistiksel Analiz

Çalışmanın örneklem büyüklüğü çalışma öncesinde "OpenEpi 3. versiyon açık kaynak hesaplayıcısında" Kempf ve Kongsted'in (18) yaptığı çalışma referans alınarak [59 katılımcının ağrılı omuz üzerinde uyuduğunu bildiren %68'i (%95 güven aralığı, 56-80)]; %80 güç ve tip-1 hata 0,05 kabul edildiğinde 42 katılımcı olarak belirlenmişti, çalışma 91 katılımcıyla tamamlanmıştır. Online anket yöntemiyle toplanan veriler, Statistical Package for Social Science (SPSS) programının 26.0 versiyonu kullanılarak analiz edilmiştir. Demografik verilerin ve bağımsız değişkenlerin tanımlayıcı istatistikleri ortalama, standart sapma, ortanca ve yüzdelik dilim şeklinde yorumlanmıştır. Uyku pozisyonunun etkisini değerlendirmek için iki grubun olduğu durumlarda Mann-Whitney U testi, ikiden fazla grubun olduğu durumlarda Kruskal-Wallis testi uygulanmıştır. Tüm testlerde istatistiksel anlamlılık düzeyi p=0,05 kabul edilmiştir. Kruskal-Wallis testinde farkın hangi gruplar arasında meydana geldiğini saptamak için ikili karşılaştırmalarda Mann-Whitney U testi kullanılmış ve Bonferroni düzeltmesi yapılmıştır. Bonferroni düzeltmesi kaç grup arasında yapıldıysa yeni anlamlılık düzeyi p=0,05'in grup sayısına bölünmesiyle bulunmuştur (örneğin; 3 grup varsa p=0,05/3=0,017). Uyku pozisyonu tercihinin; cinsiyet, yaş, VKİ ve ağrı durasyonuna göre farklılaşıp farklılaşmadığı ki kare ve Kruskal-Wallis testleriyle değerlendirilmiştir.

Bulgular

Çalışmaya 12 erkek 79 kadın toplamda 91 kişi katılmıştır. Katılımcıların ortalama yaşları 20,52±2,03 (min: 18, maks: 29'dur). Boyun ağrısı durasyonu 11,61±17,11, omuz ağrısı durasyonu 7,79±14,89 ay olarak bildirilmiştir. Katılımcılardan 40'ının subakut boyun ağrısı bulunurken, 51'inin kronik boyun ağrısı bulunmuştur. Uyku pozisyonları sorgulanan katılımcılardan 53 kişi fetüs (%58,2), 19 kişi yüzüstü (%20,9), 1 kişi denizyıldızı (%1,1), 1 kişi asker (%1,1), 16 kişi kütük/kollar önde (%17,6), 1 kişi kütük (%1,1) pozisyonunda uyuduğunu bildirmiştir. Bu uyku pozisyonları 3 temel uyku pozisyonunda gruplandırıldığında 70 kişinin yan yatış (%76,9), 19 kişinin yüzüstü (%20,9) ve 2 kişinin sırtüstü (%2,2) pozisyonunu tercih ettiği belirlenmiştir. Boyun ağrısı yaşayanların %60,4'ü omuz ağrısı da yaşadığını bildirmiştir. Diğer tanımlayıcı istatistik verileri Tablo 1'de özetlenmiştir.

Uyku pozisyonunun boyun ağrısı şiddeti, omuz ağrısı şiddeti, boyun yeti yitimi, üst ekstremite fonksiyonu ve uyku kalitesi üzerine etkisi Tablo 2'de gösterilmiştir. Uyku pozisyonu değerlendirmesinde "deniz yıldızı, asker ve kütük" pozisyonlarında uyuduğunu bildiren yalnızca birer katılımcı bulunmuş ve yeterli sayı elde edilemediği için analize dahil

edilmemiştir. Analiz "fetüs, yüzüstü ve kütük/kollar önde" pozisyonları üzerinden yapılmıştır.

Sonuç olarak "Pittsburgh uyku kalitesi skoru" hariç gruplar arasında istatistiksel olarak anlamlı fark gözlenmemiştir (p>0,05). Uyku pozisyonlarının "Pittsburgh uyku kalitesi skoru" açısından birbiriyle ikili karşılaştırmaları arasında ise istatistiksel olarak anlamlı fark olmadığı tespit edilmiştir (p>0,017), (Tablo 3).

Üçlü uyku pozisyonunun boyun ağrısı şiddeti, omuz ağrısı şiddeti, boyun yeti yitimi, üst ekstremite fonksiyonu ve uyku kalitesi üzerine etkisi incelenmiş ve Tablo 4'te gösterilmiştir.

Tablo 1. Katılımcıların demografik özellikleri

	Sayı (n)	Yüzde (%)
Cinsiyet		
Erkek	12	13,2
Kadın	79	86,8
	$\bar{X}$ ± SS	$\tilde{X}$ (min-maks)
Yaş (yıl)	20,52±2,03	20 (18-29)
Boy (cm)	166,67±8,50	165 (150-194)
Vücut ağırlığı (kg)	62,68±13,93	60 (42-120)

$\bar{X}$ ± SD: Ortalama ± standart sapma, $\tilde{X}$ (min-maks): Ortanca (minimum-maksimum)

Sonuç olarak gruplar arasında istatistiksel olarak anlamlı fark gözlenmemiştir (p>0,05).

Çalışma sonuçlarını etkileyebilecek demografik faktörleri elimine etmek için uyku pozisyonu tercihinin; cinsiyet, yaş, VKİ ve ağrı durasyonuna (subakut/kronik) göre farklılaşıp farklılaşmadığı değerlendirilmiştir. Farklı uyku pozisyonlarını tercih edenler arasında bu parametreler açısından istatistiksel anlamlı bir fark bulunmamıştır (p>0,05).

Tartışma

Bu çalışma uyku pozisyonunun NSBA olan genç bireylerde boyun ve omuz ağrısı şiddeti, boyun yeti yitimi, üst ekstremite fonksiyonu ve uyku kalitesi üzerine etkisininin değerlendirilmesi amacıyla yapılmıştır. Uyku pozisyonunun NSBA'lı genç bireylerde, boyun ve omuz ağrısı şiddeti, boyun yeti yitimi, üst ekstremite fonksiyonu ve uyku kalitesi üzerinde etkisinin olmadığı sonucuna ulaşılmıştır.

En iyi uyku pozisyonu; stresi ve aktiviteleri azaltan kasların gevşemesini sağlayan ve daha iyi bir vücut dengesini destekleyen pozisyon olarak tanımlanmaktadır (19). Literatüre bakıldığında farklı uyku pozisyonlarının çeşitli artıları ve eksileri olduğu bildirilmektedir (20,21). Sırtüstü pozisyonunda uyumanın en büyük avantajı vücut ağırlığının geniş bir yüzeye dağılmış

Tablo 2. Uyku pozisyonunun boyun ağrısı şiddeti, omuz ağrısı şiddeti, boyun yeti yitimi, üst ekstremite fonksiyonu ve uyku kalitesi üzerine etkisi

Parametreler	Uyku pozisyonu	Ortanca	Sıra ortalaması	Kruskal-Wallis Testi	
				H	p
SDÖ (BAİ)	Fetüs	3	41,01	2,827	0,243
	Yüzüstü	4	51,89		
	Kütük/kollar önde	3	47,28		
SDÖ (BAA)	Fetüs	5	44,48	1,753	0,416
	Yüzüstü	4	39,32		
	Kütük/kollar önde	5,5	50,72		
SDÖ (OAİ)	Fetüs	3	42,46	1,875	0,392
	Yüzüstü	3	51,50		
	Kütük/kollar önde	2	42,94		
SDÖ (OAA)	Fetüs	4	47,15	1,755	0,416
	Yüzüstü	4	38,32		
	Kütük/kollar önde	3	43,06		
Bornemouth	Fetüs	26	40,90	2,873	0,238
	Yüzüstü	28	48,11		
	Kütük/kollar önde	36,5	52,16		
ÜEFİ	Fetüs	72,9	44,05	1,449	0,484
	Yüzüstü	74,8	49,87		
	Kütük/kollar önde	69,2	39,63		
Pittsburgh	Fetüs	7	38,87	6,724	0,035*
	Yüzüstü	8	51,55		
	Kütük/kollar önde	9	54,78		

*İstatistiksel olarak anlamlı

Fetüs (n=53), yüzüstü (n=19), kütük/kollar önde (n=16), n: Birey sayısı, SDÖ: Sayısal derecelendirme ölçeği, BAİ: Boyun ağrısı istirahat, BAA: Boyun ağrısı aktivite, OAİ: Omuz ağrısı istirahat, OAA: Omuz ağrısı aktivite, ÜEFİ: Üst Ekstiremite Fonksiyonel İndeksi, H: Test istatistiği, p: Anlamlılık değeri

olması ve bunun sonucunda stabilitenin optimize edilmesidir. İnsanların yaklaşık %10-15'i sırtüstü pozisyonunda uyumayı tercih etmektedir. Bu pozisyonun eksileri ise horlama ve uyku apnesi ihtimalinin daha yüksek olmasıdır. Yan yatış pozisyonu genellikle insanların %40-50'sinin tercih ettiği pozisyon olarak tanımlanmaktadır. Yan yatışta uyumak, uyku apnesi riskinin önemli ölçüde azalmasını bununla birlikte de reflü semptomlarının hafiflemesini sağlamaktadır. Ancak yan yatış pozisyonunun sırtüstü pozisyonuna kıyasla omurganın rahatlamasında daha az fayda sağlamakta olduğu bildirilmektedir. Sol tarafta uyurken mide ve akciğerler üzerinde çalışan karaciğerin ağırlık oluşturması dışında sol veya sağ tarafta uyuma arasında hiçbir fark olmadığı bulunmuştur. Yüzüstü uyumanın uyku için en az tercih edilen pozisyon olduğu ve yaşla birlikte azaldığı, yüzüstü uyumanın uyku apnesini azaltmada faydalı olduğu bununla birlikte de başka bir faydasını gösteren çok çalışmanın olmadığı bildirilmektedir (20,21).

Çalışmamızda da literatürle uyumlu olarak hastalarımızda en çok tercih edilen pozisyonunun yan yatış pozisyonu (fetüs, kütük/kollar önde ve kütük pozisyonları) olduğu bulunmuştur. Literatürde servikal semptomların önlenmesi için anekdotsal olarak, sırtüstü uyku pozisyonu önerilmektedir. Gordon ve ark.'nın (8) yaptığı çalışmada ise servikal bölge semptomlarının azaltılmasında supine pozisyonunun etkili olmadığı, yan yatış pozisyonunun etkili olduğu bulunmuştur (22,23). Çalışmamızda ise yapılan bu çalışmalardan farklı olarak uyku pozisyonunun servikal ağrıda ve boyun yeti yitimi üzerinde bir fark oluşturmadığı saptanmıştır. Bunun nedeninin kişinin uyku pozisyonu ne olursa olsun kullanılan ekipmalar (yatak, yastık, battaniye) ile servikal bölgenin düzgün pozisyonlanmasıyla semptomlarının

Tablo 3. Uyku pozisyonlarının Pittsburgh Uyku Kalitesi açısından ikili karşılaştırmaları

Uyku pozisyonları	Ortanca	Sıra ortalaması	U (test istatistiği)	p
Fetüs	7	33,69	354,500	0,055
Yüzüstü	8	44,34		
Fetüs	7	32,18	274,500	0,032
Kütük/kollar önde	9	44,34		
Yüzüstü	8	17,21	137,000	0,614
Kütük/kollar önde	9	18,94		

Tablo 4. Üç gruplu uyku pozisyonlarının karşılaştırılması

Parametreler	Uyku pozisyonu	Ortanca	Sıra ortalaması	Kruskal-Wallis Testi	
				H	p
SDÖ (BAİ)	Yan yatış	3	43,90	2,148	0,572
	Yüzüstü	4	53,82		
	Sırtüstü	3,5	45,25		
SDÖ (BAA)	Yan yatış	5	47,46	0,936	0,306
	Yüzüstü	4	41,08		
	Sırtüstü	4,5	41,75		
SDÖ (OAİ)	Yan yatış	2	44,73	5,143	0,284
	Yüzüstü	3	54,11		
	Sırtüstü	0	13,50		
SDÖ (OAA)	Yan yatış	4	48,36	4,433	0,301
	Yüzüstü	4	40,76		
	Sırtüstü	0,5	13,25		
Bornemouth	Yan yatış	28,5	44,90	0,538	0,979
	Yüzüstü	28	49,87		
	Sırtüstü	31,5	47,75		
ÜEFİ	Yan yatış	72,9	44,86	1,613	0,864
	Yüzüstü	74,8	51,71		
	Sırtüstü	65	31,75		
Pittsburgh	Yan yatış	7	44,56	4,804	0,470
	Yüzüstü	8	54,45		
	Sırtüstü	5	16,00		

Yan yatış (n=70), yüzüstü (n=19), sırtüstü (n=2), n: Birey sayısı, SDÖ: Sayısal Derecelendirme Ölçeği, BAİ: Boyun ağrısı istirahat, BAA: Boyun ağrısı aktivite, OAİ: Omuz ağrısı istirahat, OAA: Omuz ağrısı aktivite, ÜEFİ: Üst Ekstiremite Fonksiyonel İndeksi, H: Test istatistiği, p: anlamlılık değeri

azalmasını sağlayabileceği düşünülmektedir. Bununla birlikte uyku pozisyonları arasında farklılık olmamasının bir diğer nedeni gruplar arasındaki heterojen dağılımdan da kaynaklanabileceği varsayılabilir.

NSBA üst ekstremite fonksiyon bozukluğu ile birlikte görülmektedir ve hastaların %80'inden fazlası üst ekstremitelerin fonksiyonel yüklenmesini içeren günlük aktivitelerde zorluklar bildirmektedir (24). Literatürde üst ekstremiteye ait ağrılı durumlarda (omuz ağrısı) uyku pozisyonunun etkisini inceleyen çalışmalar bulunmaktadır (11,25). Ancak, çalışmamız uyku pozisyonunun üst ekstremite fonksiyonuna etkisini inceleyen ilk çalışmadır. Omuz ağrısını diğer kas-iskelet sistemi ağrılarından ayıran önemli bir özellik uykuya bağlı semptomların yaygın olmasıdır ve klinik çalışmalarda omuz ağrısının özelliklerinin gece ağrısı, uykusuzluk ve etkilenen tarafta uyuyamama olduğunu göstermektedir. Omuz ağrısının uyku pozisyonu ile ilişkili olduğu bildirilmektedir. Yan yatış pozisyonu omuz için potansiyel olarak zararlı kabul edilmektedir, çünkü vücut ve yatak arasında sırtüstü veya yüzüstü pozisyonlara göre daha küçük bir temas alanı ve omuzdaki alan birimi başına daha yüksek basınçlar içermektedir. Holdaway ve ark. (11) yüzüstü ve yan yatış pozisyonlarının omuz ağrısını artırdığını bildirmişlerdir (18,25). Yapılan başka bir çalışmada da tek taraflı omuz ağrısı olan hastaların ağrısız tarafa göre ağrılı omuz tarafında uyuma oranının daha yüksek olduğu ve yatakta yüzünü partnerlerinden karşı tarafa çevirerek uyuyan kişiler olduğu bildirilmektedir (18). Çalışmamızda literatürdeki bu çalışmalardan farklı olarak uyku pozisyonunun omuz ağrısı üzerinde etkisinin olmadığı bulunmuştur. Bu durumun bir sebebinin hastalarda uyku pozisyonu seçiminin ağrının inhibe olduğu pozisyon olmasından kaynaklanabileceği düşünülmektedir. Bununla birlikte üst ekstremite fonksiyonunda da uyku pozisyonlarının farklılık oluşturmadığı saptanmış ve bu durumun da uyku sırasında bütün uyku pozisyonlarında hastaların üst ekstremitelerinin statik pozisyonda kalmasından kaynaklanabileceği varsayılabilir.

Uyku kalitesi ile boyun ağrısı arasında ilişki bulunmakta, boyun ağrılı bireylerde düşük uyku kalitesi görülmektedir (26). Çalışmamızın sonucunda da benzer sonuç bulunmuş NSBA'lı hastalarda düşük uyku kalitesi olduğu tespit edilmiştir. Uyku pozisyonlarının önemli bir uyku değişkeni oluşturmakta olduğu ve bunun uyku kalitesiyle ilişkili olabileceği bildirilmektedir (27). Yan yatış pozisyonu diğer uyku pozisyonlarına göre daha yüksek uyku kalitesi ile sonuçlanmaktadır. Bununla birlikte de yarı oturur uyku pozisyonunun uyku sırasında daha fazla uyanmaya ve düşük uyku kalitesine neden olduğu bulunmuştur (8). De Koninck ve ark.'nın (27) çalışmasında sırtüstü ve yarı oturur pozisyonda uyumanın düşük uyku kalitesiyle sonuçlandığı bildirilmektedir. Yapılan bir çalışmada da sağ tarafa yan yatış pozisyonunda uyuyanların sol tarafa göre daha yüksek uyku kalitesine sahip olduğu gösterilmiştir (28). Çalışmamızın sonuçları literatürdeki bu çalışmaların sonuçlarıyla çelişkilidir. Uyku pozisyonu uyku kalitesinde farklılık meydana getirmemiştir. Bu sonucun, uyku kalitesinde uyku pozisyonunun etkili olduğu durumların daha çok ek tıbbi hastalık varlığında (uyku apnesi, kronik obstrüktif akciğer hastalığı gibi) ortaya çıkması ve çalışmamızdaki katılımcıların ek bir tıbbi hastalığı bulunmayan genç bireylerden oluşmasından kaynaklandığı düşünülmektedir.

On sekiz-24 yaşları arasındaki genç bireylerin gece uykusu sırasında saatte 3,6 kez uyku pozisyonunu değiştirdiği ve yaşlı bireylerde bu sayının azaldığı bildirilmektedir (65-80 yaş arası saatte 2,1) (29). Çalışmamızın örneklemini 18-30 yaşları arasındaki genç bireylerin oluşturduğu düşünüldüğünde uyku sırasındaki pozisyon değişikliği sayısının muhtemelen yüksek olmasının genel olarak uyku pozisyonunun boyun ağrısı, boyun yeti yitimi, omuz ağrısı, üst ekstremite fonksiyonu ve uyku kalitesinde etkisinin olmamasını açıklayabileceği varsayılabilir.

Çalışmamızda uyku pozisyonunun boyun ve omuz ağrısı şiddeti, boyun yeti yitimi, üst ekstremite fonksiyonu ve uyku kalitesi üzerinde etkisinin olmamasının bir nedeninin de çalışma popülasyonundaki bireylerin fizyoterapi ve rehabilitasyon bölümü öğrencilerinden oluşmasının olabileceği düşünülmektedir. Öğrencilerin eğitim-öğretim sürecinde aldıkları eğitimlerdeki bilgiler doğrultusunda uyku pozisyon tercihlerini ağrılı duruma göre planlaması sonucunda doğru bir uyku pozisyonu ile ağrılı durumun önüne geçilebileceği varsayılmaktadır.

Çalışmanın Kısıtlılıkları

Çalışmamızın bazı kısıtlılıkları bulunmaktadır. Çalışmamızın popülasyonu genç bireyleri içermektedir, farklı popülasyonlarda da incelemeler yapılması gerekmektedir. Çalışmamızda sırtüstü pozisyonu tercih ettiğini bildiren kişi sayısı azdır. Ancak bu bulgu NSBA'lı genç bireylerin sırtüstü uyku pozisyonunu fazla tercih etmediğini de göstermektedir. Gelecekte boyun ağrısı ve uyku pozisyonu ilişkisinin araştırıldığı çalışmalarda sırtüstü pozisyonunu tercih eden bireylerin daha yüksek örneklemle dahil edildiği, homojen bir dağılımın sağlandığı, farklı öğrenci popülasyonunda ve uyku sırasındaki pozisyon değişikliği sayısının da incelendiği çalışmalara ihtiyaç vardır.

Sonuç

NSBA olan bireylerin tercih ettiği uyku pozisyonunun boyun yeti yitimi, üst ekstremite fonksiyonu ve uyku kalitesi üzerine farklılık oluşturmadığı sonucuna ulaşılmıştır.

Etik

Etik Kurul Onayı: Çalışmanın etik kurul onayı Süleyman Demirel Üniversitesi Sağlık Bilimleri Etik Kurulu'ndan (karar no: 1, tarih: 21.12.2021) alınmıştır.

Hasta Onayı: Çalışmaya katılmaya gönüllü olan öğrencilerden bilgilendirilmiş gönüllü olur formu aracılığı ile çalışmaya katılmaya gönüllü olduklarına dair onam alınmıştır.

Hakem Değerlendirmesi: Editörler kurulu dışında olan kişiler tarafından değerlendirilmiştir.

Yazarlık Katkıları

Konsept: R.A., H.Ö., Z.Y., Z.B., Dizayn: R.A., H.Ö., Z.Y., Z.B., Veri Toplama veya İşleme: R.A., H.Ö., Z.Y., Analiz veya Yorumlama: H.Ö., Z.B., Litaratür Arama: R.A., H.Ö., Z.Y., Z.B., Yazan: R.A., H.Ö., Z.Y., Z.B.

Çıkar Çatışması: Yazarlar tarafından çıkar çatışması bildirilmemiştir.

Finansal Destek: Yazarlar tarafından finansal destek almadıkları bildirilmiştir.

Kaynaklar

1. Evans R, Bronfort G, Nelson B, Goldsmith CH. Two-year follow-up of a randomized clinical trial of spinal manipulation and two types of exercise for patients with chronic neck pain. Spine (Phila Pa 1976) 2002;27:2383-9.
2. Jahre H, Grotle M, Smedbråten K, Dunn KM, Øiestad BE. Risk factors for non-specific neck pain in young adults. A systematic review. BMC Musculoskeletal Disorders 2020;21:1-12.
3. Saeed A, Riaz H. Risk Factors of Non-Specific Neck Pain in Students : Case Control Study. JRCRS 2018;6:43-6.
4. Jang HJ, Kim SY, Jeon JG, Shin EJ. The Association Between Neck Pain/Disability and Upper Limb Disability in Patients with Non-Specific Neck Pain. The Korea Academia-Industrial Cooperation Society 2013;14:2862-8.
5. Alreni ASE, Abdo Aboalmaty HR, De Hertogh W, Meirte J, Harrop D, McLean SM. Measuring upper limb disability for patients with neck pain: Evaluation of the feasibility of the single arm military press (SAMP) test. Musculoskelet Sci Pract 2020;50:102254.
6. Osborn W, Jull G. Patients with non-specific neck disorders commonly report upper limb disability. Man Ther 2013;18:492-7.
7. Artner J, Cakir B, Spiekermann JA, Kurz S, Leucht F, Reichel H, Lattig F. Prevalence of sleep deprivation in patients with chronic neck and back pain: a retrospective evaluation of 1016 patients. J Pain Res 2013;6:1-6.
8. Gordon S, Grimmer K, Trott P. Sleep position, age, gender, sleep quality and waking cervico-thoracic symptoms. The Internet Journal Allied Health Sciences and Practice 2007;5:1-8.
9. Özsoy H. Investigation of the relationship between neck pain and disability severity and upper extremity performance in individuals with chronic neck pain (dissertation). Ankara: Ankara Yıldırım Beyazıt Üniv. 2019.
10. Mulligan EP, Brunette M, Shirley Z, Khazzam M. Sleep quality and nocturnal pain in patients with shoulder disorders. J Shoulder Elbow Surg 2015;24:1452-7.
11. Holdaway LA, Hegmann KT, Thiese MS, Kapellusch J. Is sleep position associated with glenohumeral shoulder pain and rotator cuff tendinopathy: a cross-sectional study. BMC Musculoskelet Disord 2018;19:1-8.
12. Karabay İ, Yaşar E, Tezel K, Demir Y, Gürçay E. Does the Sleeping Position Affect Shoulder Pain? A Clinical and Sonographic Study. J PMR Sci 2020;23:174-82.
13. Yılmaz O, Gafuroğlu Ü, Yüksel S. Translation, reliability, and validity of the Turkish version of the Neck Bournemouth Questionnaire. Turkish J Phys Med Rehabil 2019;65:59-66.
14. Aytar A, Yuruk ZO, Tuzun EH, Baltaci G, Karatas M, Eker L. The Upper Extremity Functional Index (UEFI): cross-cultural adaptation, reliability, and validity of the Turkish version. J Back Musculoskelet Rehabil 2015;28:489-95.
15. Stratford PW, Binkley JM, Stratford DM. Development and initial validation of the upper extremity functional index. Physiotherapy Canada 2001;53:259-67.
16. Buysse DJ, Reynolds CF 3rd, Monk TH, Berman SR, Kupfer DJ. The Pittsburgh Sleep Quality Index: a new instrument for psychiatric practice and research. Psychiatry Res 1989;28:193-213.
17. Agargun MY, Kara H, Anlar Ö. The reliability and validity the Pittsburgh sleep quality index. Turkish J Psychiatry. 1996;7:107-11.
18. Kempf B, Kongsted A. Association between the side of unilateral shoulder pain and preferred sleeping position: a cross-sectional study of 83 Danish patients. J Manipulative Physiol Ther 2012;35:407-12.
19. Gracovetsky SA. The resting spine. A conceptual approach to the avoidance of spinal reinjury during rest. Phys Ther 1987;67:549-53.
20. Desouzart G, Matos R, Melo F, Filgueiras E. Effects of sleeping position on back pain in physically active seniors: A controlled pilot study. Work 2016;53:235-40.
21. Abuan B. Pros and Cons of Different Sleeping positions 2020. (cited 26 March, 2022). Available from: https://green.stage.koala-mattress.com/en-au/blog/pros-and-cons-of-different-sleeping-positions/
22. Jackson R. Chapter 3: The Cervıcal Spine 1976. (cited 26 March, 2022). Available from: https://chiro.org/ACAPress/Cervical_Spine.html
23. Maurice-Williams R. Intervertebral Disk Diseases: Causes, Diagnosis, Treatment and Prophylaxis Journal of Neurology, Neurosurgery & Psychiatry 1984;47:223.
24. Alreni ASE, Aboalmaty HRA, De Hertogh W, McLean SM. Interrater and intrarater reliability of the single arm military press (SAMP) test for upper limb function in patients with non-specific neck pain. Musculoskelet Sci Pract 2021;55:102428.
25. Zenian J. Sleep position and shoulder pain. Med Hypotheses 2010;74:639-43.
26. Andreucci A, Madrid-Valero JJ, Ferreira PH, Ordoñana JR. Sleep quality and chronic neck pain: a cotwin study. J Clin Sleep Med 2020;16:679-87.
27. De Koninck J, Gagnon P, Lallier S. Sleep positions in the young adult and their relationship with the subjective quality of sleep. Sleep 1983;6:52-9.
28. Agargun MY, Boysan M, Hanoglu L. Sleeping position, dream emotions, and subjective sleep quality. Sleep and Hypnosis 2004;6:8-13.
29. De Koninck J, Lorrain D, Gagnon P. Sleep positions and position shifts in five age groups: an ontogenetic picture. Sleep 1992;15:143-9.

Original Article / *Özgün Makale*

DOI: 10.4274/tjsm.galenos.2023.22448

Journal of Turkish Sleep Medicine 2023;10:199-205

Circadian Rhythm Sleep Disorders in the Young Population and Their Relationship with Psychological Distress and Disability

Genç Popülasyonda Sirkadiyen Ritim Uyku Bozuklukları ve Psikolojik Sıkıntı ve Engellilik ile İlişkisi

Habibolah Khazaie, Farid Najafi*, Azita Chehri**, Afarin Rahimi-Movaghar***, Masoumeh Amin-Esmaeili***, Mehdi Moradi-Nazar****, Ali Zakiei, Yahya Pasdar****, Alireza Ahmadi*****, Reza Mohammadi******

Kermanshah University of Medical Sciences, Sleep Disorders Research Center, Kermanshah, Iran

**Kermanshah University of Medical Sciences, Social Development and Health Promotion Research Center, Kermanshah, Iran*

***Islamic Azad University Kermanshah Branch, Department of Psychology, Kermanshah, Iran*

****Tehran University of Medical Sciences, Iranian National Center for Addiction Studies (INCAS), Tehran, Iran*

*****Kermanshah University of Medical Sciences, Department of Public Health, Research Center for Environmental Determinants of Health, Kermanshah, Iran*

******Kermanshah University of Medical Sciences Imam Reza Hospital, Department of Anesthesiology, Divison of Critical Care and Pain Management, Kermanshah, Iran*

*******Karolinska Institutet Department of Caring Science and Society, Division of Family Medicine and Primary Care, Stockholm, Sweden*

Abstract

Objective: The sleep/wake cycle plays a vital role in mental health and daily life. Therefore, this study aimed to investigate the prevalence of circadian rhythm sleep disorders in the young population and their effect on psychological health and mental disability.

Materials and Methods: The present study is part of the first phase of the Ravansar cohort (a branch of the Prospective Epidemiological Research Studies in Iran cohort) and included 2991 participants from Ravansar, Iran. Data were collected using standard questionnaires, including the Kessler Psychological Distress (PD) Scale (K10), Sheehan Disability Scale, and sleep timing.

Results: The prevalence of advanced sleep phase disorder (ASPD) was 0.4% in the sample, the prevalence of delayed sleep phase disorder (DSPD) was 4.1%, and the prevalence of the desire to change sleep patterns was 61.3%. The results also showed that the level of PD in people with and without ASPD was not significant, but the level of PD was significantly higher in people with DSPD compared to those without ($p<0.001$). In another section, the results showed that there was no association between ASPD and disability, but there was a positive association between DSPD and disability. This means that the higher the DSPD, the greater the severity of disability. Additionally, the prevalence of ASPD and DSPD was higher in males.

Conclusion: According to our results, the sleep/wake cycle in the sample did not follow a fixed pattern, and this irregularity was present in both sexes. Furthermore, the results demonstrated that the sleep/wake cycle and circadian rhythm are important factors in mental health and individual performance.

Keywords: Circadian rhythm sleep disorders, psychological distress, mental health, disability

Öz

Amaç: Uyku/uyanıklık döngüsü, ruh sağlığı ve yaşamda hayati bir rol oynamaktadır. Buna göre, bu çalışma genç popülasyonda sirkadiyen ritim uyku bozukluklarının prevalansını ve bunun psikolojik sağlık ve mental engellilik üzerindeki rolünü araştırmayı amaçlamıştır.

Gereç ve Yöntem: Bu çalışma, Ravansar kohortunun (İran'da Prospektif Epidemiyolojik Araştırma Çalışmaları kohortunun bir kolu) ilk aşamasının bir parçasıdır ve örneklemi Ravansar şehrinden (İran) 2991 kişiyi içermektedir. Veriler, Kessler Psikolojik Sıkıntı (PD) Ölçeği (K10), Sheehan Engellilik Ölçeği ve uyku zamanlaması gibi standart anketler kullanılarak toplanmıştır.

Bulgular: Örneklemde İleri Uyku Evresi Bozukluğu (ASPD) yaygınlığı %0,4, Gecikmiş Uyku Evresi Bozukluğu (DSPD) yaygınlığı %4,1 ve uyku düzenini değiştirme isteği yaygınlığı %61,3 olarak bulundu. Sonuçlar ayrıca, ASPD'si olan ve olmayan kişilerde PD miktarının anlamlı olmadığını, ancak PD miktarının DSPD'si olan ve olmayan kişilerde anlamlı olduğunu, dolayısıyla PD miktarının DSPD'si olan kişilerde daha yüksek olduğunu gösterdi ($p<0,001$). Başka bir bölümde sonuçlar, ASPD ile engellilik arasında bir ilişki olmadığını, ancak DSPD ile engellilik arasında pozitif bir ilişki olduğunu gösterdi; bu durum ise, DSPD ne kadar yüksekse, engelliliğin şiddetinin o kadar yüksek olduğu anlamına gelmektedir. Ayrıca, sonuçlar ASPD ve DSPD prevalansının erkeklerde daha yüksek olduğunu göstermiştir.

Sonuç: Bulgularımıza göre örneklemdeki uyku/uyanıklık döngüsü sabit bir örüntüye sahip değildi ve bu düzensizlik her iki cinsiyette de mevcuttu. Ayrıca, sonuçlar uyku/uyanıklık döngüsü ve sirkadiyen ritmin ruh sağlığı ve bireysel performansta önemli bir faktör olduğunu göstermiştir.

Anahtar Kelimeler: Sirkadiyen ritim uyku bozuklukları, psikolojik sıkıntı, ruh sağlığı, engellilik

Address for Correspondence/Yazışma Adresi: Ali Zakiei Ph.D, Kermanshah University of Medical Sciences, Sleep Disorders Research Center, Kermanshah, Iran
Phone: +00989187190274 **E-mail:** zakieiali@gmail.com **ORCID-ID:** orcid.org/0000-0002-5259-6104
Received/Geliş Tarihi: 07.09.2022 **Accepted/Kabul Tarihi:** 14.01.2023

Introduction

Circadian rhythm (CR) plays an important role as the internal clock of the human body. According to the 24-hour light and dark cycle in the environment, it coordinates human behavior and physiology (1). CR regulates daily physiological and behavioral rhythms such as the sleep-wake cycle, body temperature, hormonal secretion, and mood (2). One of the functions of CR is to regulate the sleep/wake cycle. However, it should be noted that each person's sleep time can be affected by various factors such as the endogenous circadian clock, behavioral factors, work conditions, and family environment. In other words, these factors can determine sleep time (3). This means that not all people follow the same rule in the sleep/wake pattern, so we are dealing with a phenomenon called CR Sleep Disorders (CRSD). The cause of CRSD is the incoordination of the endogenous circadian timing system and the 24-hour schedule in the external environment (4).

The most common circadian sleep disorders are Delayed Sleep Phase Disorder (DSPD), Advanced Sleep Phase Disorder (ASPD), jet lag, non-24 h Sleep Wake Disorder, and Shift Work Disorder (5). Patients with DSPD are known as "evening-types"; they usually sleep 3-6 hours later than the rest of the community (3). People with ASPD are also known as "morning-types"; they usually fall asleep 3 hours earlier than the social norm, have insufficient sleep duration, and are usually drowsy during the day (3).

CRSD can cause sleep disturbances, often in the form of drowsiness and excessive tiredness during the day (5). This disorder has negative consequences for family, social, occupational, and health aspects (5), and can lead to psychological and functional problems (6). The results of a review study showed that there is evidence of a link between CRSD and mental health. According to the study, CRSD is associated with mental disorders such as depression, anxiety, and bipolar disorder (7). Another review study also reported that CRSD played a major role in developing mood disorders (8). The results of other studies also indicated the effective role of CRSD in bipolar disorder (2,9-12).

Research has also shown that CRSD plays a role in depression (13-15). The results of other studies also indicate the role of CRSD in anxiety disorders (14,16). On the other hand, it is believed that turbulence in CRSD is the core feature of mood disorders and anxiety (17). In addition to mental health, CRSD is involved in physical health and the occurrence of physical diseases such as diabetes, obesity, cancer, and cardiovascular disease (18). This evidence confirms the important role of CR in health. According to what has been said, new studies should be conducted for a precise understanding of this phenomenon and its role in different aspects of life.

Psychological distress was one of the variables examined in the current research. This variable is one aspect of mental health problems and has a relatively high prevalence (19). This phenomenon is associated with symptoms such as lack of desire, hopelessness about the future, and restlessness (20), which indicate symptoms of anxiety and depression disorders (21,22). There is little research on the role of CRSD in psychological distress, and there is no comprehensive understanding of this relationship.

Disability was another variable that was examined as a consequence in this study. Impaired function is significant as a diagnostic criterion for major psychiatric disorders, but the concept and severity of disability is more than a diagnosis (23), referring to dysfunction and limitation in performance (24). The role of CRSD in mental illness has been mentioned above, but no research has been found on the role of CRSD in disability due to mental disorders. Due to the importance of disability and its costs, this research was conducted to study the prevalence of CRSD in the Iranian population. This study was conducted to answer the question: Is there a relationship between CRSD and mental distress and disability?

Materials and Methods

Design and Background

The Prospective Epidemiological Research Studies in Iran (PERSIAN) Youth Cohort (PYC) study is being run as a supplement to the main PERSIAN Cohort study. The PERSIAN Cohort is a nationwide cohort study launched in 2014 which covers 170,000 adults aged 35-70 years old (25,26). This study is designed as a research platform to investigate a variety of exposures and outcomes related to physical health, such as cardiovascular diseases, and provides infrastructure for the implementation of other potential cohort studies. Several sub-cohort studies, including the PERSIAN birth cohort, PYC, and elderly cohorts, have been added to the main PERSIAN cohort study over the years (http://persiancohort.com/aboutus/). The PYC mainly investigates the incidence, course, and correlated factors of common psychiatric disorders as well as substance use disorder, suicide attempt, traffic and non-traffic injuries, outpatient and inpatient psychiatric service use, and death.

Data Collection

The registration and data collection of the first wave was done from April 2015-2017 in the cohort center located in an urban area. A face-to-face interview was conducted by trained clinical psychologists or counselors, after receiving necessary information regarding the study, ensuring privacy and confidentiality of the information, and signing the informed consent. Each interview took an average of 60 minutes. Participants' responses were recorded in an electronic online questionnaire connected to the central cohort server. The quality of the work process was monitored daily by a general practitioner as field manager. The data were continuously assessed by the data management center located in Kermanshah University of medical sciences for completeness of the information, detecting possible errors, and providing technical feedback.

Data Collection Tools

Sleep: We used a 5-item questionnaire to measure sleep timing. The questions included: when to start sleeping, when to wake up, want to change your sleep schedule, sleep during the day, and work at night. Based on questions 1 and 2, the duration of night sleep was calculated. CRSD was classified based on the International Classification of Sleep Disorders- 2 which states that people who sleep earlier than 9 PM and wake up earlier than 5am are in the ASPD class, and people who sleep later than 2:00 AM and wake up later than 11 AM are in the DSPD class (3).

