Original Article

Refractive Errors and Academic Performance among Medical Students: Influence of Study Duration, Screen Exposure, and Sleep Patterns

Anas Gul Memon[1*], Keenjhar Rani[1], Rafique Shaikh[1], Muneeb Ur Rehman Khan[1], Waqar Ahmed[1]

ABSTRACT

OBJECTIVE: To evaluate gender-based differences in the prevalence of refractive errors and their association with study hours, screen time, sleep duration, and academic performance among MBBS students at Liaquat University of Medical & Health Sciences.

METHODOLOGY: A comparative cross-sectional study was conducted among 262 MBBS students at LUMHS using stratified random sampling. Data was collected using a self-structured questionnaire, and those unwilling to participate were excluded. SPSS version 27.0 was applied for analysis. Continuous variables were expressed as means and standard deviations, while categorical variables were presented as frequencies and percentages. Associations were tested using the t-test and chi-square tests, statistical significance was defined at $p < 0.05$.

RESULTS: Refractive errors were present in 185 students (70.6%); 111 males (60.0%) and 74 females (40.0%). Myopia was most common (74.3% in females, 72.1% in males), followed by astigmatism (17.6% and 19.8%), and hyperopia (8.1% in both). The highest overall prevalence occurred in final-year students (90.0%), while first-year students showed 80.0%. Myopia in females was significantly linked to study hours (mean 4.18 ± 1.38; $p = 0.002$), while in males, it correlated with screen time (mean 8.84 ± 1.59; $p = 0.041$). Sleep deprivation was associated with myopia in both ($p = 0.000$ and $p = 0.002$). Students with myopia had higher CGPAs (>3.0; $p = 0.004$ and $p = 0.005$).

CONCLUSION: Myopia was the predominant refractive error, strongly associated with lifestyle factors, reduced sleep, longer study hours in females, and higher screen exposure in males.

KEYWORDS: Refractive errors, Study hours, Screen time, sleep duration, CGPA, MBBS students, Gender.

INTRODUCTION

Visual Impairment (VI) is predominantly caused by refractive disorders, which is also the second prevalent cause of blindness[1,2]. Some studies have anticipated a rise in myopic patients from around 1406 million cases in 2000 to nearly 4758 million by the year 2050. Conversely, the number of people ending up being visually impaired is 101 million, and the incidence of people resulting in blindness because of uncorrected refractive errors in 2010 was 6.8 million[3]. The proportion of refractive error is alarmingly high in Pakistan, specifically in the ages 16−39 years, representing the affected population of 27.1 million[4,5]. Refractive errors occur because of disproportion between the axial length of the eye and its optical power, ultimately causing blurred vision [(6)]. Among the types of refractive disorders are primarily myopia (nearsightedness), hyperopia (farsightedness), and astigmatism[7,8]. Myopia, resulting from convergence of incoming parallel light rays at a point in front of the retina[7], is a significant cause of visual impairment worldwide and has epidemic levels in areas of East and Southeast Asia[9]. A sudden increase in frequent myopia cases has been reported in Chinese populations apart from the rise in Asian countries, in the last 50 years[10]. Similarly, the prevalence of myopia, in Pakistan is reported to be 36.5% in adults and 42.2% in the pediatric population[4,11]. Moreover, hyperopia occurs when, parallel light rays focus behind the retina with accommodation at rest[7,12]. Hyperopia is reported worldwide as 30.6% and 38.9% in Asia[4,13]. Moreover, the Estimated Population Prevalence (EPP) of hyperopia in the Southeast Asian population is reported as 44.8% [4,13]. Additionally, adults in Pakistan are 10.14% prone to hyperopia[2,4]. Astigmatism occurs when the refractive power of eye varies at distinct meridians, resulting in two focal lines and a slightly diffuse spot[14,15]. Astigmatism has a global prevalence of approximately 40.4% in adults[13]. While in the Pakistani population, the prevalence is reported to be 37% [16].

