

## EFFECT OF SHORT-TERM AND LONG TERM SLEEP DEPRIVATION ON OCULAR HEALTH

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### ABSTRACT

**Background:** Sleep is an active physiological activity that is essential to life and often takes up one-third of it. It is crucial for maintaining good physical and mental health. Sleep deprivation is becoming more widespread in today's lifestyles. Both short-term and long-term sleep loss have been associated to ocular surface abnormalities.

**Objective:** To compare the effects of short-term and long-term sleep deprivation on ocular health by assessing key parameters, including dry eye, intraocular pressure, corneal curvature, visual performance, eyelid conditions, conjunctival status, corneal sensitivity, and tear film stability.

**Methodology:** A 3-month comparative cross-sectional study was carried out at Rehmat-Ul-Lilalameen Welfare Hospital in Sargodha, with 72 participants chosen through convenience sampling. Participants aged 18-35 years were divided into short- and long-term sleep deprivation groups, and data were collected via questionnaire and proforma. Ocular assessments included visual acuity, slit lamp examination, TBUT, keratometry, corneal sensitivity, and intraocular pressure.

**Results:** The study featured 72 participants (36 per group), with males accounting for 61.1% of the sample. The short-term group had improved sleep quality, with 55.6% reporting good sleep, compared to the long-term group, which had none and 41.7% reporting poor sleep. Prolonged deprivation resulted in more severe ocular symptoms, such as daily impaired vision (61.1%) and headaches (58.3%), as well as greater rates of eye strain (52.8%), severe dry eye (41.7%), and severe conjunctival congestion. Myokymia was found in all long-term instances, compared to 41.7% in short-term cases, and ptosis was exclusively seen in the long-term group (50%). The long-term group experienced significantly greater intraocular pressure ( $\approx 15.84-16.17$  mmHg) compared to the short-term group ( $\approx 14.12-14.24$  mmHg,  $p < 0.01$ ). Furthermore, lower sleep duration was strongly correlated with increased corneal staining ( $r = 0.555$ ), conjunctival congestion ( $r = 0.539$ ), and decreased TBUT ( $r = -0.393$ ), demonstrating that sleep deprivation deteriorates ocular surface health.

**Conclusion:** Long-term sleep deprivation was linked to higher intraocular pressure, decreased tear film stability, higher corneal staining, and lower visual acuity than short-term deprivation.

**Keywords:** Long-term sleep, intraocular pressure, tear film stability, corneal staining, visual acuity, short-term deprivation

## INTRODUCTION

Sleep is an active physiological activity that is essential to life and often takes up one-third of it. It is crucial for maintaining good physical, mental, and emotional health. <sup>(1)</sup> Sleep is a natural and changeable condition governed mostly by neurological processes, and it is a physiological component of human life required for health and well-being. Sleep has been linked to decreased awareness of environmental stimuli and a cessation of motor activity. <sup>(2)</sup>

The autonomic nervous system (ANS) is responsible for sleep and is separated into two branches: sympathetic nervous system (SNS) and parasympathetic nervous system (PSNS). Sleep is divided into two separate stages: non-rapid eye movement (NREM) and rapid eye movement (REM). ANS activity is characterized by decreased sympathetic activity and increased PSNS activity during NREM sleep. REM sleep is characterized by more varied ANS activity, with periods of both SNS and PSNS effects. <sup>(3)</sup>

A complicated interaction between chronological age, maturation stage, genetic, behavioural, environmental, and social factors affects sleep patterns and needs. For the best possible health, adults should get at least 7 hours of sleep every night. <sup>(1)</sup> There is strong evidence that getting less than 7 hours of sleep every night is linked to negative health outcomes. <sup>(4)</sup>

According to the National Institutes of Health, preschoolers should get 10–12 hours of sleep per day on average, school-age children and teenagers should get 9 hours, and adults should get 7–8 hours. The body undergoes a number of biological and physiological changes while we sleep. During sleep, the immune system, blood pressure, heart rate, hormone secretion, cellular repair, temperature regulation, memory restoration, and cognition are all regulated. <sup>(5)</sup>

Public health guidelines have focused on nocturnal sleep duration, with 7 to 8 hours of sleep being recommended for older persons. <sup>(6)</sup>

In addition to growing globally, the research of sleep health has also become more varied. Sleep is now recognized as a complex phenomenon that includes its complex relationship with waking in addition to features like quality, regularity, and timing. As a result, cultural, social, and economic factors are now inextricably linked to sleep health, demonstrating that sound sleep is a sign of general health and a high standard of living. <sup>(7)</sup>