Kessler Psychological Distress Scale: The Kessler Psychological Distress Scale is a 10-item scale developed by Kessler et al. (27) to screen psychological problems in a nonclinical population. Questions are scored according to the Likert scale from never (score zero) to always (score 4). The total score of the scale ranges from zero to 40. The reliability and validity of the scale have been reported as appropriate (21). This scale measures symptoms of anxiety and depression over the past 30 days (21) and is one of the best and most attractive tests for measuring mental health (27). The reliability and validity of the PERSIAN version of this scale has also been reported as suitable, with a Cronbach's alpha coefficient of 0.87 (28). In our study, the reliability of the scale was evaluated with a Cronbach's alpha coefficient, which was 0.90.

Sheehan Disability Scale (SDS): The SDS measures disability in four elements: home management, work responsibilities, close relationships, and social life. This scale evaluates a person's performance in the four mentioned areas during the month that had the worst mental status over the past year. It also indicates the number of days that a person has been unable to perform their normal daily activities in the past 12 months due to a mental disorder. In a research conducted in Iran, the results showed that in clinical conditions, the Cronbach's alpha coefficient of this scale was 0.88 and the item-total correlation was 0.71 to 0.78 in different areas (23). The Cronbach's alpha coefficient in the general population was also 0.81 (23). The visual analog scale of this instrument scores the severity of disability as lack of disability (=0), mild disability (3-1), moderate disability (4-6), and severe disability (7-10) (29). In the present study, the reliability of this scale was checked and Cronbach's alpha was 0.75.

Statistical Analysis

Statistical analyzes were performed using SPSS20 software. All tests were two-sided and statistical significance was defined as p value <0.05. Data related to continuous variables were reported as mean and standard deviation, and discontinuous data were reported as amount and percentage. Chi-square statistical test was used to examine the difference between the groups according to the categorization of CR disorders, one-way analysis of variance (ANOVA) was used to compare PD means, and to compare the severity of disability, chi-2 statistical test was used.

Ethics approval of the study was taken from Kermanshah University of Medical Sciences Research Ethics Committee (approval no: IR.KUMS.REC.1397.652, date: 14.11.2018).

Results

As shown in Table 1, data from 2991 people were analyzed, of which 1663 (55.6%) were women and 1328 (44.4%) were

Table 1. Prevalence of CRSD in the sample and the role of demographic variables

Characteristics		Total	ASPD	DSPD	CR3*	Daily sleep	Shift work 1-5 h	Total sleep time (night)		
								5-9 h	9 h>	
Sex	Female	1663 (55.6)	3 (0.2)	56 (3.4)	1042 (62.7)	947 (56.9)	5 (0.3)	64 (3.8)	1369 (82.3)	229 (13.8)
	Male	1328 (44.4)	9 (0.7)	66 (5)	791 (59.6)	692 (52.1)	187 (14.1)	116 (8.7)	11446 (86.3)	66 (5)
	P-value	0.001	0.033	0.028	0.084	0.008	0.001	0.001		
Age	15-19	313 (10.5)	1 (0.3)	22 (7)	230 (73.5)	153 (48.9)	5 (1.6)	32 (10.2)	239 (76.4)	42 (13.4)
	20-24	610 (20.4)	3 (0.5)	41 (6.7)	354 (58)	320 (52.5)	30 (4.9)	26 (4.3)	510 (83.6)	610 (12.1)
	25-29	902 (30.2)	1 (0.1)	42 (4.7)	537 (59.5)	507 (56.2)	61 (6.8)	40 (4.4)	771 (85.5)	91 (10.1)
	30-34	1166 (39)	7 (0.6)	17 (1.5)	712 (61.1)	659 (56.5)	96 (8.2)	82 (7)	995 (85.3)	88 (7.5)
	P-value	0.001	0.356	0.001	0.001	0.048	0.001	0.001		
Education	Illiterate	11 (0.4)	0	1 (9.1)	6 (54.5)	7 (63.6)	0	2 (18.2)	8 (72.7)	1 (9.1)
	Primary school	481 (16.1)	3 (0.6)	6 (1.2)	298 (62)	289 (60.1)	9 (1.9)	25 (5.2)	402 (83.6)	54 (11.2)
	Middle school	530 (17.7)	6 (1.1)	18 (3.4)	310 (58.5)	280 (52.8)	39 (7.4)	27 (5.1)	437 (82.5)	66 (12.5)
	High school	1222 (40.9)	2 (0.2)	55 (4.5)	770 (63)	651 (53.3)	90 (7.4)	81 (6.6)	1014 (83)	126 (10.3)
	University	747 (25)	1 (0.1)	42 (5.6)	449 (60.1)	412 (55.2)	54 (7.2)	45 (6)	654 (87.6)	48 (6.4)
	P-value	0.001	0.029	0.003	0.404	0.100	0.001	0.010		
Marital status	Never married	1227 (41)	6 (0.5)	80 (6.5)	722 (58.8)	623 (50.8)	70 (5.7)	87 (7.1)	1009 (82.2)	130 (10.6)
	Married	1668 (55.8)	6 (0.4)	36 (2.2)	1055 (63.2)	963 (57.7)	116 (7)	89 (5.3)	1429 (85.7)	150 (9)
	Previously married	96 (3.2)	0	6 (6.3)	56 (58.3)	53 (55.2)	6 (6.3)	4 (4.2)	77 (80.2)	15 (15.6)
	P-value	0.001	0.706	0.001	0.046	0.001	0.398	0.032		
Occupation	Employed	1098 (36.7)	10 (0.9)	27 (2.5)	665 (60.6)	582 (53)	182 (16.6)	102 (9.3)	949 (86.4)	47 (4.3)
	Unemployed	280 (9.4)	0	26 (9.3)	150 (53.6)	153 (54.6)	0	19 (6.8)	235 (83.9)	26 (9.3)
	Student	324 (10.8)	0	33 (10.2)	218 (67.3)	173 (53.4)	0	27 (8.3)	266 (82.1)	31 (9.6)
	Housewife	1289 (43.1)	2 (0.2)	36 (2.8)	800 (62.1)	731 (56.7)	0	32 (2.5)	1065 (82.6)	191 (14.8)
	P-value	0.001	0.009	0.001	0.006	0.310	0.001	0.001		
Total		2991	12 (0.4)	122 (4.1)	1833 (61.3)	1639 (54.8)	192 (6.4)	180 (6)	2515 (84.1)	295 (9.9)

*Would like to change sleep schedule later, ASPD: Advanced Sleep Phase Disorder, DSPD: Delayed Sleep Phase Disorder, CR: Circadian rhythm, CRSD: Circadian rhythm sleep disorder

men. In our sample, the prevalence of ASPD was 0.4%, the prevalence rate of DSPD was 4.1%, and the prevalence of the desire to change sleep patterns was 61.3%. Additionally, 54.8% of participants had daily sleep, and 6.4% had night shift work. The results also showed that 6% of subjects reported night sleep in the range of 1 to 5 hours, and 9.9% had more than 9 hours of night sleep. The prevalence of ASPD and DSPD was higher in men, but in terms of the desire to change sleep patterns, 62.7% of women tended to change their sleep pattern, while this rate was 59.6% in men, although this difference was not statistically significant. Moreover, 56.9% of women and 52.1% of men had daily sleep, which was a significant difference. In terms of shift work, 14.1% of men had shift work, while this rate was 0.3% for women. The mean duration of night sleep in women was 8.10±1.14 hours, and in men, it was 7.38±1.42 hours ($p<0.001$). Also, 13.8% of women slept more than 9 hours in 24 hours, compared to 5% in men.

Table 2 presents data on "CR" and "psychological distress". The table shows the mean and standard deviation of PD for each of the CRD groups. The differences between the groups were examined by one-way analysis of variance (ANOVA), and the results are presented in Table 2. The findings indicated that the difference in PD level in people with and without ASPD was not significant, whereas the difference in PD levels in people with and without DSPD was significant. The PD rate was higher in those with ASPD ($p<0.001$). The results also showed that the mean of PD was higher in people who wanted to change their sleep pattern. Moreover, the mean score of PD was lower in people with night shift work. The role of the duration of nighttime sleep in PD was also significant ($p<0.001$), meaning that people with less than 5 hours of sleep per night had more PD, and people with 5 to 9 hours of sleep per night had less PD. The mean PD score in people who slept more than 120 minutes a day was significantly different from other people ($p<0.001$).

According to Table 3, which expresses the results of disability, and its severity and CRD, there was no significant correlation between ASPD and disability, but there was a significant relationship between DSPD and disability (sig <0.001), means that with increasing severity of DSPD, the severity of disability also increases. The results also showed that people who wanted to change their sleep pattern had more disability, but night shift did not have a significant relationship with disability. The results of Table 3 show that people who sleep less than 5 hours a night have more severe disability than others.

Multinomial logistic analysis was used to predict DSPD based on demographic variables, and the results are shown in Table 4.

Discussion

The present study aimed to investigate the prevalence of CRSD in young Iranian population in western Iran. The results showed that the prevalence of ASPD and DSPD in the sample was 0.4% and 4.1%, respectively. These results differ from those reported in studies of other nationalities. For example, a study by Paine et al. (3) in the population of 20-59 years in New Zealand showed that the prevalence of ASPD ranged from 0.25% to 7.13%, while the prevalence of DSPD was 1.51% to 8.90%. A study in Sweden also reported a prevalence of DSPD of 4% (30). The results of another study reported a prevalence of DSPD of 1.1%, although the results showed that 51.9% of people had at least one criterion for diagnosing DSPD (31). On the other hand, the results of our study revealed that the prevalence rate for ASPD and DSPD was higher in men. The prevalence of DSPD also decreased with increasing age, but age did not play a significant role in ASPD. The results of a study showed that DSPD is not equally prevalent in men and women, and age has no significant effect on it (30). The findings of another study also revealed that there is no significant difference in the prevalence of DSPD in terms of age and sex (31). Men's employment and the role of social culture can be considered as factors in the difference between DSPD in men and women. In the other part of our study, the results showed that the difference in PD between people with and without ASPD was

Table 2. Mean and standard deviation of psychological distress in terms of circadian rhythm

		Mean	Standard deviation	F	P-value	Effect size
ASPD	No	12.654	8.005	0.326	0.568	0.001
	Yes	11.333	5.851			
DSPD	No	12.503	7.926	23.170	0.001	0.008
	Yes	16.049	8.882			
CR3*	No	11.841	8.052	19.594	0.001	0.007
	Yes	13.166	7.926			
Daily sleep	No	12.792	8.173	9.420	0.001	0.009
	>30 m**	11.859	7.722			
	30-120 m	12.312	7.727			
	<120 m	15.717	8.383			
Shift work	No	12.737	8.045	4.825	0.028	0.002
	Yes	11.427	7.225			
Sleep time (night)	1-5 h***	14.605	8.849	6.980	0.001	0.005
	5-9 h	12.442	7.941			
	9 h>	13.210	7.759			

*Would like to change sleep schedule later, **m=Minutes, ***h= hour, ASPD: Advanced Sleep Phase Disorder, DSPD: Delayed Sleep Phase Disorder, CR: Circadian rhythm

not significant, but PD was different in people with and without DSPD. According to the results, PD was higher in people with DSPD. The results of a study showed that DSPD was associated with psychological distress. PD was also more prevalent in the evening-type group (32). Regarding the relationship between CRSD and mental disorders, the results of our study are consistent with previous studies. For example, a study revealed that there is a relationship between CRSD and depressive and anxiety disorders (33). The results of previous research indicate the role of CRD in the severity of depression (34-37). And the findings of a study have shown that CRD is a basic biological aspect for mood vulnerability (34).

The results of our study showed that PD was lower in people who worked night shifts, which was inconsistent with previous studies. The results of past studies have shown the negative impact of shift work on mental health (38,39). Regarding the possible cause of this discrepancy, we can mention the age of the sample, which was lower in this study than in other studies.

Table 3. Amount of disability in terms of circadian rhythm

		Disability-n (%)				
		No disability	**Mild**	**Moderate**	**Severe**	**p**
ASPD	No	215 (7.2)	1243 (41.7)	996 (33.4)	524 (17.6)	0.641
	Yes	0	4 (33.3)	5 (41.7)	3 (25)	
DSPD	No	214 (7.5)	1209 (42.2)	960 (33.5)	485 (16.9)	0.001
	Yes	1 (0.8)	38 (31.1)	41 (33.6)	42 (34.4)	
CR3*	No	110 (9.5)	494 (42.7)	372 (32.1)	182 (15.7)	0.001
	Yes	105 (5.7)	754 (41.1)	629 (34.3)	345 (18.8)	
Daily sleep	no	107 (7.9)	562 (41.6)	445 (32.9)	238 (17.6)	0.001
	>30 m**	28 (8.6)	136 (41.6)	116 (35.6)	47 (14.4)	
	30-120 m	73 (6.3)	507 (43.7)	385 (33.2)	196 (16.9)	
	<120 m	7 (4.6)	44 (28.9)	55 (36.2)	46 (30.3)	
Shift work	No	200 (7.1)	1174 (41.9)	937 (33.5)	488 (17.4)	0.693
	Yes	15 (7.8)	74 (38.5)	64 (33.3)	39 (20.3)	
Sleep time (night)	1-5 h***	12 (6.7)	53 (29.4)	57 (31.7)	58 (32.2)	0.001
	5-9 h	187 (7.4)	1058 (42.1)	848 (33.7)	422 (16.8)	
	9 h>	16 (5.4)	136 (46.1)	96 (32.5)	47 (15.9)	
Total		215 (7.2)	1248 (41.7)	1001 (33.5)	527 (17.6)	0.001

*Would like to change sleep schedule later, **m=Minutes, ***h= hour, ASPD: Advanced Sleep Phase Disorder, DSPD: Delayed Sleep Phase Disorder, CR: Circadian rhythm

Table 4. The results of Multinomial logistic analysis to predict DSPD

Characteristics		**B**	**OR**	**95% (CI)**	**P value**
Sex	Female	0.47	1.61	0.92-2.77	0.09
	Male	0	1	1	-
Age	15-19	-0.64	0.53	0.23-1.21	0.13
	20-24	-0.99	0.37	0.19-0.71	0.003
	25-29	-0.94	0.39	0.21-0.71	0.002
	30-34	0	1	1	-
Education	Illiterate	-1.67	0.18	0.02-1.62	0.128
	Primary school	-0.79	2.21	0.85-5.73	0.104
	Middle school	-0.05	0.95	0.50-1.81	0.885
	High school	-0.03	0.98	0.59-1.61	0.921
	University	0	1	1	-
Marital status	Never married	0.53	1.71	0.68-4.28	0.254
	Married	0.95	2.59	1.05-6.42	0.039
	Previously married	0	1	1	-
Occupation	Employed	0.72	2.06	0.98-4.31	0.055
	Unemployed	-0.45	0.64	0.31-1.34	0.237
	Student	-0.51	0.60	0.28-1.29	0.191
	Housewife	0	1	1	-
	The reference category is: yes, DSPD: Delayed Sleep Phase Disorder, CI: Confidence interval				

The findings of our study indicated that sleeping less than 5 hours a night can be a risk factor for mental disorders. A meta-analysis showed that sleep duration negatively affects mood (40). Another study reported that short sleep time is linked with depression, anger, confusion, anxiety, vigor, and fatigue (41), which is consistent with our research in some components.

In another part of our study, the findings indicated that there is no association between ASPD and disability, but there is a positive relationship between DSPD and disability, which means that higher DSPD is associated with more severe disability. In other words, people who wake up later have lower performance. Literature shows that CR plays an important role in individual performance. For example, a study showed that CR played a role in professional performance (42). The results of another study reported that CR was correlated with cognitive functioning (43). Another study has emphasized the role of CR in functional performance (44).

One of the factors that can explain the effect of CR on mood disorders, especially depression, is the use of light in the living environment and lifestyle (45). Exposure to light can change the CR and suppress the secretion of melatonin in the human body (46). People who have a sleep/wake cycle that receives less natural light have problems in CRs. Light plays an important role in melatonin secretion (47), which is particularly important for regulating the sleep/wake cycle. Research has also reported that the use of light can be useful in the treatment of depression (48-50). On the other hand, the lifestyle of people who have a different sleep/wake cycle is probably a very important factor in causing mental health problems. Research has shown that lifestyle is associated with mental health problems (51-53).

The results of the logistic regression analysis showed that the variables of age and marital status play a role in predicting DSPD, which means that with increasing age, the probability of DSPD occurrence increases, and it is more prevalent in people who are married. Although the prevalence of DSPD is higher in men in terms of frequency, the sex variable does not have a significant role in predicting it. The results of previous studies (30,31) have also shown that age and sex variables do not have a significant role in this field. More research should be done to investigate these contradictions. However, it is important to note that in the current research, this is only a secondary finding and is not related to the main hypothesis.

Conclusion

In this study, we found that the sleep/wake pattern in the sample was variable (is not fixed) and affected both sexes. Additionally, we identified a prevalence of 0.4% for ASPD and 4.1% for DSPD disorders. Women had longer nighttime sleep durations than men. Our results further suggest that sleep/wake patterns and CRs play a crucial role in mental health and mental function. Therefore, more research is necessary to better understand the relationship between CRSD and mental health. Based on our findings, we recommend that sleep/wake pattern modifications for young people be considered, and targeted educational programs be developed and tailored to the community to address this issue.

Ethics

Ethics Committee Approval: Ethics approval of the study was taken from Kermanshah University of Medical Sciences Research Ethics Committee (approval no: IR.KUMS.REC.1397.652, date: 14.11.2018).

Informed Consent: A face-to-face interview was conducted by trained clinical psychologists or counselors, after receiving necessary information regarding the study, ensuring privacy and confidentiality of the information, and signing the informed consent.

Peer-review: Internally peer-reviewed.

Authorship Contributions

Surgical and Medical Practices: H.K., Y.P., Concept: M.M.N., R.M.,Design: F.N., A.Z., Data Collection or Processing: A.R.M., M.A.E., Analysis or Interpretation: A.Z., Literature Search: A.C., A.A., Writing: H.K., A.Z., R.M.

Conflict of Interest: No conflict of interest was declared by the authors.

Financial Disclosure: This research project was financed by Deputy Office of Research and Technology of Kermanshah University of Medical Sciences.

References

1. Kaur S, Teoh AN, Shukri NHM, Shafie SR, Bustami NA, Takahashi M, Lim PJ, Shibata S. Circadian rhythm and its association with birth and infant outcomes: research protocol of a prospective cohort study. BMC Pregnancy Childbirth 2020;20:96.
2. Takaesu Y. Circadian rhythm in bipolar disorder: A review of the literature. Psychiatry Clin Neurosci 2018;72:673-82.
3. Paine SJ, Fink J, Gander PH, Warman GR. Identifying advanced and delayed sleep phase disorders in the general population: a national survey of New Zealand adults. Chronobiol Int 2014;31:627-36.
4. Bjorvatn B, Pallesen S. A practical approach to circadian rhythm sleep disorders. Sleep Med Rev 2009;13:47-60.
5. Wright KP, Lowry CA, Lebourgeois MK. Circadian and wakefulness-sleep modulation of cognition in humans. Front Mol Neurosci 2012;5:50.
6. Dagan Y. Circadian rhythm sleep disorders (CRSD). Sleep Med Rev 2002;6:45-54.
7. Walker WH 2nd, Walton JC, DeVries AC, Nelson RJ. Circadian rhythm disruption and mental health. Transl Psychiatry 2020;10:28.
8. McClung CA. How might circadian rhythms control mood? Let me count the ways.. Biol Psychiatry 2013;74:242-9.
9. Harvey AG. Sleep and circadian rhythms in bipolar disorder: seeking synchrony, harmony, and regulation. Am J Psychiatry 2008;165:820-9.
10. Ng TH, Chung KF, Ho FY, Yeung WF, Yung KP, Lam TH. Sleep-wake disturbance in interepisode bipolar disorder and high-risk individuals: a systematic review and meta-analysis. Sleep Med Rev 2015;20:46-58.
11. Murray G, Harvey A. Circadian rhythms and sleep in bipolar disorder. Bipolar Disord. 2010;12:459-72.
12. Melo MC, Garcia RF, Linhares Neto VB, Sá MB, de Mesquita LM, de Araújo CF, de Bruin VM. Sleep and circadian alterations in people at risk for bipolar disorder: A systematic review. J Psychiatr Res 2016;83:211-9.
13. Daut RA, Fonken LK. Circadian regulation of depression: A role for serotonin. Front Neuroendocrinol 2019;54:100746.

14. Difrancesco S, Lamers F, Riese H, Merikangas KR, Beekman ATF, van Hemert AM, Schoevers RA, Penninx BWJH. Sleep, circadian rhythm, and physical activity patterns in depressive and anxiety disorders: A 2-week ambulatory assessment study. Depress Anxiety 2019;36:975-86.
15. Ozcelik M, Sahbaz C. Clinical evaluation of biological rhythm domains in patients with major depression. Braz J Psychiatry 2020;42:258-63.
16. Silva VM, Magalhaes JEM, Duarte LL. Quality of sleep and anxiety are related to circadian preference in university students. PLoS One 2020;15:e0238514.
17. Anyan J, Verwey M, Amir S. Individual differences in circadian locomotor parameters correlate with anxiety- and depression-like behavior. PLoS One 2017;12:e0181375.
18. Montaruli A, Castelli L, Mulè A, Scurati R, Esposito F, Galasso L, Roveda E. Biological Rhythm and Chronotype: New Perspectives in Health. Biomolecules 2021;11:487.
19. Li T, Zhang X, Chen M, Wang R, He L, Xue B, Zhao D. Psychological distress and its associated risk factors among university students. Rev Assoc Med Bras (1992) 2020;66:414-8.
20. Lincoln KD, Taylor RJ, Watkins DC, Chatters LM. Correlates of Psychological Distress and Major Depressive Disorder Among African American Men. Res Soc Work Pract 2011;21:278-88.
21. Dadfar M, Lester D, Vahid MKA, Esfahani MN. The psychometric parameters of the Farsi form of the Kessler psychological distress scale (K10) in psychiatric outpatients. International Journal of Medical Research & Health Sciences 2016;5:1-7.
22. Kessler RC, Barker PR, Colpe LJ, Epstein JF, Gfroerer JC, Hiripi E, Howes MJ, Normand SL, Manderscheid RW, Walters EE, Zaslavsky AM. Screening for serious mental illness in the general population. Arch Gen Psychiatry 2003;60:184-9.
23. Amin-Esmaeili M, Motevalian A, Rahimi-Movaghar A, Hajebi A, Hefazi M, Radgoodarzi R, Sharifi V. The translation and psychometric assessment of the persian version of the sheehan disability scale. Iran J Psychiatry 2014;9:125-32.
24. Zakiei A, Kiani N, Morovati F, Komasi S. Classification of various types of disability and determining their predictive causes in western Iran. Clinical Epidemiology and Global Health 2020;8:1-7.
25. Joukar F, Naghipour M, Hassanipour S, Yeganeh S, Soltanipour S, Samadani AA, et al. Comprehensive investigation of the prevalence and risk factors of viral hepatitis B and C in PERSIAN Guilan Cohort Study. 2019. https://www.researchsquare.com/article/rs-4858/v1
26. Eghtesad S, Mohammadi Z, Shayanrad A, Faramarzi E, Joukar F, Hamzeh B, Farjam M, Zare Sakhvidi MJ, Miri-Monjar M, Moosazadeh M, Hakimi H, Rahimi Kazerooni S, Cheraghian B, Ahmadi A, Nejatizadeh A, Mohebbi I, Pourfarzi F, Roozafzai F, Motamed-Gorji N, Montazeri SA, Masoudi S, Amin-Esmaeili M, Danaie N, Mirhafez SR, Hashemi H, Poustchi H, Malekzadeh R. The PERSIAN Cohort: Providing the Evidence Needed for Healthcare Reform. Arch Iran Med 2017;20:691-5.
27. Kessler RC, Andrews G, Colpe LJ, Hiripi E, Mroczek DK, Normand SL, Walters EE, Zaslavsky AM. Short screening scales to monitor population prevalences and trends in non-specific psychological distress. Psychol Med 2002;32:959-76.
28. Hajebi A, Motevalian A, Amin-Esmaeili M, Rahimi-Movaghar A, Sharifi V, Hoseini L, Shadloo B, Mojtabai R. Adaptation and validation of short scales for assessment of psychological distress in Iran: The Persian K10 and K6. Int J Methods Psychiatr Res 2018;27:e1726.
29. Sheehan DV, Harnett-Sheehan K, Raj BA. The measurement of disability. Int Clin Psychopharmacol 1996;11(Suppl 3):89-95.
30. Danielsson K, Markström A, Broman J-E, von Knorring L, Jansson-Fröjmark M. Delayed sleep phase disorder in a Swedish cohort of adolescents and young adults: prevalence and associated factors. Chronobiology international 2016;33:1331-9.
31. Lovato N, Gradisar M, Short M, Dohnt H, Micic G. Delayed sleep phase disorder in an Australian school-based sample of adolescents. J Clin Sleep Med 2013;9:939-44.
32. Prat G, Adan A. Relationships among circadian typology, psychological symptoms, and sensation seeking. Chronobiol Int 2013;30:942-9.
33. Reid KJ, Jaksa AA, Eisengart JB, Baron KG, Lu B, Kane P, Kang J, Zee PC. Systematic evaluation of Axis-I DSM diagnoses in delayed sleep phase disorder and evening-type circadian preference. Sleep Med 2012;13:1171-7.
34. Chellappa SL, Morris CJ, Scheer FAJL. Circadian misalignment increases mood vulnerability in simulated shift work. Sci Rep 2020;10:18614.
35. Emens J, Lewy A, Kinzie JM, Arntz D, Rough J. Circadian misalignment in major depressive disorder. Psychiatry Res 2009;168:259-61.
36. Hasler BP, Buysse DJ, Kupfer DJ, Germain A. Phase relationships between core body temperature, melatonin, and sleep are associated with depression severity: further evidence for circadian misalignment in non-seasonal depression. Psychiatry Res 2010;178:205-7.
37. Murray JM, Sletten TL, Magee M, Gordon C, Lovato N, Bartlett DJ, Kennaway DJ, Lack LC, Grunstein RR, Lockley SW, Rajaratnam SM; Delayed Sleep on Melatonin (DelSoM) Study Group. Prevalence of Circadian Misalignment and Its Association With Depressive Symptoms in Delayed Sleep Phase Disorder. Sleep 2017;40.
38. Perry-Jenkins M, Goldberg AE, Pierce CP, Sayer AG. Shift Work, Role Overload, and the Transition to Parenthood. J Marriage Fam 2007;69:123-38.
39. Baron KG, Reid KJ. Circadian misalignment and health. Int Rev Psychiatry 2014;26:139-54.
40. Short MA, Booth SA, Omar O, Ostlundh L, Arora T. The relationship between sleep duration and mood in adolescents: A systematic review and meta-analysis. Sleep Med Rev 2020;52:101311.
41. Short MA, Louca M. Sleep deprivation leads to mood deficits in healthy adolescents. Sleep Med 2015;16:987-93.
42. Smith RS, Efron B, Mah CD, Malhotra A. The impact of circadian misalignment on athletic performance in professional football players. Sleep 2013;36:1999-2001.
43. Carpenter JS, Robillard R, Lee RS, Hermens DF, Naismith SL, White D, Whitwell B, Scott EM, Hickie IB. The relationship between sleep-wake cycle and cognitive functioning in young people with affective disorders. PLoS One 2015;10:e0124710.
44. Jeon S, Conley S, Redeker NS. Rest-activity rhythms, daytime symptoms, and functional performance among people with heart failure. Chronobiol Int 2020;37:1223-34.
45. Farhud D, Aryan Z. Circadian Rhythm, Lifestyle and Health: A Narrative Review. Iran J Public Health 2018;47:1068-76.
46. Even C, Schröder CM, Friedman S, Rouillon F. Efficacy of light therapy in nonseasonal depression: a systematic review. J Affect Disord 2008;108:11-23.
47. Lewy AJ, Wehr TA, Goodwin FK, Newsome DA, Markey SP. Light suppresses melatonin secretion in humans. Science 1980;210:1267-9.
48. Tuunainen A, Kripke DF, Endo T. Light therapy for non-seasonal depression. Cochrane Database Syst Rev 2004;2004:CD004050.
49. Terman M, Terman JS. Light therapy for seasonal and nonseasonal depression: efficacy, protocol, safety, and side effects. CNS Spectr 2005;10:647-63;quiz 672.
50. Oldham MA, Ciraulo DA. Bright light therapy for depression: a review of its effects on chronobiology and the autonomic nervous system. Chronobiol Int 2014;31:305-19.
51. Knowlden AP, Hackman CL, Sharma M. Lifestyle and mental health correlates of psychological distress in college students. Health Education Journal 2016;75:370-82.
52. Tanaka H, Taira K, Arakawa M, Masuda A, Yamamoto Y, Komoda Y, Kadegaru H, Shirakawa S. An examination of sleep health, lifestyle and mental health in junior high school students. Psychiatry Clin Neurosci 2002;56:235-6.
53. Giuntella O, Hyde K, Saccardo S, Sadoff S. Lifestyle and mental health disruptions during COVID-19. Proc Natl Acad Sci U S A 2021;118:e2016632118.

Original Article / *Özgün Makale*

DOI: 10.4274/tjsm.galenos.2023.52533

Journal of Turkish Sleep Medicine 2023;10:206-215

Preventive Effect of Cognitive Stimulation and Sleep Hygiene on Delirium in COVID-19 Intensive Care Patients

COVID-19 Yoğun Bakım Hastalarında Bilişsel Uyaran ve Uyku Hijyeninin Deliryumu Önleyici Etkisi

Döndü Şanlıtürk, Veysel Kaplan*, Neslihan Dörtkardeş**

Tokat Gaziosmanpaşa University Faculty of Health Sciences, Department of Nursing, Tokat, Turkey

**Harran University Faculty of Health Sciences, Department of Nursing, Şanlıurfa, Turkey*

***University of Health Sciences Turkey, Mehmet Akif İnan Training and Research Hospital, Clinic of Intensive Care Nurse, Şanlıurfa, Turkey*

Abstract

Objective: This study was conducted to evaluate the effect of a two-stage intervention, including sensory stimulation and sleep hygiene based on a nursing model, on the reduction of delirium development in Coronavirus disease-2019 (COVID-19) patients in the intensive care unit (ICU).

Materials and Methods: The study was conducted as a pretest-posttest control group and trial model. The sample size of the study was 92 patients with COVID-19, including 43 in the experimental group and 49 in the control group, based on power analysis. The study was conducted in two separate COVID-19 ICUs. Sensory stimulation and sleep hygiene interventions were applied to the patients in the intervention group according to the Living Activities-Based Nursing Model. The intervention was applied to the experimental group until the patients were discharged.

Results: It was determined that there was no statistical difference between the experimental and control group patients included in the study in terms of demographic and treatment characteristics and vital and arterial blood gas values ($p>0.05$). In the study, it was determined that sensory stimulation and sleep hygiene intervention based on the nursing model creates a statistically significant difference in the delirium development levels of the experimental and control group patients ($p<0.05$). It was determined that delirium developed in 56% of the patients in the experimental group and 80% in the control group after the intervention, and that the difference was statistically significant ($p<0.05$).

Conclusion: The sensory stimulation and sleep hygiene intervention based on the nursing model was effective in reducing the incidence of delirium in critically ill COVID-19 patients.

Keywords: COVID-19, delirium, ICU, nursing care, sleep hygiene

Öz

Amaç: Bu çalışma yoğun bakım ünitesindeki (YBÜ) Koronavirüs hastalığı-2019 (COVID-19) hastalarına duyusal uyarım ve uyku hijyenini içeren iki bileşenli girişimin deliryum gelişiminin azaltılması üzerine etkisini değerlendirmek için yapılmıştır.

Gereç ve Yöntem: Randomize kontrollü deneysel tasarımla yapılan çalışmaya, müdahale grubunda 43, kontrol grubunda 49 hasta dahil edildi. Çalışma iki ayrı COVID-19 YBÜ'de gerçekleştirildi. Müdahale grubundaki hastalara Yaşam Aktivitelerine Dayalı Hemşirelik Modeli'ne göre duyusal uyarım ve uyku hijyeni müdahaleleri uygulandı.

Bulgular: Çalışmaya alınan deney ve kontrol grubu hastaları arasında demografik ve tedavi özellikleri ile vital ve arteriyel kan gazı değerleri açısından istatistiksel olarak fark olmadığı belirlendi ($p>0,05$). Müdahale sonrası deney grubundaki hastaların %56'sında, kontrol grubundaki hastaların %80'inde deliryum geliştiği ve aradaki farkın istatistiksel olarak anlamlı olduğu belirlendi ($p<0,05$).

Sonuç: Deliryum önlemede kullanılan duyusal uyarım ve uyku hijyeni müdahaleleri yoğun bakımdaki COVID-19 hastalarında deliryum insidansını azaltmada etkilidir.

Anahtar Kelimeler: COVID-19, deliryum, YBÜ, hemşirelik bakımı, uyku hijyeni

Address for Correspondence/Yazışma Adresi: Lec, Döndü Şanlıtürk MD, Tokat Gaziosmanpaşa University Faculty of Health Sciences, Department of Nursing, Tokat, Turkey
Phone: +90 356 725 92 86 **E-mail:** dtuna@windowslive.com **ORCID-ID:** orcid.org/0000-0002-2055-759X
Received/Geliş Tarihi: 13.05.2022 **Accepted/Kabul Tarihi:** 18.01.2023

Introduction

Delirium is a transient neurocognitive syndrome associated with acute brain failure, changes and fluctuations in consciousness, attention deficit, decreased or increased psychomotor activity, and disruption of circadian rhythm (1). Delirium is a frequently encountered problem, especially in patients receiving treatment in the intensive care unit (ICU), and its prevalence varies between 56-64% (2,3). It has been reported that the prevalence of delirium is 55-84% in patients followed in the ICU due to Coronavirus disease-2019 (COVID-19) (4-6).

Similarities in the physiopathological mechanism and risk factors of COVID-19 and delirium are the reason for the high incidence of delirium in COVID-19 patients. Delirium risk factors are generally old age, sensory status, alcohol use, surgery, mechanical ventilation, sepsis, comorbidities, inactivity, social isolation, sensory deprivation, and sleep problems (7). Advanced age, comorbidities, high mortality and morbidity, which are among the specific patient characteristics of COVID-19, are accepted as the main risk factors for the development of delirium. COVID-19 results in an increase in anaerobic metabolism with hypercapnia, hypoxia and accumulation of toxic compounds due to respiratory failure and pneumonia, which causes cerebral edema due to cerebral vasodilation and inhibition of cerebral blood flow (8-10). The same mechanisms have been identified as causal factors in the development of delirium (10). Environmental factors are thought to be another factor that may cause hallucinations and delirium development in patients, especially the appearance of healthcare personnel as astronauts or aliens in personal protective equipment used to reduce the risk of COVID-19 transmission (11).

Delirium changes the clinical course of the patient negatively and causes undesirable situations. Since delirium in ICUs can cause problems that endanger patient safety, such as unplanned extubation, catheter withdrawal, and falls, it should be foreseen in the early period, and risk factors should be evaluated for its treatment and management (7,12). Delirium can potentially be prevented by appropriate identification of risk factors by nurses (2). In the diagnosis and management of delirium, it is recommended to use multi-component care interventions that include sensory, physical, psychological and environmental interventions for the patient in line with clinical guidelines. These are expressed as the ABCDE (Awakening and Breathing Coordination, Delirium Monitoring/Management, and Early Exercise/Mobility) bundle (7,12,13). However, the high contagiousness of the severe acute respiratory syndrome-coronavirus-2 (SARS-CoV-2) virus makes it impossible to administer some elements of the ABCDEF bundle to COVID-19 patients due to the lack of personal protective equipment and medical isolation to reduce virus transmission (14). Therefore, there is an urgent need for simple, safe, effective and applicable interventions that target delirium risk factors in order to protect COVID-19 patients from negative outcomes associated with delirium (7,15).

Although some special circumstances in the care of COVID-19 patients limit the number of methods to be used, considering the high prevalence of delirium, we planned a two-stage study that combines methods that are both free of contamination and provide sensory support to the patient. In our study, we think that two nurse-based practices, which will provide patients with sensory support instead of family visits and increase sleep hygiene through regulation of environmental stimuli, will be effective in preventing the development of delirium.

This study was conducted to evaluate the effect of a two-stage intervention, including sensory stimulation and sleep hygiene based on Living Activities-Based Nursing Model, on the reduction of delirium development in COVID-19 patients in the ICU.

Materials and Methods

Study Design and Participants

This study was conducted as a trial model with pretest-posttest control group. The inclusion criteria of the study were: to age 18 years or older; to receive treatment in the ICU due to SARS-CoV-2 infection; not to be connected to the life support unit for at least 24 hours after admission to the ICU; not to have pre-diagnosed mental health problems, neurodegenerative disorders, and congenital or acquired brain injury; and to have a Glasgow Coma Scale (GCS) score of 10 or higher. The exclusion criteria were as follows: to be less than 18 years of age; to have a GCS score below 10; and to be blind or deaf.

The population of the study consisted of 158 patients who were treated in the COVID-19 ICU with the diagnosis of COVID-19. Out of 158 patients, 56 patients were not included in the study because 25 had a GCS score of less than 10 or a Richmond Agitation-Sedation Scale (RASS) score of -3, 25 did not meet the inclusion criteria, and 6 refused to participate in the study. The incidence of delirium in COVID-19 patients in the ICU varies between 55-84% (5,7,16). As a result of the power analysis to determine the sample size of the research, the sample size of delirium incidence was accepted as 55% and was calculated as 78 COVID-19 patients (39 in the experimental group and 39 in the control group) at the 0.05 significance level and 0.95 confidence interval. The effect size of the study was 0.6, whereas the power to represent the population was 0.95.

In order for the experimental and control groups not to be affected by each other, patients with similar characteristics were selected and the study was conducted in two separate COVID-19 ICUs. Which unit would be the experimental or control group was determined by drawing lots.

In order to increase the power of the study, 96 (experimental group n=46, control group n=50) patients were included in the study. Due to the discharge or death of 4 patients, the study was completed with 92 patients, 43 in the experimental group and 49 in the control group.