Refractive errors have an adverse impact on many domains of life, mainly affecting medical students[17,18]. Medical students are at a higher risk of developing refractive errors due to their longer time spent reading books and longer screen time[19]. Many studies have shown myopia to be most prevalent in medical students compared to hyperopia and astigmatism[19]. Recent studies suggest that longer hours of near work

[1]*Liaquat University of Medical & Health Sciences, Jamshoro, Sindh, Pakistan*
***Correspondence:** anasmemon813@gmail.com*
doi: 10.22442/jlumhs.2026.01504

result in blurred retinal images, leading to myopia[19,20]. Medical students have higher stress levels due to their excessive academic burden, which leads to poor sleep quality and duration, ultimately leading them to develop myopia[21,22]. Sleep has a crucial role in influencing the academic performance of medical students. Students who are prone to sleep deprivation due to higher academic stress eventually develop myopia or other vision-related problems[22].

Several researchers have reported on the high incidence rate of refractive errors in Pakistan. Approximately 16 million people in Pakistan suffer from myopia, along with more than 10 million who have hyperopia, as calculated in 2020[2,23]. Numerous studies also suggested that refractive errors within medical students are seen to be strongly associated with prolonged near work, greater use of technology, sleep deprivation, and excessive academic stress, impacting CGPA/academic performance[17,21,24–28]. Despite that limited data exists on the prevalence of refractive errors and their association with Study hours, Screen time, Sleep duration, and CGPA among MBBS students at LUMHS. Therefore, this study aimed at evaluating the prevalence, types, and their relationship with Study hours, Screen time, Sleep duration, and overall impact on CGPA of students at LUMHS.

The findings of this study address significant gaps in local data regarding the prevalence and types of refractive errors and their strong association with specific lifestyle factors in a high-risk population. These findings will contribute to increasing self-awareness among students regarding eye health, thus improving their quality of life, and highlighting the importance of early correction of refractive errors with spectacles or contact lenses. This study can help university and academic policy makers understand the need to arrange eye camps for early detection of refractive errors and to make adequate academic policies that reduce the increasing rates of refractive errors among MBBS students.

METHODOLOGY

This comparative cross-sectional study was conducted at Liaquat University of Medical & Health Sciences, Jamshoro, Sindh, Pakistan, between July and October 2025. The study included undergraduate MBBS students aged 18–25 years at LUMHS who had been diagnosed by an ophthalmologist with either corrected or uncorrected refractive errors, including myopia, hyperopia, and astigmatism. Excluded group consisted of unwilling students, other university students, students diagnosed with other ocular condition (glaucoma, retinal disorders, keratoconus, etc.), who had undergone ocular surgeries (LASIK, cataract surgery), who were suffering from mental/ psychological disorders that made it difficult to administer the questionnaire, and students currently on treatment for systemic conditions affecting vision (diabetes mellitus, hypertension, autoimmune conditions, infectious diseases or other systemic causes).

The study received ethical approval from the Research Ethics Committee of Liaquat University of Medical & Health Sciences (Ref No: LUMHS/REC/-906) and was conducted in accordance with the Declaration of Helsinki 1975, and Informed consent was obtained electronically from all participants, who were also informed of their right to withdraw at any stage; all information was kept confidential and used solely for research purposes.

Sample size for all students of five MBBS years was calculated using the OpenEPi app; the data added to it was the percentage prevalence of refractive errors, which was 27.6%, measured in a research conducted on the students of Iraq[7]. The calculated sample size was 262 with a confidence level of 95% and margin of error of 5%. A probability stratified random sampling technique was used. A self-constructed questionnaire was administered via an online Google Form or an in-person interview.

The questionnaire contained items on demographic and clinical status (age, gender, year of study, and refractive error), lifestyle factors (Study Hours, Screen Time, and Sleep Duration), and academic performance (Cumulative Grade Point Average (CGPA)).

Participants were asked for their age, gender, year of study, and to self-report any diagnosis of refractive disorders, i.e., myopia, hyperopia, or astigmatism by an eye care professional, a usual practice seen in several studies[17,29,30].