Children, adolescents, and adults require sleep to maintain their health and well-being. Sleep is essential for cognitive function, emotions, mental health, cardiovascular, cerebrovascular, and metabolic health. Adequate quantity and quality of sleep also play a role in minimizing the risk of accidents and injuries caused by sleepiness and exhaustion, including workplace accidents and automobile accidents. Healthy sleep necessitates sufficient sleep duration, suitable scheduling, regularity, the absence of sleep disorders, as well as suitable quality, which can be measured by both self-rating and objective sleep continuity markers. <sup>(8)</sup>

Lack of sleep is a regular occurrence in everyday life, whether due to psychological stresses or working shift hours. In healthy people, this may cause decreased attention and vigilance, as well as an overall fall in mood. Total sleep deprivation (TSD) has been linked to general psychomotor slowdown and lower cognitive performance. In affective illnesses, only one night of sleep deprivation can improve mood in 40-60% of those with major depressive disorder, but bipolar patients may even experience (hypo)mania.

Short sleep duration is connected with impaired cognitive performance, diminished productivity, increased absenteeism, compromised immunological function, and higher risk of hypertension, poor cardiovascular outcomes, mortality, depression, rage, and suicidal behaviors. Acute sleep deprivation slows down reaction times, raises the risk of accidents, inhibits the brain's ability to encode new experiences into memory, and restricts the brain's ability to remove

neurotoxic metabolites associated with aging and neurodegenerative illnesses.<sup>(9)</sup>

Sleeping less than 6 hours each night has been linked to a higher body mass index (BMI). Epidemiological and laboratory research have consistently showed that short sleep duration is a significant risk factor for weight gain and obesity, particularly in African-Americans and men, contributing to poor health outcomes. Restricting sleep for up to 5 days can result in short-term weight gain. Several cross-sectional studies have shown that short sleep duration is connected with obesity and the risk of future weight increase in both adults and children. There is evidence that eating and sleeping at irregular times is connected with an increased risk of obesity and a poor metabolic profile. People working night shifts and those with fluctuations in the time of sleep between working "days on" and "days off" have a higher prevalence of obesity and cardiometabolic dysregulation, work habits that desynchronize the circadian clock.<sup>(10)</sup>

#### **METHODOLOGY:**

The study design was Comparative Cross-sectional, a total sample size of 72 participants was selected. The sample size was estimated using a 95% confidence level, appropriate absolute precision, and variability based on previously reported ocular parameters affected by sleep deprivation. The sample was taken using a non-probability convenience sampling technique. The study was completed over a period of months after approval. Participants between 18 to 35 years old (to minimize confounding factors of age-related ocular changes or pediatric sleep patterns). The study was carried out at Rehmat ul lilalameen Welfare Hospital, Ghala Mandi, Sargodha after the approval of the synopsis. A non-probability convenience sampling technique was used to select the 72 participants required for the study. The inclusion criteria consisted of males and females aged between 18 to 45 years to minimize confounding factors of age-related ocular changes and pediatric sleep patterns, along with systemically healthy individuals with no known pre-existing medical conditions affecting sleep or ocular health. Individuals with no known pre-

existing ocular conditions or diseases (e.g., glaucoma, cataracts) were included, as well as individuals with highly irregular sleep schedules or those working night shifts. Participants were excluded if they had active anterior segment diseases such as conjunctivitis, uveitis, keratitis, or corneal ulcers, or visual loss due to corneal opacities, cataracts, glaucoma, retinal disorders, or optic nerve pathologies. Those with recent postoperative or intraoperative complications, as well as individuals who had undergone refractive surgery within the last six months, were also excluded.

Each participant was assigned a unique Patient ID after confirming eligibility and obtaining informed consent. A structured proforma was used to collect demographic data including age, gender, address, occupation, and level of education. A standardized questionnaire was administered to collect information on sleep patterns, ocular history, and medical history. Participants were categorized into short-term and long-term sleep-deprived groups based on their reported sleep duration and duration of sleep disruption using a sleep assessment form. Ocular evaluations, including visual acuity testing, slit lamp biomicroscopy, tear film assessment, and intraocular pressure (IOP) measurement, were then conducted.