Data Collection Tools

"Personal Information Form", "Confusion Assessment Method for the ICU (CAM-ICU)", "RASS" and "GCS" were used to collect the data of the research.

Intervention

Nursing uses a combination of theory and practice. Nursing models guide practice, and practices are based on the model.

Models assist the practitioner in making informed decisions based on thought and interpretation. Thus, it is reported that a nurse who uses model-based nursing practices can define nursing problems, anticipate and take initiatives to cope with risky situations (17).

As a frequently encountered problem in ICUs, the prevention of delirium is thought to be more important than its treatment. It has been reported that when ICU nurses, who are in constant contact with the patient, follow the patient for delirium and continuously apply preventive interventions, it can reduce the incidence of delirium, and ultimately, positive results can be obtained for the patient and the hospital (18). According to the Nursing Model Based on Activities of Living developed by Roper et al. (19) nursing is perceived as the prevention or resolution of problems related to daily living activities rather than the treatment of the disease. Considering that the most appropriate nursing model that can be used in the prevention of delirium is the Nursing Model Based on Activities of Living, the theoretical framework of the study was created in accordance with this model. The ABCDEF bundles (Awakening and Breathing Coordination, Delirium Monitoring/Management, Early Exercise/Mobility and Family engagement/empowerment) are among the key strategies to prevent delirium and shorten its duration. The ABCDEF bundles and non-pharmacological interventions are used in the prevention of delirium. Non-pharmacological interventions that reduce the development of delirium include the following interventions: Effective communication (calling the patient by name, explaining interventions, making the conversation continuous), reorientation, reducing environmental stimuli, ensuring sleep hygiene (maintaining a light-dark environment consistent with the daily cycle, minimizing night sleep interruptions, and reducing monitor sounds), increased family support through the use of less sedation, early mobilization, sensory stimulation, and extended family visits (12,13). Many of these interventions are compatible with the 12 basic activities of daily living that make up the model of life. In the model, the components, such as ensuring and maintaining a safe environment, communication, mobility, and sleep, are similar to the bundles.

Many of these accepted interventions in the prevention of delirium cannot be applied in COVID-19 patients. For example, staff-time limitations often result in an inability to provide reorientation and sensory stimulation. Due to the high risk of contamination and sometimes limited access to personal protective equipment, early mobilization is not provided and family visiting hours are limited or even not allowed; therefore, the interventions to be made are limited.

Sensory stimulation and sleep hygiene interventions were applied to the experimental group in order to provide social and sensory support and to establish sleep hygiene, since family visits, which are one of the most important parameters in the prevention of delirium, were prohibited.

Nurses in the control group provided standard ICU care and no intervention was applied to the patients. The scope of sensory initiatives includes re-orientation of the patient and administration of appropriate sensory stimuli. Gloves filled with warm water were put on the hands of the patients to give the feeling of holding hands. During routine visiting hours, the gloves, which were filled with warm water and the fingers of which were tied together, were put on the hands of the patients and kept like this for half an hour. The sensory stimulation intervention applied by the researcher was applied to both hands while the patients were in the supine position. Sleep deprivation is a common ICU problem that can cause delirium. Environmental factors such as noise, crowded environment, lighting (bright lights), care and treatment practices, and disruption of day and night rhythm contribute to sleep deprivation (1,18,20). The intervention application scheme of the research is shown in Table 1.

Implementation of Data Collection Tools

The research was carried out at University of Health Sciences Turkey, Mehmet Akif İnan Training and Research Hospital, Turkey between October-December 2021. There are two ICUs serving COVID-19 patients in the hospital. The patients in one of them were determined as the experimental group and the other as the control group. While determining the participants, selection was made on a group basis, not on an individual basis. The reason for this is that the sleep hygiene intervention to be applied is not specific to the patient, but an intervention applied throughout the unit.

COVID-19 patients, who constitute the sample of the study, were informed about the study by visiting ICUs. The nurses collected the patients' data within the first 24 hours of their admission to the ICU and in each shift, not exceeding 30 days during their stay in the ICU. The nurses evaluated the patients once a day for consciousness with RASS in intubated patients and GCS in extubated patients, and for delirium with CAM-ICU. The patients with a RASS score of -4 or -5 or a GCS score of <8 who did not respond to verbal stimulation were considered comatose. The patients who responded to verbal stimulation and were positive according to CAM-ICU were considered to have delirium. The patients who were evaluated positive for delirium at least once in a 24-hour period were considered delirium positive. The research flowchart is shown in Figure 1.

Ethical Approval of Research

The study was approved by Harran University Ethics Committee (decision no: 29, date: 16.08.2021) and institutional permission were obtained in order to conduct the study. Permission was obtained for the measurement tools used in the study. The consent was obtained from human participants and that ethical clearance was obtained from the appropriate authority.

Statistical Analysis

IBM SPSS Statistics 25.0 (IBM Corp. Released 2017. IBM SPSS Statistics for Windows, Version 25.0. Armonk, NY: IBM Corp., USA) was used for statistical analysis and calculations. In the evaluation of the data, descriptive features were given as a percentage, and the relationship between the variables was tested with Student's t-test, One-Way analysis of variance, and logistic regression analysis. G*power v3.1.9.4 statistical analysis program was used to calculate the sample size. The significance level was 0.05.

Table 1. Intervention application scheme of the research

Bundle component/ components of nursing theory	Theoretical framework	Interventions	Evaluation
Sensory stimulation/ communication, work and leisure Objective: The aim of this intervention is to provide sensory support to patients who are deprived of family visits and familiar items.	Reorientation interventions are included within the scope of sensory interventions in the prevention of delirium development in the ICU. • It should be ensured that the patient is in contact with his/her relatives or familiar belongings, • It should be ensured that the patient wears personal vision devices and hearing aids, • Clock and calendar should be kept in a place where the patient can see them easily, • The patient should be oriented to place, person and time every day, • Daily news or events should be discussed with the patient and reminded to him/her, • It should be evaluated whether the patient can hear and understand the spoken language, and whether s/he responds by speaking or sign language, • Patients who cannot express their feelings and thoughts verbally may seem very anxious, restless and stressed. Patients should be followed closely in this respect, • Factors that prevent reorientation and communication (noise, pain, anxiety, darkness) should be eliminated (19-21).	• Many of these interventions cannot be applied to COVID-19 patients. For example, staff-time limitations often result in a lack of reorientation and sensory stimulation, • Due to the high risk of contamination, personal vision devices and hearing aids did not be given to the patient, family photos should not be placed next to the patient, and family visiting hours should be limited or should not be even allowed, • Protective equipment such as masks, goggles and visors used by the personnel make faces unrecognizable and limit place and person orientation, • When speaking under the mask, the sound may not be clear and the lips may not be visible, and this creates an extra problem for patients who can only read lips because of having hearing problems, • A component specific to COVID-19 patients is needed in order to maintain communication and reorientation, such as not discussing daily events with the patient due to staff and time limitations, • In particular, in order to prohibit patient visits and to prevent patients from feeling lonely, a sensory stimulation method was applied with gloves filled with warm water, which provided social and sensory support.	Statistically, significantly less delirium developed in the experimental group compared to the control group. Very few patients showed improvement in person, place and time orientation. • The patient's agitated emotions and behaviors decrease. After the intervention, some patients experienced reactions such as smiling, squeezing their eyes, and trying to pull warm water balls towards themselves, which can be seen as a result of a sensory stimulation. • It was observed that patients who did not develop delirium conveyed their thoughts and needs appropriately. • Adequate mobilization could not be achieved in patients due to high contamination and limited personal protective equipment.
Sleep hygiene/ sleep, ensuring a safe environment The goal of the sleep hygiene intervention was to get the patients to sleep for at least 4 hours each night.	Environmental factors such as noise, crowded conditions, and bright lights contribute to sleep deprivation. • Sleep hygiene interventions are included through the reduction of environmental stimuli, • Circadian rhythm should be regulated with dark-bright light cycles in closed ICU environments devoid of natural light, • Overhead or under-bed lamps should be used in beds, • Sleep pattern and night-day cycles should be established, • Noise level should be minimized in the ICU environment, • Patient safety should be ensured by lifting bed edges, • A comfortable sleep environment should be created by minimizing the physical limitation of the patient, • Tubes and catheters used should be hidden as much as possible, • Pain should be relieved, • Care interventions to support uninterrupted sleep (e.g., measurement of vital signs, radiographs, blood collection) should not be applied during the specified sleep period (midnight to 5 am).	• Within the scope of sleep hygiene interventions, in the ICU where the experimental group was located; • During the study period, ICU overhead lights were turned off between 24:00 and 01:00 in the evening. In this unit, bedside lamps on the heads of the patients were sufficient to observe the patient. • The circadian rhythm was maintained by turning on the lamps between 05:00 and 06:00 in the morning. • In order to minimize the noise level in the ICU environment, the sounds that created stimulating noise were turned down. The ambient noise (<80 decibels) was minimized by turning off the television and radios. A RadioShack was used to monitor the ambient noise level. • Bed edges were lifted. • Since undesirable situations (unplanned extubation, and removal of tubes and catheters) may be experienced in patients with restrictions, restrictions were terminated in some patients according to the condition of the patients. • Tubes and catheters were positioned in such a way that they did not disturb patients. • Painkillers were administered in the evening hours, allowing patients to sleep more comfortably. • Care interventions were made before the specified time, only patients with special conditions were awakened for care in between.	• Statistically significant less delirium developed in the experimental group compared to the control group. • It was observed that many patients in the sleep hygiene group slept for at least 4 hours at night.

ICU: Intensive care unit, COVID-19: Coronavirus disease-2019

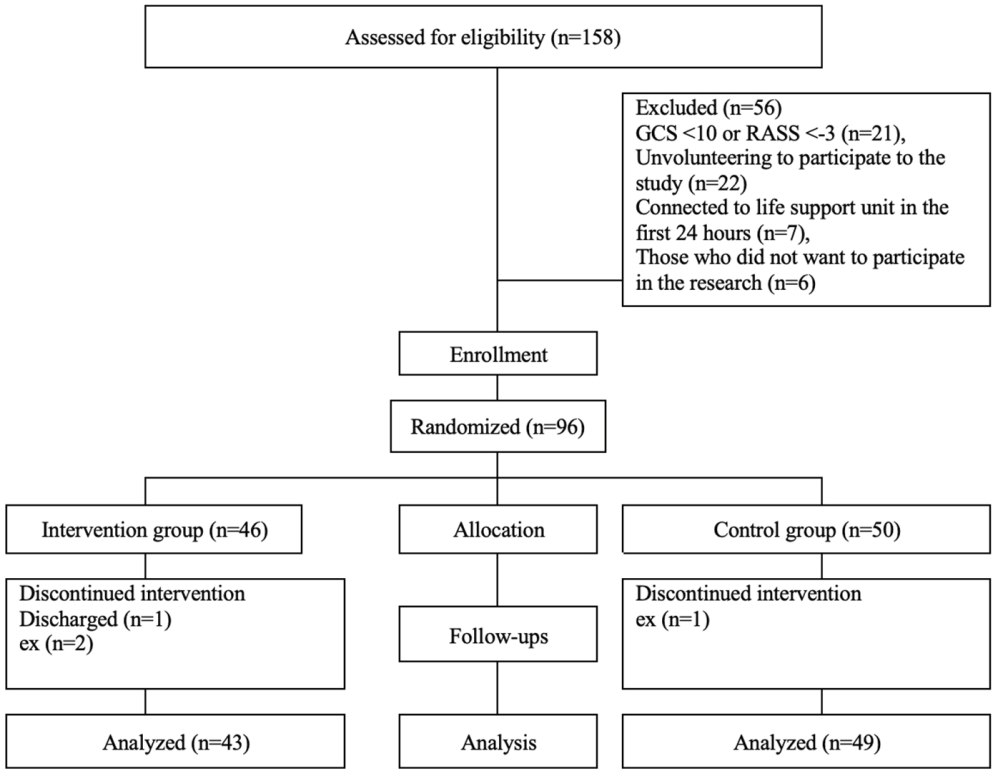


Figure 1. Consort flow chart of the study
GCS: Glasgow Coma Scale, RASS: Richmond Agitation-Sedation Scale

Results

During the study period, 158 patients were eligible for the study. After giving information about the study, 60 patients were not included in the study because they did not meet the inclusion criteria and refused to participate in the study. The study was completed with 92 patients and the criteria obtained in the power analysis were reached.

It was determined that there was no statistical difference between the experimental and control group patients included in the study in terms of demographic and treatment characteristics, and vital and arterial blood gas values ($p>0.05$). It was determined that 49% of the patients in the experimental group were vaccinated with a single dose, that 67% of the control group were unvaccinated, and that there was a statistically significant difference between the two groups in terms of vaccination status ($p<0.05$) (Table 2).

The distribution of the patients included in the study according to the state of delirium development is shown in Figure 2 and Table 3. Only patients without delirium were included in the study due to the initial inclusion criteria. Therefore, no comparison was made before the intervention in terms of delirium. It was determined that delirium developed in 56% of the patients in the experimental group and 80% in the control group after the intervention, and that the difference was statistically significant ($p<0.05$) (Table 3).

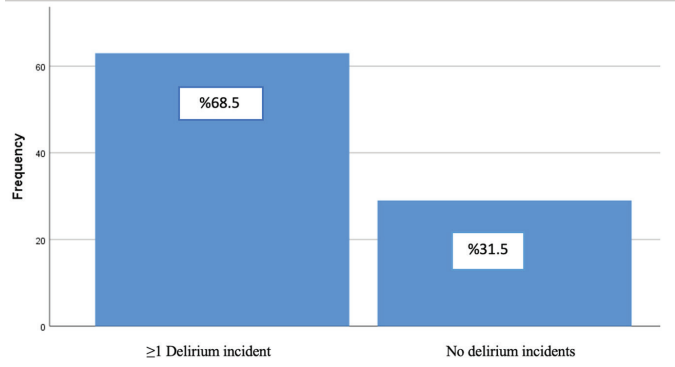


Figure 2. Graph of development of delirium in all patients included in the study. While delirium developed in 68.5% of the patients included in the study, delirium did not develop in 31.5%

Comparisons between the introductory information of the patients receiving COVID-19 treatment in the ICU and delirium incidence are shown in Table 4. According to the table, it was determined that the probability of delirium development was higher in the group that included patients who were 75 years old or older and who were unvaccinated and had lower PaO_2 and HCO_3, higher BE values and higher Acute Physiology and Chronic Health Examination (APACHE II) score. This was

Table 2. Socio-demographic characteristics of the patients (n=92)					
	Intervention group (n=43)		Control group (n=49)		Test and significance
Descriptive characteristics	**n**	**%**	**n**	**%**	**p**
Age (65.48±16.56)					
<45	6	14.0	5	10.2	-
45-64	12	27.9	18	36.7	-
65-74	10	23.3	11	22.4	0.813
≥75	15	34.9	15	30.6	-
Gender					
Female	19	44.2	22	44.9	-
Male	24	55.8	27	55.1	0.945
Smoking					
Yes	19	44.2	23	46.9	-
No	24	55.8	26	53.1	0.836
Type of respiratory support					
Invasive mechanical ventilation	1	2.3	3	6.1	-
Non-invasive mechanical ventilation	4	9.3	5	10.2	-
High flow nasal cannula	22	51.2	23	46.9	-
Low flow nasal cannula	16	37.2	18	36.7	0.637
Restraint					
Yes	9	20.9	16	32.7	-
No	34	79.1	33	67.3	0.207
Vaccination status					
Single dose	21	48.8	13	26.5	-
Double dose	4	9.3	3	6.1	0.048
Unvaccinated	18	41.9	33	67.3	-
Vital signs					
Temperature, °C	36.88±0.46		37.18±0.72		0.023
Arterial blood gases					
PaO_2 (mmHg)	73.69±14.80		70.87±13.91		0.349
$PaCO_2$ (mmHg)	42.85±10.21		42.95±10.71		0.964
pH	7.32±0.13		7.35±0.10		0.337
HCO_3	23.51±5.12		21.67±6.60		0.144
BE	3.36±1.91		3.70±2.12		0.438
Days in intensive care unit, mean (3-26 days)	10.67±4.62		10.36±6.46		0.796

Table 3. Delirium incident in experimental and control groups after intervention			
Delirium	**After intervention**		**p**
	Intervention group (n=43)	**Control group (n=49)**	
	n (%)	**n (%)**	
≥1 delirium incident	24 (55.8)	39 (79.6)	-
No delirium incidents	19 (44.2)	10 (20.4)	**0.013**

statistically significant (p<0.05). In male and non-smoker patients, who received oxygen supplementation with a high-flow nasal cannula, who did not have any restrictions and who had lower body temperature and pH, higher $PaCO_2$ values, and longer stays in the ICU, it was determined that the probability of delirium development was higher; however, this level was not statistically significant (p>0.05) (Table 4).

The logistic regression analysis revealed that all 8 explanatory (independent) variables were statistically significant (X^2=26,574, p<0.001), and these variables explained 61.7% of the variance in the risk of developing delirium (Cox & Snell R Square = 0.461; Nagelkerke R Square = 0.617) (Table 5). As shown in Table 5, it was determined that increases in age, PaO_2, PCO_2 values and APACHE II scores were associated with a significant increase in the risk of developing delirium (p<0.05). It was also found out that not smoking, not using restrictions, and increases in HCO_3 and negative base values were not statistically significant on delirium incidence (p>0.05) (Table 5).

Table 4. Examination of patients' delirium development according to variables

Characteristic	≥1 delirium incident (n=63)	No delirium incidents (n=29)	p
Age			
<45	1 (1.6)	10 (34.5)	0.001
45-64	19 (30.2)	11 (37.9)	
65-74	17 (27.0)	4 (13.8)	
≥75	26 (41.3)	4 (13.8)	
Gender			
Female	31 (49.2)	10 (34.5)	0.187
Male	32 (50.8)	19 (65.5)	
Smoking			
Yes	25 (39.7)	17 (58.6)	0.092
No	38 (60.3)	12 (41.4)	
Type of respiratory support			
invasive mechanical ventilation	4 (6.3)	0 (0.0)	
Non-invasive mechanical ventilation	7 (11.1)	2 (6.9)	0.452
High flow nasal cannula	28 (44.4)	17 (58.6)	
Low flow nasal cannula	24 (38.1)	10 (34.5)	
Restraint			
Yes	21 (33.3)	4 (13.8)	0.051
No	42 (66.7)	25 (86.2)	
Vaccination status			
Single dose	16 (25.4)	18 (62.1)	<**0.001**
Double dose	0 (0.0)	7 (24.1)	
Unvaccinated	47 (74.6)	4 (13.8)	
Vital signs			
Temperature, ºC	37.03±0.64	37.08±0.60	0.712
Arterial blood gases			
PaO2 (mmHg)	67.68±14.05	81.98±9.20	<**0.001**
PaCO2 (mmHg)	43.88±11.90	40.77±5.72	0.185
pH	7.33±0.13	7.35±0.10	0.361
HCO3	21.65±6.44	24.44±4.42	0.037
BE	3.90±2.04	2.66±1.63	**0.004**
APACHE II score	20.07±7.71	12.41±7.02	<**0.001**
Days in intensive care unit, mean	10.87±6.04	9.72±4.68	0.368

APACHE II: Acute Physiology and Chronic Health Examination

Table 5. Logistic regression results of sensory stimulation and sleep hygiene

Variable	Odds ratio (95% CI)	p
Age	0.915 (0.853-0.981)	**0.012***
Smoking	2.452 (0.277-21.714)	0.420
Restraint	0.608 (0.073-5.079)	0.646
Arterial blood gases		
PaO_2 (mmHg)	1.087 (1.007-1.172)	**0.032***
$PaCO_2$ (mmHg)	0.844 (0.726-0.980)	**0.027***
HCO_3	1.166 (0.953-1.425)	0.135
BE	0.966 (0.795-1.174)	0.727
APACHE II score	4.271 (1.581-11.534)	<**0.001***

*Statistically significant, APACHE II: Acute Physiology and Chronic Health Examination, CI: Confidence interval

Discussion

The study, which was conducted to evaluate the effectiveness of sensory stimulation and sleep hygiene interventions applied to prevent delirium development in patients diagnosed with COVID-19 and receiving treatment in the ICU, was completed with a total of 92 patients, 43 in the experimental group and 49 in the control group.

It was determined that the mean age of the patients included in the study was 65 (24-96) and that there was no statistical difference between the two groups in terms of age, gender, smoking habit, respiratory support type, restriction application, intensive care duration, and vital and arterial blood gas values. This situation is valuable in terms of comparing two homogeneous groups in the study and showing that there is no effect of socio-demographic variables on the outcome parameter.

Being treated in ICUs poses a serious risk for the patient to develop delirium. Especially if the individual has chronic diseases or has a disease that can cause serious problems both mentally and physically, such as COVID-19, the risk of possible delirium in the individual increases considerably (5,22-25). In this study, the prevalence of COVID-19 was found to be 68.5%. This rate is similar to the studies in the literature on COVID-19 patients followed in the ICU (4-6). Similarities in the physiopathological mechanism and risk factors of COVID-19 and delirium are the reason for the high incidence of delirium in COVID-19 patients. The use of non-pharmacological nurse-based interventions to prevent delirium development in the ICU has many advantages. Its most important advantages are that it can be easily applied every day to all patient groups, including those who are intubated and extubated or test positive for COVID-19, focuses on the goal of making patients more active sensoryly and functionally, and is a cost-effective and applicable method. Second, because it focuses on the assessment, prevention, and management of symptoms rather than disease processes, it is particularly important in the course of critical illness and is considered appropriate for use in conjunction with other life-sustaining treatments. Finally, it has found a place in routine practices in ICUs, as it serves to facilitate the ability of patients to express their unmet physical, emotional and spiritual needs and to help meet these needs (12,13). Sensory stimulation and sleep hygiene interventions were applied in this study. In the study, the development of delirium in 79.6% of the uninterrupted control group and 55.8% of the experimental group showed that sensory stimulation and sleep hygiene interventions were effective interventions in reducing the development of delirium. When the literature was examined, it was reported that the data

obtained in various studies were in parallel with our study results and that reducing environmental stimuli or applying positive stimuli to patients was preventive for delirium (13,18,25). In the meta-analysis study conducted by Liang et al. (7) on the effects of non-pharmacological methods applied to ICU patients on the development of delirium, it was reported that family visits and early mobilization were effective in reducing the development of delirium in ICU patients. In the same article, extended family visits and interventions that offer psychological support by communicating and encouraging patients were recommended (7). In the study of Rosa et al. (26), in which they compared the effect of restricted and extended family visits in the ICU on the development of delirium, it was reported that less delirium was observed in patients with long family visits. In the study of Simons et al. (27), in which they gave bright light during the day to regulate the circadian rhythm, the percentage of delirium development was higher in the experimental group, unlike the findings of our study. It is thought that this difference is due to the fact that only the sleep hygiene application was included in the study of Simons et al. (27) and that it was a single application. Indeed, Martinez et al. (28) reported that multi-component interventions were effective in reducing the prevalence of delirium incidence. Studies reported that environmental arrangements, such as sleep hygiene, and sensory interventions, such as reorientation and family visits, were effective in reducing the development of delirium. Due to the pandemic, the inability to apply many interventions that support the patient psychologically, such as reorientation and family visits, which were easily applied before, is thought to be a factor that increases the development of delirium in patients. In this study, it was seen that sensory stimulation and sleep hygiene interventions used to reduce the development of delirium and support patients during the pandemic process showed positive results. It is thought that this positive effect was realized thanks to the stimulations created by gloves filled with hot water and sleep hygiene interventions, which eliminate the sensory deprivation that individuals often experience, especially in ICUs, and create both physical and spiritual warmth.

It is of great importance to determine the precipitating and predisposing factors in terms of delirium and to control it with appropriate interventions, especially in COVID-19 patients receiving treatment in the ICU for various reasons (23,29). In this study, factors contributing to delirium incidence were determined in the group that included patients who were 75 years old or older and who were unvaccinated and had lower PaO_2 and HCO_3, higher BE values and APACHE II score. It is noteworthy that the interventions applied in this study are generally more effective in the lower age group. When the literature is examined, it was revealed by many studies that age was a determining factor on the development of delirium (5,30). It is thought that the main reason for the emergence of more delirium in the elderly individuals in the sample group is that old age causes serious destruction in all tissues, organs and systems (31) and may be related to sensory deterioration due to COVID-19 infection.

Vaccine is the most important agent for the end of all global or regional diseases and has made significant contributions to the immunization of individuals from all walks of life in the COVID-19 pandemic (32). It was determined that the vaccine was an important factor in delirium incidence. In the study, the development of delirium in the majority of the unvaccinated and the absence of delirium in the double-dose vaccinated patients clearly reveal the effect of the vaccine on the development of delirium. In the study, there was no statistical difference between the experimental and control groups included in the study in terms of vaccination, whereas there was a high rate of delirium development in the unvaccinated after the intervention. This indicates that the intervention made a significant contribution to reducing the development of delirium together with the vaccine. Although SARS-CoV-2 infection was initially assumed to directly contribute to neurological symptoms, neurological effects seem more likely to result indirectly from factors such as low blood-oxygen levels, coagulopathy, exposure to sedative and analgesic drugs, isolation, and immobility (5). In this study, the high rate of delirium development in patients with low PaO_2 and the statistical significance of this high rate suggested that low oxygen level contributed to the development of delirium. In the study, it was determined that there was a difference in terms of delirium development in patients with lower HCO_3 and higher BE values, and this difference was statistically significant. However, when the literature was examined, it was determined that there was no study data to compare these values. It is thought that this situation increases the power of the study in terms of revealing predisposing factors that have not been studied before.

In this study, it was determined that factors such as gender, smoking, type of oxygen support, restriction interventions, body temperature, pH, $PaCO_2$, and length of stay in intensive care were not effective factors on the development of delirium. Similar to our study results, it was reported in the literature that gender (25,30,33) and smoking (30) did not differ in terms of delirium development. Contrary to our study findings, it was reported in the literature that the use of restrictions and being on a mechanical ventilator caused significant differences in the development of delirium (4-6,13). It is thought that the difference between the results in the literature and our study may be related to the difference in study populations and treatment protocols applied to patients.

Study Limitations

The study has several limitations. As delirium affects primarily very sick patients this is a very important aspects to evaluate whether both groups are equally distributed in terms of delirium risk. While the patients included in the study were divided into groups, separation on a unit basis rather than on a patient basis can be considered as a limitation. However, although the distinction was made according to the unit, the fact that the socio-demographic distribution of the patients to the groups was homogeneous and that there was no difference between the two groups are valuable in terms of showing that the outcome parameters were not affected by demographic

characteristics. The fact that the study was conducted in a single hospital was accepted as another limitation. However, the fact that one of the researchers in the study group was an ICU nurse and the other an ICU doctor contributed to the appropriate collection of the data. In addition, the study was conducted in a province where the vaccination rate was low. However, although the study was conducted in a city with low vaccination coverage, these data provide clear information about the development of delirium in cases where vaccination is limited. It is, thus, important in terms of the limitations of the study. The responses of the patients as a result of sensory stimulation and sleep hygiene interventions were collected and recorded by nursing observation; however, the inability to analyze the relationship between these reactions and the development of delirium was considered as a limitation. The responses mentioned in the study were recorded, and the flow chart of the research was given in the evaluation section, giving the study a qualitative feature.

Conclusion

The sensory stimulation and sleep hygiene intervention based on nursing model was effective in reducing the incidence of delirium in critically ill COVID-19 patients. Patients with COVID-19 and receiving treatment in the ICU are severely affected by the social isolation resulting from visitor restrictions and infection control measures in hospitals during the pandemic. In our study, we determined that the application of hot water packs to provide social support to the patient group, for whom family visits were not allowed, made a difference in terms of delirium development. It is also known that sleep hygiene intervention, in which environmental stimuli are minimized, is among the effective interventions on the development of delirium. The fact that delirium developed in the majority of patients in the group, in which sensory stimulation and sleep hygiene interventions were not applied, and that this rate was lower in the experimental group is an indication that the interventions were effective.

As a result, it was determined that the prevalence of delirium in the COVID-19 patients was 68.5% and high, and that sensory stimulation and sleep hygiene interventions reduced the development of delirium in the ICU. It was also determined that advanced age, low vaccination rate, decrease in PaO_2 and HCO_3 values, and increase in BE values and APACHE II scores in the COVID-19 patients followed in ICU were among the effective factors on the development of delirium. It is recommended that ICU nurses who care for COVID-19 patients should closely observe patients with these parameters in terms of delirium while giving care to them.

It is thought that it will be possible to diagnose delirium at an early stage by routinely applying CAM-ICU, which was used in the determination of delirium in this study, to patients. In addition, it is recommended to develop a delirium prevention care model that combines evidence-based strategies and routine nursing interventions in ICU patients and to implement this model routinely in ICUs.

Ethics

Ethics Committee Approval: The study was approved by Harran University Ethics Committee (decision no: 29, date: 16.08.2021) and institutional permission were obtained in order to conduct the study.

Informed Consent: The consent was obtained from human participants and that ethical clearance was obtained from the appropriate authority.

Peer-review: Externallyand internally peer-reviewed.

Authorship Contributions

Surgical and Medical Practices: D.Ş., V.K., N.D., Concept: D.Ş., Design: D.Ş., N.D., Data Collection or Processing: D.Ş., V.K., N.D., Analysis or Interpretation: D.Ş., V.K., Literature Search: D.Ş., Writing: D.Ş., V.K., N.D.

Conflict of Interest: No conflict of interest was declared by the authors.

Financial Disclosure: The authors declared that this study received no financial support.

References

1. Karadas C, Ozdemir L. Nursing responsibilities and non-pharmacological approaches in delirium management. J Psychiatric Nurs 2019;10:137-42.
2. Gravante F, Giannarelli D, Pucci A, Gagliardi AM, Mitello L, Montagna A, Latina R. Prevalence and risk factors of delirium in the intensive care unit: An observational study. Nurs Crit Care 2021;26:156-65.
3. Tsuruta R, Oda Y, Shintani A, Nunomiya S, Hashimoto S, Nakagawa T, Oida Y, Miyazaki D, Yabe S; Japanese Epidemiology of Delirium in ICUs (JEDI) Study Investigators. Delirium and coma evaluated in mechanically ventilated patients in the intensive care unit in Japan: a multi-institutional prospective observational study. J Crit Care 2014;29:472.e1-5.
4. Khan SH, Lindroth H, Perkins AJ, Jamil Y, Wang S, Roberts S, Farber M, Rahman O, Gao S, Marcantonio ER, Boustani M, Machado R, Khan BA. Delirium Incidence, Duration, and Severity in Critically Ill Patients With Coronavirus Disease 2019. Crit Care Explor 2020;2:e0290.
5. Pun BT, Badenes R, Heras La Calle G, Orun OM, Chen W, Raman R, Simpson BK, Wilson-Linville S, Hinojal Olmedillo B, Vallejo de la Cueva A, van der Jagt M, Navarro Casado R, Leal Sanz P, Orhun G, Ferrer Gómez C, Núñez Vázquez K, Piñeiro Otero P, Taccone FS, Gallego Curto E, Caricato A, Woien H, Lacave G, O'Neal HR Jr, Peterson SJ, Brummel NE, Girard TD, Ely EW, Pandharipande PP; COVID-19 Intensive Care International Study Group. Prevalence and risk factors for delirium in critically ill patients with COVID-19 (COVID-D): a multicentre cohort study. Lancet Respir Med 2021;9:239-50.
6. Helms J, Kremer S, Merdji H, Schenck M, Severac F, Clere-Jehl R, Studer A, Radosavljevic M, Kummerlen C, Monnier A, Boulay C, Fafi-Kremer S, Castelain V, Ohana M, Anheim M, Schneider F, Meziani F. Delirium and encephalopathy in severe COVID-19: a cohort analysis of ICU patients. Crit Care 2020;24:491.
7. Liang S, Chau JPC, Lo SHS, Zhao J, Choi KC. Effects of nonpharmacological delirium-prevention interventions on critically ill patients' clinical, psychological, and family outcomes: A systematic review and meta-analysis. Aust Crit Care 2021;34:378-87.
8. Ahmad I, Rathore FA. Neurological manifestations and complications of COVID-19: A literature review. J Clin Neurosci 2020;77:8-12.
9. Abboud H, Abboud FZ, Kharbouch H, Arkha Y, El Abbadi N, El Ouahabi A. COVID-19 and SARS-Cov-2 Infection: Pathophysiology

and Clinical Effects on the Nervous System. World Neurosurg 2020;140:49-53.

10. Sher Y, Rabkin B, Maldonado JR, Mohabir P. COVID-19-Associated Hyperactive Intensive Care Unit Delirium With Proposed Pathophysiology and Treatment: A Case Report. Psychosomatics 2020;61:544-50.
11. van den Boogaard M, Zegers M. Delirium in ICU patients with COVID-19. Any difference? Intensive Crit Care Nurs 2021;64:103029.
12. Kaplan Serin E. Yoğun bakım ünitesinde deliryumu azaltmaya ve önlemeye yönelik stratejiler. Bülbüloğlu S (eds). Deliryum, Akut Beyin İşlev Bozukluğu ve Bakım. Çukurova Nobel Tıp Kitabevi, Antalya, 2020;139-46.
13. Pun BT, Balas MC, Barnes-Daly MA, Thompson JL, Aldrich JM, Barr J, Byrum D, Carson SS, Devlin JW, Engel HJ, Esbrook CL, Hargett KD, Harmon L, Hielsberg C, Jackson JC, Kelly TL, Kumar V, Millner L, Morse A, Perme CS, Posa PJ, Puntillo KA, Schweickert WD, Stollings JL, Tan A, D'Agostino McGowan L, Ely EW. Caring for Critically Ill Patients with the ABCDEF Bundle: Results of the ICU Liberation Collaborative in Over 15,000 Adults. Crit Care Med 2019;47:3-14.
14. LaHue SC, James TC, Newman JC, Esmaili AM, Ormseth CH, Ely EW. Collaborative Delirium Prevention in the Age of COVID-19. J Am Geriatr Soc 2020;68:947-49.
15. Duggan MC, Van J, Ely EW. Delirium Assessment in Critically Ill Older Adults: Considerations During the COVID-19 Pandemic. Crit Care Clin 2021;37:175-90.
16. Gokalp, Y. (2019). The effects of lean six sigma training on emotional intelligence in a large corporation (Doctoral dissertation, Grand Canyon University). https://www.proquest.com/openview/ff74861887a70ac499a321b3cbd6d520/1?pq-origsite=gscholar&cbl=18750&diss=y
17. Acob JRU. The Philosophical Bases of Nursing Knowledge Development. Aloha International Journal of Health Advancement 2018;1:117-120.
18. Smith CD, Grami P. Feasibility and Effectiveness of a Delirium Prevention Bundle in Critically Ill Patients. Am J Crit Care 2016;26:19-27.
19. Roper N, Logan W, Tierney A. The Roper-Logan-Tierney model of nursing: Based on activities of living. 1st Edition, Churchill Livingstone.2000.
20. Uslu Y, Demir Korkmaz F. Intensive Care Patients Sleep: Nursing Care. Journal of Education and Research in Nursing 2015;12:156-61.
21. Fitzpatrick JJ, Whall AL. Conceptual Models of Nursing Analysis and Application. New Jersey: Prentice Hall Health, 2005.
22. Alligood MR, Tomey AM. Nursing Teorists and Their Work. Seventh Edition. Mosby Elseiver. 2010:63-5.
23. Özdemir L. The Management of delirium in ıntensive care patients and the responsibilities of nurses. Journal of Hacettepe University Faculty of Nursing 2014;1:90-8
24. Zamoscik K, Godbold R, Freeman P. Intensive care nurses' experiences and perceptions of delirium and delirium care. Intensive Crit Care Nurs 2017;40:94-100.
25. Zaal IJ, Spruyt CF, Peelen LM, van Eijk MM, Wientjes R, Schneider MM, Kesecioglu J, Slooter AJ. Intensive care unit environment may affect the course of delirium. Intensive Care Med 2013;39:481-8.
26. Rosa RG, Tonietto TF, da Silva DB, Gutierres FA, Ascoli AM, Madeira LC, Rutzen W, Falavigna M, Robinson CC, Salluh JI, Cavalcanti AB, Azevedo LC, Cremonese RV, Haack TR, Eugênio CS, Dornelles A, Bessel M, Teles JMM, Skrobik Y, Teixeira C; ICU Visits Study Group Investigators. Effectiveness and Safety of an Extended ICU Visitation Model for Delirium Prevention: A Before and After Study. Crit Care Med 2017;45:1660-67.
27. Simons KS, Laheij RJ, van den Boogaard M, Moviat MA, Paling AJ, Polderman FN, Rozendaal FW, Salet GA, van der Hoeven JG, Pickkers P, de Jager CP. Dynamic light application therapy to reduce the incidence and duration of delirium in intensive-care patients: a randomised controlled trial. Lancet Respir Med 2016;4:194-202.
28. Martinez F, Tobar C, Hill N. Preventing delirium: should non-pharmacological, multicomponent interventions be used? A systematic review and meta-analysis of the literature. Age Ageing 2015;44:196-204.
29. Brummel NE, Girard TD. Preventing delirium in the intensive care unit. Crit Care Clin 2013;29:51-65.
30. Gong F, Ai Y, Zhang L, Peng Q, Zhou Q, Gui C. The Relationship Between PaO2/FiO2 and Delirium in Intensive Care: A Cross-Sectional Study, (In press) available at Research Square. https://mednexus.org/doi/full/10.1016/j.jointm.2022.08.002
31. Sarı N, Van Giersbergen MY. Assessment of delirium, dementia, and depression in older adoults and nursing care guidance. Journal of Ege University Nursing Faculty 2017;33:138-52.
32. Vural P, Hacibekiroğlu M, Yildiz FR, Vural P. Immunological Response After Vaccine in a Group of Health-Care Workers with and without COVID-19 During Pandemia. ANKEM journal 2021;35:45-52.
33. İnal MT, Memiş D, İnal V, Uyar AŞ, Tek ŞÇ, Çiftçi T, Efe S, Korkmaz S. Evaluation of Pre-Delirium Score in Intensive Care Patients. J Turk Soc Intensive Care 2018;16:26-9.