Data on lifestyle factors was collected by asking participants to report average daily time spent on: Study Hours (hours/day of reading/near-work), Screen Time (hours daily spent on digital devices), and Sleep Duration (hours of day and night sleep). Core items used in myopia risk factor studies and the International Physical Activity Questionnaire (IPAQ) were added to ensure proper assessment of Study Hours and Screen Time[17,29–31]. Sleep Duration was evaluated using the Pittsburgh Sleep Quality Index (PSQI) Component 1, a cornerstone tool considered for the assessment of sleep[32,33].

Academic performance was measured by asking students' overall Cumulative Grade Point Average (CGPA). Several studies have used CGPA for overall academic performance[33]. Furthermore, high reliability and correlation with GPAs reported by the academic registry have been established[33,34]. CGPA was classified according to the grading system at LUMHS (out of 4.00, the %age of marks; 85-100 is 4.00, 70-84 is 3.50, 60-69 is 3.00, 50-59 is 2.00, and 0-49 is 0.00 (fail)).

Data was imported into Microsoft Excel 2024 and analyzed using the IBM SPSS version 27.0. Categorical data (gender, refractive error, CGPA, year of study) were expressed in frequency and percentages. Means and standard deviations (SD) were calculated for continuous variables (hours/time).

The relationship between categorical data was evaluated using Pearson's Chi-square test. Independent Samples t-test was applied to compare the means of continuous variables (Study Hours, Screen Time, and Sleep Hours) between diagnosed cases and gender, stratified by academic years. Statistical significance was specified as $P < 0.05$ for all associations.

RESULTS

Table I represents the characteristics of study participants. The mean age of study participants was 21.69 ± 1.79 years. Among the total participants, 185 (70.6%) reported a diagnosis of one or more refractive errors. Males reported more refractive errors (n = 111, 60.0%) than females (n = 74, 40.0%). Myopia was seen as the common refractive error in both females 74.3% and 72.1% in males, followed by Astigmatism, which was 17.6% in females and 19.8% in males, and Hyperopia showed the least prevalence in both genders, 8.1%.

Table I: Socio-demographic characteristics of MBBS students

Parameters		Frequency (*n*)	Percentage (*%*)
Gender	Female	118	45.05
	Male	144	54.96
Age (*years*)	≤ 20	100	38.17
	21 – 32	120	45.80
	≥ 24	42	16.03
Academic Year of Study	1st	55	21.00
	2nd	50	19.10
	3rd	52	19.80
	4th	55	21.00
	5th	50	19.10

For the academic level, year-wise distribution as depicted in **Figure 1**, showed the total number of students diagnosed with refractive errors in the 1st year; n = 44 (80.0%), with the highest prevalence of astigmatism seen in the students of the 1st year; n = 12 (27.3%). Students: n = 25 (50.0%), were detected with refractive errors in the 2nd year and in the 3rd year; n = 31 (59.6%), among all academic years, lowest prevalence of myopia was found in the 2nd; n = 22 (88.0%), and the 3rd year; n = 22 (71.0%). Prevalence of refractive errors in 4th year; n = 40 (72.7%) with peak prevalence of myopia was found across all academic years; n = 31 (77.5%), and in final year highest number of students reported refractive errors; n = 45 (90.0%) with peak prevalence of hyperopia across all academic years; n = 5 (11.1%).

Table II presents the association between refractive errors and multiple variables, including study hours, screen time, and sleep duration, in both genders. Female students diagnosed with myopia (n = 55, 74.3%) were found to be studying for longer hours, 4.18 ± 1.38 (hrs). A significant association was observed between longest study hours and myopic females (P = 0.002). No significant association was observed with myopic males (3.74 ± 1.72 (hrs), P = 0.307) or for either gender with astigmatism or hyperopia.

Moreover, regarding Screen Time, male students with myopia (n = 80; 72.1%) were found to be more prone to longer use of digital devices (8.84 ± 1.59; P = 0.041). Screen Time of myopic females showed no significant association (7.93 ± 1.9; P = 0.68), and a similar observation was found with other refractive errors in both genders.

