International Journal for Multidisciplinary Research (IJFMR)
E-ISSN: 2582-2160 ● Website: www.ijfmr.com ● Email: editor@ijfmr.com

Correlation Between Sleep Quality and Pain Intensity in Chronic Migraine Population

Chaithanya Prem[1], Libin George Babu[2], Sinchana N[3]

[1]Lecturer, Department of Physiotherapy, Laxmi Memorial College of Physiotherapy, Rajiv Gandhi University of Health Sciences, Bangalore Karnataka, India
[2]Assistant Professor, Department of Physiotherapy, Laxmi Memorial College of Physiotherapy, Rajiv Gandhi University of Health Sciences, Bangalore Karnataka, India
[3]BPT intern, Department of Physiotherapy, Laxmi Memorial College of Physiotherapy, Rajiv Gandhi University of Health Sciences, Bangalore Karnataka, India

ABSTRACT

BACKGROUND: A debilitating neurological disorder that affects numerous individuals worldwide is chronic migraine. It impacts daily functioning, often accompanied by severe and disabling pain. Among the multiple factors complicating its management, sleep disturbances are notably prevalent, which can worsen the frequency and intensity of migraine attacks. In the migraine population, however, nothing is known about the precise relationship between pain severity and "Sleep Quality" (SQ). Exploring this relationship can provide valuable insights for better managing chronic migraine symptoms.

OBJECTIVE: The objective of the study is to find the correlation between sleep quality and pain intensity in chronic migraine population.

METHODOLOGY: This study was conducted with 30 participants diagnosed with chronic migraine, over a 4- week period. Using inclusion along with exclusion criteria, subjects were recruited. The "Visual Analog Scale" (VAS) had been employed to measure "Pain Intensity" (PI), and the "Pittsburgh Sleep Quality Index" (PSQl) had been employed to determine SQ. Pearson's correlation (PC) coefficient (or Spearman's rank correlation (SRC) for non-normal data) was employed to evaluate the data to evaluate strength and direction of association between PI and SQ.

RESULT: This study showed strong positive correlation between SQ and PI in chronic migraine population.

CONCLUSION: According to the study's findings, those with chronic migraines experience more severe pain as their sleep quality declines.

KEYWORDS: Chronic migraine, Pain intensity, Pearson correlation, Pittsburgh sleep quality index, Sleep quality, Spearman rank correlation, Visual analog scale.

INTRODUCTION

One of the most prevalent forms of chronic pain and a typical neurology symptom is a headache. About 12% of people worldwide suffer from migraine, one of the most incapacitating of the main headache conditions, with a higher prevalence rate in women. Despite this, it is still poorly understood, underdiagnosed, and undervalued in clinical practice. The strength and length of these recurrent headaches can vary, and they often come with symptoms like nausea, photophobia, vomiting, and phonophobia that significantly impair day-to-day functioning. [1]

Usually lasting 4 to 72 hours, migraines are marked by moderate to severe episodes of unilateral pulsing head pain that are followed by photophobia, phonophobia, nausea, and/or vomiting. For at least three months, a chronic migraine sufferer must have headaches at least fifteen days a month, with at least eight of those headaches fulfilling the requirements for migraine headaches. Therefore, the lesser frequency of headaches and migraines, usually one to two episodes each month, distinguishes episodic migraine apart from chronic migraine. The premonitory phase, the actual migraine headache, and the postdrome phase are the three stages of a migraine episode, according to conventional wisdom. The premonitory period, which lasts for 24 to 48hours prior to headache phase, has been marked by symptoms that include changes in emotions, fatigue, and neck pain. Furthermore, around one-third of individuals with migraines experience an aura, that might occur concurrently with premonitory or headache phases and consists of transient localized neurological symptoms, including visual, sensory, or motor abnormalities. In addition to headaches, the 72-hour postdrome phase is characterized by other symptoms like stiff neck, exhaustion, and difficulty concentrating. The length of time between migraine attacks that is pain- and symptom-free may vary depending on how chronic the migraine sufferers are. [4]

According to the most recent estimates, the prevalence of migraines worldwide is between 14 and 15 percent. In terms of burden, migraines are responsible for 4.9% of all illnesses worldwide, as measured by years lived with a disability.[2] Migraines, a severe public health concern that affects over 10% of adults globally, are two to three times more prevalent in women. The 2016 “Global Burden of Disease Study” found that, for both men and women aged 15 to 49, migraines are the predominant cause of years lived with disability globally. 2.5% of people with episodic headaches develop chronic migraines each year. The progression of migraine transformation is gradual, with the frequency of attacks steadily rising until the patient has more headaches than days without migraines. [3]