Original Article / *Özgün Makale*

DOI: 10.4274/tjsm.galenos.2023.95967

Journal of Turkish Sleep Medicine 2023;10:216-220

Effect of 24-hour Sleep Deprivation on Visual Reactivity in Healthcare Professionals

Sağlık Çalışanlarında 24 Saatlik Uyku Deprivasyonun Vizüel Reaktivite Üzerine Olan Etkisi

Nevroz Ünlü, Çiğdem Deniz*, Talip Asil**

University of Health Sciences Turkey, Kanuni Sultan Süleyman Training and Research Hospital, Clinic of Neurology, İstanbul, Turkey
**Tekirdağ Namık Kemal University Faculty of Medicine, Department of Neurology, Tekirdağ, Turkey*
***Memorial Hizmet Hospital, Clinic of Neurology, İstanbul, Turkey*

Abstract

Objective: The effects of sleep deprivation on cerebral metabolism and blood flow have been investigated using different methods. To evaluate cerebral blood flow (CBF) changes and reactivity using transcranial Doppler (TCD) sonography in response to visual stimulation before and after sleep deprivation.

Materials and Methods: The study included twenty healthcare professionals. For each cerebral hemisphere, the flow velocities of the two posterior cerebral arteries (PCA) were measured using TCD with eyes closed before and after sleep deprivation. Again, before and after sleep deprivation, visual stimulation was given with eyes open and flow velocity in PCA was recorded. The visual reactivity value was calculated for the right and left hemispheres before and after sleep deprivation. Reactivity is calculated as relative changes in blood flow velocity [ΔBFv = 100*(Vs-Vr)/Vr].

Results: It was found that CBF velocity increased significantly in response to visual stimulus before and after sleep deprivation in the right and left hemispheres ($p<0.001$).

In both hemispheres, CBF velocities measured after sleep deprivation without visual stimulus increased compared with those measured before sleep deprivation, but this increase showed statistical significance only for the right hemisphere ($p=0.008$). It was observed that the visual reactivity value calculated after sleep deprivation from the right and left hemispheres significantly decreased compared with that before sleep deprivation ($p<0.001$).

Conclusion: We found that visual reactivity values in healthcare professionals were significantly reduced after sleep deprivation. This decrease in visual reactivity value may cause decreased attention and prolongation of reaction time in healthcare professionals.

Keywords: Cerebral reactivity, sleep deprivation, posterior cerebral artery, visual stimulation

Öz

Amaç: Bu çalışmada uyku deprivasyonu öncesi ve sonrası görsel uyarıya yanıtla oluşan, serebral kan akım (CBF) hızı değişikliklerini ve reaktiviteyi transkranial Doppler sonografi (TCD) ile değerlendirmeyi amaçladık.

Gereç ve Yöntem: Çalışmaya, 20 sağlık çalışanı alındı. Her bir hemisfer için, uyku deprivasyonu öncesi ve sonrası, gözler kapalı konumda iken TCD ile her iki posterior serebral arterden (PCA) akım hızlarına bakıldı. Ve yine uyku deprivasyonu öncesi ve sonrası, gözler açıkken, görsel uyarı verildi ve PCA'daki akım hızları kaydedildi. Ayrıca sağ ve sol hemisfer için uyku deprivasyonu öncesi ve sonrası vizüel reaktivite değeri hesaplandı. Reaktivite, göreceli kan akım hızı değişiklikleri [ΔBFv = 100*(Vs-Vr)/Vr VR] olarak hesaplandı. Vr; minimum hızı gösterir (gözler kapalı, uyaran yok) ve Vs; maksimum hızı gösterir (gözler açık, uyaran var).

Bulgular: Sağ ve sol hemisferde uyku deprivasyonu öncesi ve sonrası görsel uyarıya yanıtta, CBF hızlarının anlamlı olarak arttığı görülmştür ($p<0,001$). Her iki hemisferde de vizüel uyaran olmadan uyku yoksunluğu sonrasında ölçülen CBF hızları, uyku yoksunluğu öncesine göre artmıştır, ancak bu artış sadece sağ hemisfer için istatistiksel anlamlılık göstermiştir ($p=0,008$). Sağ ve sol hemisferden uyku deprivasyonu sonrası hesaplanan vizüel reaktivite değerinin, uyku deprivasyonu öncesi değere göre anlamlı düştüğü görülmüştür ($p<0,001$).

Sonuç: Sağlık çalışanlarında görsel reaktivite değerlerinin uyku yoksunluğundan sonra önemli ölçüde azaldığını bulduk. Görsel reaktivite değerindeki bu azalma, sağlık çalışanlarında dikkatin azalmasına ve reaksiyon süresinin uzamasına neden olabilecektir.

Anahtar Kelimeler: Serebral reaktivite, uyku deprivasyonu, posterior serebral arter, görsel uyarı

Address for Correspondence/Yazışma Adresi: Lec, Çiğdem Deniz MD, Tekirdağ Namık Kemal University Faculty of Medicine, Department of Neurology, Tekirdağ, Turkey
Phone: +90 505 390 29 81 **E-mail:** teriyaki9@hotmail.com **ORCID-ID:** orcid.org/0000-0003-1325-4328
Received/Geliş Tarihi: 01.11.2022 **Accepted/Kabul Tarihi:** 21.01.2023

Introduction

The activity and rest periods of human life are variable. For survival, an individual needs sleep to work and perform daily activities. Waking and sleeping periods change in a cyclical (circadian) rhythm. Neglect of sleep can lead to disturbances in various systems of the body. Modern society often makes it necessary to increase productivity at the expense of insomnia. However, research has shown that long- term sleep deprivation or chronic short sleep causes a decrease in cognitive functions which may lead to reduced productivity (1-4).

Prolonged sleep deprivation causes loss of several basic cognitive abilities, such as attention, as well as complex cognitive functions such as fluent speech, logical thinking, and decision-making ability (5). Sleep deprivation causes a general decrease in cerebral blood flow (CBF) and metabolism, as well as a more pronounced decrease in high cortical functions (6). Previous studies have shown that suppression of sleep also causes decreased visual attention (7).

Vasodilation and an increase in blood flow velocity occur in the cerebral arteries in response to the metabolic demand, which increases as a result of the activation of the cerebral cortex (8). Using transcranial Doppler (TCD) sonography, it is possible to observe the changes in blood flow velocity in the cerebral arteries, as well as in the CBF with visual and motor stimulation (8,9). TCD can also show the relationship between neuronal activation and metabolic requirement by enabling continuous recording of blood flow velocity changes from the posterior cerebral artery (PCA) using visual stimulation (10).

In this study, we aimed to evaluate changes in CBF velocity and reactivity caused by the response to visual stimulation before and after sleep deprivation using TCD.

Materials and Methods

Upon the approval of the ethics committee, 20 healthcare professionals were included in this study to evaluate the changes in CBF and reactivity caused by the response to visual stimulation before and after sleep deprivation between May 1st 2010 and August 1st 2010. Approval was obtained from the Ethics Committee of Trakya University (decision no: 10-07, date: 28.05.2009). All participants gave their written informed consent to participate in the study. Healthcare professionals were evaluated twice, before and after a 24-hour sleep deprivation. 24-hour sleep deprivation was evaluated by recruiting healthcare professionals who are working 24-hour shifts, meaning, who are awake for 24 hours. Getting at least 8 hours of sleep before 24-hour sleep deprivation was taken as an inclusion criterion. The study included healthy young males who are aged 20 to 40 of age with no history of chronic illness, sleeep disorder and visual disturbances, and with normal physical and neurologic examinations.

Individuals younger than 20 years and older than 40 years, females, and those with a previous sleep disorder, history of psychiatric or organic illness, visual impairment, and those who smoked more than ten cigarettes and consumed more than five cups of coffee per day were excluded from the study. The healthcare professionals who participated in the study were informed that no medication that could affect the central nervous system should be taken 24 hours before the procedure, and, smoking should be stopped at least half an hour before and coffee should not be consumed at least 6 hours before the procedure.

The participants were placed in a quiet room, relaxed and in a lying position with 2-MHz TCD (Multi-Dop X4/CD8, DWL Elektronische Systeme GmbH, Sipplingen) probes being placed on the bilateral temporal bone with an elastic headband and the temporal bone at a depth of 60-70 mm. Probes were fixed by finding P2 branches of two PCAs. Whether the artery was a PCA was proved according to the increase in blood flow velocity in response to visual stimulation. The participants were asked to follow the testers fingertips for 20 seconds with the eyes open, and then to keep their eyes closed for 20 seconds. This 40 second period was repeated a total of 10 times. The time at which the visual stimulation began was indicated by an acoustic signal every 20 seconds.

For each cerebral hemisphere, the flow velocities of the two PCAs were measured using TCD at different times, before and after sleep deprivation, with eyes closed. Again, before and after sleep deprivation, visual stimulation was given with eyes open, and flow velocity in the PCAs was recorded. The visual reactivity value was calculated for the right and left hemispheres before and after sleep deprivation. Reactivity is calculated as relative changes in blood flow velocity. [$\Delta BFv = 100*(Vs-Vr)/ Vr$ Vr; indicates minimum velocity (eyes closed, stimulus off) and Vs; indicates maximum velocity (eyes open, stimulus on)] (10).

Statistical Analysis

The statistical analysis of the data was performed using the SPSS 11.5 software. Descriptive statistics (mean, standard deviation, median, lowest, highest, frequency and ratio values) were used for the data. Nonparametric tests were used for the measurements obtained. Wilcoxon signed-rank test was used for repeated measurements. P values less than 0.05 were considered as statistically significant.

Results

Twenty healthcare professionals were included in this study to evaluate the changes in CBF velocity and reactivity in response to visual stimulation before and after sleep deprivation. The average age of the participants was 31.3±4.7 years, and all were male.

It was found that the CBF velocity increased significantly in response to visual stimulus before and after sleep deprivation in the right and left hemispheres ($p<0.001$) (Table 1).

In both hemispheres, CBF velocities measured after sleep deprivation without visual stimulus increased compared to before sleep deprivation, but this increase showed statistical significance only for the right hemisphere ($p=0.008$). Under visual stimulus in both hemispheres, there was no statistically significant difference in CBF velocities before and after sleep deprivation (Table 1).

It was observed that the visual reactivity value calculated after sleep deprivation from the right and left hemispheres significantly decreased compared to before sleep deprivation ($p<0.001$) (Table 2).

Table 1. Blood flow velocity before and after sleep deprivation					
PCA flow velocity	**After sleep deprivation**	**p**	**Before sleep deprivation**	**p**	**p**
Right hemisphere PCA Vr (stimulus off)	28.4±7.32	p<0.001	22.6±6.5	p<0.001	p=0.008
Right hemisphere PCA Vs (stimulus on)	37±10.4		37.7±9.5		p=0.22
Left hemisphere PCA Vr (stimulus off)	29.5±8.07	p<0.001	25.9±8.3	p<0.001	p>0.05
Left hemisphere PCA Vs (stimulus on)	39.9±10.6		40.3±9.8		p>0.05
Vr; minumum velocity cm/sec (eyes closed, stimilus off), Vs; maximum velocity cm/sec (eyesopen, stimulus on). P value of <0.05 was considered as statistically significant. PCA: Posterior cerebral arteries					

Discussion

In our study, CBF velocities in the right and left hemispheres increased significantly in response to visual stimuli before and after sleep deprivation (p<0.001). In both hemispheres, CBF velocities measured after sleep deprivation without visual stimuli increased compared to before sleep deprivation, but this increase showed statistical significance only for the right hemisphere (p=0.008). There was no statistically significant difference in CBF velocity before and after sleep deprivation under visual stimulus in both hemispheres (Table 1). In addition, visual reactivity values in the right and left hemispheres calculated after sleep deprivation were significantly decreased compared to the values obtained before sleep deprivation (p<0.001) (Table 2).

TCD is a technique that noninvasively measures alters in CBF velocity in the main cerebral arteries during a given stimulus with high temporal resolution. Alters in CBF velocity have been reported to correlate with changes in CBF in the basal cerebral arteries if the arterial diameter remains constant (11,12). In fact, flowmetry studies with TCD have demonstrated the presence of visually evoked CBF velocity responses (13). It has been shown that subjects looking at an inverted checkerboard, commonly used as a visual stimulus, caused an 18% increase in blood flow velocity in the PCA, which supplies blood to the visual cortex (14). In general, the increased metabolic demands of cerebral activation cause dilation of arterioles and a consequent increase in the flow velocity of basal cerebral arteries (15-17). Increased regional cerebral metabolism in the occipital cortex due to visual stimulation has also been demonstrated by positron emission tomography (PET) studies (18). In our study, it was observed that flow velocities in the right and left hemispheres increased significantly in response to visual stimuli before and after sleep deprivation (p<0.001) (Table 1).

Using PET, Thomas et al. (19) demonstrated that total metabolism reduced after short-time sleep deprivation, with further decreases in the thalamus, prefrontal and posterior parietal cortices. Similar to PET studies, multiple studies of acute sleep deprivation on attention using functional magnetic resonance imaging (fMRI) have also reported reduced activation in prefrontal regions (20). However, findings from fMRI studies specifically for the thalamus are controversial. Some fMRI studies on attention and sleep deprivation have reported increased thalamic activation after sleep loss, while others have not.

Table 2. Reactivity values before and after sleep deprivation		
Vissual reactivity		**p**
Reactivity in right hemisphere before sleep deprivation	69.9±25.1	p<0.001
Reactivity in right hemisphere after sleep deprivation	29.9±11	
Reactivity in left hemisphere before sleep deprivation	61.8±26.4	p=0.006
Reactivity in left hemisphere after sleep deprivation	36.5±14.7	
P value of <0.05 was considered as statistically significant		

A recent meta-analysis of 11 studies assessing sleep deprivation using fMRI showed that brain activation in regions including the bilateral intraparietal sulcus, bilateral insula, right prefrontal cortex, medial frontal cortex and right parahippocampal gyrus was significantly decreased after sleep deprivation compared to rested wakefulness, while it was increased only in the bilateral thalamus (20). In other words, it has also been reported that sleep deprivation may cause regional changes in the brain, i.e. decreased activity in the anterior brain but increased activity in the posterior brain, and decreased default network and thalamocortical connectivity but increased interhemispheric connectivity (21).

The thalamus is crucial in maintaining wakefulness and vigilant attention (22-24). Previous behavioural reports have shown that alertness and vigilant attention are reduced after sleep deprivation (25). The observation of increased rather than decreased thalamic activity with decreased alertness and vigilant attention after sleep deprivation could be interpreted as an increased effort of thalamic activation to compensate for the dysfunction of the fronto-parietal attention network after sleep loss (19). Studies have found that thalamic activation is greater in sleep deprivation than in rested wakefulness, and task difficulty in rested wakefulness is relation with increases in thalamic activation, but not in sleep deprivation (19). In conclusion, increased thalamic activation after sleep deprivation may demonstrate a complex interaction between the arousing effects of sleep loss and the arousing effects of task performance on thalamic activity (20). It has also been shown that cognitive performance is maintained at an acceptable level as a result of prolonged sleep deprivation and that this compensation mechanism is more pronounced in the right

cerebral hemisphere, according to Drummond and Brown (26), and Drummond et al. (27). Consistent with the above, our study showed an increase in blood flow after sleep deprivation in the absence of visual stimuli compared to before sleep deprivation in both hemispheres, but this was significant in the right hemisphere (Table 1).

Nutrition and blood flow in the brain, are provided by neurovascular coupling (NVC), which is determined as the adjustment of local CBF in accordance with the underlying cortical neural activity (8). NVC includes a complex interaction between activated neurons, astrocytes, and microvascular endothelial and smooth muscle cells. These may involve alterations in neuronal activation, dysfunction of astrocytes, and/or changes in production of vasodilator mediators by microvascular endothelial cells (28). Cerebrovascular reactivty (CVR) measurement can indicate the capacity of cerebral blood vessels to respond to neuronal metabolic stimuli, hence NVC, and is commonly used to assess cerebrovascular function (29). As a result, decreased CVR may cause inadequate energy supply, especially in regions with increased energy demand (30). Jackson et al. (7) evaluated 27 hours of sleep deprivation with electoencephalography and revealed performance deficits in visual tasks. In the study by Lee et al. (31), P300 latency was prolonged and amplitude was decreased during 38 hours of sleep deprivation; this was shown to cause impairment in cognitive performance in terms of alertness and reaction time. In a recent study using TCD and functional near-infrared spectroscopy, it was shown that 24 hours of sleep deprivation impaired maintenance of attention and slowed reaction time without profound changes in cognitive areas such as working memory, visual memory and short-term visual information matching (28). In our study, in which we evaluated the posterior circulation system, a significant decrease in reactivity in response to visual stimuli was observed in both hemispheres after sleep deprivation (Table 2). This may result in decreased attention and prolonged reaction time.

Numerous studies have indicated the disruptive neurobehavioural effects of sleep deprivation on attention, working memory and other cognitive tasks; these effects are manifested in the form of psychomotor slowing, increased neglect and application errors, and decreased learning of cognitive task (25,32). It is inevitable that this situation will affect people who work in shifts or are exposed to long working hours, and of course health professionals more. Shift work is associated with deep synchronisation of circadian rhythm (33). As the circadian rhythm reduces daytime sleepiness, sleep time between consecutive night shifts may be further reduced. When this reduced sleep duration is added to the circadian dysfunction associated with the night shift, the impact of reduced sleep duration on cognitive function in healthacre professionals will be of concern. Sleep deprivation and misalignment of circadian phase will also be associated with slow reaction time, frequent loss of attention and increased error rates when performing tasks (34).

Study Limitations

The fact that the subject group in our study consisted of healthcare professionals of similar age, male gender and without a history of previous illness is important in terms of ensuring the homogeneity of the group. On the other hand, the small number of healthcare professionals and the inability to perform cognitive tests can be considered as limitations of our study.

Conclusion

In our study, CBF velocities in the right and left hemispheres increased significantly in response to visual stimuli before and after sleep deprivation. In both hemispheres, CBF velocities measured after sleep deprivation without visual stimuli increased compared to before sleep deprivation, but this increase was more pronounced in the right hemisphere, suggesting that the compensation mechanism after sleep deprivation is more effective in the right hemisphere. We also found that visual reactivity values in healthcare professionals were significantly reduced after sleep deprivation. This decrease in visual reactivity value may cause decreased attention and prolongation of reaction time in healthcare professionals.

Acknowledgements: We would like to thank Bengü Altunan who edited the English text.

Ethics

Ethics Committee Approval: Approval was obtained from the Ethics Committee of Trakya University (decision no: 10-07, date: 28.05.2009).

Informed Consent: All participants gave their written informed consent to participate in the study.

Peer-review: Externally peer-reviewed.

Authorship Contributions

Surgical and Medical Practices: N.Ü., Ç.D., T.A., Concept: N.Ü., Ç.D., T.A., Design: N.Ü., Ç.D., T.A., Data Collection or Processing: N.Ü., Ç.D., Analysis or Interpretation: N.Ü., Ç.D., T.A., Literature Search: N.Ü., Ç.D., Writing: N.Ü., Ç.D.

Conflict of Interest: No conflict of interest was declared by the authors.

Financial Disclosure: The authors declared that this study received no financial support.

References

1. Alkadhi K, Zagaar M, Alhaider I, Salim S, Aleisa A. Neurobiological consequences of sleep deprivation. Curr Neuropharmacol 2013;11:231-49.
2. Virtanen I, Kalleinen N, Urrila AS, Leppänen C, Polo-Kantola P. Cardiac autonomic changes after 40 hours of total sleep deprivation in women. Sleep Med 2015;16:250-7.
3. He J, Hsuchou H, He Y, Kastin AJ, Wang Y, Pan W. Sleep restriction impairs blood-brain barrier function. J Neurosci 2014;34:14697-706.
4. Ko CH, Fang YW, Tsai LL, Hsieh S. The effect of experimental sleep fragmentation on error monitoring. Biol Psychol 2015;104:163-72.
5. Kendall AP, Kautz MA, Russo MB, Killgore WD. Effects of sleep deprivation on lateral visual attention. Int J Neurosci 2006;116:1125-38.

6. Tomasi D, Wang RL, Telang F, Boronikolas V, Jayne MC, Wang GJ, Fowler JS, Volkow ND. Impairment of attentional networks after 1 night of sleep deprivation. Cereb Cortex 2009;19:233-40.
7. Jackson ML, Croft RJ, Owens K, Pierce RJ, Kennedy GA, Crewther D, Howard ME. The effect of acute sleep deprivation on visual evoked potentials in professional drivers. Sleep 2008;31:1261-9.
8. Aaslid R. Visually evoked dynamic blood flow response of the human cerebral circulation. Stroke 1987;18:771-5.
9. Uzuner N, Yalcinbaş O, Gücüyener D, Ozdemir G. Hand gripping effect on cerebral blood flow in normal subjects. Eur J Ultrasound 2000;11:147-50.
10. Uzuner N, Ak I, Gücüyener D, Asil T, Vardareli E, Ozdemir G. Cerebral hemodynamic patterns with technetium Tc 99m exametazime single photon emission computed tomography and transcranial Doppler sonography: a validation study using visual stimulation. J Ultrasound Med 2002;21:955-9.
11. Deppe M, Ringelstein EB, Knecht S. The investigation of functional brain lateralization by transcranial Doppler sonography. Neuroimage 2004;21:1124-46.
12. Serrador JM, Picot PA, Rutt BK, Shoemaker JK, Bondar RL. MRI measures of middle cerebral artery diameter in conscious humans during simulated orthostasis. Stroke 2000;31:1672-8.
13. Willie CK, Colino FL, Bailey DM, Tzeng YC, Binsted G, Jones LW, Haykowsky MJ, Bellapart J, Ogoh S, Smith KJ, Smirl JD, Day TA, Lucas SJ, Eller LK, Ainslie PN. Utility of transcranial Doppler ultrasound for the integrative assessment of cerebrovascular function. J Neurosci Methods 2011;196:221-37.
14. Fabjan A, Musizza B, Bajrović FF, Zaletel M, Strucl M. The effect of the cold pressor test on a visually evoked cerebral blood flow velocity response. Ultrasound Med Biol 2012;38:13-20.
15. Droste DW, Harders AG, Rastogi E. Two transcranial Doppler studies on blood flow velocity in both middle cerebral arteries during rest and the performance of cognitive tasks. Neuropsychologia 1989;27:1221-30.
16. Knecht S, Deppe M, Bäcker M, Ringelstein EB, Henningsen H. Regional cerebral blood flow increases during preparation for and processing of sensory stimuli. Exp Brain Res 1997;116:309-14.
17. Becker VU, Hansen HC, Brewitt U, Thie A. Visually evoked cerebral blood flow velocity changes in different states of brain dysfunction. Stroke 1996;27:446-9.
18. Wiedensohler R, Kuchta J, Aschoff A, Harders A, Klug N. Visually evoked changes of blood flow velocity and pulsatility index in the posterior cerebral arteries: a transcranial Doppler study. Zentralbl Neurochir 2004;65:13-7.
19. Thomas M, Sing H, Belenky G, Holcomb H, Mayberg H, Dannals R, Wagner H, Thorne D, Popp K, Rowland L, Welsh A, Balwinski S, Redmond D. Neural basis of alertness and cognitive performance impairments during sleepiness. I. Effects of 24 h of sleep deprivation on waking human regional brain activity. J Sleep Res 2000;9:335-52.
20. Ma N, Dinges DF, Basner M, Rao H. How acute total sleep loss affects the attending brain: a meta-analysis of neuroimaging studies. Sleep 2015;38:233-40.
21. Zhou F, Huang M, Gu L, Hong S, Jiang J, Zeng X, Gong H. Regional cerebral hypoperfusion after acute sleep deprivation: A STROBE-compliant study of arterial spin labeling fMRI. Medicine (Baltimore) 2019;98:e14008.
22. Luria AR. The working brain. Harmondsworth, England: Penguin Books 1973.
23. Schiff ND. Central thalamic contributions to arousal regulation and neurological disorders of consciousness. Ann N Y Acad Sci 2008;1129:105-18.
24. Parasuraman R, Warm JS, See JE. Brain systems of vigilance. In: Parasuraman R, ed. The attentive brain. Cambridge, MA: MIT Press 1998;221-256.
25. Lim J, Dinges DF. Sleep deprivation and vigilant attention. Ann N Y Acad Sci 2008;1129:305-22.
26. Drummond SP, Brown GG. The effects of total sleep deprivation on cerebral responses to cognitive performance. Neuropsychopharmacology 2001;25:S68-73.
27. Drummond SP, Gillin JC, Brown GG. Increased cerebral response during a divided attention task following sleep deprivation. J Sleep Res 2001;10:85-92.
28. Csipo T, Lipecz A, Owens C, Mukli P, Perry JW, Tarantini S, Balasubramanian P, Nyúl-Tóth Á, Yabluchanska V, Sorond FA, Kellawan JM, Purebl G, Sonntag WE, Csiszar A, Ungvari Z, Yabluchanskiy A. Sleep deprivation impairs cognitive performance, alters task-associated cerebral blood flow and decreases cortical neurovascular coupling-related hemodynamic responses. Sci Rep 2021;11:20994.
29. Kisler K, Nelson AR, Montagne A, Zlokovic BV. Cerebral blood flow regulation and neurovascular dysfunction in Alzheimer disease. Nat Rev Neurosci 2017;18:419-34.
30. Smoliński Ł, Litwin T, Kruk K, Skowrońska M, Kurkowska-Jastrzębska I, Członkowska A. Cerebrovascular reactivity and disease activity in relapsing-remitting multiple sclerosis. Adv Clin Exp Med 2020;29:183-8.
31. Lee HJ, Kim L, Suh KY. Cognitive deterioration and changes of P300 during total sleep deprivation. Psychiatry Clin Neurosci 2003;57:490-6.
32. Durmer JS, Dinges DF. Neurocognitive consequences of sleep deprivation. Semin Neurol 2005;25:117-29.
33. Kuhn G. Circadian rhythm, shift work, and emergency medicine. Ann Emerg Med 2001;37:88-98.
34. Hirsch Allen AJ, Park JE, Adhami N, Sirounis D, Tholin H, Dodek P, Rogers AE, Ayas N. Impact of work schedules on sleep duration of critical care nurses. Am J Crit Care 2014;23:290-5.

Original Article / *Özgün Makale*

DOI: 10.4274/tjsm.galenos.2023.03016

Journal of Turkish Sleep Medicine 2023;10:221-228

Analysis of Nighttime Sleep and the Impact of Selected Predictors (Pain and Delirium) on its Quality in Hospitalized Patients Over Sixty Years of Age

Altmış Yaş Üstü Yatan Hastalarda Gece Uykusunun Analizi ve Seçilmiş Prediktörlerin (Ağrı ve Deliryum) Uykunun Kalitesi Üzerindeki Etkisi

Hana Locihová*,**,***, Karel Axmann****, Pavlìna Štěpánová*, Bohdana Břegová*****, Renata Zittová******, Jana Hrušková******

**Department of Anesthesiology, Resuscitation and Intensive Care Medicine, Faculty of Medicine, University of Ostrava, Ostrava, Czech Republic*

***Department of Nursing and Midwifery, Faculty of Medicine, University of Ostrava, Ostrava, Czech Republic*

****AGEL Třinec-Podlesí Hospital, Třinec, Czech Republic*

*****Department of Anesthesiology, Resuscitation and Intensive Care Medicine, University Hospital Olomouc, Olomouc, Czech Republic*

******Internal and Cardiological Clinic, University Hospital Ostrava, Ostrava, Czech Republic*

*******Department of Respiratory Medicine and Tuberculosis, University Hospital Olomouc, Olomouc, Czech Republic*

Abstract

Objective: Sleep disturbances, commonly seen in hospitalized patients, are influenced by the presence of disruptive factors. There is a proven relationship between sleep disturbances and delirium, or pain. It may be assumed that the association is bidirectional, has negative impacts, and leads to poor outcomes.

Materials and Methods: A prospective observational study. To analyze sleep quality (assessed subjectively with the Richards-Campbell Sleep Questionnaire (RCSQ), and objectively using actigraphy) in a high-risk population of patients (age over 60 years, a hospital stay longer than 48 hours) and its relationships to selected risk factors-pain [assessed with a visual analog scale (VAS)] and delirium (assessed with the confusion assessment method for the intensive care unit).

Results: Nighttime sleep was disrupted, as seen from some studied parameters, both objective and subjective. It was found that nurses tended to overestimate sleep quality. In delirious patients, significant changes ($p<0.05$) were noted for several autography parameters (total sleep time -0.5707; movement index 0.4155; number of awakenings 0.2868; wake after sleep onset 0.3874) as well as RCSQ items (sleep depth -0.3712; sleep quality -0.2985). In patients with pain (VAS ≥4), certain changes were also found in autography (movement index 0.3226) and RCSQ parameters (sleep depth -0.2908; returning to sleep -0.2856; RCSQ total -0.2746)

Conclusion: The study demonstrated relationships between sleep disturbances and selected factors (pain and delirium) in hospitalized patients. To objectively assess the obtained data, a combination of subjective and objective measures is a prerequisite. However, a more robust multicenter study would be needed to strengthen the evidence base.

Keywords: Sleep disturbances, delirium, pain, elderly patient, autography

Öz

Amaç: Hastanede yatan hastalarda yaygın olarak görülen uyku bozuklukları, yıkıcı faktörlerin varlığından etkilenir. Uyku bozuklukları ile deliryum veya ağrı arasında kanıtlanmış bir ilişki vardır. Bu ilişkinin çift yönlü olduğu, olumsuz etkilerinin olduğu ve kötü sonuçlara yol açtığı varsayılabilir.

Gereç ve Yöntem: Bu çalışma prospektif gözlemsel bir çalışma olarak dizayn edildi. Yüksek riskli bir hasta popülasyonunda (60 yaşın üzerinde, hastanede 48 saatten uzun bir süre kalış) uyku kalitesini değerlendirmek için, sübjektif olarak Richards-Campbell Uyku Ölçeği (RCSQ) ve objektif olarak aktigrafi kullanıldı. Ayrıca bunun seçilen risk faktörleriyle, yani ağrı ve deliryum ile olan ilişkilerini analiz etmek amacıyla sırasıyla görsel analog skala (VAS) ve yoğun bakım ünitesi konfüzyon değerlendirme yöntemi kullanıldı.

Bulgular: Çalışılan bazı parametrelerden görüldüğü gibi, hem nesnel hem de öznel olarak gece uykusu bozuldu. Hemşirelerin uyku kalitesini fazla önemseme eğiliminde oldukları gözlendi. Deliryumlu hastalarda, birkaç aktigrafi parametresinde (toplam uyku süresi -0,5707; hareket indeksi 0,4155; uyanma sayısı 0,2868; uyku başlangıcından sonra uyanma 0,3874) ve ayrıca RCSQ maddelerinde (uyku derinliği -0,3712; uyku kalitesi -0.2985) anlamlı değişiklikler görüldü ($p<0,05$). Ağrısı olan hastalarda (VAS ≥4), aktigrafide (hareket indeksi 0,3226) ve RCSQ parametrelerinde (uyku derinliği -0,2908; uykuya dönüş -0,2856; RCSQ toplam -0,2746) bazı değişiklikler bulundu.

Sonuç: Çalışma, hastanede yatan hastalarda uyku bozuklukları ile seçilmiş faktörler (ağrı ve deliryum) arasındaki ilişkileri göstermiştir. Elde edilen verileri objektif olarak değerlendirmek için, sübjektif ve objektif ölçümlerin kombinasyonu bir ön koşuldur. Bununla birlikte, kanıt tabanını güçlendirmek için daha sağlam, çok merkezli bir çalışmaya ihtiyaç duyulacaktır.

Anahtar Kelimeler: Uyku bozuklukları, deliryum, ağrı, yaşlı hasta, aktigrafi

Address for Correspondence/Yazışma Adresi: Hana Locihová, Department of Anesthesiology, Resuscitation and Intensive Care Medicine, Faculty of Medicine, University of Ostrava

Phone: +90 420739026151**E-mail:** hana.locihova@osu.cz **ORCID-ID:** orcid.org/0000-0002-4854-394X

Received/Geliş Tarihi: 01.09.2022 **Accepted/Kabul Tarihi:** 02.02.2023

Introduction

Sleep quality and disturbances have been increasingly assessed and monitored in hospitalized patients, particularly those receiving intensive care. The incidence of insomnia is estimated between 36% and 57 % (1), with disturbances commonly persisting for as long as 12 months from discharge (2). Sleep disturbances are associated with a higher risk for developing delirium (3) and hypertension (4), poor blood glucose control in diabetics (5), reduced physical performance (6) and increased pain perception (7). Studies using objective methods to assess sleep have confirmed that sleep architecture is disrupted in hospitalized patients. Even though the total amount of sleep over 24 hours may be normal, daytime sleep accounts for as much as 50% (8). Moreover, this phenomenon is intensified during a hospital stay, with sleep architecture being restored long after discharge (9).

There have been increasing studies not only assessing sleep and its quality but also focusing on factors influencing inpatients' sleep (10-12). The risk factors have traditionally been classified as non-environmental and environmental and. The former include the patient's underlying disease and physical condition, pain or discomfort, psychosocial factors (stress, anxiety) and medication. The latter are noise, light and nursing interventions. As the environmental factors may be controlled, the quality of sleep (and, in fact, the outcome of the entire hospital stay) may be improved (13). Upon identification of negative factors, measures were proposed that may improve sleep and its quality (14,15). At the same time, better sleep quality may reduce the incidence of delirium (16), which itself is a factor impacting on the hospital stay. The association between sleep disturbances and delirium has been reported in several studies, suggesting their neurocognitive similarity (attention disorders, impaired memory and cognition) (17,18). Recent studies (19) have documented a higher risk of delirium in elderly patients with sleep disturbances, irrespective of their dementia status. A promising technique able to detect, objectively assess and quantify both sleep disturbances and delirium based on changes in patients' motor activity seems to be actigraphy. A review (20) has shown that actigraphy may be used to detect sleep disturbances, potentially distinguish delirious from non-delirious patients and, thus, identify at-risk patients.

There is a well-proven, bidirectional association between sleep disturbances and pain (21,22). Poor sleep quality increases nociception and reduces the effectiveness of analgesics, thus increasing their consumption (23). As it is difficult to differentiate these two conditions (and to confirm the superiority of one over the other), a comprehensive, holistic approach appears to be most useful, with the sleep-pain-delirium interactions being considered as multimorbidity. This has a negative impact on the well-being, quality of life and clinical outcome of patients, especially elderly ones (24).

Materials and Methods

Design and Patients

A prospective observational study was carried out on 34 patients receiving follow-up care in a general ward between March and June 2021 (Figure 1).

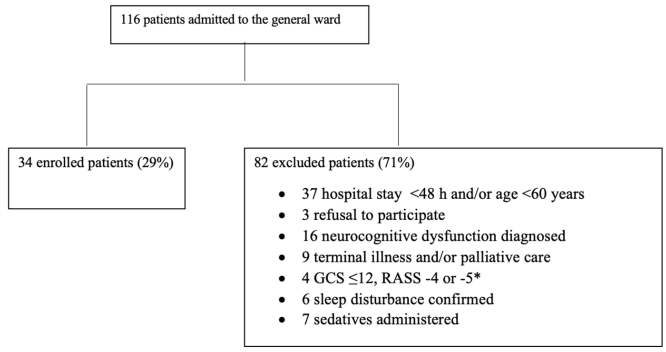


Figure 1. Flowchart of patients in the study
*GCS: Glasgow Coma Scale, RASS: Richmond Agitation-Sedation Scale

Inclusion criteria: Age over 60 years; a hospital stay longer than 48 hours.

Exclusion criteria: A Glasgow Coma Scale score of 12 or less; terminal illness and/or palliative care; previous or current treatment for sleep disturbances; neurocognitive dysfunction (dementia); sedative administration over the last 24 hours; refusing consent to participate.

Actigraphy

The activity monitor (wGT3X-BT, ActiGraph, USA) was placed on the non-dominant wrist. The epoch length was set at 60 seconds. The obtained data were processed using software (ActiLife 6.13.3, ActiGraph) and a specific algorithm (Cole-Kripke). The continuous measurements lasted for 72 hours (monday through thursday). Nighttime sleep analysis was carried out between 9 PM and 5 AM. The actigraphy parameters are shown in Table 1.

Diagnostic Tools

Delirium was assessed with a validated and standardized Czech version of the Confusion Assessment Method for the Intensive Care (CAM-ICU). The assessment involves several steps. First, the depth of consciousness (sedation) is assessed with the Richmond Agitation-Sedation Scale (RASS); in patients with RASS scores of -4 or less, delirium cannot be assessed and the test must be repeated later. In the next step, four main features of delirium are assessed: acute change or fluctuating course of mental status (feature 1), inattention (feature 2), altered level of consciousness (feature 3) and disorganized thinking (feature 4). Delirium is deemed positive when feature 1 and feature 2 and either feature 3 or 4 are present; otherwise, the patient is CAM-ICU negative. RASS scores ranging from 0 to -3 are associated with hypoactive delirium. A RASS score of +1 to +4 suggests hyperactive delirium. Mixed delirium is when the patient fluctuates between the two forms. The Czech version of the original CAM-ICU used upon approval from the authors from Brno, Czech Republic (25).

Sleep quality was assessed using the Richards-Campbell Sleep Questionnaire (RCSQ) containing five items: sleep depth, sleep latency, awakenings, returning to sleep and sleep quality. Noise, an optional item, is evaluated separately. Each item is scored by using a 0-100 visual analog scale (VAS). The total score is

Table 1. Definitions of actigraphy parameters	
Actigraphy parameter	**Definition**
Time in bed (TIB) (min)	The time between the start and the end of the recording
Total sleep time (TST) (min)	The total number of minutes scored as "asleep"
Sleep efficiency (SE) (%)	Number of sleep minutes divided by the total number of minutes the subject was in bed multiplied by 100
Wake after sleep onset (WASO) (min)	The total number of minutes the subject was awake after sleep onset occurred
Number of awakenings (-)	Number of awakenings per night
Average awakening length (min)	The average length, in minutes, of all awakening episodes
Sleep fragmentation index (SFI) (-)	Expressed as a percentage and calculated as the sum of the proportion of all epochs from sleep onset to sleep offset that were mobile*
*Actigraph software used; calculated per night time (9 PM to 5 AM)	

calculated as the mean of all items, with 0 and 100 representing the worst and best sleep, respectively. The subjective assessment may be supplemented with the Sleep Efficiency Index (SEI) using the following formula: SEI = 46.88 + (0.39 × total RCSQ score), with an SEI higher than 85% indicating good sleep quality. The questionnaire was translated and validated by Locihová et. (26) after obtaining consent from the author (27). For pain assessment, the VAS is most frequently used in common clinical practice. To subjectively assess their pain intensity, the patient makes a mark on a 10 cm line, ranging from "no pain" (0) to "the worst possible" pain (10). In the present study, a VAS score of 4 or more was considered significant.

