RESEARCH ARTICLE

A comparative analysis of intelligence, grades, and lifestyle in myopic vs. non-myopic Karachi students

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Abstract

Objective: To compare intelligence levels, academic grades and demographic, family, social and academic factors between myopic and non-myopic undergraduate students.

Method: The analytical, prospective, cross-sectional study was conducted from June 2023 to April 2024 at Dow University of Health Sciences, Karachi, and comprised undergraduate students from medical, dental and allied health sciences programmes. Data was collected using a subject evaluation proforma, and was analysed using SPSS 21.

Result: Of the 302 subjects, 233(77.2%) were females and 249(82.4%) were aged 19-21 years. The frequency of myopia was 172(57%). There were no significant differences in grade point average, intelligence quotient, gender and blood group (p>0.05) between myopic and non-myopic subjects. Paternal myopia showed a significant trend towards positive association with myopia (*p*=0.084). Although not significant, myopic students tended to study more (*p*=0.904). No significant differences were found in time spent on computers (*p*=0.127), mobile phones (*p*=0.802), outdoor activities (*p*=0.778) and sleep duration (*p*=0.673).

Conclusion: The study found no significant association of myopia with cognitive ability or academic success among university students.

Keywords: Myopia, Intelligence, Academic achievements. (JPMA 76: 1809; 2026)

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Introduction

Myopia, or short-sightedness, is a refractive error (RE) in which the light rays are focused in front of the retina due to an elongated eyeball or excessively curved cornea.[1] In 2020, approximately 46.1% of the South-East Asian population aged 10-39 years were affected by myopia.[2] Although no recent nationwide population-based study has reported a definitive overall prevalence of myopia across all age groups in Pakistan, available epidemiological evidence from regional and age-specific studies indicates a substantial burden of the disease, with reported prevalence ranging from 36% to 54%.[3]

Being the most prevalent type of RE, myopia not only impairs vision, but also places a significant financial strain on individuals due to the high expense of spectacles, lenses and other related ocular corrective treatments.[4]

Although the mechanism of development of myopia and its progression is still unclear, myopia has been associated with genetic, environmental and lifestyle factors.[5] It is more prevalent in girls than boys.[6] Individuals with one or two myopic parents are 2-3 times more myopic than their counterparts.[7] A number of environmental factors have been explored in relation to its causation, including excessive exposure to low or dim light, limited outdoor time and activities.[8] Digital eye strains caused by the use of smartphones, tablets, computers, televisions or other screens are all found responsible for its increasing prevalence.[9] Individuals with O+ and A+ blood groups are found to have increased RE incidence.[10]

Studies indicate that students with myopia have a higher intelligence quotient (IQ) than non-myopic, suggesting a link between genetic inheritance of intelligence and myopia.[11] Intelligence is regarded as a general mental capacity for reasoning, problem-solving and learning that necessitate mental perception, focus, memory, language and planning.[12] Intelligence level is measured by a consolidation of multiple IQ tests that require answering of questions based on available information, thus assessing an individual's reasoning, specific knowledge, vocabulary, visual spatial processing skills, working memory and perceptual skills. The result of IQ test is denoted as score that ranges 0-190, where 0-39 is for severely challenged, while 145 or above is for a genius.[13]

Research has also shown a link between myopia and

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educational levels. An individual's years of education have a positive relationship with myopia. The higher the academic performance, the faster is the development of myopia. Academic grades and achievement test results are frequently regarded as indicators of cognitive ability. Grades show the student's overall academic prowess and intelligence, based on a four-point scale.[14-16]

Some studies comparing the two indicate that IQ and academic success do not significantly correlate with each other, and that a person's hard work can compensate for their lack of intelligence in order to get better grades. Although some studies suggest a connection between the two, their relationship with myopia has not been clearly defined.[17,18]

In view of diverse study results, the current study was planned to assess and compare IQ levels and academic grades among undergraduate university students based on their myopia status, and to analyse various demographic, familial, social and academic factors between myopic and non-myopic students.