Sleep is a vital physiological process necessary for cognitive function, memory consolidation, tissue repair, and recovery from fatigue. Pain is an essential aspect of human existence, serving as physical and emotional indicator of bodily injury that profoundly impacts human behavior.[5] In modern society, sleep quality has been deteriorating despite its importance. This reduction is caused by numerous factors, that include lifestyle choices, erratic job patterns, and more screen usage. As per the “Centers for Disease Control and Prevention” (CDC), a large portion of people does not receive the advised 7-9hours of sleep each night, making insufficient sleep a public health issue. Sleep problems often alter brain function, particularly in areas such as the hypothalamus, which is implicated in both sleep regulation and migraine generation. According to studies, disturbed sleep patterns might raise cortical excitability, which has been suggested can contribute to the onset of migraines.[6]

Poor sleep quality, defined as difficulty falling or staying asleep, a shorter total duration of sleep, and disruptions in architecture of sleep, has been related to higher frequency and intensity of migraine attacks. However, having a migraine can cause sleep disturbances, which feeds a vicious cycle that makes both disorders worse. This interaction implies that sleep disruptions may postpone recovery and heighten pain sensitivity in addition to causing migraine attacks.[6] Based on validated self-reports, patients with episodic migraine typically report less sleep than those without migraine. Sleep issues that are more prevalent among those who have trouble falling asleep include bruxism, insomnia, and restless legs syndrome.[7] Poorer SQ is directly related to a higher frequency of migraine attacks. Insomnia symptoms are present almost every day in 68% to 84% of patients with chronic migraines. A 40% increased incidence of headaches, including migraines, can result from insomnia.[3]

Romberg suggested in 1853 that sleep could prevent a migraine episode. About 75% of headache cases occur during sleep or right after waking up, and sleep is usually a migraine attack reliever. A significant correlation exists between headaches and sleep, with over 50% of individuals experiencing headaches reporting diverse sleep disorders. Sleep was the primary preventive measure against migraine attacks in a study of arctic populations. This patient group suffers from frequent morning headaches that are related to sleep deprivation or insomnia. Therefore, a migraine attack may also be triggered by inadequate sleep duration or quality. A headache that follows oversleeping is known as a "weekend migraine." The most frequent causes of morning migraine attacks are likely to be excessive sleep exposure and sleep deprivation, as per Park et al. (2021).[8]

Improving treatment procedures may be made easier with an understanding of the relationship between migraine intensity and SQ.[8] The objective of this research is to provide additional evidence on subject.[3] This particular study aims to examine the correlation between PI and SQ in individuals with chronic migraines.

MATERIALS AND METHODS

The study's participants were chosen using a convenience sample technique in an observational study design. Every participant in the study filled out a consent form. Convenience sampling was used to choose participants who reported sleep difficulties and met the “International Classification of Headache Disorders” (ICHD) criteria for chronic migraine. Secondary headaches, main sleep disorders, neurological illnesses, and cognitive impairment were among the exclusion criteria. Sleep quality and pain intensity had been determined using the VAS and the PSQI questionnaire. These surveys were employed to collect data, and nonparametric SRC coefficient was employed for analysis because the data was not regularly distributed.

The participants signed an informed consent form after receiving thorough information about the study.

PROCEDURE

Participants who met the requirements for inclusion had been involved in the study. All of the subjects received a brief introduction to the testing process. The subject who met the inclusion requirements gave their informed consent. A preliminary analysis that included demographic information was conducted. The PSQI Questionnaire was used to determine the subjects' SQ and the VAS had been employed to compute their level of pain. The association between PI and SQ in a population with chronic migraines had been studied by employing PC for normally distributed data and SRC for non-normally distributed data.