Measurements and Data Collection

After assessing the eligibility and obtaining consent, the actigraph was put on the non-dominant wrist by a trained nurse to be worn for 72 hours (monday morning to thursday morning). Over that time, delirium and pain were assessed by a nurse every 12 hours. The quality of sleep during the previous night was assessed by a nurse every morning.

Ethical Aspects

The study complied with the Declaration of Helsinki and was approved by the Vzděl.vac. a výzkumný institut AGEL Ethics Committee (reference no: INT 2019003, date: 28.08.2019). Patients who volunteered to participate were guaranteed anonymity. Consent to use the Czech version of the CAM-ICU and to translate the RCSQ was obtained from the authors.

Statistical Analysis

Differences between night 1 and night 3 were evaluated using Wilcoxon's robust paired test. Correlations between pairs of variables were tested using robust Kendall's τ correlations (28). Changes between night 1, night 2 and night 3 were evaluated using a repeated measures ANOVA model consisting of the factors night and subject. For the parametric methods, the original data were transformed using power transformations to attain symmetry of the data distribution and constant variance (homoscedasticity) in the data and residuals. The homogeneity and symmetry in transformed data was checked as described elsewhere (29).

The NCSS 12 statistical software from Number Cruncher Statistical Systems (Kaysville, Utah, USA), Statgraphics Centurion 18 from Statgraphics Technologies, Inc. (The Plains, Maryland, USA) and SIMCA from Umetrics (Umeå, Sweden) were used for calculations.

Results

The sample comprised 17 males (50%) and 17 females; there were 14 smokers (41%). Twenty-nine patients (85%) were acutely admitted and six (17%) underwent surgery. Four patients (11%) were transferred from the ICU; four patients (11%) died. The most frequent reasons for hospital admission were diseases of the respiratory system (ICD-10 J00-J99; e.g. respiratory failure, respiratory infections, chronic obstructive pulmonary disease) in 11 patients (32%), diseases of the circulatory system (ICD-10 I00-I99; e.g. heart failure, ischemic heart diseases) in 7 patients (20%) and various injuries in 5 patients (14%). Delirium (CAM-ICU positivity) was found in 13 patients (38%) and significant pain (VAS ≥4) in 16 patients (47%). The participants' mean age was 70.6 years [standard deviation (SD) 17.6] and mean Body Mass Index was 29.0 (SD 18.2). The mean length of hospital stay was 18.0 days (SD 13.5); see Table 2.

The total nighttime sleep duration was reduced to approximately 400 minutes (6.6 hours); the approximate number of nocturnal awakenings lasting about 5 minutes was 12.

Objective analysis of nighttime sleep (9 PM to 5 AM) monitored for 72 hours showed significant changes ($p<0.05$) between night 1 and night 3 (N1-3) in the following parameters: (i) wake after sleep onset (WASO) N1 a median of 54.8 (quartiles, 49.1, 60.9); N2 65.2 (59.2, 71.7); N3: 64.2 (58.1, 70.7); night: $F=2.6$, $p=0.08$ $\eta p2=0.0796$; (ii) Movement Index (MI) N1 19.6 (18.2, 21.2); N2 22.1 (20.5, 23.7); N3 23.6 (21.9, 25.4); night: $F=4.6$, $p=0.014$, $\eta p2=0.128$; (iii) total sleep time (TST) N1 403 (395, 410); N2 392 (385, 399); N3 392 (384, 398); night: $F=2.3$, $p=0.092$, $\eta p2=0.0669$. The other parameters [sleep efficiency, number of awakenings, average awakening length, Fragmentation Index (FI), sleep FI] showed no significant changes ($p>0.05$); see Table 3.

Assessments with the RCSQ showed statistically significant nighttime sleep quality changes ($p<0.05$) between the nights (N1-3) in the following parameters: (i) sleep latency N1 67.3 (65.1, 69.6); N2 70.2 (68.8, 75.2); N3 72.3 (70, 74.5); night: $F=5$, $p=0.033$, $\eta p2=0.148$ and (ii) sleep quality N1 61.2

(57.7, 64.7); N2 65.3 (58.2, 69.4); N3 72.3 (68.8, 75.7); night: F=10.7, p=0.003, ηp2=0.263. The parameters RCSQ total N1 66.6 (63.6,69.5); N2 69.4 (62.8, 76.2); N3 71.5 (68.5, 74.4); night: F=2.8, p=0.102, ηp2=0.084 and SEI N1 73.7 (72.6, 74.8); N2 74.2 (71.6, 77.9); N3 75.4 (74.3, 76.4); night: F=2.4, p=0.135, ηp2=0.0706 were on the border of statistical significance. The remaining parameters (sleep depth, returning to sleep, awakenings and noise) showed no significant changes; see Table 4.

Relationships with risk factors (delirium, pain) were assessed with the Kendall test and their power was expressed as Kendall's τ (using 95% confidence interval), with higher values indicating stronger relationships and positive or negative values indicating direct or indirect causality, respectively. For delirium, the selected sleep parameters were as follows: TST -0.5707, MI +0.4155, WASO +0.3874, sleep depth (RCSQ) -0.3712, sleep quality (RCSQ) -0.2985 and number of awakenings +0.2868; see Table 5. Similarly, the relationships between sleep parameters and pain (VAS ≥4) were assessed and the results were as follows (in ascending order): MI +0.3226; sleep depth -0.2908, returning to sleep -0.2856 and RCSQ total -0.2746; see Table 6.

Table 2. Summary table for dichotomous variables (n=34)

Variable	n (%)	Median (quartiles)	Mean (SD)
Male sex	17 (50%)	-	-
Smoker	14 (41%)	-	-
Acute admission	29 (85%)	-	-
Surgery	6 (17%)	-	-
Previous ICU stay	4 (11%)	-	-
Death in hospital	4 (11%)	-	-
ICD-10 I00-I99	7 (20%)	-	-
ICD-10 J00-J99	11 (32%)	-	-
ICD-10 S00-S99	5 (14%)	-	-
CAM-ICU+	13 (38%)	-	-
VAS ≥4	16 (47%)	-	-
Age (years)	-	72.5 (61.5, 81.3)	70.6 (17.6)
Weight (kg)	-	73.5 (67.3, 80.0)	76.7 (19.9)
Height (cm)	-	170 (165, 175)	170 (29.8)
BMI (kg/m^2)	-	28 (12.0, 36.8)	29.0 (18.2)
Patient/room	-	2 (2, 2)	1.910 (0.628)
Alcohol	-	1 (0, 1)	0.824 (0.753)
Hospital days	-	21 (9, 36)	18.0 (13.5)

SD: Standard deviation, CAM-ICU: Confusion Assessment Method for the Intensive Care, BMI: Body Mass Index, VAS: Visual analog scale

Discussion

The study results confirm disturbed sleep quality in hospitalized patients, as reported by other authors (30,31). Despite literature data (32,33) and our initial assumptions, there was no improvement in objective parameters over monitored nights and some of them even deteriorated. This may be explained by numerous factors that were not considered in the study (e.g. severity or worsening of the patient's condition, other patients sharing the same room with the patient, undiagnosed preexisting sleep disorder). Even though sleep assessment by nurses is considered effective, easy to perform and inexpensive, it is limited by observer bias. When sleep quality was subjectively assessed by nurses in the present study, almost all parameters

Table 3. Changes in objective (actigraphy) parameters during 3 nights (n=34)

	Night		
Variable	**N1 median (quartiles)**	**N2 median (quartiles)**	**N3 median (quartiles)**
SE	83.9 (82.4, 85.3)	82.0 (80.5, 83.4)	81.9 (80.4, 83.4)
	Night: F=1.7, p=0.186, ηp2=0.0512		
TST	403 (395, 410)	392 (385, 399)	392 (384, 398)
	Night: F=2.3, p=0.092, ηp2=0.0669		
WASO	54.8 (49.1, 60.9)	65.2 (59.2, 71.7)	64.2 (58.1, 70.7)
	Night: F=2.6, p=0.08, ηp2=0.0796		
Number of awakenings	11.7 (10.6, 12.8)	12.5 (11.5, 13.6)	12 (11, 13)
	Night: F=0.5, p=0.642, ηp2=0.014		
Average awakening length	5.16 (4.66, 5.69)	5.75 (5.23, 6.31)	5.83 (5.30, 6.40)
	Night: F=1.4, p=0.244, ηp2=0.0425		
MI	19.6 (18.2, 21.2)	22.1 (20.5, 23.7)	23.6 (21.9, 25.4)
	Night: F=4.6, p=0.014, ηp2=0.128		
FI	10.60 (7.82, 13.80)	13.5 (10.3, 17.0)	11.1 (8.27, 14.4)
	Night: F=0.7, p=0.508, ηp2=0.0203		
SFI	32.7 (28.9, 36.8)	38.3 (34.2, 42.8)	36.7 (32.7, 41.1)
	Night: F=1.5, p=0.235, ηp2=0.0436		

SE: Sleep efficiency, TST: Total sleep time, WASO: Wake after sleep onset, MI: Movement Index, FI: Fragmentation Index, SFI: Sleep fragmentation index

Table 4. Changes in subjective (RCSQ) parameters during 3 nights (n=34)			
	Night		
Variable	N1 median (quartiles)	N2 median (quartiles)	N3 median (quartiles)
Sleep depth	69.4 (65.9, 72.9)	68.2 (60.5, 73.4)	67.1 (63.5, 70.6)
	Night: F=0.4, p=0.512, ηp2=0.0132		
Sleep latency	67.3 (65.1, 69.6)	70.2 (68.8, 75.2)	72.3 (70.0, 74.5)
	Night: F=5, p=0.033, ηp2=0.148		
Returning to sleep	70.8 (66.4, 75.0)	75.2 (69.2, 81.7)	71.4 (67.1, 75.6)
	Night: F=0, p=0.883, ηp2=0.000669		
Awakenings	69.6 (65.2, 73.9)	70.1 (66.9, 72.8)	70.6 (66.2, 74.9)
	Night: F=0.1, p=0.819, ηp2=0.00162		
Sleep quality	61.2 (57.7, 64.7)	65.3 (58.2, 69.4)	72.3 (68.8, 75.7)
	Night: F=10.7, p=0.003, ηp2=0.263		
RCSQ total	66.6 (63.6, 69.5)	69.4 (62.8, 76.2)	71.5 (68.5, 74.4)
	Night: F=2.8, p=0.102, ηp2=0.084		
SEI	73.7 (72.6, 74.8)	74.2 (71.6, 77.9)	75.4 (74.3, 76.4)
	Night: F=2.4, p=0.135, ηp2=0.0706		
Noise	82.3 (79.5, 85.0)	81.1 (76.9, 82.3)	80.1 (77.2, 82.9)
	Night: F=0.6, p=0.441, ηp2=0.0181		
RCSQ: Richards-Campbell Sleep Questionnaire, SEI: Sleep Efficiency Index			

Table 5. Significant relationships between delirium (CAM-ICU+) and sleep variables (n=13)		
Variable	Kendall's τ	p-value
TST (OBJ)	-0.5707	0.0008
Sleep depth (SUBJ)	-0.3712	0.0305
MI (OBJ)	0.4155	0.0154
Number of awakenings (OBJ)	0.2868	0.0464
WASO (OBJ)	0.3874	0.0086
Sleep quality (SUBJ)	-0.2985	0.0456
TST: Total sleep time, WASO: Wake after sleep onset, MI: Movement Index, CAM-ICU: Confusion Assessment Method for the Intensive Care		

Table 6. Significant relationships between pain (VAS ≥4) and sleep variables (n=16)		
Variable	Kendall's τ	p-value
Returning to sleep (SUBJ)	-0.2856	0.0483
RCSQ total (SUBJ)	-0.2746	0.0495
MI (OBJ)	0.3226	0.021
Sleep depth (SUBJ)	-0.2908	0.0439
RCSQ: Richards-Campbell Sleep Questionnaire, MI: Movement Index, VAS: Visual analog scale		

(except for sleep depth and noise) were shown to improve. The study results suggest that nurses tend to overestimate sleep quality and, at the same time, are unable to correctly recognize the extent of sleep disturbances that patients may experience. Our findings are therefore consistent with those from earlier studies. Kamdar et al. (34) stated that patient-nurse interrater reliability on the RSCQ was "slight to moderate" and that nurses tended to overestimate sleep quality perceived by patients. Locihová et al. (35) found a very low level of agreement between subjective sleep quality assessment (RCSQ) and objective actigraphy measurements. Based on their study analyzing sleep in 62 older adults, Yeh et al. (36) concluded that sleep is difficult to assess using a single parameter, underscoring the need for a multidimensional approach with both self-reported (questionnaire) and objective methods.

Actigraphy has been increasingly used to assess sleep in hospitalized patients (37), with validation studies reporting a sensitivity of approximately 90% and specificity of approximately 80% as compared with polysomnography (38,39). On the other hand, the above studies claim that one weakness of the method is analysis of the obtained data. Selecting the appropriate algorithm may be crucial for specificity of the measurements.

The present study showed that both investigated predictors (i.e. delirium and pain) had an impact on sleep quality. Even though the relationships may be assumed, literature data are not so conclusive regarding delirium. While Jaiswal et al. (17) confirmed the relationship between delirium and sleep disturbances, others (40) failed to show it using a different assessment technique (polysomnography) in a different population (mechanically ventilated ICU patients). In a Chinese study (41), delirious patients had less rapid eye movement (REM) sleep, lower melatonin levels and higher cortisol levels than controls, suggesting impaired circadian rhythm. The so-called PADIS guidelines on sleep in ICU patients recommend the use of a multi-component sleep-promoting protocol which, when implemented, results in improved sleep quality and thus a reduced incidence of delirium (42). A potentially interesting outcome of the present study is a confirmed relationship

between the actigraphy parameter MI and the presence of delirium. This may confirm an earlier hypothesis (20) suggesting differences in motor activity patterns between delirious and non-delirious patients. As actigraphy is able to identify these patterns, it may aid in revealing delirium. However, a more robust high-quality study is needed to definitely confirm the hypothesis.

The present study also found associations between pain and several subjective sleep parameters (returning to sleep, RCSQ total, sleep depth) and one objective parameter (MI). The relationship between sleep quality and pain has been repeatedly and sufficiently confirmed in the literature (23,43). Yet many questions remain concerning the causality as well as mechanisms that may explain it. A review by Moldofsky (7) showed that the risk for the association of insomnia or unrefreshing sleep and pain increases with severity of pain. The relationship between pain intensity and disturbed sleep is expected to increase with age, with the elderly being particularly affected. Experimental animal studies have suggested that REM sleep deprivation increases pain perception. leading to hyperalgesia. According to other authors, this may be explained by sleep deprivation preventing the action of endogenous and exogenous opioids (44). A questionnaire study (166 patients, 28 hospitalists, 37 nurses) on a range of disruptions to sleep in hospital patients identified pain as the most disruptive factor, followed by vitals and tests. The results only highlight the importance of good pain management, not just in relation to sleep (45). The significance of sleep quality in hospitalized patients and the need for interventions to improve it have been documented by numerous authors (14,15,42), raising an awareness of this aspect of nursing care.

Recommendations for Practice

There is a likely relationship between sleep disturbances and the selected predictors (pain, delirium), with the causation being bidirectional.

The presence and extent of the association is difficult to quantify and assess objectively, mainly due to the variable accuracy of assessment methods.

Sleep quality improvements (sleep-promoting interventions) appear to be potentially very important and beneficial.

Study Limitations

The main limitation is the design (single-center study, small number of participants). Sleep quality assessment and objective measures of sleep are limited by accuracy of the assessment method used. This limitation is also essential when the associations are confirmed and quantified. Valid and comprehensive assessment of the impact that selected predictors have on nighttime sleep quality will require a high-quality multi-center randomized study.

Conclusion

The study has revealed a relationship between sleep disturbances and the selected predictors (pain and delirium). The association is difficult to clearly confirm in clinical practice due to a range of limitations, the most important cause of which is the sleep quality assessment method. The most suitable appears to be a combination of objective (actigraphy) and subjective (questionnaire) assessments. In hospitalized patients, sleep is disrupted due to a variety of reasons. Sleep quality and its improvement receive increasing attention in nursing. Mounting evidence suggests that non-pharmacological interventions should be the first choice to promote sleep in hospital patients.

Acknowledgements

I would like to thank nurses from AGEL Hospital in Valašské Meziříčí for helping with data collection, Martin Hill for statistical analysis and Pavel Kurfürst for translating the text.

Ethics

Ethics Committee Approval: Ethics approval of the study was taken from Vzdělávací a výzkumný institut AGEL Ethics Committee (reference no: INT 2019003, date: 28.08.2019).

Informed Consent: Consent to use the Czech version of the CAM-ICU and to translate the RCSQ was obtained from the authors.

Peer-review: Internally peer-reviewed.

Authorship Contributions

Concept: H.L., R.Z., Design: H.L., R.Z., Data Collection or Processing: H.L., B.B., R.Z., J.H., Analysis or Interpretation: H.L., P.Š., B.B., J.H., Literature Search: H.L., K.A., P.Š., Writing: H.L., K.A.

Conflict of Interest: No conflict of interest was declared by the authors.

Financial Disclosure: The study was supported by AGEL Internal Project.

References

1. Ho A, Raja B, Waldhorn R, Baez V, Mohammed I. New onset of insomnia in hospitalized patients in general medical wards: incidence, causes, and resolution rate. J Community Hosp Intern Med Perspect 2017;7:309-13.
2. Altman MT, Knauert MP, Pisani MA. Sleep Disturbance after Hospitalization and Critical Illness: A Systematic Review. Ann Am Thorac Soc 2017;14:1457-68.
3. Farasat S, Dorsch JJ, Pearce AK, Moore AA, Martin JL, Malhotra A, Kamdar BB. Sleep and Delirium in Older Adults. Curr Sleep Med Rep 2020;6:136-48.
4. Makarem N, Alcántara C, Williams N, Bello NA, Abdalla M. Effect of Sleep Disturbances on Blood Pressure. Hypertension 2021;77:1036-46.
5. Lee SWH, Ng KY, Chin WK. The impact of sleep amount and sleep quality on glycemic control in type 2 diabetes: A systematic review and meta-analysis. Sleep Med Rev 2017;31:91-101.
6. Zhang W, Liu Y, Yu J, Li D, Jia Y, Zhang Q, Gao Y, Wan Z, Wei W. Exercise improves sleep quality in older adults: a protocol for a systematic review and meta-analysis. BMJ Open 2022;12:e047555.
7. Moldofsky H. Sleep and pain. Sleep Med Rev 2001;5:385-96.
8. Stewart NH, Arora VM. Sleep in Hospitalized Older Adults. Sleep Med Clin 2018;13:127-35.
9. Prajapat B, Gupta N, Chaudhry D, Santini A, Sandhya AS. Evaluation of Sleep Architecture using 24-hour Polysomnography in Patients

Recovering from Critical Illness in an Intensive Care Unit and High Dependency Unit: a Longitudinal, Prospective, and Observational Study. J Crit Care Med (Targu Mures) 2021;7:257-66.

10. Wesselius HM, van den Ende ES, Alsma J, Ter Maaten JC, Schuit SCE, Stassen PM, de Vries OJ, Kaasjager KHAH, Haak HR, van Doormaal FF, Hoogerwerf JJ, Terwee CB, van de Ven PM, Bosch FH, van Someren EJW, Nanayakkara PWB; "Onderzoeks Consortium Acute Geneeskunde" Acute Medicine Research Consortium. Quality and Quantity of Sleep and Factors Associated With Sleep Disturbance in Hospitalized Patients. JAMA Intern Med 2018;178:1201-8.
11. Honarmand K, Rafay H, Le J, Mohan S, Rochwerg B, Devlin JW, Skrobik Y, Weinhouse GL, Drouot X, Watson PL, McKinley S, Bosma KJ. A Systematic Review of Risk Factors for Sleep Disruption in Critically Ill Adults. Crit Care Med 2020;48:1066-74.
12. Medrzycka-Dabrowska W, Lewandowska K, Kwiecień-Jaguś K, Czyż-Szypenbajl K. Sleep Deprivation in Intensive Care Unit - Systematic Review. Open Med (Wars) 2018;13:384-93.
13. Knauert MP, Pisani M, Redeker N, Murphy T, Araujo K, Jeon S, Yaggi H. Pilot study: an intensive care unit sleep promotion protocol. BMJ Open Respir Res 2019;6:e000411.
14. Ritmala-Castren M, Salanterä S, Holm A, Heino M, Lundgrén-Laine H, Koivunen M. Sleep improvement intervention and its effect on patients' sleep on the ward. J Clin Nurs 2022;31:275-82.
15. Bellon F, Beti-Abad A, Pastells-Peiró R, Casado-Ramirez E, Moreno-Casbas T, Gea-Sánchez M, Abad-Corpa E. Effects of nursing interventions to improve inpatients' sleep in intensive and non-intensive care units: Findings from an umbrella review. J Clin Nurs 2023;32:1963-78.
16. Flannery AH, Oyler DR, Weinhouse GL. The Impact of Interventions to Improve Sleep on Delirium in the ICU: A Systematic Review and Research Framework. Crit Care Med 2016;44:2231-40.
17. Jaiswal SJ, Kang DY, Wineinger NE, Owens RL. Objectively measured sleep fragmentation is associated with incident delirium in older hospitalized patients: Analysis of data collected from an randomized controlled trial. J Sleep Res 2021;30:e13205.
18. Weinhouse GL, Schwab RJ, Watson PL, Patil N, Vaccaro B, Pandharipande P, Ely EW. Bench-to-bedside review: delirium in ICU patients - importance of sleep deprivation. Crit Care 2009;13:234.
19. FitzGerald JM, O'Regan N, Adamis D, Timmons S, Dunne CP, Trzepacz PT, Meagher DJ. Sleep-wake cycle disturbances in elderly acute general medical inpatients: Longitudinal relationship to delirium and dementia. Alzheimers Dement (Amst) 2017;7:61-8.
20. Davoudi A, Manini TM, Bihorac A, Rashidi P. Role of Wearable Accelerometer Devices in Delirium Studies: A Systematic Review. Crit Care Explor 2019;1:e0027.
21. Whibley D, AlKandari N, Kristensen K, Barnish M, Rzewuska M, Druce KL, Tang NKY. Sleep and Pain: A Systematic Review of Studies of Mediation. Clin J Pain 2019;35:544-58.
22. Afolalu EF, Ramlee F, Tang NKY. Effects of sleep changes on pain-related health outcomes in the general population: A systematic review of longitudinal studies with exploratory meta-analysis. Sleep Med Rev 2018;39:82-97.
23. Griffin SC, Ravyts SG, Bourchtein E, Ulmer CS, Leggett MK, Dzierzewski JM, Calhoun PS. Sleep disturbance and pain in U.S. adults over 50: evidence for reciprocal, longitudinal effects. Sleep Med 2021;86:32-9.
24. Herrero Babiloni A, Beetz G, Bruneau A, Martel MO, Cistulli PA, Nixdorf DR, Conway JM, Lavigne GJ. Multitargeting the sleep-pain interaction with pharmacological approaches: A narrative review with suggestions on new avenues of investigation. Sleep Med Rev 2021;59:101459.
25. Mitášová A, Bednařík J, Košťálová M, Michalčáková R, Ježková M, Kašpárek T, Skutilová S, Straževská E, Šályová P, Šikolová V, Šrámková L. Straževská E, Šályová P, Šikolová V, Šrámková L., Standardizace české verze The Confusion Assessment Method for the Intensive Care Unit (CAMICUcz) Cesk Slov Neurol N 2010;73/106:258-66.
26. Locihová H, Žiaková K, Šerková D, Černochová S, Rajtrová N, Ponč íková V. The reliability of the Czech version of the Richards–Campbell Sleep Questionnaire, KONTAKT 2019;21:128-34.
27. Richards KC, O'Sullivan PS, Phillips RL. Measurement of sleep in critically ill patients. J Nurs Meas 2000;8:131-44.
28. Trygg J, Wold S. Orthogonal projections to latent structure. J Chemometrics 2002;16:119-28.
29. Meloun M, Hill M, Militký J, Kupka K. Transformation in the PC-aided biochemical data analysis. Clin Chem Lab Med 2000;38553-9.
30. Macfarlane M, Rajapakse S, Loughran S. What prevents patients sleeping on an acute medical ward? An actigraphy and qualitative sleep study. Sleep Health 2019;5:666-69.
31. Okutan B, Kjer CKW, Poulsen LM, Gögenur I, Mathiesen O, Estrup S, Madsen MT. Sleep-wake rhythms determined by actigraphy during in-hospital stay following discharge from an intensive care unit. Acta Anaesthesiol Scand 2021;65:801-8.
32. Elías MN, Munro CL, Liang Z. Sleep Quality Associated With Motor Function Among Older Adult Survivors of Critical Illness. Nurs Res 2020 69:322-8.
33. Wilcox ME, Rubenfeld GD, Walczak KD, Black SE, McAndrews MP, Lim AS. Actigraphic measures of sleep on the wards after ICU discharge. J Crit Care 2019;54:163-9.
34. Kamdar BB, Shah PA, King LM, Kho ME, Zhou X, Colantuoni E, Collop NA, Needham DM. Patient-nurse interrater reliability and agreement of the Richards-Campbell sleep questionnaire. Am J Crit Care 2012;21:261-9.
35. Locihová H, Axmann K, Žiaková K, Šerková D, Černochová S. Sleep quality assessment in intensive care: actigraphy vs. Richards-Campbell sleep questionnaire. Sleep Sci 2020;13:235-41.
36. Yeh AY, Pressler SJ, Giordani BJ. Actigraphic and Self-reported Sleep Measures in Older Adults: Factor Analytic Study. West J Nurs Res 2023;45:4-13.
37. Schwab KE, Ronish B, Needham DM, To AQ, Martin JL, Kamdar BB. Actigraphy to Evaluate Sleep in the Intensive Care Unit. A Systematic Review. Ann Am Thorac Soc 2018;15:1075-82.
38. Bigué JL, Duclos C, Dumont M, Paquet J, Blais H, Menon DK, Bernard F, Gosselin N. Validity of actigraphy for nighttime sleep monitoring in hospitalized patients with traumatic injuries. J Clin Sleep Med 2020;16:185-92.
39. Marino M, Li Y, Rueschman MN, Winkelman JW, Ellenbogen JM, Solet JM, Dulin H, Berkman LF, Buxton OM. Measuring sleep: accuracy, sensitivity, and specificity of wrist actigraphy compared to polysomnography. Sleep 2013;36:1747-55.
40. Boesen HC, Andersen JH, Bendtsen AO, Jennum PJ. Sleep and delirium in unsedated patients in the intensive care unit. Acta Anaesthesiol Scand 2016;60:59-68.
41. Sun T, Sun Y, Huang X, Liu J, Yang J, Zhang K, Kong G, Han F, Hao D, Wang X. Sleep and circadian rhythm disturbances in intensive care unit (ICU)-acquired delirium: a case-control study. J Int Med Res 2021;49:300060521990502.
42. Devlin JW, Skrobik Y, Gélinas C, Needham DM, Slooter AJC, Pandharipande PP, Watson PL, Weinhouse GL, Nunnally ME, Rochwerg B, Balas MC, van den Boogaard M, Bosma KJ, Brummel NE, Chanques G, Denehy L, Drouot X, Fraser GL, Harris JE, Joffe AM,

Kho ME, Kress JP, Lanphere JA, McKinley S, Neufeld KJ, Pisani MA, Payen JF, Pun BT, Puntillo KA, Riker RR, Robinson BRH, Shehabi Y, Szumita PM, Winkelman C, Centofanti JE, Price C, Nikayin S, Misak CJ, Flood PD, Kiedrowski K, Alhazzani W. Clinical Practice Guidelines for the Prevention and Management of Pain, Agitation/Sedation, Delirium, Immobility, and Sleep Disruption in Adult Patients in the ICU. Crit Care Med 2018;46:e825-73.

43. Finan PH, Goodin BR, Smith MT. The association of sleep and pain: an update and a path forward. J Pain 2013;14:1539-52.
44. Lautenbacher S, Kundermann B, Krieg JC. Sleep deprivation and pain perception. Sleep Med Rev 2006;10:357-69.
45. Grossman MN, Anderson SL, Worku A, Marsack W, Desai N, Tuvilleja A, Ramos J, Francisco MA, Lafond C, Balachandran JS, Mokhlesi B, Farnan JM, Meltzer DO, Arora VM. Awakenings? Patient and Hospital Staff Perceptions of Nighttime Disruptions and Their Effect on Patient Sleep. J Clin Sleep Med 2017;13:301-6.

Original Article / *Özgün Makale*

DOI: 10.4274/tjsm.galenos.2023.37980

Journal of Turkish Sleep Medicine 2023;10:229-234

Relationship Between Chronotype, Social Jetlag, Attention Control, and Academic Achievement in Nursing Students During the COVID-19 Pandemic

COVID-19 Pandemisinde Hemşirelik Öğrencilerinde Kronotip, Sosyal Jetlag, Dikkat Kontrolü ve Akademik Başarı İlişkisi

Nazmiye Çıray, Meltem Adaiçi*, Aybüke Özcan**

Ege University Faculty of Nursing, Department of Nursing, Division of Internal Medicine Nursing, İzmir, Turkey

**İzmir Tınaztepe University Vocational School of Health Services, İzmir, Turkey*

***Dokuz Eylül University Institute of Health Sciences, Department of Nursing, Division of Internal Medicine Nursing Master, İzmir, Turkey*

Abstract

Objective: This study aimed to examine the relationship between chronotype, social jetlag, attention control, and academic performance in nursing students during the Coronavirus disease-2019 pandemic.

Materials and Methods: The descriptive study was conducted online with undergraduate nursing students (n=405) who were members of the Student Nurses Association and volunteered to participate in the study between July 2021 and April 2022. In collecting the data of the research, students' academic performance information and sociodemographic data that may affect their chronotype were evaluated using the Student Information Form. In addition, the Social Jetlag Form, Morning Evening Scale, and Attention Control Scale were used for evaluation.

Results: The mean age of the students participating in the study was 20.29±0.91, 75.8% were female and 41.5% were freshmen. When the chronotypes of the students were examined, it was observed that 18.0% of them were morning-type, 68.6% of them were intermediate -type, and 13.4% of them were evening-type. When the chronotype characteristics of the students, their weighted passing grade, attention control point average, and weekday sleep duration were examined, no significant difference was observed between them ($p>0.05$). However, when the average of social jetlag hours was compared according to chronotypes, a statistically significant difference was found ($p<0.05$). Social jetlag values of morning students were found to be significantly lower than those in the evening and intermediate students. The social jetlag values in the intermediate type.

Conclusion: There is no significant relationship between social jetlag and chronotype variables, attention control, and academic performance in the post-pandemic period. It can be said that students with an evening type chronotype and creating their own timelines for the social jetlag value create a positive change. However, in the new post-pandemic period, this seemingly positive change is thought to have negative consequences in terms of the adaptation of university students to the new normal. Further studies are needed on the changes in chronotypes in the post-pandemic period.

Keywords: Social jetlag, circadian rhythm, attention control, academic performance, nursing students

Öz

Amaç: Araştırmada, Koronavirüs hastalığı-2019 pandemisinde hemşirelik öğrencilerinde kronitip, sosyal jetlag, dikkat kontrolü ve akademik başarı arasındaki ilişkinin incelenmesi amaçlanmıştır.

Gereç ve Yöntem: Tanımlayıcı tipte olan araştırma Temmuz 2021-Nisan 2022 tarihleri arasında Öğrenci Hemşireler Derneği'ne üye ve çalışmaya katılmaya gönüllü lisans hemşirelik öğrencileri (n=405) ile online olarak yürütülmüştür. Araştırmanın verilerinin toplanmasında öğrencilerin akademik başarı bilgileri ve kronotipini etkileyebilecek sosyodemografik verileri, Öğrenci Bilgi Formu ile değerlendirilmiştir. Ayrıca Sosyal Jetlag Formu, Sabahçıl Akşamcıl Ölçeği ve Dikkat Kontrol Ölçeği değerlendirme için kullanılmıştır.

Bulgular: Çalışmaya katılan öğrencilerin yaş ortalaması 20,29±0,91, %75,8'i kadın ve %41,5'i birinci sınıf öğrencisidir. Öğrencilerin kronotipleri incelendiğinde; %18,0'ının sabahçıl tip, %68,6'sının ara tip ve %13,4'ü akşamcıl tipte oldukları görülmüştür. Öğrencilerin kronotip özellikleri ile ağırlıklı geçer notu, dikkat kontrol puan ortalaması ve hafta içi uyku süresi incelendiğinde, aralarında anlamlı bir fark görülmemiştir ($p>0,05$). Ancak kronotiplere göre sosyal jetlag saat ortalaması karşılaştırıldığında, istatistiksel olarak anlamlı bir fark saptanmıştır ($p<0,05$). Sabahçıl öğrencilerin sosyal jetlag değerleri akşamcıl ve ara tipte olanlara göre anlamlı düzeyde daha düşük olduğu bulunmuştur. Ara tipte olanlarda sosyal jetlag değerleri akşamcıl tipte olanlara göre anlamlı derecede daha düşüktür ($p<0,005$).

Sonuç: Pandemi sonrası dönemdeki sosyal jetlag ve kronotip değişkenleri ile dikkat kontrolü ve akademik başarı arasında anlamlı bir ilişki saptanamamıştır. Akşamcıl tip kronotipe sahip öğrenciler ve sosyal jetlag değeri için kendi zaman çizelgelerini oluşturmalarının olumlu anlamda bir değişim yarattığından söz edilebilir. Ancak pandemi sonrası yeni dönemde üniversite öğrencilerinin yeni normale adaptasyonu açısından bu olumlu görünen değişimin aslında olumsuz sonuçları olduğu düşünülmektedir. Pandemi sonrası dönemde kronotipler üzerinde oluşan değişimler ile ilgili yapılacak daha ileri çalışmalara ihtiyaç vardır.

Anahtar Kelimeler: Sosyal jetlag, sirkadiyen ritim, dikkat kontrolü, akademik başarı, hemşirelik öğrencisi

Address for Correspondence/Yazışma Adresi: Meltem Adaiçi Nurs., İzmir Tınaztepe University Vocational School of Health Services, İzmir, Turkey
Phone: +90 507 651 98 99 **E-mail:** meltem_adaici@hotmail.com **ORCID-ID:** orcid.org/0000-0001-5915-7457
Received/Geliş Tarihi: 25.11.2022 **Accepted/Kabul Tarihi:** 02.03.2023

Introduction

The earth has a certain rhythm that occurs with the sunrise and sunset. Phylogenetically, living things determine their behavioral rhythms according to light and darkness and regulate their physiological functions by adapting to this rhythm. Human beings also adapt to this cycle of light and darkness by resting during the night and performing their activities during the day (1). Regulation of the physiological processes and rhythm of the body according to the daylight is called the circadian rhythm (1). Environmental conditions that change over time and social processes independent of daylight have changed the preferences of individuals about sleeping and activity times. This affects individuals both physiologically and behaviorally and is defined as the chronotype of the circadian rhythm (1,2). Chronotype is defined as the preference and tendency in individuals to wake up and sleep at certain times in a day (1-3). Chronotypes are examined in three groups: Morning, intermediate, and evening types (3). Evening chronotypes have been proven to have more difficulty remembering words early in the morning (4), lower academic performance levels (5), poorer sleep qualities, and higher social jetlag values (1). The highest cognitive and physical performances vary according to biological time; however, different chronotypes work at the same local time due to social programs such as school and working hours. Thus, there is a conflict between the social and biological clocks. The conflict between the social clock (external and common) and the biological clock (internal and individual) is defined as "social jetlag" (6).

Social jetlag is the primary indicator of circadian rhythm disorders and disrupts sleep patterns, which is a fundamental aspect of health, causing attention deficit by its negative effect on neurocognitive performance (7). Although attention deficit is associated with impaired cognitive functions such as slower response times and reduced working memory, it may result in compromising academic performance and achievement in university students (8,9). It is very common among university students due to the quite high pressure of academic performance on them (10). In addition, hybrid/mixed education, which is a combination of face-to-face education and online education that students encountered as the "new normal" during the pandemic, has negatively affected attention performance and led to severe anxiety (11,12). Changing chronotype cycles and related social jetlag create a cycle in students by negatively affecting cognitive functions (13,14).

Studies have been conducted on chronotype, social jetlag, and related attention deficits (7). On the other hand, no study was found on attention control, social jetlag, or chronotype in nursing students during the post-pandemic period. Therefore, it is very important that this study was conducted during the pandemic, and it is thought that knowing the chronotypes of the students could provide important data to increase their academic success.

Materials and Methods

This cross-sectional study was conducted online with undergraduate nursing students, who were members of the Student Nurses Association (OHDER), between July 2021 and April 2022 (n=405). The size of the sample was calculated with the formula for finite population ($n=Nt^2\ pq/d2(N-1)+t^2$) (11.000) $(1.96)^2$ x (0.5)(0.5)/$(0.05)^2$. (11.000)+$(1.96)^2$. (0.5). (0.5). In the study, the number of students who revealed their grades was 214. The inclusion criteria were being a member of the OHDER, studying in the nursing department, attending classes during the study period, and agreeing to participate in the research. The data collection forms used in the study were prepared online and distributed through Google Forms. The link to this form was shared on social media platforms created by students, who were members of OHDER, through OHDER. OHDER was founded in Izmir in 2006 and with its representative and 5 commissions in 90 universities, it is an association where all undergraduate nursing students in Turkey can become members in the field of nursing. The first part of the form included an informative text about the purpose of the study, the content of the questions, potential risks and benefits, inclusion criteria, our statement that the responses will be kept confidential and will not be shared with third parties, and the ethical aspect of the study. The participants who clicked the "Agree" button and continued were deemed to have declared their voluntary consent. No personal contact information (name, phone, e-mail) was requested. While preparing the questions with Google Forms, the "mandatory field" option, which enabled the participants to be informed by the system in case the questions were not answered, was selected for each question to prevent data loss. Attention was paid to ensuring that the students were not in the exam period at the time of data collection.