In addition to that, a strong association of refractive errors was observed with Sleep Duration, as given in **Table III**. All those female students (74.3%) who had an average sleep time of 5.73 ± 0.89 were myopic (P = 0.000). Similarly, myopic males (72.1%) with a sleep duration of 5.96 ± 1.00 showed a significant association (P = 0.002). Moreover, the sleep duration of male students with astigmatism (19.8%) was 5.73 ± 1.03 and showed a significant association (P = 0.032).

Regarding the academic performance of students, **Table III** illustrates characteristics of CGPA and refractive errors. The majority of the female students had a CGPA of more than 3.0 (47.27%), and a large group had a CGPA of more than 3.5 (43.64%).

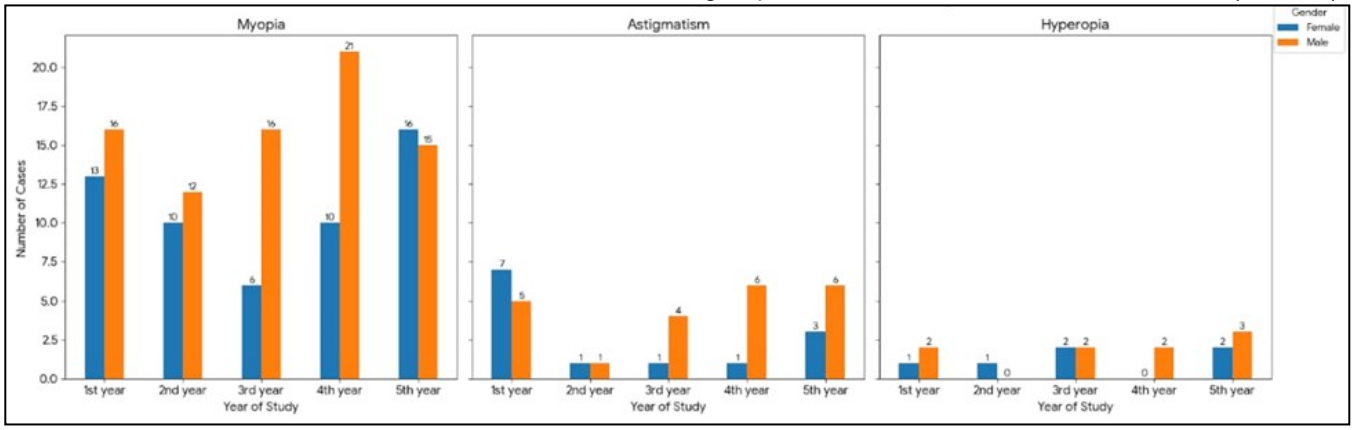

Figure 1: Year-wise distribution of cases of refractive errors

Table II: Refractive errors in relation to study hours, screen time, and sleep duration

Variable	Gender	Refractive Error	Frequency (*n*)	Mean (*hrs*)	SD	p−value
Study Hours	Female	Myopia	55	4.18	1.38	0.002
		Astigmatism	13	3.69	1.70	0.873
		Hyperopia	6	3.83	1.72	0.922
	Male	Myopia	80	3.74	1.23	0.307
		Astigmatism	22	3.73	1.24	0.769
		Hyperopia	9	3.44	1.24	0.605
Variable	**Gender**	**Refractive Error**	**Frequency (*n*)**	**Mean (*hrs*)**	**SD**	**p−value**
Screen Time	Female	Myopia	55	7.93	1.98	0.680
		Astigmatism	13	8.23	1.83	0.439
		Hyperopia	6	5.83	2.48	0.092
	Male	Myopia	80	8.84	1.59	0.041
		Astigmatism	22	9.18	1.62	0.069
		Hyperopia	9	8.22	1.64	0.516
Variable	**Gender**	**Refractive Error**	**Frequency (*n*)**	**Mean (*hrs*)**	**SD**	**p−value**
Sleep Duration	Female	Myopia	55	5.73	0.89	0.000
		Astigmatism	13	6.15	1.14	0.943
		Hyperopia	6	6.17	1.17	0.985
	Male	Myopia	80	5.96	1.00	0.002
		Astigmatism	22	5.73	1.03	0.032
		Hyperopia	9	6.56	0.73	0.145