OUTCOME MEASURES

Pittsburgh Sleep Quality Index (PSQI) Questionnaire

Insomnia and quality are evaluated over four weeks using a self-administered questionnaire called the PSQI (PSQI; Buysee et al., 1989). Seven "component" scores are derived from 19 items, encompassing subjective SQ, subjective sleep duration, habitual sleep efficiency, subjective sleep disruptions, subjective sleep latency, subjective medication usage for sleep, and subjective daytime dysfunction. A singular global score is generated by addition of these 7 component scores.[11] Poorer SQ is indicated by a higher score. The total score is between zero and twenty-one. A PSQI score >5 indicates poor sleep quality. [12] It was developed to offer a relevant, standardized, and reliable

evaluation of SQ to differentiate between "good" and "poor" sleepers and to provide patients and physicians with an easy-to-complete index.[13]

Visual analog scale (VAS)

The VAS pain score is a prevalent instrument for evaluating the subjective pain intensity of individuals suffering from migraines. It is a simple self-reported measure whereby the patient shows the degree of pain they are experiencing on a horizontal line, usually 10 cm long. "No pain" is represented by one end of line, and "worst pain imaginable" by other. To evaluate the degree of pain, the distance between the patient's mark and the point where they are not in pain is measured.[14] The PI had been assessed by asking "On a scale of 0-10 (where 0= no pain at all and 10= pain as bad as it can get), on an average how painful are your headaches?".[12] Validity and reliability of Visual Analog Scale (VAS) demonstrated that strong construct validity and reliability which makes it a suitable tool for assessing pain intensity.[17]

RESULT

PSQI Scores

VAS Score

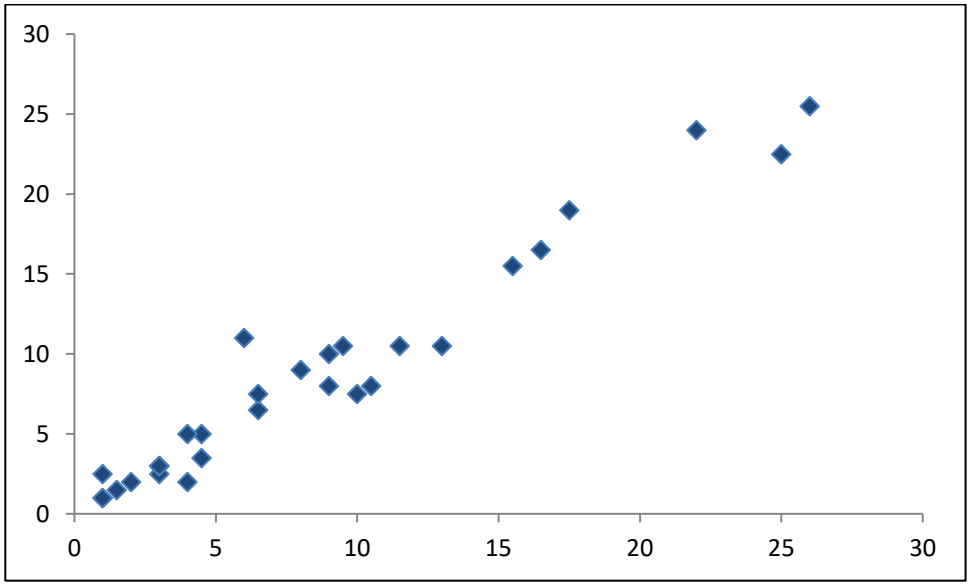

Figure 1.1

Figure 1.1 demonstrated a significant favorable relationship among the severity of pain and sleep quality in people with chronic migraines. Therefore, there is a connection between increased PI and poor sleep quality.

DISCUSSION

Examining the relationship among chronic migraine sufferers' pain levels and SQ was the aim of current investigation. One of the most prevalent neurological illnesses, migraines cause moderate to severe headaches.[12] Headaches that recur at least 15days a month for at least 3months are referred to as chronic migraines.[4] The strength and length of these recurring headaches can vary, and they often come with symptoms that include nausea, vomiting, photophobia, and phonophobia that significantly impair day-to-day functioning.[1] The study found a strong positive correlation and concluded that as sleep quality decreases, pain intensity increases in chronic migraine population. Poor sleep quality

has been found to significantly exacerbate migraine severity, with insufficient or disrupted sleep leading to more frequent and intense migraine attacks.[10]

According to this study, people with chronic migraines had highly disrupted SQ, as measured by the PSQI. This shows a pattern of impaired sleep that is frequently seen in this population. Sleep physiology shows that disturbances in both "Rapid Eye Movement" (REM) and "Non- Rapid Eye Movement" (NREM) stages of sleep can contribute to intensification of migraine symptoms. Chronic disruption in these stages can lead to dysregulation of body's pain response contributing to both frequency and intensity of migraines. It was corroborated by Stanyer et al. (2021), who conducted a study comparing the subjective and objective sleep architecture of migraineurs and healthy controls. The results showed that people with migraines had much worse sleep quality, particularly those who had chronic migraines.[19] Relatively a study by Sylwia Orzeszek et.al. (2024) conducted a self-reported study and they observed that sleep patterns were significant predictors of migraine episodes the following day whereas total sleep duration did not play a significant role.[9]