To ensure uniformity and reduce test interference, all ocular evaluations were performed in a predetermined sequence. Visual acuity was assessed first using standardized charts such as the Snellen or ETDRS chart at a specified working distance under controlled lighting conditions. Participants were instructed to read letters of decreasing size, and their best-corrected visual acuity was recorded. This was followed by an external examination of the eye to assess blinking, lid position, and any visible ocular abnormalities. A slit lamp biomicroscopic examination was then conducted to evaluate the anterior segment of the eye. The eyelids, conjunctiva and cornea were examined under high magnification using varying beam illumination to detect subtle ocular surface changes associated with sleep deprivation. Tear film assessments, including Tear Break-Up Time (TBUT) test were subsequently performed to

evaluate tear quality and stability. For the TBUT test, a fluorescein dye strip moistened with sterile saline was gently applied to the lower conjunctival sac. After several blinks to distribute the dye evenly, the tear film was observed under a slit-lamp biomicroscope with cobalt blue illumination. Participants were asked to keep their eyes open without blinking, and the time interval between the last blink and the appearance of the first dry spot on the corneal surface was recorded as the TBUT. The procedure was repeated at least three times, and the average value was calculated to ensure accuracy. Under standard settings, a Javal and Schiottz keratometer was used to take keratometric values. To ensure perfect alignment, the patient was sat comfortably, chin on the chin rest, forehead on the headband. The device was carefully focused, and the eyepiece was adjusted to get a clear view of the mires. The horizontal and vertical corneal meridians were measured by lining up the doubling prisms until the pictures were appropriately overlaid. The drum was rotated to measure the cornea's curvature in diopters, and readings were taken along both primary meridians. Errors were reduced by establishing good fixation and minimizing excessive blinking during measurements. Corneal sensitivity was assessed using a sterile cotton wisp as a simple and reliable method. Each participant was asked to look straight ahead while the examiner gently approached the corneal surface from the lateral side to avoid visual anticipation. The central and peripheral areas of the cornea were lightly touched, and participants were instructed to report the sensation immediately. The response was noted as normal, reduced, or absent based on the participant's perception. Care was taken to ensure minimal contact to avoid reflex tearing or discomfort. The procedure was repeated in both eyes to ensure consistency and accuracy of the findings. All observations were recorded systematically on the structured data sheet for further analysis. Intraocular pressure was measured using a Perkinson's tonometer. Standardized procedures were followed throughout, and all

instruments were disinfected before use on each participant. A basic scoring system was used to document ocular symptoms such as dryness, discomfort, eye strain, and photophobia. All collected data were recorded on structured data sheets and analyzed using Excel or SPSS. Each participant was assigned a unique code to maintain confidentiality, and all data were securely stored until completion of analysis.

## RESULTS

The study compared short-term and long-term sleep deprivation groups across ocular and symptom parameters. Independent t-tests showed significantly higher intraocular pressure in the long-term group for both right eye ( $M = 15.84$  vs  $14.24$ ,  $p < 0.01$ ,  $d = 1.12$ ) and left eye ( $M = 16.17$  vs  $14.12$ ,  $p < 0.01$ ,  $d = 0.881$ ). Paired analysis revealed a significant interocular IOP difference ( $p < 0.01$ ,  $d = 1.44$ ). Mann-Whitney U tests indicated the long-term group had significantly less sleep duration, more screen time, worse TBUT, poorer distance and near visual acuity, increased corneal staining, and increased corneal sensitivity, all  $p \leq .005$ . Chi-square analyses showed symptom severity was significantly associated with sleep group ( $p < 0.01$ ): daily blurred vision, headache, and burning sensation occurred exclusively in the long-term group, while severe dry eye, severe redness, and photophobia were also concentrated in or universal to the long-term group. Spearman's correlations confirmed that reduced sleep duration was significantly linked to worse corneal staining ( $r = .555$ ,  $p < 0.01$ ), conjunctival congestion ( $r = .539$ ,  $p < 0.01$ ), and lower TBUT ( $r = -.393$ ,  $p = .001$ ). TBUT was strongly negatively correlated with corneal staining ( $r = -.780$ ,  $p < 0.01$ ) and conjunctival congestion ( $r = -.678$ ,  $p < 0.01$ ). Collectively, the results demonstrate that prolonged sleep deprivation is significantly associated with elevated IOP, impaired tear film and ocular surface health, reduced visual function, and increased frequency/severity of ocular symptoms.