Table III: Refractive errors in relation to academic performance (CGPA)

Gender	Refractive Error	Frequency (*n*)	p−value	Percentage of Students with CGPA (%)
Female	Myopia	55	0.004	>2.5: (9.09), >3.0: (47.27), >3.5: (43.64)
	Astigmatism	13	0.152	>2.5: (23.08), >3.0: (23.08), >3.5: (53.85)
	Hyperopia	6	–	>2.5: (33.33), >3.0: (0.00), >3.5: (66.67)
Male	Myopia	80	0.005	>2.5: (26.25), >3.0: (38.75), >3.5: (35.00)
	Astigmatism	22	0.292	>2.5: (40.91), >3.0: (31.82), >3.5: (27.27)
	Hyperopia	9	0.599	>2.5: (33.33), >3.0: (55.56), >3.5: (11.11)

Furthermore, the smallest portion had a CGPA of more than 2.5 (9.09%), and all were diagnosed with myopia (P = 0.004). Similarly, a significant proportion of males with a CGPA of more than 3.0 (38.75%), more than 3.5 (35.00%), and more than 2.5 (26.25%) had myopia (P = 0.005). These findings suggest that students diagnosed with myopia tend to have higher academic performance.

DISCUSSION

This study estimated that 185 (70.6%) MBBS students at Liaquat University of Medical & Health Sciences have refractive errors. The results align with research carried out in Akhtar Saeed Medical and Dental College, Lahore, which showed a 67% prevalence of refractive errors among undergraduate medical students[4]. Refractive errors were reported to be present in 68.2% of medical students by another study conducted at DOW Medical College, Karachi[35].

The most frequently observed refractive error was myopia, affecting both 55 (74.3%) female and 80 (72.1%) male students. Astigmatism was reported by 13 (17.6%) females and 22 (19.8%) males, while hyperopia was reported by 6 (8.1%) females and 9 (8.1%) males. These results are approximated to a study performed at Kazerun University, Iran, which demonstrated that about 50% of students were found to have refractive errors, following a similar order of prevalence for various errors. The most typical error of refraction was identified to be myopia, as seen in 44.2% female and 38.8% male students, while astigmatism was found in 29.2% females and 30.2% males, and hyperopia in 2.2% females and 2.8% male study participants[3].

This study demonstrated highest prevalence of refractive errors in myopic female students with the longest hours of study per day (4.18±1.38). The marked increase in myopia among female medical students with the longest study hours might be due to such prolonged duration of tasks requiring near vision[3]. Findings of a study conducted in Guntur

Medical College, Guntur, Andhra Pradesh, also reflected those medical students who are engaged in reading and studying on an average for more than 25 hours weekly have a higher prevalence of myopia[25]. Higher prevalence of myopia in females doing longer hours of study might be due to increased stress, because it is widely encountered by most medical students as they pass through rigorous and highly challenging academic environment.

Higher screen times may be linked to the occurrence of refractive errors. In this study, 80 (72.1%) male students with myopia reported the highest hours of screen time (8.84±1.59). In a study carried out among Jordanian medical students, more than 25% of students had more than 8 h/day use of electronic devices[30]. Similar finding was observed in students who spent over 3 hours on mobile phones, had 74.6% refractive errors[4].

A higher percentage of Myopia was reported by female (74.3%) and male (72.1%) students who had the least sleeping time (5.73±0.89 & 5.96±1.00). Researchers described in this study, conducted at Shenyang, China, that sleep duration below 8 hours was correlated with increased risk of myopia [(22)]. Our study found a unique association between males with Astigmatism (19.8%), who also had fewer sleeping hours (5.73±1.03). While astigmatism is the primary variable, it may be interacting with other lifestyle factors. It is crucial to emphasize that this finding demonstrates a significant association and not a direct causal relationship.