Data Collection Tools

The data for the study were collected using four forms, which included the "Student Information Form, Social Jetlag Form, Morning-evening Scale, and Attention Control Scale".

Student Information Form: It was prepared by the researchers based on the literature (1,5,14-16). It consisted of questions related to demographic information, such as age, gender, and year in the program, and questions about subjective sleep quality.

Social Jetlag Form: The social jetlag value was calculated by asking about the waking up/sleeping hours of the students on working/school days and waking/sleeping hours on free days, with the help of the following formula: Social Jetlag = (mid-sleep on free days - mid-sleep on workdays). For calculating the social jetlag value, students were asked to specify waking up/sleeping hours on working/school days and waking up/sleeping hours on free days, as open-ended questions (1).

Morning-evening Scale: Morning-Evening Scale was developed by Horne and Ostberg (17) and it was adapted to Turkish by Pündük et al. (18). The scale consists of 19 questions in total. Participants receive different scores according to the answers they mark for each question. Questions 3, 4, 5, 6, 7, 8, 9, 13, 14, 15, and 16 are scored between 1 and 4, questions 1, 2, 10, 17, and 18 are scored between 1 and 5, questions 11 and 19 are scored between 0 and 6, and question 12 is scored between

0 and 5. The total score varies between 16 and 86. Participants are classified as morning type for scores between 86 and 59, intermediate type for scores between 42 and 58, and evening type for scores between 6 and 41. Cronbach's alpha coefficient of the scale was 0.812 (18). In the present study, Cronbach's alpha coefficient of the scale was 0.758.

Attention Control Scale: Attention Control Scale was developed by Fajkowska and Derryberry (19) and adapted to Turkish by Akın et al. (20). In the original study of the scale, the Cronbach's alpha coefficient was found to be 0.88. The scale consists of 20 items. The frequency of the behaviors and conditions specified in the items by participants are scaled with a quadruple rating (1 = almost never, 2 = sometimes, 3 = often, 4 = always). The high score to be obtained from the scale indicates that the attention control levels of university students are high, and the low score indicates that the attention control levels of university students are low. The scores on the scale vary between 20-80. The Cronbach's alpha coefficient was found to be 0.78 (20). In this study, Cronbach's alpha coefficient of the scale was 0.82.

Academic Performance

The academic performance of the students was evaluated by asking about the grade point average (GPA) in a 4-point system in the same year. The 4-point system has been developed by the Council of Higher Education. The equivalent of 4 reflecting the highest GPA in the 100-point system is 100 (21).

Statistical Analysis

The data were analyzed using the SPSS software. The data obtained in the study were presented as frequency, percentage, mean, and standard deviation values, which were descriptive statistics. The suitability of the data for normal distribution was evaluated by Kolmogorov-Smirnov analysis. According to the statistical analysis of the measurement tools, it was found that the distribution was not normal, and the Kruskal-Wallis H test was applied. A Pearson correlation analysis was implemented to test the relationship between the scales. In the study, values below $p<0.05$ were considered significant. Cronbach's alpha coefficient was calculated to determine the reliability of the measurement tools.

Ethical Considerations

A written permission was obtained from the Scientific Research and Publication Ethics Committee of Izmir Tınaztepe University to conduct the study (protocol no: 17/2021, date: 20.04.2021). In addition to the approval of the Ethical Board, written permission was obtained from the OHDER. Permission was obtained by e-mail from the researchers, who had conducted the Turkish validity and reliability studies of the scales used in the study. Participation in the study was voluntary, and online written consent was obtained from the students participating in it. During the study, all the principles of the Declaration of Helsinki were adhered to.

Results

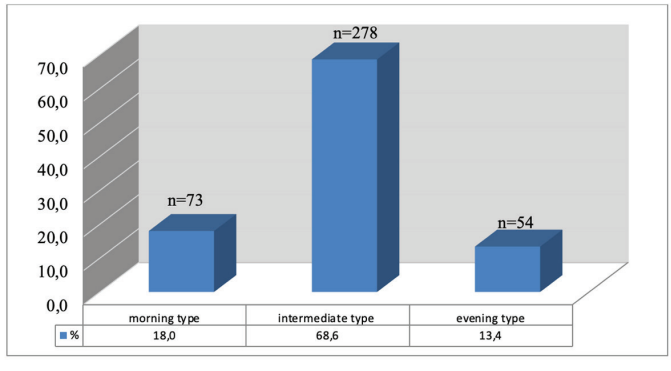
The mean age of the nursing students was 20.34±1.63 (min: 17, max: 30), 75.8% were female, 30.9% were in year 1, 41.5% were in year 2, 20.0% were in year 3, and 7.7% were in year 4. It was found that 58.8% had equal income and expenses, and 47.4% lived with their families (Table 1). Looking at the distribution of the students according to their chronotypes, it was observed that 18.0% were morning types, 68.6% were intermediate types, and 13.4% were evening-type (Graphic 1). The chronotype, social jetlag, and attention control scale mean scores and GPA total mean scores of the students are presented in Table 2.

There was no significant difference between the chronotype characteristics of the students and their GPAs, mean attention control scores, and sleep times during the week ($p>0.05$). A statistically significant difference was found when the mean social jetlag hours were compared according to the chronotypes ($p<0.05$), and it was observed that the "social jetlag" scores of the "morning" types were significantly lower compared to the "evening" and "intermediate" types. "Social jetlag" scores

Table 1. Descriptive characteristics of nursing students (n=405)

Descriptive characteristics	n	%
Age group		
17-20	235	58.0
21-23	161	39.8
24 and over	9	2.2
Age (mean ± SD)	20.34±1.63 (min: 17, max: 30)	
	n	**%**
Gender		
Female	307	75.8
Male	98	24.2
Grade		
1	125	30.9
2	168	41.5
3	81	20.0
4	31	7.7
Sleep quality		
Good	280	69.1
Bad	125	30.9

SD: Standard deviation



Graphic 1. Distribution of students according to chronotypes

were significantly lower in "intermediate type" participants compared to "evening type" participants (p<0.005). There was a significant difference between the groups in terms of the "weekend sleep duration" scores (p<0.05). "Weekend sleep duration" scores were significantly lower in "morning type" participants compared to "evening type" participants (p<0.05) (Table 3).

A negative relationship was found between social jetlag and chronotype (r=-0.399, p=-0.000). There was no relationship between attention control and academic performance (r=-0.070, p=0.305), social jetlag (r=0.045 p=0.370), or chronotype (r=-0.087 p=0.080) (Table 4).

Discussion

The unexpected emergence of Coronavirus disease-2019 (COVID-19) has affected many institutions, including higher education. Universities had to switch from face-to-face education to online education for the first time within the scope of social isolation measures (11). The need for social and economic activities brought about by the restrictions, the "new normal" lifestyle that integrated the face-to-face with the virtual, and the several variants emerging have necessitated acting carefully (11,22). In this context, universities have been trying to keep up with the changing conditions of the pandemic and decide on education processes for developing solutions for the pandemic (11). The changes in lifestyles and the concern regarding the recurrence possibility of the pandemic may cause anxiety in students. In addition, students have been involved in a limited area and scope of collective life for a long time, which has led to anxiety and insomnia (11,22). Chronotype is an individual characteristic related to the preference to function at different times of the day. Preference for morning or evening reflects individual differences in endogenous circadian rhythms manifested in various physiological and behavioral functions such as hormonal secretion, being asleep/awake, and mood (2,3,7,16). The majority of the study sample consisted of intermediate type students. During adolescence, both genders tend to become closer to the evening type, and it is the most common type among women at the age of 18 and men at the age of 19. While men have more evening chronotypes between 15 and 20 years of age, they have more morning chronotypes between 20 and 40. During these periods, the evening chronotype is more common in women on average. While more than 50% of chronotype changes occur in adolescence and early adulthood during the life span, variability decreases with age (23). Studies have reported that the gender difference disappears in chronotype around age 50 (24), and this is explained by changes in the endocrine system that coincide with the average onset of menopause in women (23,24). Among the students participating in our study, 58% were in early adulthood, and the majority (75.8%) were female students. This finding is consistent with the study data conducted on students before and during the pandemic quarantine. In the study conducted by Hasan et al. (16) during the pandemic period with the participation of 1011 students, 802 students (79.3%) were found to be of the intermediate type, and Marelli et al. (25) found that 400 university students (54%) were of intermediate type. In their study on nursing students during the pandemic, Çıray and Özcan (26) found that 67.5% of the students were of the intermediate type. Another study conducted with 117 students before the pandemic concluded

Table 2. Nursing students' chronotype, social jetlag, and Attention Control Scale mean scores and GPA total mean scores (n=405)

Variables	Mean ± SD
Chronotype (MEQ scores)	50.64±0.44
Social jetlag (h: min)	1.65±0.05
Attention Control Scale	47.44±0.28
GPA	3.09±0.82

MEQ: Morningness-Eveningness Questionnaire, GPA: Grade point average, SD: Standard deviation

Table 3. Variable distribution of nursing students by chronotypes

Variable	Chronotypes	n	Median	Rank average	Min-max	
*GPA	[a]Morning type	35	3.00	87.11	0.00-4.00	h=4.788 p=0.091
	[b]Intermediate type	145	3.10	110.39	0.00-4.00	
	[c]Evening type	34	3.36	116.15	0.00-4.00	
Social jetlag	[a]Morning type	73	1.10	126.01	0.00-4.15	h=60.422 p=0.0001 c-a (p=0.028<0.05) c-b (p=0.039<0.05) b-a (p=0.031<0.05)
	[b]Intermediate type	278	1.45	206.74	0.00-7.30	
	[c]Evening type	54	2.30	287.80	0.30-6.30	
Attention Control Scale	[a]Morning type	73	46.00	193.93	37.00-62.00	h=1.127 p=0.569
	[b]Intermediate type	278	47.00	202.82	36.00-80.00	
	[c]Evening type	54	47.00	216.18	37.00-59.00	

*GPA (n=214), [a]Morning type, [b]Intermediate type, [c]Evening type, GPA: Grade point average

Table 4. Relationship between social jetlag, chronotype, GPA and attention control

		Social jetlag	Chronotype	Attention control
GPA	r	-0.043	-0.114	-0.070
	p	0.527	0.097	0.305
	n	214	214	214
Social jetlag	r	-	-0.399**	0.045
	p	-	0.000	0.370
	n	-	405	405
Chronotype	r	-	-	-0.087
	p	-	-	0.080
	n	-	-	405

**p<0.05, GPA: Grade point average

that 51% of the students were of intermediate type (3). Social jetlag arises in the case of a conflict between environmental time and the internal clock of the body. Social jetlag is affected by school, work, and other responsibilities that require people to start the day before the natural waking time, especially the use of artificial light (1,6,11,26). In our study, the social jetlag score found to be 1.65. In the study conducted by Çıray and Özcan (26) during the pandemic quarantine, the social jetlag scores of the students was found to be 1.47. In a study conducted with university students in the new normal period, it was demonstrated that the social jetlag scores of the students decreased compared to the scores before the pandemic (22). In a study on sleep changes during the pandemic, which was conducted with 2,222 individuals, 61.7% (1,371 individuals) of whom were students, it was reported that the social jetlag scores decreased in all groups, and a 0.4-hour decrease was observed in students, while a 0.1-hour decrease was observed in employees (27). These findings suggested that the social jetlag scores changed positively in the new normal period compared to the studies conducted before the pandemic; however, they might have increased according to the studies conducted during the pandemic quarantine. This may be due to the fact that students could create a flexible calendar for themselves in the pandemic quarantine and limit their flexibility in the new normal period. In our study, 30.9% of the students indicated their subjective sleep quality assessments as poor. In their study examining the changes brought about by the COVID-19 pandemic during the post-pandemic period, Montagnese et al. (28) stated that university students reported a deterioration in their subjective sleep qualities, they slept and woke up later, and they experienced interruptions in their sleep. Duan et al. (12) concluded that 32% of university students developed insomnia during the post-pandemic period, 19% became overweight or obese, 15% got anxious, and 65% got depressed. In addition, it was found in our study that the weekend sleep duration of the individuals of the evening-type chronotype was higher compared to the morning-type students. It is thought that this may be because they slept less during the week to adapt to their obligatory schedules and tried to compensate at the weekend. Similarly, a study conducted before the pandemic reported that individuals of the evening type slept less during the week (29). Staller and Randler (30) stated that the sleep duration of evening chronotypes was higher during the pandemic restrictions and it was a positive development for their internal biological clock. Ramírez-Contreras et al. (22) demonstrated that university students woke up later on weekends in the new normal period, and their sleep time increased both on weekends and weekdays. It is thought that the fact that universities continued their education face-to-face during the post-pandemic period started to create a disadvantage for evening chronotypes. In the study conducted with a sample consisting of students during the pandemic quarantine period, the attention levels of the students were reported to have decreased (31). Cognitive components such as attention, attention maintenance, alertness, reaction time, and academic performance have hemostatic and circadian changes (32). In our study, chronotype and social jetlag were not found to be associated with attention control and academic performance. Nevertheless, social jetlag is known to have negative effects on cognitive performance (13,14,32). McGowan et al. (7) suggested that social jetlag had similar behavioral responses to attention disorders such as hyperactivity disorder. Unlike the literature, it is thought that the results of our study indicated a positive change in social jetlag value and that the attention control scale was a subjective data collection tool.

Conclusion

No significant relationship was found between social jetlag and chronotype variables and attention control and academic achievement during the post-pandemic period. It was observed that the ability of students to adjust their appropriate timetables during the COVID-19 pandemic created a positive change in evening types and social jetlag scores. On the other hand, the fact that university students retrieved their schedules before the pandemic with the developments to prevent disease transmission in the new normal period after the pandemic suggested that this change, which appeared positive, may have been negatively affected in reality. The limitation of this study was that there were no exclusion criteria due to the application of the online questionnaire based on the research design, the study population was not sufficiently homogeneous, and the basal sleep quality, chronotype, and attention control performances of the individuals before the pandemic were not questioned. The presence of a psychiatric or chronic systemic disease was not evaluated in this study. Considering the limitations, further studies are necessary on the changes in chronotypes. In addition, since the Attention Control Scale is a subjective data collection tool, it is recommended to conduct randomized controlled experimental studies on this subject.

Ethics

Ethics Committee Approval: A written permission was obtained from the Scientific Research and Publication Ethics Committee of Izmir Tınaztepe University to conduct the study (protocol no: 17/2021, date: 20.04.2021).

Informed Consent: Participation in the study was voluntary, and online written consent was obtained from the students participating in it.

Peer-review: Externally peer-reviewed.

Authorship Contributions

Concept: N.Ç., A.Ö., Design: N.Ç., M.A., A.Ö., Data Collection or Processing: A.Ö., Analysis or Interpretation: N.Ç., A.Ö., Literature Search: N.Ç., M.A., A.Ö., Writing: N.Ç., M.A., A.Ö.

Conflict of Interest: No conflict of interest was declared by the authors.

Financial Disclosure: The authors declared that this study received no financial support.

References

1. Wittmann M, Dinich J, Merrow M, Roenneberg T. Social jetlag: misalignment of biological and social time. Chronobiol Int 2006;23:497-509.
2. Müller MJ, Haag A. The concept of chronotypes and its clinical importance for depressive disorders. Int J Psychiatry Med 2018;53:224-40.
3. Jankowski KS.Is the shift in chronotype associated with an alteration in well-being?, Biological Rhythm Research 2015;46:237-48.
4. Evansová K, Červená K, Novák O, Dudysová D, Nekovářová T, Fárková E, Fajnerová I. The effect of chronotype and time of assessment on cognitive performance. Biological Rhythm Research 2022;53:608-27.
5. Preckel F, Lipnevich AA, Schneider S, Roberts RD. Chronotype, cognitive abilities, and academic achievement: A meta-analytic investigation. Learning and Individual Differences 2011;21:483-92.
6. Zerbini G, Kantermann T, Merrow M. Strategies to decrease social jetlag: Reducing evening blue light advances sleep and melatonin. Eur J Neurosci 2020;51:2355-66.
7. McGowan NM, Uzoni A, Faltraco F, Thome J, Coogan AN. The impact of social jetlag and chronotype on attention, inhibition and decision making in healthy adults. J Sleep Res 2020;29:e12974.
8. de Medeiros Lopes XF, Araújo MFS, Lira NCC, Dantas DS, de Souza JC. Social, Biological and Behavioral Factors Associated with Social Jet Lag and Sleep Duration in University Students from a Low Urbanized City. J Multidiscip Healthc 2022;15:11-20.
9. Minges KE, Redeker NS. Delayed school start times and adolescent sleep: A systematic review of the experimental evidence. Sleep Med Rev 2016;28:86-95.
10. Zavecz Z, Nagy T, Galkó A, Nemeth D, Janacsek K. The relationship between subjective sleep quality and cognitive performance in healthy young adults: Evidence from three empirical studies. Sci Rep 2020;10:4855.
11. Singh J, Steele K, Singh L. Combining the Best of Online and Face-to-Face Learning: Hybrid and Blended Learning Approach for COVID-19, Post Vaccine, & Post-Pandemic World. Journal of Educational Technology Systems 2021;50:140-71.
12. Duan H, Gong M, Zhang Q, Huang X, Wan B. Research on sleep status, body mass index, anxiety and depression of college students during the post-pandemic era in Wuhan, China. J Affect Disord 2022;301:189-92.
13. Castilhos Beauvalet J, Luísa Quiles C, Alves Braga de Oliveira M, Vieira Ilgenfritz CA, Hidalgo MP, Comiran Tonon A. Social jetlag in health and behavioral research: a systematic review. ChronoPhysiology and Therapy 2017;7:19-31.
14. Díaz-Morales JF, Escribano C. Social jetlag, academic achievement and cognitive performance: Understanding gender/sex differences. Chronobiol Int 2015;32:822-31.
15. Silva CM, Mota MC, Miranda MT, Paim SL, Waterhouse J, Crispim CA. Chronotype, social jetlag and sleep debt are associated with dietary intake among Brazilian undergraduate students. Chronobiol Int 2016;33:740-8.
16. Hasan MM, Jankowski KS, Khan MHA. Morningness-eveningness preference and shift in chronotype during COVID-19 as predictors of mood and well-being in university students. Pers Individ Dif 2022;191:111581.
17. Horne JA, Ostberg O. A self-assessment questionnaire to determine morningness-eveningness in human circadian rhythms. Int J Chronobiol 1976;4:97-110.
18. Pündük Z, Gür H, Ercan I. Sabahçil-Akşamcil Anketi Türkçe Uyarlamasinda Güvenilirlik Calişmasi [A reliability study of the Turkish version of the mornings-evenings questionnaire]. Turk Psikiyatri Derg 2005;16:40-5.
19. Fajkowska M, Derryberry D. Psychometric properties of Attentional Control Scale: The preliminary study on a Polish sample. Polish Psychological Bulletin 2010;41:1-7.
20. Akın A, Kaya Ç, Uysal R, Çardak M, Çitemel N, Özdemir E, Gülşen M. Dikkat Kontrol Ölçeği Türkçe Formu: Geçerlik ve Güvenirlik Çalışması. VI. Ulusal Lisansüstü Eğitim Sempozyumu'nda sunulmuş bildiri 2013
21. Yüksek Öğretim Kurumu. 4'lük sistemdeki notların 100'lük sistemdeki karşılıkları. https://oyp.yok.gov.tr/Documents/Anasayfa/4lukSistem.pdf
22. Ramírez-Contreras C, Zerón-Rugerio MF, Izquierdo-Pulido M. Life before and after COVID-19: The 'New Normal' Benefits the Regularity of Daily Sleep and Eating Routines among College Students. Nutrients 2022;14:351.
23. Fischer D, Lombardi DA, Marucci-Wellman H, Roenneberg T. Chronotypes in the US - Influence of age and sex. PLoS One 2017;12:e0178782.
24. Randler C, Engelke J. Gender differences in chronotype diminish with age: a meta-analysis based on morningness/chronotype questionnaires. Chronobiol Int 2019;36:888-905.
25. Marelli S, Castelnuovo A, Somma A, Castronovo V, Mombelli S, Bottoni D, Leitner C, Fossati A, Ferini-Strambi L. Impact of COVID-19 lockdown on sleep quality in university students and administration staff. J Neurol 2021;268:8-15.
26. Çıray N, Özcan A. Effect of social jetlag and chronotype on academic achievement in nursing students during the COVID-19 pandemic. Prog Health Sci 2021;11.
27. Tanioka K, Kayaba M, Tomishima S, Komada Y, Inoue Y. Changes in sleep behavior, sleep problems, and psychological distress/health-related quality of life of young Japanese individuals before and during the COVID-19 pandemic. Chronobiol Int 2022;39:781-91.
28. Montagnese S, Zarantonello L, Formentin C, Giusti G, Mangini C, Isherwood CM, Paoli A, Mapelli D, Rizzuto R, Toppo S, Skene DJ, Vettor R, Costa R. Sleep and circadian indices for planning post-pandemic university timetables. medRxiv 2022;1-30.
29. Merikanto I, Kronholm E, Peltonen M, Laatikainen T, Lahti T, Partonen T. Relation of chronotype to sleep complaints in the general Finnish population. Chronobiol Int 2012;29:311-7.
30. Staller N, Randler C. Changes in sleep schedule and chronotype due to COVID-19 restrictions and home office. Somnologie (Berl) 2021;25:131-7.
31. Znazen H, Slimani M, Bragazzi NL, Tod D. The Relationship between Cognitive Function, Lifestyle Behaviours and Perception of Stress during the COVID-19 Induced Confinement: Insights from Correlational and Mediation Analyses. Int J Environ Res Public Health 2021;18:3194.
32. Taillard J, Sagaspe P, Philip P, Bioulac S. Sleep timing, chronotype and social jetlag: Impact on cognitive abilities and psychiatric disorders. Biochem Pharmacol 2021;191:114438.

Original Article / *Özgün Makale*

DOI: 10.4274/tjsm.galenos.2023.94834

Journal of Turkish Sleep Medicine 2023;10:235-239

Evaluation of Serum Vitamin D Levels in Obstructive Sleep Apnea Syndrome

Obstrüktif Uyku Apne Sendromunda D Vitamini Düzeylerinin Değerlendirilmesi

Utku Oğan Akyıldız, Aslı Akyol Gürses*

Aydın Adnan Menderes University Faculty of Medicine, Department of Neurology, Aydın, Turkey
**Gazi University Faculty of Medicine, Department of Neurology, Division of Clinical Neurophysiology, Ankara, Turkey*

Abstract

Objective: The relationship between obstructive sleep apnea syndrome (OSAS) and vitamin D deficiency (VDD) has been an attractive issue for researchers in recent years because both are prevalent conditions with common comorbidities and pathophysiological mechanisms. However, the reported results have often been inconsistent, possibly due to multiple confounders such as obesity. The aim of this study was to assess serum 25-hydroxyvitamin D [25(OH)D] levels in cases screened for OSAS and demonstrate whether there is an association between [25(OH)D] and OSAS.

Materials and Methods: Two hundred and sixty two cases were retrospectively analyzed. The ones with an apnea hypopnea index (AHI) of ≥5/hour were categorized as OSAS patients, and <5/hour were classified as non-OSAS controls. Clinical features, polysomnographic indices, and serum 25(OH)D levels were compared between the groups.

Results: Serum 25(OH)D levels were similar between OSAS patients and non-OSAS controls as well as among different disease stages within the OSAS group itself. OSAS patients were then divided into two groups regarding the presence of VDD (<20 ng/mL). Although no difference was detected in terms of AHI, body mass index (BMI) was significantly increased in the VDD group (p=0.04). An inverse correlation was observed between 25(OH)D and BMI (p=0.037) in OSAS patients.

Conclusion: The current study demonstrated that neither the presence nor severity of OSAS has a significant association with serum 25(OH)D levels. Our results also confirmed the well-known negative correlation between increased BMI and vitamin D.

Keywords: Obstructive sleep apnea syndrome, 25(OH)D, vitamin D, vitamin D deficiency

Öz

Amaç: Tıkayıcı uyku apne sendromu (TUAS) ve D vitamini eksikliği toplumda yaygın görülen bozukluklardır. Örtüşen patofizyolojik mekanizmalarla birlikte pek çok ortak komorbiditeyi de paylaştıklarından, bu iki durum arasındaki ilişki son yıllarda araştırmacıların dikkatini çeken bir konu olmuştur. Bununla birlikte konuyla ilgili yayınlarda, muhtemelen obezite gibi bir seri karıştırıcı faktörün de etkisinden ötürü, tutarsız sonuçlar bildirilmektedir. Bu çalışmada amaç, TUAS varlığı yönünden araştırılan hastalarda serum 25 hidroksivitamin D [25(OH)D] düzeylerini değerlendirmek ve iki durum arasında gerçek bir ilişki olup olmadığını ortaya koymaktır.

Gereç ve Yöntem: İki yüz altmış iki olgu retrospektif olarak incelendi. Apne hipopne indeksi (AHI) ≥5/saat bulunanlar TUAS hastası olarak kategorize edilirken, AHI <5/saat saptananlar kontrol olguları olarak sınıflandı. Klinik bulgular, polisomnografik belirteçler ve serum 25(OH)D düzeyleri gruplar arasında karşılaştırıldı.

Bulgular: Serum 25(OH)D düzeyleri TUAS grubu ve kontrol olguları arasında benzer saptandı. TUAS grubunun kendi içinde yapılan karşılaştırmalarda da; hafif, orta ve ağır hastalık arasında anlamlı farklılık göstermedi. Ardından TUAS hastaları, D vitamini eksikliğine göre [VDE (<20 ng/mL)] ikiye ayrılarak incelendi. İki grup arasında AHI açısından fark gözlenmezken; VDE bulunan TUAS hastalarında vücut kitle indeksi (VKI) anlamlı olarak yüksek bulundu (p=0,004). TUAS hastalarındaki serum 25(OH)D düzeyleri ve VKI arasında negatif korelasyon izlendi (p=0,037).

Sonuç: Mevcut bulgular, serum 25(OH)D düzeylerinin TUAS varlığıyla ya da şiddetiyle anlamlı ilişki göstermediğini ortaya koymuştur. Bulgularımız ayrıca VKI artışı ve serum 25(OH)D düzeyleri arasında iyi tanımlanmış negatif korelasyonun varlığını bir kez daha kanıtlamıştır.

Anahtar Kelimeler: Tıkayıcı uyku apne sendromu, 25(OH)D, D vitamini, D vitamini eksikliği

Address for Correspondence/Yazışma Adresi: Lec, Utku Oğan Akyıldız MD, Aydın Adnan Menderes University Faculty of Medicine, Department of Neurology, Aydın, Turkey
Phone: +90 533 654 15 69 **E-mail:** uakyildiz@adu.edu.tr **ORCID-ID:** orcid.org/0000-0001-6452-0492
Received/Geliş Tarihi: 19.06.2023 **Accepted/Kabul Tarihi:** 30.06.2023

Introduction

Obstructive sleep apnea syndrome (OSAS) is a frequent disease characterized by excessive daytime sleepiness, snoring, and witnessed apnea arising from intermittent restrictions of the upper airway during sleep, which finally leads to arterial desaturation and sleep fragmentation. Besides causing an increased baseline sympathetic tonus, this typical failure of oxygenation-so-called cyclic intermittent hypoxia-eems to promote the activation of several inflammatory pathways, which remarkably contribute to the cardiovascular consequences (1). Obesity is the most common risk factor and accompaniment at the same time, and OSAS is also known to be associated with numerous further cardiovascular risk (CVR) factors, like hypertension (HT), metabolic syndrome (MS) and diabetes mellitus (DM) (2). It is estimated to affect 3-9% of females and 10-17% of the male population in developed countries and therefore constitutes a significant public health problem (3). Vitamin D deficiency (VDD) is another prevalent condition, with a reported prevalence of 20-100% among adults. Following the current improvement in knowledge of the molecule's critical non-skeletal functions, it has been claimed to predispose various similar disorders associated with immune regulation, homeostasis of vascular tonus, and electrolyte balance (4,5). The biologically active form of vitamin D is "$1.25(OH)_2D$", which is achieved after two consequent hydroxylation steps; however, the deficiency status and measurements are based on 25(OH)D according to guideline recommendations, as it constitutes the majority in circulation (4). Widespread expression of the signaling components and receptors of vitamin D on cardiovascular structures, as well as immune cells, makes the deficient status a reasonable risk factor for inflammatory atherosclerotic processes and corresponding disorders (5).

Taken together, the relationship between these two common situations, which looks much closed because of some shared comorbidities and pathophysiological mechanisms in the background, has been the subject of interest in many recent studies. In this context, some groups reported no identifiable relationship between the two (6,7), while some others demonstrated a noticeable diminution of 25OH(D) in patients with OSAS-particularly in the severe form-as to non-OSAS counterparts (8). Furthermore, some papers with positive results also suggested a notable correlation between 25(OH)D values and OSAS stage (9).

However, the general opinion regarding contamination of findings by multiple confounders (e.g., obesity, location, gender, season), and thus difficulty in objectively interpreting the results have not been overcome yet (10). In this retrospective cohort, we analyzed 25(OH)D values and polysomnographic (PSG) data among a considerable number of patients, who were screened for OSAS and aimed to clarify the abovementioned ambiguity.

Materials and Methods

Patients

The patient records, who were applied one-night diagnostic polysomnography due to the symptoms indicative of OSAS or excess body mass index (BMI) in a single center's sleep disorders unit between January 2018-2022 December were retrospectively evaluated. Sex, age, BMI, results of Epworth Sleepiness Scale (ESS) with a Turkish validation (11), and concurrent CVR factors, which include hyperlipidemia, HT, DM, MS, and 25(OH)D values, were recorded. Patients with a history of any medical condition that could impair the metabolism of vitamin D (e.g., renal insufficiency, chronic hepatic failure, and parathyroid disease), patients with a history of multivitamin or vitamin D supplement use, and the ones without available laboratory data regarding 25(OH)D were excluded from this study. Regarding vitamin D, cases with a <20 ng/mL 25(OH)D value were identified to have "VDD," whereas a further decrease indicating <10 ng/mL was categorized as "severe VDD." An interval between 21-29 ng/mL was referred to as "insufficiency" and ≥30 ng/mL values were accepted to be adequate (4). This retrospective study was approved by the Aydın Adnan Menderes University Faculty of Medicine Ethics Committee (no: 2023/106, date: 07.06.2023).

Polysomnography

All cases were subjected to a full night diagnostic polysomnography (SOMNOscreen/Somnomedics GmbH - Randersacker Germany) in the sleep clinic. The PSG records included an electrooculogram and a six-channel electroencephalogram (EEG), chin and leg electromyogram, pulse oximetry, oronasal thermistor, and nasal airflow, electrocardiogram (ECG), body position, and thoracic and abdominal respiratory effort. The PSG data were manually scored under the rules of American Association of Sleep Medicine 2014 v2.4. Regarding respiratory events, a ≥90% decrease in airflow on the thermistor for a minimum of 10 seconds duration was scored as apnea, and a ≥30% diminution in nasal airflow persisting at least 10 seconds accompanied by arousal on EEG or ≥3% desaturation in oximetry was scored as a hypopnea (12). The patient was diagnosed with severe OSAS in the presence of an apnea hypopnea index (AHI) ≥30/hr and moderate OSAS when the corresponding value was between ≥15 - <30/hour. An AHI between ≥5 - <15/hour, together with typical symptoms, was referred to mild OSAS, while AHI <5/hour was accepted as normal (13).

Statistical Analysis

IBM SPSS.20 program was conducted for analysis (SPSS, Inc., Chicago, Illinois). For the assessment of normality, a Shapiro-Wilk test was applied. If normal distribution was present, the data were expressed as mean ± standard deviation and in case of skewed distribution, it was introduced as median (minimum-maximum). Categorical variables were analyzed using the chi-squared test. Considering the normality, the student's t-test or Mann-Whitney U was utilized for pairwise comparisons. Concerning more than two groups, one-way ANOVA or the Kruskal-Wallis test was used accordingly. Bivariate correlations were examined by Spearman's test, and a two-tailed p-value of <0.05 was considered statistically significant.

Results

Two hundred and sixty-two cases fulfilling the inclusion criteria were analyzed. In this study, 66% (n=174) were male, and 34% (n=88) were female. The mean age was 49.9±13.3 years, and

the mean BMI was 32.3±6.9 kg/m^2. After one-night diagnostic polysomnography, 239 (91%) had an AHI ≥5/hour and were diagnosed with OSAS, whereas AHI was <5/hour for the remaining 23 (9%) that were classified as non-OSAS controls. A severe disease grade comprised the majority of patients with OSAS (60%, n=144), while the rate of moderate and mild disease was 26% (n=62) and 14% (n=33), respectively. Among the whole study population, 78% (n=205) had serum 25(OH)D below 20 ng/mL, and out of these individuals with VDD, 41% (n=84) had further reduced levels below <10 ng/mL, that is referred as "severe VDD". The average 25(OH)D in the study cohort was 14.97±7.86 ng/mL, and only 6% (n=16) had sufficient serum levels indicating ≥30 ng/mL.Although age [52 (18-80) vs 40.5 (18-61) years, p<0.001] and BMI [31.6 (18.8-68.7) vs 29.8 (18.9-35.7) kg/m^2, p=0.02] increased in patients with OSAS, average serum 25OH(D) values were similar between the patients and controls [13.3 (4.2-53.7) vs 16.6 (4.2-36.9) ng/mL, p=0.10]. 25OH(D) levels within the OSAS group also demonstrated no significance according to different disease grades [mild: 17.2 (4.2-37) vs moderate: 13.2 (4.2-34) vs. severe 13.2 (4.2-53.7) ng/mL, p=0.32] (Figure 1). Pairwise comparisons depending on the VDD status of whole cohort [$VD_{<20}$ (25(OH)D <20 ng/mL) vs $VD_{\geq 20}$ (25(OH)D ≥20 ng/mL)] revealed that age, sex, rate of patients with OSAS, AHI and proportion of patients with concurrent CVRs were comparable between the two groups ($VD_{<2}$ vs $VD_{\geq 20}$, p>0.05) (Table 1). However, the median BMI notably increased in the group of $VD_{<20}$ [31.8 (18.8-68.7) vs 30.1 (20.8-40.3) kg/m^2, p=0.025], and a borderline negative correlation was detected between 25(OH)D and BMI (r=-0.122, p=0.05).

After excluding non-OSAS controls, a similar relation pattern was proper for patients with OSAS. BMI was higher in $VD_{<20}$ patients with OSAS as to $VD_{\geq 20}$ ones [32.0 (18.8-68.7) vs 30.4 (20.8-40.3) kg/m^2, p=0.04], and a significant inverse correlation was present between serum 25(OH)D level and BMI (r=-0.0135, p=0.037) (Figure 2). Although a trend towards increased AHI was observed for $VD_{<20}$ OSAS group, the difference did not reach significance, and the rate of patients with severe disease grade was similar between the two [63% (n=118) for $VD_{<20}$-OSAS vs 51% (n=26) for $VD_{\geq 20}$-OSAS, p=0.09]. Sleep indices yielded from polysomnogram, including total sleep time, sleep efficiency, and proportion of N3 stage, as well as respiratory parameters, including AHI, ODI, desaturation duration (SpO_2<90% duration), and average SpO_2, were similar between the $VD_{<20}$-OSAS and $VD_{\geq 20}$-OSAS groups (Table 2).

None of the abovementioned PSG parameters demonstrated significantly correlated with serum 25(OH)D levels in patients with OSAS (Table 3).

Discussion

Current results revealed that neither the presence nor severity of OSAS has a significant association with serum 25(OH)D levels and also confirmed a well-known negative correlation between vitamin D and obesity (14,15).

