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A COMPARATIVE ANALYSIS OF MYOPIA PREVALENCE AMONG MADARSA STUDENTS VS NON-MADARSA STUDENTS IN SUKKUR

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CONFLICT OF INTEREST
None declared.

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None declared.

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ABSTRACT

Purpose: To compare the prevalence of myopia among Madarsa and school students in Sukkur.
Methods: This comparative cross-sectional study, conducted at Al Shifa Trust Eye Hospital, included students aged 5–21 years from schools and Madrasas in Sukkur. The sample size was 364, with 10% dropout rate; 328 participants met the eligibility criteria. After consent, participants underwent visual acuity testing and refractive error assessment.
Results: Myopia prevalence was high in both groups, with no significant difference for right eye ($p = 0.750$, OR = 0.658), left eye ($p = 0.750$, OR = 0.658), or either eye ($p = 0.685$, OR = 0.494). Mean spherical equivalent was −1.2 D (OD) and −1.1 D (OS), axial length ≈ 26.6 mm, and mean distance visual acuity 0.39–0.51 LogMAR. Significant differences were found in right-eye spherical refraction ($p = 0.042$) and axial length (OD $p = 0.007$, OS $p = 0.002$), while other visual, refractive, and biometric parameters showed no significant variation.
Conclusion: Based on the findings, myopia prevalence was high in both school and madrassa students, with no significant difference for the right eye, left eye, or either eye. Most visual acuity, refractive, and biometric parameters were similar, except for longer axial length in school students and slightly higher myopic spherical refraction in madrassa students' right eyes, indicating group type was not a strong predictor of myopia.

Registration No: NCT06913972

KEYWORDS Myopia, Refractive Error, Prevalence.

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INTRODUCTION

Refractive error (ametropia) occurs when parallel rays of light do not focus sharply on the retina, despite accommodation. [1] Myopia is the optical condition of the non-accommodating eye in which parallel rays of light entering the eye are brought to a focus anterior to the retina. [2] According to geographical variations, low- and middle-income countries have around four times the prevalence of distant vision impairment as compared to high-income regions. Rapid growth in population and ageing will increase the risk of vision impairment. There is also a lack of knowledge and awareness about refractive error that prevents timely treatment. [3] Uncorrected refractive errors significantly impact individuals at various life stages. In children, Uncorrected refractive errors can affect education, social interaction, and future productivity, while in adults, presbyopia can hinder daily activities and quality of life. Correcting refractive errors in both children and adults improves academic performance and work productivity. [4]

Myopia, or short-sightedness, is a leading cause of visual impairment and is rising in children, increasing the risk of high myopia. It is a result of both genetic and environmental factors, with much of the evidence pointing to the latter. Age, sex, level of schooling, outdoor and near work exposure, and family history are all associated with its development. [5] As defined by the American Optometric Association's clinical practice guidelines, myopia is categorized as mild (-0.50 to -3.00 DS), moderate (-3.25 to -6.00 DS), and high (> -6.00 DS) in at least one eye. Myopia is screened or clinically examined by eliciting a history of symptoms (blurred distance vision), noting signs (reduced unaided distance visual acuity), and with clinical tools such as retinoscopy, autorefraction, or photorefraction. [6]

1.4 billion people had myopia in 2000. That number is expected to grow to 4.8 billion by 2050. In 2015, the overall productivity loss associated with uncorrected myopia-related distance vision impairment was estimated to be $244 billion. [7] In East Asia, children and adolescents are particularly highly myopic. In China, myopia prevalence in preschool children is 5.9% in Shanghai, while a study covering six provinces found a prevalence of 55.7% in school-age children, and 86.8% in university students in Nanjing. [8] There are significant lifestyle changes and greater use of technology, particularly mobile devices, which are driving myopia in school-age children and young adults.

Children today face considerable pressure to complete more schoolwork, and, because of technological advances, they also spend more time on mobile devices and video games. These conditions are thought to foster the onset and development of myopia. [9] The impact of myopia on individuals and society makes this health condition increasingly worrying. The World Health Organization has stated that by 2050, one-half of the global population may have myopia. Recent research points to not spending enough time outdoors as a significant myopia risk factor and also links the time spent and intensity level of near vision activities to the myopia exacerbation. [10] Other risk factors associated with refractive errors in Madressa students include mobile devices, a family history of refractive errors, and the time spent outdoors. The most prevalent refractive error was myopia, with the others being astigmatism and hyperopia. [11]