Paired sample statistics of IOP

Intra Ocular Pressure						
Within group analysis	Mean	Mean difference	Std. Deviation	Cohen's d	T	P-value
IOP OD	15.04	-.1073	1.38	1.44	-.630	<0.01
IOP OS	15.15		1.35			

The table shows that the mean intraocular pressure (IOP) was slightly higher in the left eye (15.15 mmHg) compared to the right eye (15.04 mmHg). Although the difference is very small, it

was reported as statistically significant ( $p < 0.01$ ). Overall, this indicates a minimal but measurable interocular variation in IOP within the same participants

Table Descriptive Statistics of Independent Samples Test across sleep deprived groups

Between Group Analysis	sleep group	Mean	Std. Deviation	Mean Difference	F	Cohen's d	P-value
IOP od	short-term sleep deprivation	14.24	1.18	-1.602	1.614	1.12	<0.01
	Long-term sleep deprivation	15.84	1.06				
IOP os	short-term sleep deprivation	14.12	.728	-2.04	5.134	.881	<0.01
	Long-term sleep deprivation	16.17	1.01				

The table shows that individuals with long-term sleep deprivation had significantly higher intraocular pressure (IOP) in both eyes compared to those with short-term sleep deprivation. The differences were statistically significant ( $p < 0.01$ )

with large effect sizes, indicating a strong association. This suggests that prolonged sleep deprivation may contribute to increased IOP and potential ocular risk.

Mann Whitney Test

Between group analysis	sleep group	Mean Rank	Sum of Ranks	Std. Deviation	Z	P Value
Sleep duration	short-term sleep deprivation	26.50	954.00	4.801	-4.801	<0.01
	Long-term sleep deprivation	46.50	1674.00			
Screen time	short-term sleep deprivation	27.50	990.00	.436	-4.865	<0.01

	Long-term sleep deprivation	45.50	1638.00			
Tbut	short-term sleep deprivation	53.11	1912.00	1.70	-6.735	<0.01
	Long-term sleep deprivation	19.89	716.00			
Distance VA	short-term sleep deprivation	31.00	1116.00	.458	-6.735	.005
	Long-term sleep deprivation	42.00	1512.00			
Near VA	short-term sleep deprivation	40.50	1458.00	.316	-2.979	.003
	Long-term sleep deprivation	32.50	1170.00			
Corneal staining	short-term sleep deprivation	18.50	666.00	.822	-7.946	<0.01
	Long-term sleep deprivation	54.50	1962.00			
Corneal sensitivity	short-term sleep deprivation	24.85	894.50	.864	-5.031	<0.01
	Long-term sleep deprivation	48.15	1733.50			
Keratometric values (K1 and K2)	short-term sleep deprivation	K1	.666	0.29	-6.02	<0.01
		K2				
	Long-term sleep deprivation	K1	.641	0.26		
		K2				

The Mann-Whitney U test showed statistically significant differences between short-term and long-term sleep deprivation groups for all non-normally distributed variables. The long-term group had considerably reduced sleep duration (Mean Rank = 46.50 vs 26.50,  $p < 0.01$ ) and more screen time (Mean Rank = 45.50 vs 27.50,  $p < 0.01$ ) than the short-term group. The chronic sleep deprivation group had considerably higher mean Keratometric values (K1 and K2) than the moderate group ( $p < 0.001$ ), indicating increased corneal curvature variability due to continuous sleep deprivation. Ocular parameters were also

significantly worse in the long-term group, including reduced TBUT indicating poorer tear film stability (Mean Rank = 19.89 vs 53.11,  $p < 0.01$ ), worse distance visual acuity (Mean Rank = 42.00 vs 31.00,  $p = .005$ ) and near visual acuity (Mean Rank = 32.50 vs 40.50,  $p = .003$ ), increased corneal staining (Mean Rank = 54.50 vs 18.50,  $p < 0.01$ ), and increased corneal sensitivity (Mean Rank = 48.15 vs 24.85,  $p < 0.01$ ). These data show that extended sleep deprivation causes much more damage in sleep, screen exposure, and a variety of ocular surface and visual function metrics than short-term deprivation.