Subjects and Methods

The analytical, prospective, cross-sectional study was conducted from June 2023 to April 2024 Dow University of Health Sciences (DUHS), Karachi. After approval from the institutional review board, (#IRB-3009/DUHS/Approval/2023/210), undergraduate students from medical, dental and allied health sciences of either gender aged 19-25 years were enrolled from various DUHS-affiliated institutes using non-probability convenience sampling technique based on voluntary participation. All eligible myopic and non-myopic students available during the data-collection period were invited to participate. As recruitment was based on availability and willingness to participate, the total number of students approached was not formally recorded, and a non-response rate was not calculated. Participants with uncorrected REs, those with a history of corrective surgery for myopia, individuals who provided incomplete information, and those who did not provide informed consent were excluded. The sample size for estimating a single population proportion was calculated using the standard formula: $n = Z^2 \times p \times (1 - p) / d^2$ where n was the required sample size, Z was the standard normal deviate corresponding to a 95% confidence level (Z=1.96), p was the expected prevalence of myopia (84%), based on a previous study 3, and d was the margin of error set at 5% (0.05). With a design effect of 1.0, the sample size was inflated by >45% to improve the robustness of the study.

Data was collected using a structured proforma that obtained self-reported information on myopic status, associated risk factors, and lifestyle characteristics. Prior to data-collection, the proforma was pilot-tested on a small group of participants (n=10) to assess clarity and comprehension. Minor modifications were made accordingly, and these participants were excluded from the final analysis.

The final proforma included items on personal demographics, family history, social factors and daily-life habits considered potential risk factors for the development of myopia. Academic performance in preceding educational years was recorded in the form of grades. The proforma was adapted from available literature, but formal reliability and validity was not tested. IQ was assessed using an online Free IQ screening test, comprising 20 verbal and non-verbal questions.[19] The IQ test generated an estimated IQ score on a standardised scale ranging 0-145 and above, with higher scores indicating higher estimated cognitive performance. This tool was used for comparative purposes only, and not for clinical diagnosis.

Data was analysed using SPSS 21. The non-myopic group's data followed a normal distribution, while the myopic group's data showed a slight deviation from normality, as determined by the Kolmogorov-Smirnov test. Nominal variables were presented as frequencies and percentages. For categorical variables, associations between myopic and non-myopic groups were primarily assessed using the Pearson's chi-square test. Comparison of IQ levels, academic grades and grade point average (GPA) between myopic and non-myopic students were assessed using independent samples *t*-test. P≤0.05 was considered significant.

Results

Of the 302 subjects, 233(77.2%) were females and 249(82.4%) were aged 19-21 years. The frequency of myopia was 172(57%) (Table 1). The self-reported age at which myopia was first diagnosed varied, with the majority reporting diagnosis at 11-15 years, 64(21.2%), followed by 16-20 years, 55(18.2%). The distribution of current dioptre (D) measurements among the myopic revealed that

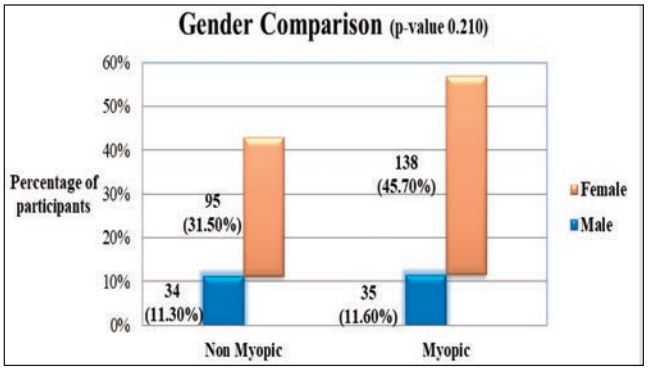

Figure-1: Gender comparison between myopic and non-myopic groups.

30(9.9%) had <1D, and 80(26.5%) fell within the 1-3 D range. Additionally, 42(13.9%) ranged 3.1-5 D.

The comparison between myopic and non-myopic individuals with respect to gender showed no statistical significance (p=0.210) (Figure 1). There was no significant association (p=0.459) between blood groups and eyesight status (Figure 2).

The comparison of various risk factors between myopic and non-myopic individuals showed no significant difference (Table 2). The comparative analysis of time distribution related to lifestyle factors in myopic and non-myopic

Table-1: Demographic characteristics of the participants.

Variables	n (%)
Eyesight Status	
Myopic	172 (57%
Non-Myopic	130 (43%
Gender	
Male	69 (22.8%
Female	233 (77.2%
Enrolment Programme	
MBBS	107 (35.4)
BDS	37 (12.3)
BS	97 (32.1)
Diploma	61 (20.2)
Study Year	
1st year	64 (21.2)
2nd year	219 (72.5)
3rd year	3 (1.0)
4th year	16 (5.3)
Age Distribution	
19-21 year	249 (82.4)
22-25 year	53 (17.5)

Table-2: Comparison of risk factors and lifestyle factors between myopic and non-myopic subjects.