Most of the students with good academic performance were myopic females and males having a CGPA of more than 3.0 (47.3% and 38.8%), followed by having a CGPA of more than 3.5 (43.6% and 35.0%). These results show that medical students are vulnerable to high stress due to academic burdens and are prone to longer periods of near work/reading, ultimately developing myopia. Another study conducted at Guntur Medical College, Guntur, Andhra Pradesh, also suggests that intraocular pressure is raised by the eyeball during accommodation (near-work), contributing in axial elongation of the eyeball and leading to myopia[25]. Similarly, a study on Iranian University Students, Kazerun, suggests that educated people, due to longer hours of near activities like studying and limited outdoor activity, are at increased risk of developing myopia[3].

Focusing on the high-risk population (MBBS students) with the highest prevalence of refractive errors, exploration of significant association of modifiable lifestyle risk factors, and comprehensive analysis of variables (Study Hours, Screen Time, Sleep Duration, Gender-based variation, and impacts on Academic Performances (CGPA) of medical students) were the strengths of this study. On the other hand, this study was based on a single department of a single institution, which means the specified setting of that department and institution could have influenced the precision and generalizability of the results. Gathering responses at one point in time, the cross-sectional design failed to establish a causal relationship between variables. Additionally, reliance on self-reported data about lifestyle variables (Study Hours, Screen Time, and Sleep Duration) is subject to recall bias. Along with that, an objective diagnosis of refractive errors should have been made instead of a self-reported diagnosis of refractive errors to ensure accurate severity of the errors. Further large-scale studies are required to suggest any changes in lifestyle factors responsible for causing refractive errors and their overall effect on the academic performance of medical students.

CONCLUSION

This study establishes a high prevalence of myopia among both male and female students of MBBS at Liaquat University of Medical & Health Sciences, Jamshoro, Sindh, Pakistan. The study found a strong association between modifiable lifestyle factors and refractive errors, with a critical finding between insufficient sleep and myopic students (both genders). Significant gender variations were also seen in females with myopia linked to prolonged study hours and myopic males to longer screen time. In addition to that, this study revealed exceptional academic performance of students associated with refractive errors in both genders. These findings underscore the need for increased awareness of eye health and for organizing eye camps in the University for early identification and correction of these refractive errors among MBBS students. These findings would help academic policy makers in managing the academic load of students and encourage a healthy academic life balance.

Ethical permission: Liaquat University of Medical & Health Sciences, Jamshoro, Pakistan, ERC approval letter No. LUMHS/REC/-906.

Conflict of interest: There is no conflict of interest between the authors.

Financial Disclosure / Grant Approval: This study did not receive any specific grant from funding agencies in the public, commercial, or not-for-profit sectors.

Data Sharing Statement: The corresponding author can provide the data proving the findings of this study on request. Privacy or ethical restrictions bound us from sharing the data publicly.

AUTHOR CONTRIBUTION

Memon AG: Study design and concept, data analysis, literature review, manuscript writing and formatting.
Rani K: Supervisor, revision of article, and final approval.
Shaikh R: Data collection, manuscript proofreading.
Khan MR: Data collection, literature review, critical revision of manuscript.
Ahmed W: literature search and intellectual input.