Table 13: Correlations Spearman's rho

Correlations Spearman's rho		Sleep duration	Corneal staining	Corneal sensitivity	Conjunctival congestion	Tbut
Sleep duration	Correlation Coefficient	.344	.555	.344	.539	-.393
	Sig. (2-tailed)	.003	.000	.003	.000	.001
	N	72	72	72	72	72
Tbut	Correlation Coefficient	-.474	-.780	-.474	-.678	1.000
	Sig. (2-tailed)	.000	.000	.000	.000	.
	N	72	72	72	72	72
Corneal staining	Correlation Coefficient	.570	1.000	.570	.779	-.780
	Sig. (2-tailed)	.000	.	.000	.000	.000
	N	72	72	72	72	72
Corneal sensitivity	Correlation Coefficient	1.000	.570	1.000	.410	-.474
	Sig. (2-tailed)	.	.000	.	.000	.000
	N	72	72	72	72	72
Conjunctival congestion	Correlation Coefficient	.410	.779	.410	1.000	-.678
	Sig. (2-tailed)	.000	.000	.000	.	.000
	N	72	72	72	72	72

Spearman's rho correlations were used to examine the associations between sleep duration, tear film stability, and ocular surface parameters (N = 72 for all experiments). Sleep length had a significant positive link with corneal staining ( $r = .555$ ,  $p < 0.01$ ), corneal sensitivity ( $r = .344$ ,  $p = .003$ ), and conjunctival congestion ( $r = .539$ ,  $p < 0.01$ ), showing that reduced sleep duration is related with worse scores on these ocular measures. Sleep duration also had a negative correlation with TBUT ( $r = -.393$ ,  $p < .001$ ), implying that less sleep leads to poorer tear film stability. TBUT had significant negative correlations with corneal staining ( $r = -.780$ ,  $p < 0.01$ ), conjunctival congestion ( $r = -.678$ ,  $p < 0.01$ ), and corneal sensitivity ( $r = -.474$ ,  $p < 0.01$ ), indicating that decreased tear film stability leads to increased corneal damage, congestion, and altered sensitivity. Corneal staining and conjunctival congestion showed a significant positive correlation ( $r = .779$ ,  $p < 0.01$ ). Overall, the correlation matrix reveals that shorter sleep duration and unstable tear film are substantially linked with poor ocular surface health across a

variety of criteria. According to Spearman's correlation data, a lack of sleep is highly connected with poor ocular surface health. Less sleep was associated with greater corneal staining, conjunctival congestion, increased corneal sensitivity, and lower TBUT, indicating poorer tear film stability. TBUT revealed a substantial negative connection with corneal staining and conjunctival congestion, demonstrating that an unstable tear film is linked to increased corneal damage and redness. The pattern reveals a considerable dose-response relationship: as sleep duration reduces, ocular surface characteristics deteriorate, and these ocular variables are likewise closely associated. In summary, sleep deprivation and tear film instability are major causes of corneal and conjunctival degeneration.

## DISCUSSION

The purpose of my study was to compare the effects of short-term sleep and long term sleep deprivation on ocular health. A total of 72 participants were included, with 36 each in the short-term and long-term sleep deprivation

groups. In the current study, dry eye severity exhibited a definite worsening trend with increasing duration of sleep loss. Participants in the short-term sleep deprivation group had mostly mild (44.4%) to moderate (55.6%) dry eye, but those in the long-term sleep deprivation group had a shift toward more severe disease, with 58.3% having moderate and 41.7% having severe dry eye. These data show that continuous sleep deprivation worsens tear film instability and ocular surface damage, leading to increased severity of dry eye symptoms.

These findings are consistent with those reported by An Y and Kim H in their study published in *Scientific Reports* in 2022, which found a strong link between short sleep duration and a higher prevalence of dry eye disease (DED). A large-scale population-based investigation found that persons sleeping  $\leq 5$  hours per night had a higher prevalence of DED symptoms (19.40%) compared to those who slept longer, which also show that prolonged sleep deprivation not only increases the risk but also worsens the severity of dry eye disease.<sup>(11)</sup>

In the current study, a clear association was shown between sleep quality and the severity of dry eye disease. Participants in the short-term sleep deprivation group reported good (55.6%) to average (30.6%) sleep quality, with only a tiny number having bad sleep (13.9%). In comparison, the long-term sleep deprivation group had much lower sleep quality, with no participants reporting good sleep, 58.3% reporting ordinary sleep, and a sizable minority (41.7%) reporting poor sleep quality. This decrease in sleep quality is associated with an increase in the severity of dry eye. Short-term sleep deprivation resulted in mild to moderate dry eye, however long-term sleep loss resulted in a shift towards more severe forms, with 41.7% having severe dry eye.