Variable	Myopic Yes n (%)	Non-Myopic Yes n (%)	p-value
Vitamin A intake	118 (39.1)	100 (33.1)	0.110
Maternal Eyesight Weakness	106 (35.1)	71 (23.5)	0.166
Paternal Eye sight weakness	117 (38.7)	77 (25.5)	0.084
Family History of Diabetes	82 (27.2)	57(18.9)	0.574
Family History of Hypertension	99 (32.8)	70 (23.2)	0.388
Take rest after 30 minutes continuous reading	97 (32.1)	84(27.8)	0.250
Bad Posture while studying/ reading	134 (44.4)	91 (30.1)	0.173
Smoking	8 (2.7)	7 (2.3)	0.453
Awareness about eye exercise protocol	64 (21.2)	55 (18.2)	0.221
Perform Eye exercise	26 (8.6)	26 (8.6)	0.243

*Pearson Chi-Square test of independence

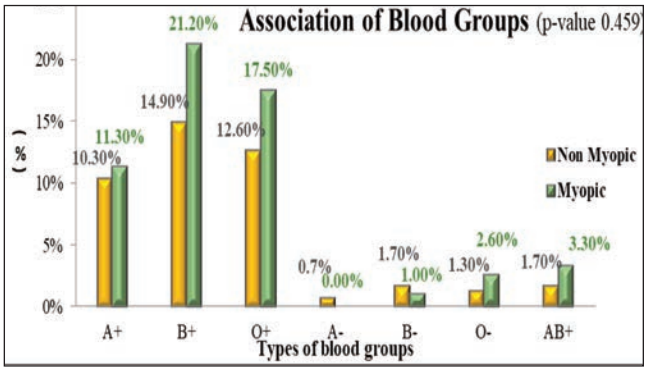

Figure-2: Association of blood groups with eyesight.

Table-3: Comparative analysis of time distribution and lifestyle factors in myopic and non-myopic subjects.

	Groups	1- 4 hrs	5- 8 hrs	9-12 hrs	13-16 hrs	p-value*
		n (%)				
Time given to studies /24 hrs.						
	Myopic	103 (34.1)	55 (18.2)	13 (4.3)	2 (0.7)	0.904
	Non- Myopic	82 (27.2)	37 (12.3)	9 (3.0)	1 (0.3)	
Time spent on Computer /24 hrs.						
	Myopic	134 (44.4)	30 (9.9)	4 (1.3)	5 (1.7)	0.127
	Non- Myopic	100 (33.1)	19 (6.3)	9 (3.0)	1 (0.3)	
Time spent on Mobile/ 24 hr.						
	Myopic	83 (27.5)	62 (20.5)	23 (7.6)	5 (1.7)	0.802
	Non- Myopic	62 (20.5)	47 (15.6)	14 (4.6)	6 (2.0)	
Time spent outdoor/ 24 hrs.						
	Myopic	87 (28.8)	63 (20.9)	18 (6.0)	5 (1.7)	0.778
	Non-Myopic	63 (20.9)	47 (15.6)	17 (5.6)	2 (0.7)	
Sleeping hrs. / 24 hrs.						
	Myopic	17 (5.6)	124 (41.1)	29 (9.6)	3 (1.0)	0.673
	Non- Myopic	9 (3.0)	99 (32.8)	20 (6.6)	1 (0.3)	

*Pearson Chi-Square test of independence

Table-4: Comparison of academic grades between myopic and non-myopic individuals.

	Groups	Academic Grades A+	A	B	C	p-value*
		n (%)				
Matric Result	Myopic	104 (34.4)	57 (18.9)	11 (3.6)	1 (0.3)	0.688
	Non- Myopic	86 (28.5)	35 (11.6)	7 (2.3)	1 (0.3)	
Intermediate Result	Myopic	91 (30.1)	60 (19.9)	19 (6.3)	3 (1.0)	0.418
	Non- Myopic	79 (26.2)	35 (11.6)	14 (4.6)	1 (0.3)	

*Pearson Chi-Square test of independence

Table-5: Comparison of intelligence quotient (IQ) level and cumulative grade point average (cGPA) between myopic and non-myopic subjects.