Table 1. Clinical and laboratory characteristics of the study cohort according to VDD status

Variable	$VD_{<20}$ cases (n=205)	$VD_{\geq 20}$ cases (n=57)	p value
Age (yrs) (min-max)	50 (18-80)	54 (18-77)	0.08
Sex [male, % (n)]	66% (136)	67% (38)	0.69
BMI kg/m^2 (min-max)	31.8 (18.8-68.7)	30.1 (20.8-40.3)	0.03*
ESS (min-max)	5 (0-20)	5 (0-12)	0.69
OSAS rate [% (n)]	92% (188)	90% (51)	0.60
AHI	37.5 (0.4-95.2)	32.9 (1-82.9)	0.21
Concurrent CVR [% (n)]	48% (98)	60% (34)	0.11

*P<0.05 denotes statistical significance, VDD: Vitamin D deficiency, $VD_{<20}$ cases (cases with serum 25(OH)D <20 ng/mL; in other terms cases with VDD), $VD_{\geq 20}$ cases (cases with serum 25(OH)D ≥20 ng/mL; in other terms cases without VDD), BMI: Body mass index, CVR: Cardiovascular risk, OSAS: Obstructive sleep apnea syndrome, AHI: Apnea hypopnea index

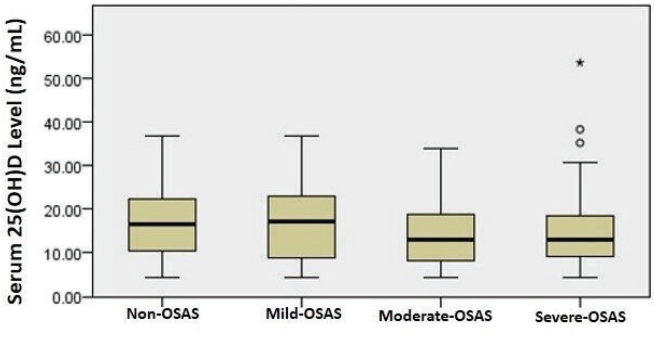


Figure 1. Demonstration of serum 25(OH)D levels in the study population
OSAS: Obstructive sleep apnea syndrome

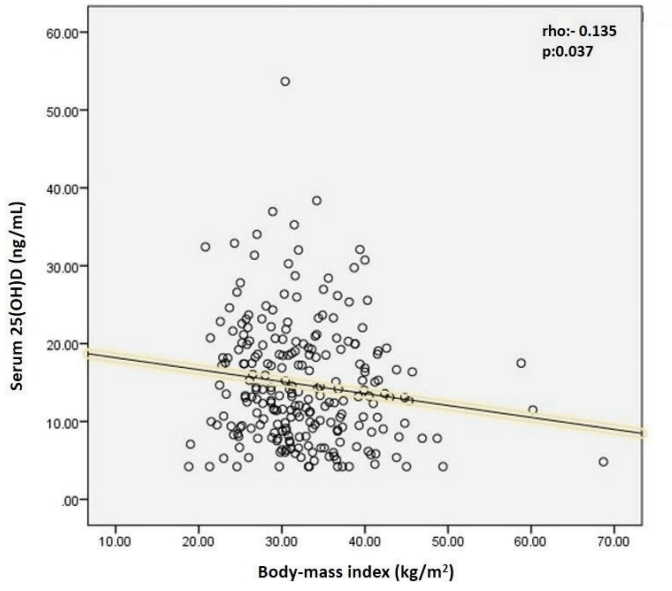


Figure 2. Correlation between BMI and serum 25(OH)D levels in OSAS patients
BMI: Body mass index, OSAS: Obstructive sleep apnea syndrome

Table 2. PSG Features of OSAS patients according to VDD status			
Variable	**$VD_{<20}$-OSA patients (n=175)**	**$VD_{\geq 20}$ patients (n=51)**	**p value**
Respiratory indices			
AHI (hour)	35.1 (5.3-95.2)	30.1 (7.6-82.9)	0.22
ODI	39.1 (0.8-112.3)	38.04 (5.3-94.1)	0.07
SpO_2 <90% duration (%)	7.8 (0-98)	3.3 (0-87.9)	0.06
Average SpO_2	92.5% (71.7-96.1)	92.6% (84.2-96.7)	0.60
Sleep indices			
TST (min)	353.3 (127.5-477.1)	339.5 (138-446.5)	0.44
SE (%)	76.9 (48.7-95.7)	77.3 (49.9-94.5)	0.62
N3 ratio (%)	12.4 (0-48.5)	12.4 (0-31.6)	0.87

*P<0.05 denotes statistical significance, PSG: Polysomnography, OSAS: Obstructive sleep apnea syndrome, VDD: Vitamin D deficiency, $VD_{<20}$-OSA patients (OSAS patients with serum 25(OH)D <20 ng/mL; in other terms OSAS patients with VDD), $VD_{\geq 20}$-OSA patients (OSSA patients with serum 25(OH)D ≥20 ng/mL; in other terms OSAS patients without VDD), AHI: Apnea hypopnea index, ODI: Oxygen desaturation index, TST: Total sleep time, SE: Sleep efficiency, N3 ratio: Proportion of N3 sleep stage

Table 3. Spearman correlation of serum 25(OH)D and respiratory indices on PSG in OSAS patients		
AHI	rho	-0.047
	p-value	0.482
ODI	rho	-0.091
	p-value	0.172
SpO_2 <90% duration	rho	-0.088
	p-value	0.186
Average SpO_2	rho	-0.093
	p-value	0.164

P<0.05 denotes statistical significance, PSG: Polysomnography, OSAS: Obstructive sleep apnea syndrome, AHI: Apnea hypopnea index, ODI: Oxygen desaturation index

The relationship between OSAS and vitamin D has been an attractive issue for researchers in recent years. However, the reported results have often been inconsistent. In 2016, Kerley et al. (9) stated that patients with OSAS have significantly lower serum 25(OH)D levels than controls, and the decrease was parallel to the severity of the disease. A few years later, Archontogeorgis et al. (8) published their cohort analysis from 169 participants, which showed diminished serum 25(OH) D levels in patients with OSAS compared to controls, and presented further findings regarding negative correlations between many hypoxia parameters on polysomnography and 25(OH)D. In contrast, the results of Salepci et al. (6) were completely different. The authors did not observe any significant difference between patients with OSAS and non-apneic individuals, as well as different categories of OSAS, in terms of serum 25(OH)D levels and rate of VDD. According to their results, BMI, AHI, and other hypoxia-related parameters did not demonstrate any correlation with vitamin D. Our results were largely similar to the latter one; however, we detected a significant correlation between BMI and serum 25(OH)D in our sample. The interaction between obesity and vitamin D has been recognized and extensively studied so far. Dilution effect because of already existing large volume, decreased bioavailability arising from inappropriate dietary patterns or insufficient synthesis from the skin due to a sedentary lifestyle, and consequent decrease in sunlight exposure as well as sequestration of vitamin D throughout the adipose tissue have been all proposed as responsible factors for low 25(OH)D levels among obese individuals (14). Moreover, such confounding effects of obesity could not be excluded in most studies reporting a positive association between OSAS severity and VDD. For instance, on multivariate regression analysis applied for identifying independent associates regarding AHI, Kerley et al. (9) noticed that BMI was markedly more predictive than the other factors, including 25(OH)D and ESS. Erden et al. (16) revealed poorer values of 25(OH)D in severe patients with OSAS as to controls and detected an inverse correlation between 25(OH)D and BMI concerning all subjects, while mean 25(OH)D levels of the 85 patients with OSAS did not show any difference according to disease severity. Although Mete et al. (17) did not find any relation between 25(OH)D and BMI among their patients with OSAS, as well as no difference regarding the pairwise comparison of 25(OH)D levels between patients with OSAS and controls, they demonstrated a lower mean level of 25(OH)D and increased frequency of VDD in severe patients with OSAS after performing subgroup analysis. The authors stated that BMI was similar between patients and controls at the beginning. However, there was an overlooked trend towards an increase of BMI in the severe OSAS group, and a correlation of 25(OH)D and BMI within this group was neither evaluated nor mentioned. More recently, Bouloukaki et al. (18) have disclosed a significant association of vitamin D levels with both AHI and BMI in a quite large population of patients with OSAS and controls and identified severe OSAS -but not increased BMI- as an independent predictor of VDD. During the latter analysis, BMI was considered a categorical variable rather than continuous, and thus it could not be possible to make a clear comment regarding the influence of BMI values up to 30 kg/m^2 on VDD. Taken together, it would be plausible to suggest that a great magnitude of results from the accumulating data supports -at least could not contradict- our findings indicating an apparent effect of increased BMI on lower 25(OH)D levels and VDD among patients with OSAS. The current study has some limitations based mainly on its retrospective design. First, the size of the groups subjected to comparison was different, favoring patients, especially the ones with severe OSAS. However, it is unignorable that a greater representation of severe OSAS, among all others, is consistent with the plenty of previous literature (16,18) and the real-life data as a result. Second, the sampling term of 25(OH)D, of which the levels are known to display a seasonal variability, was not considered during the assignment of patients to any group (6,19). We consider adjusting for the season would be more appropriate in case of a significant difference between groups to explain the independency of association further, as we observed no difference in terms of 25 (OH)D among groups in our study population.

Conclusion

Alterations of vitamin D in the context of OSAS appear to be BMI-dependent, or at least associated. Studying the relevant parameter among the similar size of groups matched for BMI, rather than adjustment, and preferably in a cross-sectional design rather than retrospective, could provide valuable insight regarding this issue.

Ethics

Ethics Committee Approval: This retrospective study was approved by the Aydın Adnan Menderes University Faculty of Medicine Ethics Committee (no: 2023/106, date: 07.06.2023).
Informed Consent: Retrospective study.
Peer-review: Externally and internally peer-reviewed.

Authorship Contributions

Surgical and Medical Practices: U.O.A., A.A.G., Concept: U.O.A., A.A.G., Design: U.O.A., A.A.G., Data Collection or Processing: U.O.A., A.A.G., Analysis or Interpretation: U.O.A., A.A.G., Literature Search: U.O.A., A.A.G., Writing: U.O.A., A.A.G.
Conflict of Interest: No conflict of interest was declared by the authors.
Financial Disclosure: The authors declared that this study received no financial support.

References

1. Ryan S, Taylor CT, McNicholas WT. Selective activation of inflammatory pathways by intermittent hypoxia in obstructive sleep apnea syndrome. Circulation 2005;112:2660-7.
2. Al Lawati NM, Patel SR, Ayas NT. Epidemiology, risk factors, and consequences of obstructive sleep apnea and short sleep duration. Prog Cardiovasc Dis 2009;51:285-93.
3. Peppard PE, Young T, Barnet JH, Palta M, Hagen EW, Hla KM. Increased prevalence of sleep-disordered breathing in adults. Am J Epidemiol 2013;177:1006-14.
4. Holick MF, Binkley NC, Bischoff-Ferrari HA, Gordon CM, Hanley DA, Heaney RP, Murad MH, Weaver CM; Endocrine Society. Evaluation, treatment, and prevention of vitamin D deficiency: an Endocrine Society clinical practice guideline. J Clin Endocrinol Metab 2011;96:1911-30.
5. Hiemstra TF, Lim K, Thadhani R, Manson JE. Vitamin D and Atherosclerotic Cardiovascular Disease. J Clin Endocrinol Metab 2019;104:4033-50.
6. Salepci B, Caglayan B, Nahid P, Parmaksiz ET, Kiral N, Fidan A, Comert SS, Dogan C, Gungor GA. Vitamin D Deficiency in Patients Referred for Evaluation of Obstructive Sleep Apnea. J Clin Sleep Med 2017;13:607-12.
7. Yassa OY, Domac SF, Kenangil G. Serum vitamin D status does not correlate with the severity of obstructive sleep apnea in male adults: A controlled study design with minimized factors influencing serum vitamin D levels. Int J Vitam Nutr Res 2020;90:470-6.
8. Archontogeorgis K, Nena E, Papanas N, Zissimopoulos A, Voulgaris A, Xanthoudaki M, Manolopoulos V, Froudarakis M, Steiropoulos P. Vitamin D Levels in Middle-Aged Patients with Obstructive Sleep Apnoea Syndrome. Curr Vasc Pharmacol 2018;16:289-97.
9. Kerley CP, Hutchinson K, Bolger K, McGowan A, Faul J, Cormican L. Serum Vitamin D Is Significantly Inversely Associated with Disease Severity in Caucasian Adults with Obstructive Sleep Apnea Syndrome. Sleep 2016;39:293-300.
10. Archontogeorgis K, Nena E, Papanas N, Steiropoulos P. The role of vitamin D in obstructive sleep apnoea syndrome. Breathe (Sheff) 2018;14:206-15.
11. Ağargün MY, Çilli AS, Kara H, Bilici M, Telcioğlu M, Semiz ÜB, Başoğlu C. Epworth Uykululuk Ölçeği'nin Geçerliği ve Güvenirliği. Türk Psikiyatri Dergisi 1999;10:261-7.
12. Berry RB, Brooks R, Gamaldo C, Harding SM, Lloyd RM, Quan SF, Troester MT, Vaughn BV. AASM Scoring Manual Updates for 2017 (Version 2.4). J Clin Sleep Med 2017;13:665-6.
13. Sleep-related breathing disorders in adults: recommendations for syndrome definition and measurement techniques in clinical research. The Report of an American Academy of Sleep Medicine Task Force. Sleep 1999;22:667-89.
14. Parikh SJ, Edelman M, Uwaifo GI, Freedman RJ, Semega-Janneh M, Reynolds J, Yanovski JA. The relationship between obesity and serum 1,25-dihydroxy vitamin D concentrations in healthy adults. J Clin Endocrinol Metab 2004;89:1196-9.
15. Wortsman J, Matsuoka LY, Chen TC, Lu Z, Holick MF. Decreased bioavailability of vitamin D in obesity. Am J Clin Nutr 2000;72:690-3. Erratum in: Am J Clin Nutr 2003;77:1342.
16. Erden ES, Genc S, Motor S, Ustun I, Ulutas KT, Bilgic HK, Oktar S, Sungur S, Erem C, Gokce C. Investigation of serum bisphenol A, vitamin D, and parathyroid hormone levels in patients with obstructive sleep apnea syndrome. Endocrine 2014;45:311-8.
17. Mete T, Yalcin Y, Berker D, Ciftci B, Guven SF, Topaloglu O, Yavuz HC, Guler S. Obstructive sleep apnea syndrome and its association with vitamin D deficiency. J Endocrinol Invest 2013;36:681-5.
18. Bouloukaki I, Tsiligianni I, Mermigkis C, Bonsignore MR, Markakis M, Pataka A, Steiropoulos P, Ermidou C, Alexaki I, Tzanakis N, Schiza S. Vitamin D deficiency in patients evaluated for obstructive sleep apnea: is it associated with disease severity? Sleep Breath 2021;25:1109-17.
19. Lagunova Z, Porojnicu AC, Lindberg F, Hexeberg S, Moan J. The dependency of vitamin D status on body mass index, gender, age and season. Anticancer Res 2009;29:3713-20.

Original Article / *Özgün Makale*

DOI: 10.4274/tjsm.galenos.2023.71463

Journal of Turkish Sleep Medicine 2023;10:240-249

Factors Affecting Pressure Change Requirement in Obstructive Sleep Apnea Patients Under Positive Airway Pressure Therapy

Pozitif Hava Yolu Basıncı Tedavisi Altındaki Obstrüktif Uyku Apnesi Hastalarında Basınç Değişim İhtiyacını Etkileyen Faktörler

Ersan Atahan, Ayşegül Gencer*, Buket Çalışkaner Öztürk

İstanbul University-Cerrahpasa, Cerrahpasa Faculty of Medicine, Department of Pulmonary Diseases, İstanbul, Turkey
**İstanbul Bakırköy Dr. Sadi Konuk Training and Research Hospital, Clinic of Chest Diseases, İstanbul, Turkey*

Abstract

Objective: Obstructive sleep apnea syndrome is a chronic disease characterized by recurrent apnea and daytime sleepiness. The effect of weight or symptom change on the ideal positive airway pressure (PAP) change in regular users of PAP therapy is unknown. This study investigated the effect of weight or symptom change on an ideal PAP change in patients with severe obstructive sleep apnea.

Materials and Methods: Fifty-eight patients who were diagnosed with severe obstructive sleep apnea by polysomnography, titration polysomnography determined PAP and PAP treatment was started, and retitrated polysomnography was performed due to weight change or obstructive sleep apnea symptoms while under PAP treatment for at least six months was included in the study. Weight changes, ongoing symptoms, and data from all three polysomnography results were recorded.

Results: There was no difference in the effect of the weight change on ideal PAP. In the persistence of symptoms, PAP change was higher.

Conclusion: Weight gain, loss, or being the same weight did not affect PAP change. However, PAP change was more common in symptom persistence under PAP treatment.

Keywords: Sleep apnea, PAP retitration, weight change, symptom change, oxygen desaturation index, amnesia

Öz

Amaç: Obstrüktif uyku apne sendromu tekrarlayan apneler ve gündüz uyku hali ile karakterize kronik bir hastalıktır. Pozitif havayolu basıncı (PAP) tedavisini düzenli kullananlarda kilo değişimi ya da semptom değişiminin, ideal PAP değişimi üzerine etkisi bilinmemektedir. Bu çalışmanın amacı; düzenli PAP tedavisi kullanan şiddetli obstrüktif uyku apneli hastalarda, kilo değişimi veya semptom değişiminin ideal PAP değişimi üzerindeki etkisini araştırmaktır.

Gereç ve Yöntem: Polisomnografi ile ağır obstrüktif uyku apne tanısı konmuş olan, titrasyon polisomnografiyle PAP belirlenerek tedavisi başlanmış olan, en az 6 ay tedavi altındayken kilo değişimi veya uyku apne semptomları nedeniyle retitrasyon polisomnografisi yapılan 58 hasta çalışmaya dahil edildi. Kilo değişiklikleri, devam eden semptomlar ve her üç polisomnografi sonucundan elde edilen veriler kaydedildi.

Bulgular: Kilo değişiminin ideal PAP üzerine etkisinde anlamlı bir fark bulunmadı. Semptomların devamlılığı halinde ise PAP değişiminin daha fazla olduğu saptandı.

Sonuç: Kilo almanın, vermenin ya da aynı kiloda olmanın PAP değişimi üzerine anlamlı etkisi olmamıştır. Ancak tedavi altında semptom devamlılığında basınç değişimi daha fazla saptanmıştır.

Anahtar Kelimeler: Uyku apne, PAP retitrasyon, kilo değişimi, semptom değişimi, oksijen desatürasyon indeksi, amnezi

Address for Correspondence/Yazışma Adresi: Ayşegül Gencer MD, İstanbul Bakırköy Dr. Sadi Konuk Training and Research Hospital, Clinic of Chest Diseases, İstanbul, Turkey
Phone: +90 212 414 71 71 **E-mail:** aysegulbozkurtgencer@gmail.com **ORCID-ID:** orcid.org/0000-0002-8365-6210
Received/Geliş Tarihi: 07.01.2023 **Accepted/Kabul Tarihi:** 17.07.2023

Introduction

Obstructive sleep apnea syndrome (OSAS) is a chronic disease characterized by recurrent apneas and excessive daytime sleepiness (1). These episodes are associated with nocturnal desaturations and arousals, which lead to disruption of the sleep pattern and cognitive deterioration (2). They are known to be some risk factors for OSAS development; obesity is the most critical risk factor; at least 70% of patients are obese (3). It is known that weight gain is an important risk factor for the development of OSAS, but it is not present in every obese patient. In other words, although a clear relationship between OSAS and obesity cannot be demonstrated, there is no doubt that obesity plays a role in the cause or severity of OSAS (4). Various conditions closely related to obesity include oxidative stress, systemic inflammation, visceral fat accumulation, dyslipidemia, and insulin resistance (5). With these multiple mechanisms, obesity increases the prevalence of OSAS, and morbidity and mortality due to OSAS have risen significantly in these patients (6,7).

The diagnosis of OSAS is the combination of symptoms and polysomnography (PSG) findings (8). Positive airway pressure (PAP) is the gold standard in treatment (9). PAP treatment activates the sympathetic system, decreases leptin levels, and improves leptin resistance in patients. It results in a reduction in visceral fat deposition and weight loss. In addition to being a successful method in treating OSAS and related morbidities, weight loss has additional health benefits and should be routinely recommended to most overweight patients (7,10). Although it is possible to lose weight with the improvement of metabolism under PAP treatment, a meta-analysis including 3181 OSAS patients revealed an increase in weight and body mass index (BMI) with PAP treatment (7,11).

PAP retitration is recommended in patients with OSAS who have weight loss after bariatric surgery for obesity (12). As in OSAS patients with weight change under PAP treatment, PAP retitration is recommended for patients whose symptoms continue under treatment (12,13).

PAP retitration is recommended for regular use of PAP therapy, both in weight change and in the presence of symptoms; however, the superiority of these two variables over each other is unknown. This study aims to evaluate the effect of weight change and symptom persistence on the pressure change between PAP titration and retitration and to compare the superiority of these two variables.

Materials and Methods

Study Design and Study Population

The study protocol was designed as a prospective real-life study. Fifty-eight patients who applied to the sleep unit outpatient clinic between January 1, 2016 and January 1, 2017, were chosen to be included in this study.

The İstanbul University-Cerrahpasa, Cerrahpasa Faculty Clinical Research Ethics Committee approved this study (no: E-83045809-604.01.02-2627).

Participants

Inclusion criteria:

- Patients who applied to the sleep unit outpatient clinic,
- Between the ages of 18 and 85,
- Diagnosed with severe OSAS,
- PSG and PAP titration study,
- Having received regular PAP therapy for six months,
- The PAP retitration study was performed due to persistent symptoms or weight change despite regular PAP therapy,
- Provided signed written consent.

Exclusion criteria:

- Patients with a diagnosis of malignancy, chronic kidney disease, heart, and liver failure,
- Pregnancy,
- Having insufficient sleep time or technically unsuitable for PSG.

Patient Categorisation

Despite regular and appropriate PAP treatment;

- Patients without weight change: No-weight change group: W0,
- Patients with weight change: Weight change group: W1,
- Weight loss: Weight decreased group: W1d,
- Weight gainers: Weight increased group: W1i,
- Patients without symptoms: No-symptom group: S0,
- Patients with persistent symptoms: Symptom group: S1, as separated.

Data Collection

Demographic and anthropometric data of the patients were recorded. The symptoms and weight changes of the patients who were using PAP therapy regularly for 6-36 months with the diagnosis of severe OSAS were recorded, and PAP retitration admissions were performed.

The BMI was calculated by dividing the patient's weight in kg by the square of his/her height in m (kg/m^2). Neck circumference was measured in cm from the level of the cricothyroid membrane.

The Epworth Sleepiness Scale (ESS) was applied to each patient, scored, and the results during 8 hours of monitoring throughout the night were recorded. ESS scores of 10 and above were considered daytime sleepiness. The ESS, which has reliability and validity in Turkish, was used in this study (14).

PSG data: The minimum requirements for PSG are based on the recording protocol from the American Association of Sleep Medicine (AASM) 2007 report (7). Monitorizations were performed using electroencephalography (C3/A2, C4/A1, Fp1/A1, Fp2/A2, O1/A1, O2/A2), electrooculogram (right and left), chin, and 2 legs electromyography, electrocardiogram, nasal cannula, thermistor, tracheal microphone, body position, oximetry, and respiratory effort channels.

PSG recordings were made using the SOMNOscreen plus system (SOMNOmedics GmbH, Randersacker, Germany).

The PSG result of each patient was scored by the same person in accordance with the standards (3). The AASM 2012 scoring criteria were used. The AASM 2013 hypopnea recommended criteria were used for the scoring of hypopneas: required a ≥3%

decline in oxygen saturation accompanied by a ≥30% decline in the amplitude of the nasal airflow.

The AASM has outlined the clinical and sleep testing criteria for OSAS in the third edition of the International Classification of Sleep Disorders (15). The severity of OSAS can be classified according to the number of respiratory events observed per hour, termed the apnea hypopnea index (AHI): mild OSA (AHI 5-14.9/hour), moderate OSA (AHI 15-29.9/hour), and severe OSA (>30/hour) (16).

The respiratory disturbance index (RDI): The number of abnormal breathing events per hour of sleep. It is calculated as the number of apnea events/hour plus the number of hypopnea events/hour plus the number of respiratory-effort-related arousals per hour of sleep.

The oxygen desaturation index (ODI) was calculated as the number of oxygen desaturations per hour during the total sleep time. 3% desaturation was used.

Arousal: It is the sudden transition to lighter sleep or wakefulness during sleep.

Statistical Analysis

All analyses were performed on SPSS v25 (SPSS Inc., Chicago, IL, USA). Q-Q and histogram plots were used to determine whether variables are normally distributed. Data are given as mean ± standard deviation or median (1st quartile-3rd quartile) for continuous variables according to the normality of distribution and as frequency (percentage) for categorical variables. Normally distributed variables were analyzed with the independent samples t-test or one-way analysis of variance (ANOVA) depending on the count of groups. Non-normally distributed variables were analyzed with the Mann-Whitney U test or Kruskal-Wallis test depending on the count of groups. Categorical variables were analyzed with the chi-square tests or Fisher's exact tests. Repeated measurements were analyzed with Friedman's analysis of variance by ranks. Pairwise comparisons were performed with the Bonferroni correction method. Spearman correlation coefficients were calculated to evaluate relationships between continuous variables. P<0.05 values accepted as statistically significant results.

Results

We included 58 patients (21 females and 37 males) in our study, the mean age was 51.83±10.00 (range 30-82). Weight changed (W1) in 41 (70.69%) patients and remained same (W0) in 17 (29.31%) patients. The duration of PAP use was significantly higher in the W1 group than in the W0 group (p=0.029) (Table 1). The ODI at diagnosis was significantly higher in the W0 group than in the W1 group (p=0.026). The RDI at the PAP retitration was significantly higher in the W0 group than in the W1 group (p=0.021) (Table 1). The PAP pressure decreased in 6 (35.29%) patients, remained the same in 6 (35.29%) patients, and increased in 5 (29.41%) patients in the W0 group. The PAP decreased in 19 (46.34%) patients, remained the same in 13 (31.71%) patients, and increased in 9 (21.95%) patients in the W1 group (Figure 1).

Table 1. Summary of patients' characteristics and measurements regarding body weight change

	Weight change			
	No: W0 (n=17)	**Yes: W1 (n=41)**	**Total (n=58)**	**p**
Age	54.94±11.82	50.54±8.99	51.83±10.00	0.128
Gender				
Female	6 (35.29%)	15 (36.59%)	21 (36.21%)	1.000
Male	11 (64.71%)	26 (63.41%)	37 (63.79%)	
Smoking	10 (58.82%)	23 (56.10%)	33 (56.90%)	1.000
Pack-year	5 (0-20)	12 (0-30)	5 (0-23)	0.810
Comorbidities	13 (76.47%)	32 (78.05%)	45 (77.59%)	1.000
Diabetes mellitus	4 (23.53%)	9 (21.95%)	13 (22.41%)	1.000
Hypertension	8 (47.06%)	20 (48.78%)	28 (48.28%)	1.000
Coronary artery disease	4 (23.53%)	6 (14.63%)	10 (17.24%)	0.458
COPD	1 (5.88%)	2 (4.88%)	3 (5.17%)	1.000
Asthma	1 (5.88%)	2 (4.88%)	3 (5.17%)	1.000
Psychiatric disease	0 (0.00%)	3 (7.32%)	3 (5.17%)	0.548
Hypothyroidism	2 (11.76%)	2 (4.88%)	4 (6.90%)	0.573
Other	7 (41.18%)	14 (34.15%)	21 (36.21%)	0.836
Regular use				
No	1 (5.88%)	7 (17.07%)	8 (13.79%)	0.415
Yes	16 (94.12%)	34 (82.93%)	50 (86.21%)	
Symptom, initial	14 (93.33%)	37 (94.87%)	51 (94.44%)	1.000
Snoring	6 (40.00%)	11 (28.21%)	17 (31.48%)	0.516
Apnea	5 (33.33%)	11 (28.21%)	16 (29.63%)	0.747
EDS	10 (66.67%)	33 (84.62%)	43 (79.63%)	0.256
Fatigue	6 (40.00%)	27 (69.23%)	33 (61.11%)	0.097
Headache	3 (20.00%)	14 (35.90%)	17 (31.48%)	0.338
Nocturia	10 (66.67%)	28 (71.79%)	38 (70.37%)	0.747
Amnesia	6 (40.00%)	22 (56.41%)	28 (51.85%)	0.437
Symptom, final	12 (80.00%)	23 (82.14%)	35 (81.40%)	1.000
Snoring	9 (60.00%)	22 (78.57%)	31 (72.09%)	0.287
Apnea	9 (60.00%)	22 (78.57%)	31 (72.09%)	0.287
EDS	11 (73.33%)	22 (78.57%)	33 (76.74%)	0.719
Fatigue	2 (13.33%)	0 (0.00%)	2 (4.65%)	0.116
Headache	0 (0.00%)	0 (0.00%)	0 (0.00%)	N/A
Nocturia	2 (13.33%)	0 (0.00%)	2 (4.65%)	0.116
Amnesia	3 (20.00%)	0 (0.00%)	3 (6.98%)	0.037
Symptom during PAP	12 (70.59%)	16 (39.02%)	28 (48.28%)	0.057
Snoring	6 (35.29%)	7 (17.07%)	13 (22.41%)	0.171
Apnea	6 (35.29%)	7 (17.07%)	13 (22.41%)	0.171
EDS	12 (70.59%)	16 (39.02%)	28 (48.28%)	0.057
Height	164.29±9.60	166.68±10.88	165.98±10.49	0.435
Weight				
Initial	90 (85-105)	96 (86-110)	95 (85-109)	0.241
Final	90 (85-105)	95 (84-112)	94 (84-110)	0.596
Body mass index				
Initial	32.89 (29.67-40.43)	35.27 (32.00-38.74)	34.19 (31.67-39.96)	0.745
Final	32.89 (29.67-40.43)	36.30 (28.89-38.20)	35.53 (29.41-39.44)	0.898

Table 1. Continued				
Neck circumference				
Initial	42.25 (40.25-45)	43 (42-45)	43 (42-45)	0.601
Final	42 (40-43)	42.75 (40.25-44.75)	42 (40-44.5)	0.452
Change	0 (-0.75-0)	0 (-1.5-1)	0 (-1-1)	0.450
Epworth Sleepiness Scale				
Initial	8 (3-11)	7 (5-10)	7 (4-11)	0.738
Final	7 (4-12)	5 (2.5-8)	5 (3- 8.5)	0.212
Change	-2.5 (-5 - -0.5)	-2 (-4 - -1)	-2 (-4 - -1)	0.956
Duration of PAP use, month	8.5 (4-15)	15 (12-24)	14 (7.5-24)	0.029
PAP pressure				
Titration	7 (5-8)	8 (6-9)	8 (5-9)	0.616
Retitration	6 (5-11)	7 (5-8)	6.5 (5-8)	0.877
Change[(1)]	0 (-1-1)	0 (-2-0)	0 (-2-0)	0.459
Decreased	6 (35.29%)	19 (46.34%)	25 (43.10%)	0.717
Same	6 (35.29%)	13 (31.71%)	19 (32.76%)	
Increased	5 (29.41%)	9 (21.95%)	14 (24.14%)	
AHI				
Diagnosis	36 (27.6-42.4)[a]	33.1 (26.4-42.4)[a]	33.4 (27-42.4)[a]	0.709
Titration	4.45 (1.4-9.9)[b]	4.5 (2.9-7.6)[b]	4.5 (2.8-8.3)[b]	0.972
Retitration	4.3 (2.4-5.6)[b]	3.2 (1.3-4.1)[b]	3.2 (1.45-5.1)[b]	0.209
P (within groups)	<0.001	<0.001	<0.001	
Change[(1)]	-0.15 (-0.7-3.45)	-1.3 (-4.4-0)	-0.7 (-3.6-0.3)	0.148
RDI				
Diagnosis	41.8 (30.3-45.1)[a]	38 (30.3-42.9)[a]	39.35 (30.3-43.95)[a]	0.634
Titration	10.75 (5.6-15.2)[b]	8.1 (4.2-15.8)[b]	8.7 (4.2-15.8)[b]	0.585
Retitration	9.2 (4.6-12.6)[b]	4.2 (1.8-7.9)[b]	4.55 (2.75-10.6)[b]	0.021
P (within groups)	<0.001	<0.001	<0.001	
Change[(1)]	-0.75 (-3.15-1.75)	-2.6 (-5.6-1.3)	-0.8 (-4.5-1.7)	0.648
ODI				
Diagnosis	35 (28.4-54.2)[a]	28.4 (9.2-35.9)[a]	29.6 (15.3-41.2)[a]	0.026
Titration	9.8 (6-14.6)[b]	7.9 (3.2-11)[b]	8.3 (3.2-12.8)[b]	0.163
Retitration	6.2 (3.8-12.9)[b]	4.5 (0.4-11.8)[b]	4.7 (1.5-12.35)[b]	0.279
P (within groups)	<0.001	<0.001	<0.001	
Change[(1)]	-1.85 (-4.6-0.4)	-1.2 (-5.8-1.3)	-1.4 (-5-0.9)	0.749
Total sleep duration				
Diagnosis	358 (288-372)	306 (255-366)	349.5 (255-366)	0.274
Titration	362 (329-423)	348.5 (285-368)	351.5 (290-385)	0.220
Retitration	368.5 (273.5-390)	328 (290-379)	343.5 (286-383)	0.513
p (within groups)	0.920	0.962	0.900	
Change[(1)]	-0.5 (-61.25-36.5)	-2 (-52-44)	-2 (-52-44)	0.831
Deep sleep (stage 3) duration				
Diagnosis	50 (25-74.5)	37 (17.5-64)	50 (24-64)	0.377
Titration	36.5 (25.5-80.25)	53.5 (25.5-84)	51 (25.5-84)	0.797
Retitration	43 (28.5-75)	50 (27-73.5)	50 (27-73.5)	0.976
P (within groups)	0.913	0.089	0.118	
Change[(1)]	-3 (-55-62)	-4 (-41.5-14)	-3.5 (-41.5-14)	0.797
REM duration				
Diagnosis	59 (46-83)	46 (12-66)	50 (12.75-66)	0.122
Titration	48 (37.5-76)	58.5 (31-68)	58.25 (36.5-73)	0.798
Retitration	58 (25.5-79.25)	45.5 (35-66)	45.5 (33.5-71.5)	0.670
P (within groups)	0.320	0.656	0.446	
Change[(1)]	6.5 (-4.5-35.5)	0 (-16.5-10.5)	3 (-14-16.5)	0.157

Data are given as mean ± standard deviation or median (1st quartile-3rd quartile) for continuous variables according to normality of distribution and as frequency (percentage) for categorical variables. Same letters denote the lack of statistically significant difference between repeated measurements.

[(1)]Difference between retitration and titration. Negative values represent decrease and positive values represent increase in measurements.

The lettering a b b indicates that the first measurement is different from the others, and there is no difference between the second and third measurements. The letters in the tables represent pairwise comparison results.

COPD: Chronic obstructive pulmonary disease, EDS: Excessive daytime sleepiness, ODI: Oxygen desaturation index, REM: Rapid eye movement, RDI: Respiratory disturbance index, AHI: Apnea hypopnea index, PAP: Positive airway pressure

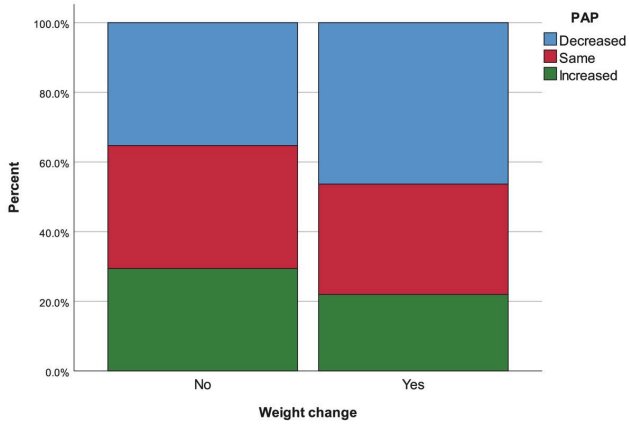


Figure 1. PAP change status regarding presence of weight change
PAP: Positive airway pressure

Weight decreased (W1d) in 19 (32.76%) patients, remained the same (W0) in 17 (29.31%) patients, and increased (W1i) in 22 (37.93%) patients. Regular PAP use percentage was significantly lower in the W1d group than in the other groups (p=0.023). Symptom during PAP use percentage was significantly higher in the W0 group than in the W1d group (p=0.029). When compared according to symptoms, amnesia was significantly higher in the W0 group than in other groups (p=0.049) (Table 2).

We found no significant differences between weight change groups regarding PAP titration, PAP retitration, change in PAP pressure and, changing status (Figure 2).

Twenty eight (48.28%) patients had symptoms (S1) during PAP use and 30 (51.72%) patients had no symptoms (S0) during PAP use. The coronary artery disease percentage was significantly higher in the S1 group than in the S0 group (p=0.038). The decrease in weight percentage was significantly higher in the S0 group than in the S1 group (p=0.029). The final ESS score was significantly higher in the S1 group than in the S0 group. When we evaluated PSG results between symptom groups, RDI at PAP retitration was significantly higher in the S1 group than in the S0 group (p=0.015). The ODI at PAP titration was significantly higher in the S1 group than in the S0 group (p=0.020) (Table 3).

The difference between PAP retitration and titration pressure was significantly lower in the S0 group than in the S1 group (p=0.043). We found no significant difference between symptom groups regarding PAP titration, PAP retitration, or changing status (Figure 3).

We found a negative correlation between PAP pressure change and change in sleep stage N3 duration (r=-0.334, p=0.040). We found a positive correlation between PAP change and change in rapid eye movement (REM) duration (r=0.429, p=0.007) (Table 4).

In the study, there were 5 (8.62%) patients with no weight change and no symptoms during PAP use. PAP decreased in three of them, PAP remained the same in one of them and PAP increased in one of them (Table 5).

Discussion

In this study, investigating the effect of weight change and symptom change with regular PAP treatment on PAP pressure, it was observed that weight gain, loss, or being at the same weight did not significantly affect the pressure change. However, PAP pressure change was more significant in the persistence of symptoms. While the persistence of symptoms was less in those who lost weight, the persistence of symptoms was more frequent in those without weight change, and primarily amnesia was found to be significantly more frequent. Weight change was little, and symptom persistence was more frequent in those with high ODI at diagnosis. The incidence of coronary artery disease was found to be higher in patients with ongoing symptoms. It was determined that as the PAP pressure difference between titration and retitration increased, the duration of deep sleep decreased, while REM sleep increased.