This study also indicates that PI, as computed by VAS, is significantly elevated in individuals with chronic migraines. This explains the severity of pain experienced in this population. Pain physiology suggests that migraine pain involves complex mechanisms including central sensitization where brain's pain processing areas become more sensitive, leading to increased pain perception. The trigeminal nerve's activation and secretion of inflammatory substances like calcitonin gene-related peptides can exacerbate pain. Supporting this a study conducted by Garrigós-Pedrón et.al. (2022) where explored factors influencing pain severity in migraine patients, which also highlights that pain in migraine patients is not only more frequent but also more intense.[3]

The relationship between SQ and migraine risk as well as migraine-related burdens like pain intensity has been examined by Duan et al. (2023). They have found that chronic migraineurs have higher levels of headache-related disability, underscoring the significance of pain management in this population.[12]

In the current investigation, the PSQI is employed to evaluate how well people with chronic migraines sleep. Correspondingly this scale is used by Cynthia L Larche et.al.(2021) who applied the PSQI in their study examining clinical factors such as pain and fatigue commonly associated with chronic conditions like fibromyalgia, migraine, and osteoarthritis. This highlights PSQI's relevance and emphasizes the importance of evaluating sleep quality in various chronic pain conditions for deeper understanding.[22] As per Mollayeva T. et al. (2016), the PSQI showed excellent validity and reliability across a range of groups, confirming its usefulness as a reliable tool for assessing sleep quality.[13]

In this current study, VAS is employed to assess pain intensity among chronic migraine population. Homogenously this scale is used by Astrom M et.al.(2023) who conducted a study on use of visual analog scale specifically to assess conditions involving chronic pain such as rheumatoid arthritis, low back pain, osteoarthritis, post-surgical pain, fibromyalgia. It measures subjective pain levels for different chronic pain conditions to provide valuable insights into severity of pain. [23] Begum MR et.al.(2019) reported the validity and reliability of VAS which demonstrated strong construct validity and reliability which makes it a suitable tool for assessing pain intensity.[17]

The discussion emphasizes a strong correlation between chronic migraine sufferers' increasing pain intensity and poor sleep quality. Insomnia and other sleep disorders can make headaches more frequent and severe. The reliability of measurement instruments such as the VAS and the PSQI in

evaluating these variables is highlighted. The intensity of migraines may be lessened by treatments such as cervical mobilization, TENS, relaxation techniques, cognitive behavioral therapy for insomnia (CBT-1), and SQ improvement. This study underlines the critical role of addressing sleep disturbance as a part of migraine management, which can alleviate pain intensity and help improve the overall well-being of individuals with chronic migraine.

This study was limited in certain ways. In the first place, the small sample size might not accurately reflect the wide range of chronic migraine sufferers. It can be repeated on a larger sample size in the future. Secondly, the study might not adequately account for confounding factors such as comorbidities example depression, and anxiety, these factors could influence both SQ and PI. Lastly, a short-term study may not capture the variability of SQ and PI over time. Future studies might concentrate on the part played by comorbid conditions such as anxiety, depression, and sleep apnea, which frequently coexist with chronic migraines. Additionally, studies could explore whether different migraine subtypes exhibit distinct sleep patterns or sleep disturbances and variations in pain intensity. Lastly investigating impact of specific treatments or interventions on both sleep and pain would also provide valuable insights.

CONCLUSION

According to the study's findings, those with chronic migraines experience greater levels of pain as their sleep quality declines.

