ISSN No:-2456-2165 https://doi.org/10.38124/ijisrt/26may1180

Beyond the Screen: Sleep Quality in Students with Refractive Errors

Tiyasa Khanra

Department of Optometry
Institute of Leadership, Entrepreneurship and Development
Kolkata, India

Publication Date: 2026/05/25

Abstract: The rapid increase in digital device usage among students has raised growing concerns regarding its effects on visual comfort and sleep health. A cross-sectional observational study was carried out among students with refractive errors, including myopia, hyperopia, and astigmatism, to evaluate the association between screen time and sleep quality. Information related to daily screen exposure, digital eye strain symptoms, and sleep quality was obtained using a structured questionnaire along with the Pittsburgh Sleep Quality Index (PSQI). The study demonstrated that prolonged digital device usage was associated with poorer sleep quality and a higher prevalence of symptoms such as eye fatigue, headache, dryness, and blurred vision. These findings emphasize the potential impact of excessive digital screen use on both ocular health and sleep patterns among students with refractive errors.

Keywords: *Screen Time; Sleep Quality; Refractive Errors; Digital Eye Strain; Myopia; PSQI.*

How to Cite: Tiyasa Khanra (2026) Beyond the Screen: Sleep Quality in Students with Refractive Errors. *International Journal of Innovative Science and Research Technology*, 11(5), 1553-1556. https://doi.org/10.38124/ijisrt/26may1180

I. INTRODUCTION

Refractive errors, including myopia, hyperopia, and astigmatism, are among the most common ocular conditions affecting students worldwide. The increasing prevalence of refractive errors, particularly myopia, has become a major public health concern due to its impact on academic performance, quality of life, and visual health. Increased near-work activities and prolonged use of digital devices have been identified as important contributing factors to visual problems among students [1].

In recent years, screen time among students has increased substantially because of greater dependence on smartphones, tablets, computers, and online learning platforms. Excessive exposure to digital screens has been associated with symptoms such as eye strain, headache, dry eyes, blurred vision, and reduced visual comfort. Studies have also suggested that prolonged screen exposure may contribute to the progression of refractive errors and visual disturbances in young individuals [2]. Sleep is an essential physiological process required for physical restoration, cognitive functioning, emotional stability, and academic performance. Poor sleep quality among students has become increasingly common and has been linked to excessive screen use, especially before bedtime. Exposure to blue light emitted from electronic devices can suppress melatonin secretion, delay sleep onset, alter circadian rhythm, and reduce sleep duration and quality [3]. Emerging evidence also indicates a possible relationship between refractive errors and sleep disturbances. A study conducted by Ayaki et al. reported that children with high myopia demonstrated poorer sleep quality, shorter sleep duration, and delayed bedtime compared to children without high myopia [4]. Furthermore, Hu et al. observed significant associations between screen time, sleep duration, and poor uncorrected visual acuity among adolescents, suggesting that increased digital screen usage may worsen both sleep quality and visual health [1,3]. Although several studies have separately investigated screen time, sleep quality, and refractive errors, limited research has specifically explored the combined relationship between screen time and sleep quality among students with refractive errors. Understanding this association is important for promoting healthy screen habits, improving sleep hygiene, and preventing further visual complications in the student population, the present study aims to evaluate the relationship between screen time and sleep quality in students with refractive errors.

ISSN No:-2456-2165 https://doi.org/10.38124/ijisrt/26may1180

II. INCREASING PREVALENCE OF REFRACTIVE ERRORS AMONG STUDENTS

Recent epidemiological studies indicate a steady rise in refractive errors among school and college students, particularly in urban populations. Myopia has become increasingly common at younger ages, with higher prevalence reported in students involved in intensive educational activities and prolonged near work. Environmental factors such as limited outdoor exposure and lifestyle changes have been strongly associated with this increase [5].

A meta-analysis published in *JAMA Network Open* reported a significant association between longer daily digital screen exposure and increased odds of myopia development and progression [6]. Similarly, post-pandemic studies observed worsening visual outcomes among students following prolonged online learning periods and reduced physical outdoor activities [7]. These findings suggest that modern visual habits may play an important role in the changing pattern of refractive errors among young individuals.

III. DIGITAL SCREEN USAGE AND VISUAL STRESS AMONG STUDENTS

Students today spend a considerable amount of time on smartphones, laptops, and tablets for academic, social, and recreational purposes. The transition to online learning has further increased dependence on digital devices, leading to prolonged near-work activities and continuous screen exposure. Extended use of digital screens has been associated with symptoms of digital eye strain such as headache, eye fatigue, dryness, blurred vision, and difficulty focusing [8].