Table 2. Summary of patients' characteristics and measurements regarding body weight change

	Weight			
	W1d: decreased (n=19)	**W0: same (n=17)**	**W1i: increased (n=22)**	**p**
Age	49.11±6.85	54.94±11.82	51.77±10.50	0.220
Gender				
Female	6 (31.58%)	6 (35.29%)	9 (40.91%)	0.822
Male	13 (68.42%)	11 (64.71%)	13 (59.09%)	
Smoking	13 (68.42%)	10 (58.82%)	10 (45.45%)	0.328
Pack-year	15 (0-30)	5 (0-20)	0 (0-30)	0.645
Comorbidities	14 (73.68%)	13 (76.47%)	18 (81.82%)	0.817
Diabetes mellitus	3 (15.79%)	4 (23.53%)	6 (27.27%)	0.674
Hypertension	8 (42.11%)	8 (47.06%)	12 (54.55%)	0.724
Coronary artery disease	1 (5.26%)	4 (23.53%)	5 (22.73%)	0.241
COPD	0 (0.00%)	1 (5.88%)	2 (9.09%)	0.418
Asthma	0 (0.00%)	1 (5.88%)	2 (9.09%)	0.418
Psychiatric disease	2 (10.53%)	0 (0.00%)	1 (4.55%)	0.358
Hypothyroidism	1 (5.26%)	2 (11.76%)	1 (4.55%)	0.639
Other	6 (31.58%)	7 (41.18%)	8 (36.36%)	0.836
Regular use				
No	6 (31.58%)	1 (5.88%)	1 (4.55%)	0.023
Yes	13 (68.42%)	16 (94.12%)	21 (95.45%)	
Symptom, initial	16 (94.12%)	14 (93.33%)	21 (95.45%)	0.960
Snoring	5 (29.41%)	6 (40.00%)	6 (27.27%)	0.698
Apnea	4 (23.53%)	5 (33.33%)	7 (31.82%)	0.797
EDS	15 (88.24%)	10 (66.67%)	18 (81.82%)	0.302
Fatigue	11 (64.71%)	6 (40.00%)	16 (72.73%)	0.125
Headache	6 (35.29%)	3 (20.00%)	8 (36.36%)	0.529
Nocturia	10 (58.82%)	10 (66.67%)	18 (81.82%)	0.277
Amnesia	12 (70.59%)	6 (40.00%)	10 (45.45%)	0.166
Symptom, final	9 (81.82%)	12 (80.00%)	14 (82.35%)	0.985
Snoring	9 (81.82%)	9 (60.00%)	13 (76.47%)	0.413
Apnea	9 (81.82%)	9 (60.00%)	13 (76.47%)	0.413
EDS	9 (81.82%)	11 (73.33%)	13 (76.47%)	0.879
Fatigue	0 (0.00%)	2 (13.33%)	0 (0.00%)	0.141
Headache	0 (0.00%)	0 (0.00%)	0 (0.00%)	N/A
Nocturia	0 (0.00%)	2 (13.33%)	0 (0.00%)	0.141
Amnesia	0 (0.00%)	3 (20.00%)	0 (0.00%)	0.049
Initial	7 (5-11)	8 (3-11)	7 (4-9)	0.848
Final	5 (2-10)	7 (4-12)	5 (4-7)	0.445
Change	-3 (-4- -1)	-2.5 (-5- -0.5)	-2 (-4-0)	0.626
Duration of PAP, month	15 (7-24)	8.5 (4-15)	15 (12-24)	0.089
PAP				
Titration	8 (6-10)	7 (5-8)	7 (5-8)	0.247
Retitration	7 (5-8)	6 (5-11)	6 (5-8)	0.912
Change[1]	-1 (-2-0)	0 (-1-1)	0 (-1-0)	0.457
Decreased	11 (57.89%)	6 (35.29%)	8 (36.36%)	0.558
Same	4 (21.05%)	6 (35.29%)	9 (40.91%)	
Increased	4 (21.05%)	5 (29.41%)	5 (22.73%)	

Table 2. Continued				
AHI				
Diagnosis	33.7 (31.2-42.4)[a]	36 (27.6-42.4)[a]	32.75 (26.2-41.95)[a]	0.877
Titration	4.25 (2.85-7.9)[b]	4.45 (1.4-9.9)[b]	5.2 (3.2-7.6)[b]	0.999
Retitration	1.9 (1.3-3.2)[b]	4.3 (2.4-5.6)[b]	3.95 (2.1-4.8)[b]	0.211
P (within groups)	<0.001	<0.001	<0.001	
Change[(1)]	-2.7 (-5.8-0)	-0.15 (-0.7-3.45)	-0.6 (-3.6-0.3)	0.166
RDI				
Diagnosis	39.7 (31.2-42.9)[a]	41.8 (30.3-45.1)[a]	34.2 (29.65-42.65)[a]	0.781
Titration	4.45 (4.1-9.75)[b]	10.75 (5.6-15.2)[b]	8.8 (5.2-22)[b]	0.253
Retitration	3.8 (1.8-6.5)[b]	9.2 (4.6-12.6)[b]	4.25 (2.3-10.1)[b]	0.052
P (within groups)	<0.001	<0.001	<0.001	
Change[(1)]	-3 (-3.4-0.3)	-0.75 (-3.15-1.75)	-1.6 (-6.6-1.3)	0.867
ODI				
Diagnosis	28.4 (8.4-34.7)[a]	35 (28.4-54.2)[a]	24.75 (9.2-38.3)[a]	0.082
Titration	3.95 (2.75-12.4)[b]	9.8 (6-14.6)[b]	8.3 (3.2-11)[b]	0.377
Retitration	3.2 (0.9-11.6)[b]	6.2 (3.8-12.9)[b]	4.95 (0.4-13.7)[b]	0.508
P (within groups)	0.001	<0.001	0.003	
Change[(1)]	-0.1 (-3.6-0.9)	-1.85 (-4.6- 0.4)	-1.75 (-5.8-1.3)	0.893
Total sleep duration				
Diagnosis	294 (254-366)	358 (288-372)	325.5 (275-364)	0.536
Titration	323.75 (248.75-355.5)	362 (329-423)	362 (305-402)	0.062
Retitration	336 (294-358)	368.5 (273.5-390)	320 (248-382)	0.807
P (within groups)	0.232	0.920	0.232	
Change[(1)]	27.5 (-12-44.5)	-0.5 (-61.25-36.5)	-28 (-82-14)	0.214
Level 3 duration				
Diagnosis	35.5 (24-54)	50 (25-74.5)	45.5 (12-69)	0.625
Titration	50 (28.5-81.75)	36.5 (25.5-80.25)	54 (21-95)	0.921
Retitration	50 (36.3-73.5)	43 (28.5-75)	51.75 (16.5-73)	0.949
P (within groups)	0.232	0.913	0.368	
Change[(1)]	1.5 (-34-18.5)	-3 (-55-62)	-4 (-41.5-9)	0.745

Table 2. Continued				
REM duration				
Diagnosis	46 (12-66)	59 (46-83)	44.5 (12.25-62)	0.302
Titration	43.75 (27.75-64.25)	48 (37.5-76)	62 (47.5-76.8)	0.574
Retitration	45.5 (33.5-66)	58 (25.5-79.25)	44.5 (39.5-62)	0.886
P (within groups)	0.926	0.320	0.538	
Change[(1)]	2.5 (-12-10.5)	6.5 (-4.5-35.5)	-1 (-27.5-8)	0.325

Data are given as mean ± standard deviation or median (1st quartile-3rd quartile) for continuous variables according to normality of distribution and as frequency (percentage) for categorical variables. Same letters denote the lack of statistically significant difference between repeated measurements.

[(1)]Difference between retitration and titration. Negative values represent decrease and positive values represent increase in measurements.

The letters in the tables represent pairwise comparison results. The lettering a b b indicates that the first measurement is different from the others, and there is no difference between the second and third measurements.

COPD: Chronic obstructive pulmonary disease, EDS: Excessive daytime sleepiness, ODI: Oxygen desaturation index, REM: Rapid eye movement, RDI: Respiratory disturbance index, AHI: Apnea hypopnea index, PAP: Positive airway pressure

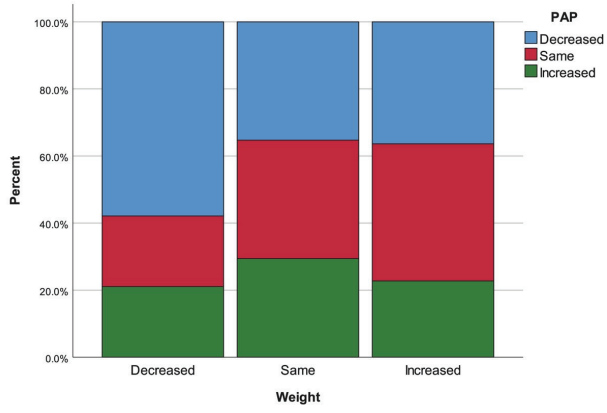


Figure 2. PAP change status regarding weight change groups
PAP: Positive airway pressure

A study on patients with severe OSAS showed that PAP treatment prevents weight gain and facilitates weight loss (17). Another study that included 86 OSAS patients diagnosed with metabolic syndrome found a significant decrease in BMI after three months of regular PAP treatment (18). On the other hand, in another study investigating the change in BMI in the first year after regular PAP treatment, no significant difference was found in BMI, and it was emphasized that some patients had weight gain (19). Contrary to these, in our study, the effect of weight and symptom change on PAP pressure was investigated, and it was observed that a negative or positive weight change did not cause a significant change in PAP pressure, while PAP pressure change was found to be more in symptom persistence.

Although publications show that OSAS may develop memory impairment and cause amnesia, its etiology is still unknown (20). In this study, amnesia was found to be more common in

Table 3. Summary of patients' characteristics and measurements with regard to symptom			
	Symptom during PAP		
	No (n=30)=S0	**Yes (n=28)=S1**	**p**
Age	50.90±9.85	52.82±10.25	0.470
Gender			
Female	14 (46.67%)	7 (25.00%)	0.149
Male	16 (53.33%)	21 (75.00%)	
Smoking	17 (56.67%)	16 (57.14%)	1.000
Pack-year	8.5 (0-20)	3.5 (0-26.5)	0.808
Comorbidities	25 (83.33%)	20 (71.43%)	0.440
Diabetes mellitus	7 (23.33%)	6 (21.43%)	1.000
Hypertension	14 (46.67%)	14 (50.00%)	1.000
Coronary artery disease	2 (6.67%)	8 (28.57%)	0.038
COPD	3 (10.00%)	0 (0.00%)	0.238
Asthma	1 (3.33%)	2 (7.14%)	0.605
Psychiatric disease	3 (10.00%)	0 (0.00%)	0.238
Hypothyroidism	2 (6.67%)	2 (7.14%)	1.000
Other	13 (43.33%)	8 (28.57%)	0.370
Regular use			
No	4 (13.33%)	4 (14.29%)	1.000
Yes	26 (86.67%)	24 (85.71%)	
Height	165.47±10.61	166.54±10.53	0.702
Weight			
Initial	95 (86-109)	95 (84-109)	1.000
Final	90 (84-106)	95 (85-110)	0.523
Body mass index			
Initial	33.60 (32.05-37.89)	35.48 (30.62-40.81)	0.950
Final	35.28 (28.39-38.05)	36.11 (29.54-40.67)	0.465
Body weight change			
Decreased	14 (46.67%)	5 (17.86%)	0.029
Same	5 (16.67%)	12 (42.86%)	
Increased	11 (36.67%)	11 (39.29%)	
Neck circumference			
Initial	42.5 (42-45)	43 (40.5-47)	0.312
Final	42.25 (40.5-44.5)	42 (40-45)	0.974
Change	0 (-1-1)	0 (-1-0.5)	0.668
Symptom, initial	26 (92.86%)	25 (96.15%)	1.000
Snoring	7 (25.00%)	10 (38.46%)	0.441
Apnea	8 (28.57%)	8 (30.77%)	1.000
EDS	22 (78.57%)	21 (80.77%)	1.000
Fatigue	19 (67.86%)	14 (53.85%)	0.438
Headache	8 (28.57%)	9 (34.62%)	0.854
Nocturia	19 (67.86%)	19 (73.08%)	0.903
Amnesia	17 (60.71%)	11 (42.31%)	0.280
Symptom, final	16 (76.19%)	19 (86.36%)	0.457
Snoring	15 (71.43%)	16 (72.73%)	1.000
Apnea	15 (71.43%)	16 (72.73%)	1.000
EDS	15 (71.43%)	18 (81.82%)	0.488

Table 3. Continued			
Fatigue	0 (0.00%)	2 (9.09%)	0.488
Headache	0 (0.00%)	0 (0.00%)	N/A
Nocturia	0 (0.00%)	2 (9.09%)	0.488
Amnesia	0 (0.00%)	3 (13.64%)	0.233
Epworth Sleepiness Scale			
Initial	7 (4-8)	8.5 (4-12.5)	0.232
Final	4 (3-7)	7 (3-12)	0.040
Change	-2 (-4-0)	-3 (-4 - -1)	0.609
Duration of PAP, month	15 (12-24)	13 (4-23)	0.119
PAP			
Titration	8 (6-9)	7.5 (5-8.5)	0.648
Retitration	6 (5-8)	7 (5-9.5)	0.494
Change[1]	-1 (-2-0)	0 (-1-1.5)	0.043
Decreased	17 (56.67%)	8 (28.57%)	0.092
Same	7 (23.33%)	12 (42.86%)	
Increased	6 (20.00%)	8 (28.57%)	
AHI			
Diagnosis	31.65 (26.2-39.2)[a]	38.7 (31.8-43.9)[a]	0.101
Titration	3.95 (1.6-7.3)[b]	7.6 (3.3-9.9)[b]	0.076
Retitration	2.55 (0.9-4.5)[b]	3.95 (2.8-7.1)[b]	0.077
P (within groups)	<0.001	<0.001	
Change[1]	-1.4 (-3.6-0)	-0.5 (-0.7-1.9)	0.444
RDI			
Diagnosis	33.7 (28.65-41.6)[a]	41.05 (34.2-45.05)[a]	0.081
Titration	7.15 (4-14.9)[b]	10.4 (5.6-16.4)[b]	0.167
Retitration	4.05 (1-6.5)[b]	8.4 (4.2-13.2)[b]	0.015
P (within groups)	<0.001	<0.001	
Change[1]	-3 (-6.6-0)	0.3 (-2.6-1.7)	0.157
ODI			
Diagnosis	29 (9.2-39.15)[a]	29.8 (20.85-41.2)[a]	0.472
Titration	3.75 (1.2-10.5)[b]	9.1 (7.5-13.6)[b]	0.020
Retitration	3.6 (0.9-6.7)[b]	8.15 (2.5-13.7)[b]	0.276
P (within groups)	<0.001	<0.001	
Change[1]	-1.05 (-3.6-0.9)	-3.1 (-5-0.6)	0.461
Total sleep duration			
Diagnosis	302.5 (255-365)	358 (291.5-370)	0.262
Titration	352 (295-385)	349 (285-367)	0.763
Retitration	320 (294-380)	357.5 (264-390)	0.640
P (within groups)	0.385	0.444	
Change[1]	-5.5 (-52-34)	2 (-47-53)	0.734
Level 3 duration			
Diagnosis	54 (25-64)	35.25 (15.5-59.5)	0.212
Titration	53.5 (25.5-74.5)	49 (23.5-94.5)	0.568
Retitration	51.75 (34-73.5)	38.5 (27-73)	0.955
P (within groups)	0.293	0.344	
Change[1]	1.25 (-34-14)	-4.25 (-47.85-13.75)	0.647

Table 3. Continued			
REM duration			
Diagnosis	44.5 (12.25-66)	50.5 (26.5-72)	0.333
Titration	52.75 (31-70.5)	59.75 (39.25-74.5)	0.723
Retitration	44.5 (35-66)	52 (31-73.5)	0.610
P (within groups)	0.422	0.813	
Change[(1)]	1 (-12-7.5)	7.25 (-25.75-20.75)	0.574

Data are given as mean ± standard deviation or median (1st quartile - 3rd quartile) for continuous variables according to normality of distribution and as frequency (percentage) for categorical variables. Same letters denote the lack of statistically significant difference between repeated measurements.

[(1)]Difference between retitration and titration. Negative values represent decrease and positive values represent increase in measurements.

The letters in the tables represent pairwise comparison results. The lettering a b b indicates that the first measurement is different from the others, and there is no difference between the second and third measurements.

COPD: Chronic obstructive pulmonary disease, EDS: Excessive daytime sleepiness, ODI: Oxygen desaturation index, REM: Rapid eye movement, RDI: Respiratory disturbance index, AHI: Apnea hypopnea index, PAP: Positive airway pressure

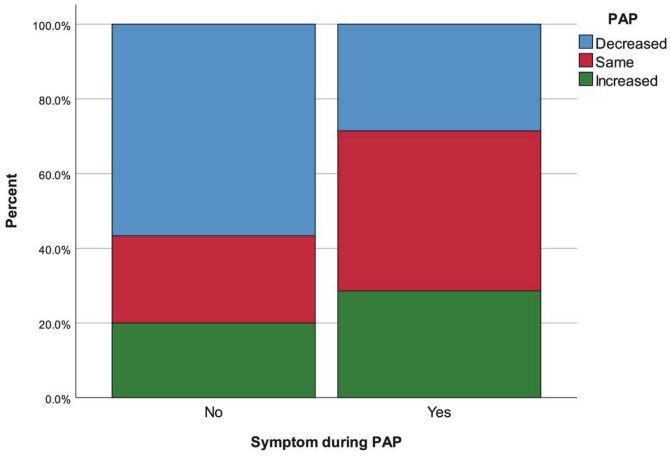


Figure 3. PAP change status regarding presence of symptoms during PAP use
PAP: Positive airway pressure

Table 4. Correlations between PAP change and other variables					
Age	r	0.233	Change in AHI	r	0.106
	p	0.079		p	0.522
Smoking pack-year	r	-0.125	Change in RDI	r	0.076
	p	0.349		p	0.645
Change in weight	r	0.088	Change in ODI	r	0.058
	p	0.511		p	0.728
Change in body mass index	r	0.091	Change in total sleep duration	r	0.024
	p	0.497		p	0.883
Change in neck circumference	r	0.033	Change in level 3 duration	r	**-0.334**
	p	0.814		p	**0.040**
Change in Epworth Sleepiness Scale score	r	0.032	Change in REM duration	r	**0.429**
	p	0.817		p	**0.007**

r: Spearman correlation coefficient, REM: Rapid eye movement, RDI: Respiratory disturbance index, AHI: Apnea hypopnea index, PAP: Positive airway pressure, ODI: Oxygen desaturation index

Table 5. Summary of PAP change regarding body weight change and symptom status					
	No weight change & no symptom (n=5)	**No weight change & symptom (n=12)**	**Weight change & no symptom (n=25)**	**Weight change & symptom (n=16)**	**p**
PAP change					
Decreased	3 (60.00%)	3 (25.00%)	14 (56.00%)	5 (31.25%)	0.533
Same	1 (20.00%)	5 (41.67%)	6 (24.00%)	7 (43.75%)	
Increased	1 (20.00%)	4 (33.33%)	5 (20.00%)	4 (25.00%)	

Data are given as frequency (percentage), PAP: Positive airway pressure

patients with elevated ODI, whose symptoms persisted during PAP treatment, and in patients with persistent symptoms and no weight change. More studies are needed regarding the relationship between hypoxia and amnesia in OSAS.

A study investigating OSAS in men with coronary artery disease emphasized that ODI was higher, and hypoxemia was more frequent in them (21). In our study, symptom persistence under treatment was more common in patients with high ODI. The incidence of coronary artery disease was higher in these patients whose symptoms continued under treatment.

Studies have shown that apneas last longer and hypoxemia deepens in REM sleep (22). However, it has been shown that improvement in RDI with PAP treatment is correlated with REM sleep duration (23). This study showed that as the PAP pressure requirement increases, our study's strength is that it is the first study to investigate and compare the effects of weight and symptom change on PAP pressure changes as the REM time increases.

The strength of our study is that it is the first study to investigate and compare the effects of weight and symptom change on PAP pressure change.

The limitations of our study are that the number of patients included in the study was limited, as sleep service hospitalizations were delayed due to the Coronavirus-2019 pandemic.

Conclusion

Weight gain, loss, or being the same weight did not significantly affect PAP pressure change. However, PAP pressure change was more common in symptom persistence under PAP treatment. More studies are needed on conditions that affect PAP pressure.

Ethics

Ethics Committee Approval: The İstanbul University-Cerrahpasa, Cerrahpasa Faculty Clinical Research Ethics Committee approved this study (no: E-83045809-604.01.02-2627).
Informed Consent: Informed consent was obtained from all individual participants included in the study.
Peer-review: Internally peer-reviewed.

Authorship Contributions

Surgical and Medical Practices: E.A., A.G., B.Ç.Ö., Concept: E.A., Design: E.A., B.Ç.Ö., Data Collection or Processing: A.G., Analysis or Interpretation: E.A., A.G., B.Ç.Ö., Literature Search: A.G., Writing: A.G.
Conflict of Interest: No conflict of interest was declared by the authors.
Financial Disclosure: The authors declared that this study received no financial support.

References

1. López-Padrós C, Salord N, Alves C, Vilarrasa N, Gasa M, Planas R, Montsserrat M, Virgili MN, Rodríguez C, Pérez-Ramos S, López-Cadena E, Ramos MI, Dorca J, Monasterio C. Effectiveness of an intensive weight-loss program for severe OSA in patients undergoing CPAP treatment: a randomized controlled trial. J Clin Sleep Med 2020;16:503-14.
2. Mannarino MR, Di Filippo F, Pirro M. Obstructive sleep apnea syndrome. Eur J Intern Med 2012;23:586-93.
3. Tuomilehto H, Seppä J, Uusitupa M. Obesity and obstructive sleep apnea--clinical significance of weight loss. Sleep Med Rev 2013;17:321-9.
4. Gülbay B, Acıcan T, Erdemir Işık M, Çiftci F, Önen ZP. Obez ve non-obez obstrüktif uyku apneli hastalar arasında klinik ve polisomnografik farklılıklar [The clinical and polysomnographic differences between obese and non-obese patients with obstructive sleep apnea]. Tuberk Toraks 2019;67:258-64.
5. Kuvat N, Tanriverdi H, Armutcu F. The relationship between obstructive sleep apnea syndrome and obesity: A new perspective on the pathogenesis in terms of organ crosstalk. Clin Respir J 2020;14:595-604.
6. Schwartz AR, Patil SP, Laffan AM, Polotsky V, Schneider H, Smith PL. Obesity and obstructive sleep apnea: pathogenic mechanisms and therapeutic approaches. Proc Am Thorac Soc 2008;5:185-92.
7. Veasey SC, Guilleminault C, Strohl KP, Sanders MH, Ballard RD, Magalang UJ. Medical therapy for obstructive sleep apnea: a review by the Medical Therapy for Obstructive Sleep Apnea Task Force of the Standards of Practice Committee of the American Academy of Sleep Medicine. Sleep 2006;29:1036-44.
8. Ursavaş A, Öztürk Ö, Köktürk O, Mutlu P, Kılıç H, Güzel A, Aydın Güçlü Ö, Erboy F, Argüder E, Hezer H, Şeref Parlak EŞ, Pazarlı AC, Özkurt S, Dursunoğlu N, Sevimli N, Kanbay A, Tutar Ü, Yeşilkaya S, Arslan NG, Savaş Bozbaş Ş, Küpeli E, Pınar M, Ermiş H, Özdilekcan Ç, Sarıoğlu N, Çetintaş Avşar G, Usalan AK, Saraç S, Ekici A, Burgazlıoğlu B. Türk popülasyonunda obstrüktif uyku apne sendromunda rol oynayan antropometrik ölçümlerin belirlenmesi [Determination of anthropometric measurements in obstructive sleep apnea syndrome in Turkish population]. Tuberk Toraks 2019;67:248-57.
9. McDaid C, Durée KH, Griffin SC, Weatherly HL, Stradling JR, Davies RJ, Sculpher MJ, Westwood ME. A systematic review of continuous positive airway pressure for obstructive sleep apnoea-hypopnoea syndrome. Sleep Med Rev 2009;13:427-36.
10. Chin K, Shimizu K, Nakamura T, Narai N, Masuzaki H, Ogawa Y, Mishima M, Nakamura T, Nakao K, Ohi M. Changes in intra-abdominal visceral fat and serum leptin levels in patients with obstructive sleep apnea syndrome following nasal continuous positive airway pressure therapy. Circulation 1999;100:706-12.
11. Drager LF, Brunoni AR, Jenner R, Lorenzi-Filho G, Benseñor IM, Lotufo PA. Effects of CPAP on body weight in patients with obstructive sleep apnoea: a meta-analysis of randomised trials. Thorax 2015;70:258-64.
12. Lankford DA, Proctor CD, Richard R. Continuous positive airway pressure (CPAP) changes in bariatric surgery patients undergoing rapid weight loss. Obes Surg 2005;15:336-41.
13. Littner M, Hirshkowitz M, Davila D, Anderson WM, Kushida CA, Woodson BT, Johnson SF, Merrill SW; Standards of Practice Committee of the American Academy of Sleep Medicine. Practice parameters for the use of auto-titrating continuous positive airway pressure devices for titrating pressures and treating adult patients with obstructive sleep apnea syndrome. An American Academy of Sleep Medicine report. Sleep 2002;25:143-7.
14. Izci B, Ardic S, Firat H, Sahin A, Altinors M, Karacan I. Reliability and validity studies of the Turkish version of the Epworth Sleepiness Scale. Sleep Breath 2008;12:161-8.
15. Sateia, MJ. International Classification of Sleep Disorders-Third Edition. CHEST 2014;146:1387-94.
16. Sleep-related breathing disorders in adults: recommendations for syndrome definition and measurement techniques in clinical research. The Report of an American Academy of Sleep Medicine Task Force. Sleep 1999;22:667-89.
17. Quan SF, Budhiraja R, Clarke DP, Goodwin JL, Gottlieb DJ, Nichols DA, Simon RD, Smith TW, Walsh JK, Kushida CA. Impact of treatment with continuous positive airway pressure (CPAP) on weight in obstructive sleep apnea. J Clin Sleep Med 2013;9:989-93.
18. Sharma SK, Agrawal S, Damodaran D, Sreenivas V, Kadhiravan T, Lakshmy R, Jagia P, Kumar A. CPAP for the metabolic syndrome in patients with obstructive sleep apnea. N Engl J Med 2011;365:2277-86.
19. Redenius R, Murphy C, O'Neill E, Al-Hamwi M, Zallek SN. Does CPAP lead to change in BMI? J Clin Sleep Med 2008;4:205-9.
20. Buratti L, Petrelli C, Potente E, Plutino A, Viticchi G, Falsetti L, Provinciali L, Silvestrini M. Prevalence of obstructive sleep apnea syndrome in a population of patients with transient global amnesia. Sleep Med 2017;32:36-9.
21. Martinez D, da Silva RP, Klein C, Fiori CZ, Massierer D, Cassol CM, Bos AJ, Gus M. High risk for sleep apnea in the Berlin questionnaire and coronary artery disease. Sleep Breath 2012;16:89-94.
22. Findley LJ, Wilhoit SC, Suratt PM. Apnea duration and hypoxemia during REM sleep in patients with obstructive sleep apnea. Chest 1985;87:432-6.
23. Aldrich M, Eiser A, Lee M, Shipley JE. Effects of continuous positive airway pressure on phasic events of REM sleep in patients with obstructive sleep apnea. Sleep 1989;12:413-9.

2023 Hakem Dizini - 2023 Referee Index

Ahmet Uğur Demir
Ali Deniz
Asuman Çelikbilek
Aylin Bican Demir
Ayşe Çağlar Sarılar
Ayşın Kısabay Ak
Betül Çevik
Burak Gümüştaş
Bülent Devrim Devrim Akçay
Canan Gündüz Gürkan
Ceren Bibinoğlu
Demet İlhan Algın
Deniz Tuncel Berktaş
Derya Karadeniz
Didem Kafadar
Duygu Kurt Gök
Duygu Seyhan
Erdem Tüzün
Esra Ünverdi Bıçakçı
Figen Hanağası
Genco Gençdal
Gülin Sünter
Güray Koç
Hanife Kocakaya
Hayriye Baykan
Hikmet Fırat
Hüseyin Güleç
İbrahim Öztura
İlker İnanç Balkan
Kadriye Ağan
Meda Kondolot
Mehmet Emin Demirkol
Mehmet Sezai Taşbakan
Melike Yüceege
Merve Aktan Süzgün
Merve Hazal Yılmaz
Metin Akgün
Musaffa Banu Salepci
Mutlu Acar
Nazmiye Çıray
Nevin Günaydın
Onur Durmaz
Özdem Ertürk
Özlem Timirci
Serdar Sarıtaş
Temel Kayıkçıoğlu
Turgay Demir
Tülin Taner
Utku Oğan Akyıldız
Vuslat Yılmaz
Zeynep Ece Kaya Güleç

2023 Yazar Dizini - 2023 Author Index

Afarin Rahimi-Movaghar 199
Alev Yıldırım Keskin 48
Ali Akyol 163
Ali Zakiei 199
Alireza Ahmadi 199
Arzu Sarıalioğlu 175
Aslı Akyol Gürses 235
Aslı Tekin 60
Aybüke Özcan 229
Ayça Elçim Sahar 65
Ayça Şolt Kırca 137
Ayla Yava 122
Aylin Bican Demir 60
Aynur Koyuncu 122
Ayse Karadaş 84
Ayşegül Gencer 240
Ayyüce Tuba Koçak 36
Azita Chehri 199
Beyza Aslı Bilsel 1
Birsel Molu 48
Bohdana Břegová 221
Buket Çalışkaner Öztürk 240
Büşra Eser 182
Cem Bölük 187
Çiğdem Deniz 216
Çiğdem Müge Haylı 9
Derya Kanza Gül 137
Derya Karadeniz 187
Didem Coşkun Şimşek 110
Dilek Demir Kösem 9
Döndü Şanlıtürk 206
Eda Atay 122
Eda Kalaycı 71
Elif Nur Duman 65
Ergün Haldun Sümer 65
Ersan Atahan 240
Esra Tural Büyük 98
Ezgi Çetin 26
Farid Najafi 199
Ferdi Başkurt 104
Figen Dığın 71
Filiz Polat 110
Gülçin Benbir Şenel 116,187
Gülten Güvenç 152
Güven Aslan 182
Habibolah Khazaie 199
Hacer Akgül Ceyhun 144
Halil İbrahim Tuna 48
Halise Coşkun 152
Hana Locihová 221
Handan Özcan 54
Hande Şenol 42
Hasan Özbek 192
Hatice Bal Yılmaz 129
Havva Kaçan 17
Hilal Fındık 26
Hülya Çakmur 5
İlknur Kaya 42
İrem Akova 65
İrem Damla Çimen 26
Jana Hrušková 221
Kadiriye Pehlivan 122
Karel Axmann 221
Kıymet Öztepe Yeşilyurt 168
Masoumeh Amin-Esmaeili 199
Mehdi Moradi-Nazar 199
Melike Mercan Başpınar 91
Meltem Adaiçi 229
Merve Hazal Ser 116
Mustafa Karadeniz 116
Nazmiye Çıray 229
Neriman Güdücü 137
Neslihan Dörtkardeş 206
Neşe Ataman Bor 168
Neşe Dursunoğlu 42
Nevra Güllü Arslan 78
Nevroz Ünlü 216
Nilifer Gürbüzer 144
Nursu Çakın Memik 26
Okcan Basat 91
Öznur Kavaklı 152
Pavlina Štěpánová 221
Pelin Palas Karaca 84
Pınar Doğan 129
Pınar Tunç Tuna 48
Pınar Uzun Uslu 60
Renata Zittová 221
Reza Mohammadi 199
Rumeysa Ateş 192
Sadık Ardıç 5
Seda Geylani Güleç 91
Selda Arslan 36
Sema Çifçi 17
Serap Kaynak 84
Seren Kayhan Aygün 91
Sibel Ergün 84
Sibel Pekcan 42
Soner Kılıç 182
Sümeyra Damsarsan 54
Tahir Keskin 104
Talip Asil 216
Tuba İnce Parpucu 104
Turgut Akyol 175
Utku Oğan Akyıldız 163,235
Vasfiye Bayram Değer 17
Veysel Kaplan 206
Yahya Pasdar 199
Yunus Hacımusalar 182
Zeliha Başkurt 104,192
Zeynep Kızılcık Özkan 71
Zeynep Öztürk Savaş 98
Ziya Yıldız 192

2023 Konu Dizini - 2023 Subject Index

25(OH)D/*25(OH)D* 235
Ağrı/*Pain* 221
Akademik başarı/*Academic performance* 229
Aktigrafi/*Autography* 221
Amnezi/*Amnesia* 240
Ani bebek ölüm sendromu/*Sudden infant death syndrome* ...129
Anksiyete/*Anxiety* 17,65,152,182
Asetilsalisilik asit/*Acetilsalyciclic acid* 163
Aspirin duyarsızlığı/*Aspirin unresponsiveness* 163
Aspirin/*Aspirin* 163
Bebek/*Infant* 175
Bellek/*Memory* 1
Bilgisayar oyun bağımlılığı/*Computer game addiction* 91
Boyun yeti yitimi/*Neck disability* 192
BPAP/*BPAP* 78
Cerrahi/*Surgery* 71,168
COVID-19 pandemisi/*COVID-19 pandemic* 17
COVID-19/*COVID-19* 26,54,84,98,122,182,206
CPAP başarısızlığı/*CPAP failure* 78
Çocuk/*Child* 91,98,110
Çocuklar/*Children* 5
D vitamini eksikliği/*Vitamin D deficiency* 235
D vitamini/*Vitamin D* 235
Danışmanlık/*Counseling* 152
Değerlendirme/*Evaluation* 9
Deliryum/*Delirium* 206,221
Depresyon/*Depression* 65,182
Dikkat eksikliği hiperaktivite bozukluğu/*Attention deficit hyperactivity disorder* 144
Dikkat kontrolü/*Attention control* 229
Direnç/*Resistance* 163
Dürtüsellik/*Impulsivity* 144
Ebeveyn/*Parents* 175
Eğitim/*Training* 129
Enflamasyon/*Inflammation* 187
Engellilik/*Disability* 199
Ergenler/*Adolescents* 9
Fiziksel aktivite/*Physical activity* 104,110
Gebelik/*Pregnancy* 116,137
Geçerlik ve güvenirlik/*Reliability and validity* 36
Geçerlilik/*Validity* 175
Görsel uyarı/*Visual stimulation* 216
Göz maskesi/*Eye mask* 152
Gündüz uykululuğu/*Daytime sleepiness* 104,137
Günlük yaşam aktiviteleri/*Activities of daily living* 104
Güvenirlik/*Reliability* 175
Güvenli uyku çevresi/*Safe sleep* 129
Hasta/*Patient* 71,152
Hemşire/*Nurse* 110,122
Hemşirelik bakımı/*Nursing care* 206
Hemşirelik öğrencisi/*Nursing students* 229
Hemşirelik/*Nursing* 71,168
Huzursuz bacaklar sendromu/*Restless leg disease* 116
Kadın/*Women* 54
Kafein/*Caffeine* 65
Kalp hızı değişkenliği/*Heart rate variability* 187
Kanser/*Cancer* 168
Kardiyovasküler morbidite/*Cardiovascular morbidity* 163
Kilo değişimi/*Weight change* 240
KOAH/*COPD* 42
Konsolidasyon/*Consolidation* 1
Koronavirüs kaygısı/*Coronavirus anxiety* 26
Kronotip/*Chronotype* 26
Kronotipler/*Chronotypes* 48
Lökosit/*White blood cells* 187
Meme kanseri/*Breast cancer* 168
Non-spesifik boyun ağrısı/*Non-specific neck pain* 192
Nötrofil/*Neutrophil* 187
Obstrüktif uyku apne sendromu/*Obstructive sleep apnea syndrome* 42,163,187
Oksijen desatürasyon indeksi/*Oxygen desaturation index* 240
OSAS tedavisi/*OSAS treatment* 78
OSAS/*OSAS* 78,163
Öğrenci/*Student* 122
Pandemi/*Pandemic* 84,98
PAP retitrasyon/*PAP retitration* 240
Parkinson hastalığı/*Parkinson disease* 36
Pediatrik uyku anketi/*Pediatric sleep questionnaire* 5
Posterior serebral arter/*Posterior cerebral artery* 216
Psikolojik iyi oluş/*Psychological well-being* 84
Psikolojik sıkıntı/*Psychological distress* 199
Rekonsolidasyon/*Reconsolidation* 1
Ruh sağlığı/*Mental health* 199
Saldırganlık/*Aggression* 144
Semptom değişimi/*Symptom change* 240
Serebral reaktivite/*Cerebral reactivity* 216
Sirkadiyen ritim uyku bozuklukları/*Circadian rhythm sleep disorders* 199
Sirkadiyen ritim/*Circadian rhythm* 229
Sosyal jetlag/*Social jetlag* 48,229
Stres/*Stress* 65
Tahmin/*Prediction* 78
Teknolojik cihaz/*Technological device* 98
Tıkayıcı uyku apne sendromu/*Obstructive sleep apnea syndrome* 235
Tıp öğrencisi/*Medical student* 65
Trimester/*Trimester* 137
Uyku alışkanlığı/*Sleeping habits* 122
Uyku alışkanlıkları/*Sleep habits* 9
Uyku apne/*Sleep apnea* 240
Uyku bozukluğu/*Sleep disorder* 42,110,182
Uyku bozuklukları/*Sleep disorders* 26
Uyku bozuklukları/*Sleep disturbances* 221
Uyku bozuklukları/*Sleeping disorders* 60
Uyku deprivasyonu/*Sleep deprivation* 216
Uyku hijyeni/*Sleep hygiene* 206

Uyku ile ilgili davalar/*Sleep-related lawsuits*.....60
Uyku ilişkili solunum bozuklukları/*Sleep related breathing disorders*.....5
Uyku kalitesi/*Quality of sleep*.....71
Uyku kalitesi/*Sleep quality*.....17,54,84,116,144,192
Uyku pozisyonu/*Sleep position*.....192
Uyku sağlığı/*Sleep health*.....5
Uyku sorunları/*Sleep disorder*.....36
Uyku ve hukuk/*Sleep and law*.....60
Uyku-uyanıklık bozuklukları/*Sleep-wake disorders*.....91
Uyku/*Sleep*.....1,9,36,48,65,91,98,104,110,152,168,175
Uykusuzluk/*Insomnia*.....137,182
Üniversite öğrencileri/*University students*.....17
Üniversite öğrencisi/*College students*.....84
Üst ekstremite fonksiyonu/*Upper extremity function*.....192
Vardiyalı çalışan/*Shift worker*.....48
Yaşam kalitesi/*Quality of life*.....48,144
Yaşlı hasta/*Elderly patient*.....221
Yaşlı/*Elderly*.....104
Yavaş dalga aktivitesi/*Slow wave activity*.....1
YBÜ/*ICU*.....206
Yenidoğan/*Newborn*.....129
Yoğun bakım/*Intensive care*.....71
Yorgunluk/*Fatigue*.....104