Groups	N	IQ Level Mean±SD	Std. Error Mean	95% C.I Difference (Lower-Upper)	p-value*	GP Mean±SD	Std. Error Mean	95% C.I Difference (Lower-Upper)	p-value*
Myopic	173	94.3±23.1	1.76	90.8 - 97.7	0.419	3.30±0.50	0.03	3.2 - 3.3	0.864
Non- Myopic	129	96.2 ±24.0	2.11	92.3- 100.7		3.29±0.51	0.04	3.2- 3.3	

*Independent Sample test. CI: Confidence interval.

showed no significant difference (Table 3). The difference between academic grades in matriculation and intermediate examination of myopic and non-myopic students was not significant (Table 4). Finally, the difference in terms of GPA and IQ levels between myopic and non-myopic students was also not significant (Table 5).

Discussion

The perception that people who wear glasses are smarter than those who do not suggests a direct correlation between myopia and intelligence, implying that those who require corrective eyewear possess higher intellectual abilities. However, it's important to reiterate that this is a stereotypical assertion that lacks scientific evidence to support it. Intelligence is a complex and multifaceted trait that cannot be accurately determined based solely on physical appearance or characteristics, such as wearing glasses or having eyesight weakness.[20]

In this study, 57% of the participants were myopic. The study found non-significant higher frequency of myopic females, which is similar to some studies and contradictory to others.[21,22]

Among the myopic participants, the study observed a non-significant higher frequency of blood group B+ and O+. While specific studies directly linking blood groups to myopia are limited, the results align somewhat with existing research suggesting that blood group O+ is more prevalent among myopic individuals.[23,24] The current study found no association between vitamin A intake and myopia, consistent with earlier findings.[25]

The current study found a trend of weak positive association and correlation between paternal eyesight weakness and myopia. Although there was no significant statistical difference, maternal myopia was more frequent in myopic than in non-myopic individuals, confirming a genetic relationship between parental myopia and the likelihood of myopia in their offspring.[26]

Similarly, the frequency of myopia was higher in those with a family history of hypertension compared to non-myopic subjects, but this difference was not statistically significant. Studies have explored related health factors that may contribute to eye conditions.[27] Although studies have examined the effect of passive smoking on myopia, none has evaluated the direct relationship between smoking and myopia.[28] In the current study, most participants were non-smokers, resulting in non-significant difference between myopic and non-myopic groups.

No difference was found between the two groups regarding the awareness of eye exercise protocols. The majority of students did not perform any type of eye exercise due to lack of knowledge, leading to a non-significant difference between the groups. This is in slight accordance with studies that suggest that eye exercise for myopia have limited to no efficacy in controlling or slowing the progression of myopia.[29]

Although not significant, myopic individuals exhibited a higher frequency of adopting poor posture. This aligns with the finding that greater degrees of myopia are associated with more incorrect upper body posture, such as slouching or forward head posture.[30]

The current study found no significant differences between the two groups in terms of average time spent on studies, computers, mobile devices, outdoor activities or sleep over a 24-hour period. Research has shown mixed results regarding the relationship between screen time and the development of myopia, with most studies indicating no significant difference.[31] However, studies suggest that spending time outdoors can help slow the progression of axial length changes and reduce the risk of myopia. This effect is believed to be due to increased exposure to natural light, which may regulate eye growth, and the opportunity for distance vision, which reduces the eye strain associated with prolonged near work.[32]

The current study's main objective was to find the difference, if any, in the academic grades, GPA and IQ between myopic and non-myopic students. The difference found was not significant. This is in accordance with some studies[33,34] and contradictory to others.[35,36]

The goal of the current study was also to educate students about different lifestyle habits that could contribute to the development and progression of myopia, like promoting good eye-care practices, reducing screen time, ensuring adequate lighting while studying, and emphasising the importance of regular eye examinations and exercises.

The significance of the current study lies in its comprehensive evaluation of the determinants and risk factors of myopia among undergraduate university students. To our knowledge, the current study is the first to assess the associations involving IQ, academic grades and lifestyle factors among myopic and non-myopic undergraduates in Karachi.

The current study has several limitations, including its cross-sectional design, use of non-probability sampling technique, student's self-reported data, and single–centre sample. Additionally, excluding myopic with corrective surgery may have overlooked relevant data, and the use of non-specialised measurement tools may have limited the accuracy of myopia classification. As the study relied on a self-reported questionnaire without formal validation, the

findings should be interpreted with caution. Future studies should include longitudinal designs, broader sampling, and advanced diagnostic methods.

Conclusion

Despite the higher frequency of myopia in undergraduate university students, no significant differences were found between myopic and non-myopic individuals concerning gender distribution, blood groups, myopic risk factors, time distribution, lifestyle factors, academic grades, GPA and IQ levels.

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Author Contribution:
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BND & MP: Data collection, drafting and final approval.
SBS: Drafting, data analysis, critical revision and final approval.