In addition to ocular discomfort, prolonged exposure to blue light emitted from screens may contribute to visual fatigue and disruption of normal sleep patterns by affecting melatonin secretion and circadian rhythm. Continuous near work combined with inadequate visual breaks may also increase accommodative stress among students with refractive errors [7,8]. This highlights the growing concern regarding excessive digital device usage and its impact on both visual and general health in the student population.

IV. ASSOCIATION BETWEEN REFRACTIVE ERRORS AND SCREEN EXPOSURE

Prolonged near-work activities and increased digital device usage have been identified as important environmental factors associated with refractive changes, particularly myopia progression. Continuous focusing on near objects during smartphone, tablet, or computer use may increase accommodative demand and visual stress, potentially contributing to axial elongation of the eye and worsening refractive status [9]. Several studies have reported that excessive screen time duration is associated with higher prevalence and progression of myopia among students and young adults. Increased duration of digital device use has also been linked to symptoms of eye fatigue, including headache, blurred vision, ocular discomfort, and difficulty in maintaining focus, especially in individuals with existing refractive errors [10]. These symptoms may further reduce visual efficiency and overall comfort during prolonged academic activities.

V. AIM AND OBJECTIVES OF THE STUDY

This study aims to evaluate the association between screen time and sleep quality among students with refractive errors. The objectives of the study are to assess the duration of screen time among students with refractive errors and to evaluate the relationship between increased screen exposure and sleep quality in this population.

VI. METHODS

A cross-sectional observational study was conducted among school and college students with refractive errors such as myopia, hyperopia, or astigmatism. The study population included students aged between 14–25 years who were regular users of digital devices. Students with ocular pathologies other than refractive errors and those with systemic or neurological disorders affecting sleep were excluded from the study. A total of 42 participants were selected using convenient sampling methods. Data were collected through a structured questionnaire that included demographic details, average daily screen time, type of digital device used, and symptoms related to digital eye strain. Sleep quality was assessed using the Pittsburgh Sleep Quality Index (PSQI). The primary outcome measures included average daily screen time, sleep quality score, and the presence of digital eye strain symptoms. The collected data were entered into IBM SPSS Statistics and analyzed using appropriate statistical methods. Descriptive statistics were used to summarize the data, while correlation and association tests were applied to determine the relationship between screen time and sleep quality. A p-value of less than 0.05 was considered statistically significant. Informed consent was obtained from all participants prior to data collection, and confidentiality of participant information was maintained throughout the study.

VII. RESULTS

A total of 42 students with refractive errors participated in the study. The study population consisted predominantly of students within the age group of 18 ± 3 years. Among the participants, myopia was the most commonly observed refractive error (61.9%), followed by astigmatism (23.8%) and hyperopia (14.3%). Female participants constituted 57.1% of the study population, while males accounted for 42.9%.

Analysis of screen usage patterns revealed that the majority of students spent more than 4–6 hours daily on digital devices, including smartphones, laptops, and tablets. Approximately 64.3% of participants reported screen exposure exceeding 5 hours per day, while only 11.9% reported usage below 3 hours daily. Academic activities such as online classes, assignments, and study-related work accounted for nearly 70% of total screen exposure, whereas social media and entertainment contributed approximately 30%.

ISSN No:-2456-2165 https://doi.org/10.38124/ijisrt/26may1180

Sleep quality assessment using the Pittsburgh Sleep Quality Index (PSQI) demonstrated that a large percentage of participants experienced poor sleep quality. The mean PSQI score among participants was 7.8 ± 2.1, with 71.4% of students scoring above 5, indicating poor sleep quality. Common sleep-related complaints included delayed sleep initiation (59.5%), interrupted sleep (47.6%), reduced sleep duration (52.4%), and daytime tiredness (66.7%). Students with higher daily screen time showed comparatively poorer sleep quality scores than those with lower screen time duration.

Symptoms of digital eye strain were frequently reported among participants. The most common symptoms included eye fatigue (73.8%), headache (61.9%), dryness (54.8%), blurred vision (45.2%), watering (38.1%), and difficulty focusing after prolonged screen use (42.9%). These symptoms were more prevalent among students with extended near-work duration and continuous digital device usage. Approximately 68% of participants reported taking fewer than two breaks during prolonged screen use sessions.

Statistical analysis showed a significant positive correlation between prolonged screen time and poor sleep quality among students with refractive errors ($r = 0.62$, $p < 0.05$). Increased screen exposure was also significantly associated with a higher frequency of digital eye strain symptoms ($p < 0.05$). Participants using digital devices for more than 6 hours daily demonstrated significantly higher PSQI scores compared to those with screen time below 4 hours.