These findings are consistent with those reported by Magno MS, Vehof J, and colleagues in *The Ocular Surface* in 2021, who found a strong link between poor sleep quality and dry eye disease in a large population-based investigation. Individuals with dry eye had a significantly higher prevalence of poor sleep quality (36.4%) compared to controls (24.8%), with an elevated risk of dry eye

(OR = 1.5). Furthermore, the link was significantly higher in very symptomatic dry eye, with nearly half (44.9%) of affected patients reporting poor sleep quality (OR = 2.0). Their findings also revealed that decreasing sleep metrics, such as lower sleep duration and increased disturbances in sleep, were consistently linked to higher dry eye prevalence and symptom intensity.<sup>(12)</sup>

Prolonged sleep deprivation was found to be strongly associated with myokymia in the current investigation. In contrast to just 41.7% in the short-term group, it was seen in every participant (100%) in the long-term sleep deprivation group. This significant difference suggests that the probability of eyelid twitching is significantly increased by persistent sleep loss. The findings show a distinct trend where the prevalence of myokymia rises with longer sleep deprivation periods, indicating that insufficient sleep is a major factor in eyelid neuromuscular instability.

In comparison, Hadžić S et al. in 2016 discovered a strong correlation between a higher prevalence of myokymia and less sleep. They found that eyelid twitching was more common in students who slept less during exam times. Stress and specific lifestyle choices were also found to be relevant factors. These results corroborate the current study and provide more evidence that sleep deprivation is a major risk factor for the onset and increasing incidence of myokymia.<sup>(13)</sup>

The findings of the current research indicate that long-term sleep deprivation has a significant deleterious impact on corneal health and structure. Individuals with extended sleep deprivation demonstrated decreased tear film stability (lower TBUT), as well as increased corneal staining and sensitivity. Furthermore, greater Keratometric readings (K1 and K2) in the long-term group indicate changes in corneal curvature, which could reflect early structural or biomechanical changes. The strong negative association between TBUT and corneal staining emphasizes how tear film instability contributes to corneal surface injury.

In 2024, Wang et al. showed that sleep deprivation causes considerable corneal endothelium damage in experimental models. Their findings revealed increased central corneal thickness, as well as

downregulation of critical endothelium functional markers as ZO-1 and Atp1a1, indicating compromised barrier and pump functions. Furthermore, sleep deprivation caused morphological changes, such as increased cellular variability (pleomorphism), and was closely related with mitochondrial dysfunction, which was defined by increased oxidative stress and decreased ATP generation. Their data confirm the negative impact of sleep deprivation on corneal structure and function at both the cellular and molecular levels.<sup>(14)</sup>

The current investigation showed a strong and statistically significant correlation between elevated intraocular pressure (IOP) and extended sleep deprivation. In comparison to the short-term group, participants in the long-term sleep deprivation group had noticeably higher IOP values in both eyes. A slight but statistically significant interocular variation in IOP within individuals was also found by paired analysis. These results imply that ocular hypertension, a recognized risk factor for diseases like glaucoma, may be exacerbated by long-term sleep loss. The long-term group's consistently elevated intraocular pressure (IOP) suggests that prolonged sleep deprivation may have a physiological effect on autonomic modulation or aqueous humor dynamics, underscoring the significance of getting enough sleep to maintain normal intraocular pressure.

In contrast, study conducted by Huang Z et al. in 2025 examined the association between sleep duration, sleep quality, and age-related ocular disorders in a large longitudinal cohort rather than directly measuring intraocular pressure. They found a U-shaped relationship in which the risks of cataract, primary open-angle glaucoma, and diabetic retinopathy were associated with both excessive and insufficient sleep, and these risks were further exacerbated by poor sleep quality. The found correlation with glaucoma indicates that sleep disturbances may have a detrimental effect on ocular health, presumably through mechanisms such as reduced ocular perfusion, autonomic imbalance, or inflammation, even though IOP was not measured. These results highlight the relevance of sleep disturbances in the

development of ocular diseases, which is consistent with and supports the current investigation.<sup>(15)</sup>

## CONCLUSION

The findings of the current research clearly show that long-term sleep deprivation has a considerably greater negative influence on ocular health than short-term sleep deprivation. Participants with extended sleep deprivation had higher intraocular pressure, less tear film stability (as measured by lower TBUT), poorer visual acuity (both distance and near), and increased corneal staining and sensitivity. Furthermore, the frequency and severity of ocular symptoms such as impaired vision, headaches, burning sensations, photophobia, and dry eye—were significantly higher in the long-term group. Structural and functional ocular abnormalities, such as higher Keratometric values, conjunctival congestion, myokymia, and even ptosis, highlight the cumulative nature of ocular damage caused by chronic sleep deprivation. These findings demonstrate that prolonged sleep deprivation is more than just a temporary inconvenience, but a significant risk factor for decreased ocular integrity and visual function.

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