REFERENCES

1. Naidoo KS, Fricke TR, Frick KD, Jong M, Naduvilath TJ, Resnikoff S, et al. Potential Lost Productivity Resulting from the Global Burden of Myopia. Ophthalmology. 2019 Mar; 126(3): 338–46.
2. GBD 2019 Blindness and Vision Impairment Collaborators, Vision Loss Expert Group of the Global Burden of Disease Study. Causes of blindness and vision impairment in 2020 and trends over 30 years, and prevalence of avoidable blindness in relation to VISION 2020: the Right to Sight: an analysis for the Global Burden of Disease Study. Lancet Glob Health. 2021 Feb; 9 (2): e144–60.
3. Hashemi H, Pakzad R, Ali B, Yekta A, Ostadimoghaddam H, Heravian J, et al. Prevalence of Refractive Errors in Iranian University Students in Kazerun. J Curr Ophthalmol. 2020 Mar 23; 32(1): 75–81.
4. Maqbool S, Rizwan AR, Manzoor I, Qais A, Furqan A, Rehman A. Prevalence of Refractive Errors among Medical Students and Identification of Associated Factors. Life Sci. 2021 Sept 28; 2 (4): 5.
5. Lee MJ, Varadaraj V, Tian J, Bandeen-Roche K, Swenor BK. The Association between Frailty and Uncorrected Refractive Error in Older Adults. Ophthalmic Epidemiol. 2020 June; 27(3): 219–25.
6. Harb EN, Wildsoet CF. Origins of Refractive Errors: Environmental and Genetic Factors. Annu Rev Vis Sci. 2019 Sept 15; 5: 47–72.
7. Aljaberi HA, Ali IR, Noori ZTM. Prevalence of refractive errors among school students in Iraq — A systematic review and meta-analysis. J Optom. 2025; 18(1): 100534.
8. Maru L, Yitayew M, Getu D, Melkamu S, Debebe W. Visual Impairment and Associated Factors among randomly selected Secondary School Students of Assosa Zone, North West Ethiopia [Internet]. Research Square; 2022 [cited 2025 June 22]. Available from: https:// www.researchsquare.com/article/rs-2095664/v1.
9. Wang SK, Guo Y, Liao C, Chen Y, Su G, Zhang G et al. Incidence of and Factors Associated With Myopia and High Myopia in Chinese Children, Based on Refraction Without Cycloplegia. JAMA Ophthalmol. 2018 Sept; 136(9): 1017–24.
10. Huang L, Kawasaki H, Liu Y, Wang Z. The prevalence of myopia and the factors associated with it among university students in Nanjing. Medicine (Baltimore). 2019 Mar 8; 98(10): e14777.
11. Abbas H, Awais M, Naimat K. Prevalence and pattern of refractive errors in school going children of Mangla Cantonment. Pak Armed Forces Med J. 2019 Oct 23; 69(5): 1125–8.
12. Abady NH. Refractive status of patients attending the eye clinic at Fallujah Teaching Hospital in Iraq. J Emerg Med Trauma Acute Care. 2024 Feb 8; 2024(1-The 3rd Annual International Conference on Information and Sciences): 5.
13. Hashemi H, Fotouhi A, Yekta A, Pakzad R, Ostadimoghaddam H, Khabazkhoob M. Global and regional estimates of prevalence of refractive errors: Systematic review and meta-analysis. J Curr Ophthalmol. 2018 Mar; 30(1): 3–22.
14. Wang Y, Mu J, Yang Y, Li X, Qin H, Mulati B et al. Prevalence and risk factors for astigmatism in 7 to 19-year-old students in Xinjiang, China: a cross-sectional study. BMC Ophthalmol. 2024 Mar 13; 24: 116.
15. Harvey EM. Development and Treatment of Astigmatism-Related Amblyopia. Optom Vis Sci Off Publ Am Acad Optom. 2009 June; 86(6): 634–9.
16. Shah SP, Jadoon MZ, Dineen B, Bourne RRA, Johnson GJ, Gilbert CE et al. Refractive errors in the adult pakistani population: the national blindness and visual impairment survey. Ophthalmic Epidemiol. 2008; 15(3): 183–90.
17. Sleiman K, Damaj A, Ali HM, Akiki D, Bleik J. Myopia prevalence and risk factors among medical trainees in Lebanon. Saudi J Ophthalmol. 2023 Mar 13; 37(3): 241–6.
18. Berhane MA, Demilew KZ, Assem AS. Myopia: An Increasing Problem for Medical Students at the University of Gondar. Clin Ophthalmol Auckl NZ. 2022; 16: 1529–39.
19. Prevalence of Refractive Errors Among Medical Students of Raichur Institute of Medical Sciences, Raichur, Karnataka, India - PMC [Internet]. [cited 2025 Oct 14]. Available from: https:// pmc.ncbi.nlm.nih.gov/articles/PMC11117172/.
20. Lin LL, Shih YF, Lee YC, Hung PT, Hou PK. Changes in ocular refraction and its components among medical students--a 5-year longitudinal study. Optom Vis Sci Off Publ Am Acad Optom. 1996 July; 73(7): 495–8.
21. Biswas S, El Kareh A, Qureshi M, Lee DMX, Sun CH, Lam JSH, et al. The influence of the environment and lifestyle on myopia. J Physiol Anthropol. 2024 Jan 31; 43: 7.
22. Zhang D, Sun B, Wu M, Liu H, Zhou L, Guo L. Prevalence and associated factors of myopia among school students in Shenyang, China: a cross-sectional study. Front Public Health. 2023 Aug 30; 11: 1239158.
23. Lee L, Javaid MI, Riaz F, Awan F, Varga B, Ho SM et al. Quality of refractive error care in Pakistan: an unannounced standardised patient study. BMJ Open Ophthalmol. 2023 Oct 25; 8(1): e001354.
24. Bahakim NO, Geddawy AI, Sharma K, Alkhathlan KM, Alsheddi MIM, Al-Zogbi ASA, et al. Visual status among undergraduate students: Findings from an emerging university in Saudi Arabia. Saudi J Biol Sci. 2021 Aug; 28(8): 4683–90.
25. Bussa M, Ravi BG, Nehakamalini P. Study on