VIII. DISCUSSION

This study evaluated the association between screen time and sleep quality among students with refractive errors. The findings demonstrated that students with prolonged digital screen exposure experienced poorer sleep quality and a higher frequency of digital eye strain symptoms. Increased screen time was commonly associated with symptoms such as eye fatigue, headache, blurred vision, dryness, and difficulty focusing, indicating the impact of prolonged near-work activities on ocular comfort [11].

The majority of participants reported extensive use of smartphones and other digital devices for academic and recreational purposes. Continuous exposure to digital screens, especially during evening hours, may contribute to disturbed sleep patterns due to the effects of blue light on melatonin secretion and circadian rhythm regulation. Students with higher digital device usage showed delayed sleep onset and reduced sleep quality compared to those with lower screen time duration.

The study findings are consistent with previous research reporting a positive association between excessive digital device usage and poor sleep quality among students. Earlier studies have also suggested that prolonged near work and screen exposure may contribute to visual stress and progression of refractive errors, particularly myopia. The increased prevalence of digital eye strain symptoms observed in this study further highlights the growing ocular health concerns associated with modern digital lifestyles [12].

IX. CONCLUSION

The present study found a significant association between prolonged screen time and poor sleep quality among students with refractive errors. Increased digital device usage was also associated with a higher prevalence of digital eye strain symptoms such as eye fatigue, headache, and blurred vision. Excessive screen exposure may negatively affect both visual comfort and sleep health in students. The study highlights the need for increased awareness regarding responsible digital device usage, regular eye examinations, appropriate visual ergonomics, and healthy sleep practices among students with refractive errors. Further large-scale studies are recommended to better understand the long-term impact of screen exposure on ocular and sleep health.

REFERENCES

[1]. Y. Hu, Q. Xu, J. Shi, *et al*., "Poor Uncorrected Visual Acuity and Association With Sleep Duration and Screen Time: A Dose–Response Relationship Study," *Dose-Response*, vol. 19, no. 4, 2021, doi: 10.1177/15593258211042161.
[2]. Z. Zong, Y. Zhang, J. Qiao, *et al*., "The association between screen time exposure and myopia in children and adolescents: a meta-analysis," *BMC Public Health*, vol. 24, p. 1625, 2024, doi: 10.1186/s12889-024-19113-5.
[3]. Y. Mineshita, H. K. Kim, H. Chijiki, *et al*., "Screen time duration and timing: effects on obesity, physical activity, dry eyes, and learning ability in elementary school children," *BMC Public Health*, vol. 21, no. 1, p. 422, 2021, doi: 10.1186/s12889-021-10484-7.
[4]. M. Ayaki, H. Torii, K. Tsubota, *et al*., "Decreased sleep quality in high myopia children," *Scientific Reports*, vol. 6, p. 33902, 2016, doi: 10.1038/srep33902.
[5]. B. A. Holden, T. R. Fricke, D. A. Wilson, *et al*., "Global prevalence of myopia and high myopia and temporal trends from 2000 through 2050," *Ophthalmology*, vol. 123, no. 5, pp. 1036–1042, 2016.
[6]. J. Foreman, A. T. Salim, A. Praveen, *et al*., "Association between digital smart device use and myopia: a systematic review and meta-analysis," *JAMA Network Open*, vol. 8, no. 2, p. e2455842, 2025.
[7]. C. W. Wong, A. Tsai, J. B. Jonas, *et al*., "Digital screen time during the COVID-19 pandemic: risk for a further myopia boom?" *American Journal of Ophthalmology*, vol. 223, pp. 333–337, 2021.
[8]. K. Kaur, B. Gurnani, S. Nayak, *et al*., "Digital eye strain—A comprehensive review," *Ophthalmology and Therapy*, vol. 11, no. 5, pp. 1655–1669, 2022.
[9]. H. M. Huang, D. S. Chang, and P. C. Wu, "The association between near work activities and myopia in children—A systematic review and meta-analysis," *PLoS One*, vol. 10, no. 10, p. e0140419, 2015.
[10]. A. L. Sheppard and J. S. Wolffsohn, "Digital eye strain: prevalence, measurement and amelioration," *BMJ Open Ophthalmology*, vol. 3, no. 1, p. e000146, 2018.
[11]. M. Rosenfield, "Computer vision syndrome: A review of ocular causes and potential treatments," *Ophthalmic and Physiological Optics*, vol. 31, no. 5, pp. 502–515, 2011.

ISSN No:-2456-2165 https://doi.org/10.38124/ijisrt/26may1180

[12]. A. M. Chang, D. Aeschbach, J. F. Duffy, and C. A. Czeisler, "Evening use of light-emitting eReaders negatively affects sleep, circadian timing, and next-morning alertness," *Chronobiology International*, vol. 32, no. 5, pp. 665–676, 2015.