REFERENCES

1. Bigal ME, Lipton RB, Stewart WF. The epidemiology and impact of migraine. Curr.Neurol. Neurosci.Rep. 2004 Mar;4(2):98-104.
2. Puledda F, Silva EM, Suwanlaong K, Goadsby PJ. Migraine: from pathophysiology to treatment. J. Neurol. 2023 Jul;270(7):3654-66.
3. Garrigós-Pedrón M, Segura-Ortí E, Gracia-Naya M, La Touche R. Predictive factors of sleep quality in patients with chronic migraine. Neurol. 2022 Mar 1;37(2):101-9.
4. Mungoven TJ, Henderson LA, Meylakh N. Chronic migraine pathophysiology and treatment: a review of current perspectives. Front. Pain Res. 2021 Aug 25;2:705276.
5. Orzeszek S, Martynowicz H, Smardz J, Wojakowska A, Bombała W, Mazur G, Wieckiewicz M. Assessment of sleep quality in patients with orofacial pain and headache complaints: A polysomnographic study. Dent. Med. Probl. 2024 Jun 4;61:549-62.
6. Engstrøm M, Hagen K, Bjørk MH, Stovner LJ, Gravdahl GB, Stjern M, Sand T. Sleep quality, arousal and pain thresholds in migraineurs: a blinded controlled polysomnographic study. J. Headache Pain. 2013 Dec;14:1-0.
7. Vgontzas A, Pavlović J, Bertisch S. Sleep Symptoms and Disorders in Episodic Migraine: Assessment and Management. Curr. Pain Headache Rep. 2023 Oct;27(10):511-20.
8. Waliszewska-Prosół M, Nowakowska-Kotas M, Chojdak-Łukasiewicz J, Budrewicz S. Migraine and sleep—an unexplained association?. Int. J. Mol. Sci. 2021 May 24;22(11):5539.
9. Stanyer EC, Brookes J, Pang JR, Urani A, Holland PR, Hoffmann J. Investigating the relationship between sleep and migraine in a global sample: a Bayesian cross-sectional approach. J. Headache Pain. 2023 Sep 8;24(1):123.

10. Bag A, Bhoi SK, Jha M, Palo GD. Sleep quality evaluation, correlation with headache frequency, and propensity to conversion from episodic to chronic daily headache in migraine patients: A cross-sectional study. J. Neurosci. Rural Pract. 2023 Jan;14(1):70.
11. Buysee DJ, Reynolds CF, Monk TH, Berman SR, Kupfer DJ. Pittsburgh sleep quality index. J. Clin. Psychol. 1989.
12. Duan S, Ren Z, Xia H, Wang Z, Zheng T, Liu Z. Association between sleep quality, migraine and migraine burden. Front Neurol. 2022 Aug 26;13:955298.
13. Mollayeva T, Thurairajah P, Burton K, Mollayeva S, Shapiro CM, Colantonio A. The Pittsburgh sleep quality index as a screening tool for sleep dysfunction in clinical and non-clinical samples: A systematic review and meta-analysis. Sleep Med. Rev. 2016 Feb 1;25:52-73.
14. Heller GZ, Manuguerra M, Chow R. How to analyze the Visual Analogue Scale: Myths, truths and clinical relevance. Scand. J. Pain. 2016 Oct 1;13(1):67-75.
15. Lucas C, Romatet S, Mekiès C, Allaf B, Lantéri-Minet M. Stability, responsiveness, and reproducibility of a visual analog scale for treatment satisfaction in migraine. Headache: J. Head Face Pain. 2012 Jun;52(6):1005-18.
16. Buse DC, Reed ML, Fanning KM, Bostic R, Dodick DW, Schwedt TJ, Munjal S, Singh P, Lipton RB. Comorbid and co-occurring conditions in migraine and associated risk of increasing headache pain intensity and headache frequency: results of the migraine in America symptoms and treatment (MAST) study. J. Headache Pain. 2020 Dec;21:1-6.
17. Begum MR, Hossain MA. Validity and reliability of visual analogue scale (VAS) for pain measurement. J. Med. Case Rep. 2019;2(11).
18. Moldofsky H. Sleep and pain. Sleep Med. Rev. 2001 Oct 1;5(5):385-96.
19. Stanyer EC, Creeney H, Nesbitt AD, Holland PR, Hoffmann J. Subjective sleep quality and sleep architecture in patients with migraine: a meta-analysis. Neurology. 2021 Oct 19;97(16):e1620-31.
20. Saçmacı H, Tanik N, İnan LE. Current perspectives on the impact of chronic migraine on sleep quality: a literature review. Nat. Sci. Sleep. 2022 Jan 1:1783-800.
21. Song TJ, Yun CH, Cho SJ, Kim WJ, Yang KI, Chu MK. Short sleep duration and poor sleep quality among migraineurs: a population-based study. Cephalalgia. 2018 Apr;38(5):855-64.
22. Larche CL, Plante I, Roy M, Ingelmo PM, Ferland CE. The Pittsburgh Sleep Quality Index: reliability, factor structure, and related clinical factors among children, adolescents, and young adults with chronic pain. Sleep disorders. 2021;2021(1):5546484.
23. Åström M, Thet Lwin ZM, Teni FS, Burström K, Berg J. Use of the visual analogue scale for health state valuation: a scoping review. Qual. Life Res. 2023 Oct;32(10):2719-29.