Incidence and Progression of Refractive Errors in Medical Students. Nepal J Ophthalmol. 2019 Dec 31; 11(2): 167–71.
26. Huang HM, Chang DST, Wu PC. The Association between Near Work Activities and Myopia in Children—A Systematic Review and Meta-Analysis. PLoS ONE. 2015 Oct 20; 10(10): e0140419.
27. Dyrbye LN, Thomas MR, Shanafelt TD. Systematic review of depression, anxiety, and other indicators of psychological distress among U.S. and Canadian medical students. Acad Med J Assoc Am Med Coll. 2006 Apr; 81(4): 354–73.
28. Albqoor MA, Shaheen AM. Sleep quality, sleep latency, and sleep duration: a national comparative study of university students in Jordan. Sleep Breath Schlaf Atm. 2021 June; 25 (2): 1147–54.
29. Abuallut II, Alhulaibi AA, Alyamani AA, Almalki NM, Alrajhi AA, Alharbi AH et al. Prevalence of Refractive Errors and its Associated Risk Factors among Medical Students of Jazan University, Saudi Arabia: A Cross-sectional Study. Middle East Afr J Ophthalmol. 2021 Jan 19; 27(4): 210–7.
30. Alqudah AA, Bauer AJ, Aleshawi A. Refractive errors among medical students in Jordan: prevalence, types and possible risk factors. Future Sci OA. 9(2): FSO839.
31. Clina JG, Sayer RD, Friedman JE, Chui TK, Mehta T, Rimmer JH et al. Reliability and Validity of the International Physical Activity Questionnaire Adapted to Include Adults With Physical Disability. J Phys Act Health. 2024 Feb 1; 21(2): 189–96.
32. Buysse DJ, Reynolds CF, Monk TH, Berman SR, Kupfer DJ. The Pittsburgh Sleep Quality Index: a new instrument for psychiatric practice and research. Psychiatry Res. 1989 May; 28(2): 193–213.
33. Alotaibi AD, Alosaimi FM, Alajlan AA, Bin Abdulrahman KA. The relationship between sleep quality, stress, and academic performance among medical students. J Fam Community Med. 2020; 27(1): 23–8.
34. Cassady JC. Self-Reported GPA and SAT A Methodological Note. Practical Assessment, Research, and Evaluation. Scientif Res Publ. 2001; 7: 1-4.
35. Economics MA, Jabir M. Refractive Errors, Eye Disorders & Associated Risk Factors Amongst Medical Students. Ophthalmology. 2017; 15: 384.