The global prevalence and incidence myopia data primarily with an urban-rural focus demonstrates the near-work hypothesis. There has been an increase in myopia prevalence especially amongst young Asian children, attributed to an increase in reading with other environmental factors also contributing. Experts in Asia explain the high rates of myopia in children are due to the rigorous education system and numerous study hours children are exposed to. This also seems to be a driving factor for the rising myopia rates. Since myopia develops and advances mainly during childhood, this research area needs to be prioritized. [12]

One study conducted in Pakistan estimated the prevalence of myopia to be 36.5% and, although myopia prevalence in the country is rapidly increasing, research on the myopia prevalence risk factors remains scant.Timely action is crucial to control and mitigate its impact, especially in the digital age. Therefore, to implement effective preventive measures, it is essential to assess the risk factors for myopia in young adults and take appropriate steps for its management. [13] The primary cause of myopia, a refractive aberration and worldwide public health concern, is an increase in the axial length of the eyeball. Globally, myopia is on the rise, with a "myopia global growing epidemic" emerging. Twenty percent of children under six have abnormalities, with refractive anomalies being the most frequent, followed by strabismus and amblyopia. [14]

METHODOLOGY

This comparative cross-sectional study was conducted over a period of six months after approval from the BASR and was carried out at Al Shifa Trust Eye Hospital, Sukkur. A total sample size of 364 participants was finalized using G*Power version 3.1.9.7, based on an independent t-test with a 95% confidence level, 90% power, an effect size of 0.4, and an additional 10% adjustment for anticipated dropouts. Stratified random sampling was employed to recruit students aged 5–20 years enrolled in schools and madrasas of Sukkur. Students with systemic or ocular diseases, prior corrective eye surgery, recent spectacle or contact lens use, neurological conditions, communication barriers, or poor cooperation during visual testing were excluded. Ethical approval was obtained from the Ethical Committee of Superior University, and written informed consent from parents/guardians along with verbal assent from students was secured. Data collection was performed by trained personnel under controlled clinical conditions. Visual acuity was assessed using a Snellen chart, followed by cycloplegic and non-cycloplegic refraction to identify refractive errors. Keratometry, ocular biometry, and axial length measurements were recorded to evaluate anatomical determinants of refractive status. A structured questionnaire was administered to document demographic details, lifestyle factors, near-work activities, outdoor exposure, family history, and spectacle use. All data were anonymized, coded, and securely stored. Statistical analysis was performed using SPSS, with normality assessed via the Shapiro-Wilk test. Fisher's exact test and independent sample t-tests were applied as appropriate, and results were interpreted at a significance level of $p < 0.05$.

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RESULTS

In this study, a total of 328 participants were enrolled, of whom 181(54.85%) were females and 149(45.15%) were males, as shown in Figure No. 1. Overall average age in this study was 11.51±3.70 years, ranging from 05-21 years. The average age of school students was 10.68±3.40 years, ranging from 5-18 years, and the average age of madrassa students was 12.34±3.80 years, ranging from 5-21years. The normality of the data was assessed through the Shapiro-Wilk test. Results indicated that the data were normally distributed (P >0.05). The cohort was predominantly myopic, with a mean spherical equivalent of around −1.2 D (OD) and −1.1 D (OS), an axial length was approximately 26.6 mm, and a mean distance visual acuity was approximately 0.39–0.51 logMAR. In this study, Fisher's exact test and the Independent Sample T-test were applied to assess the significance of categorical and quantitative variables between groups.

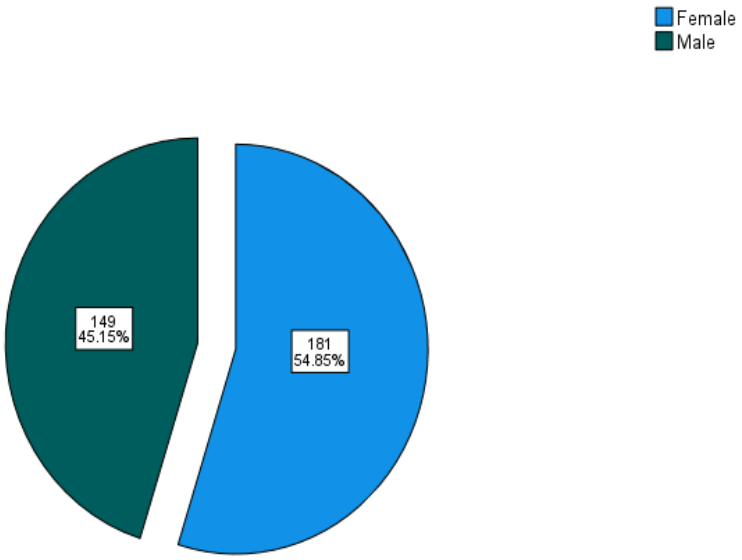

Figure No. 1: Gender Distribution Among Study Participants

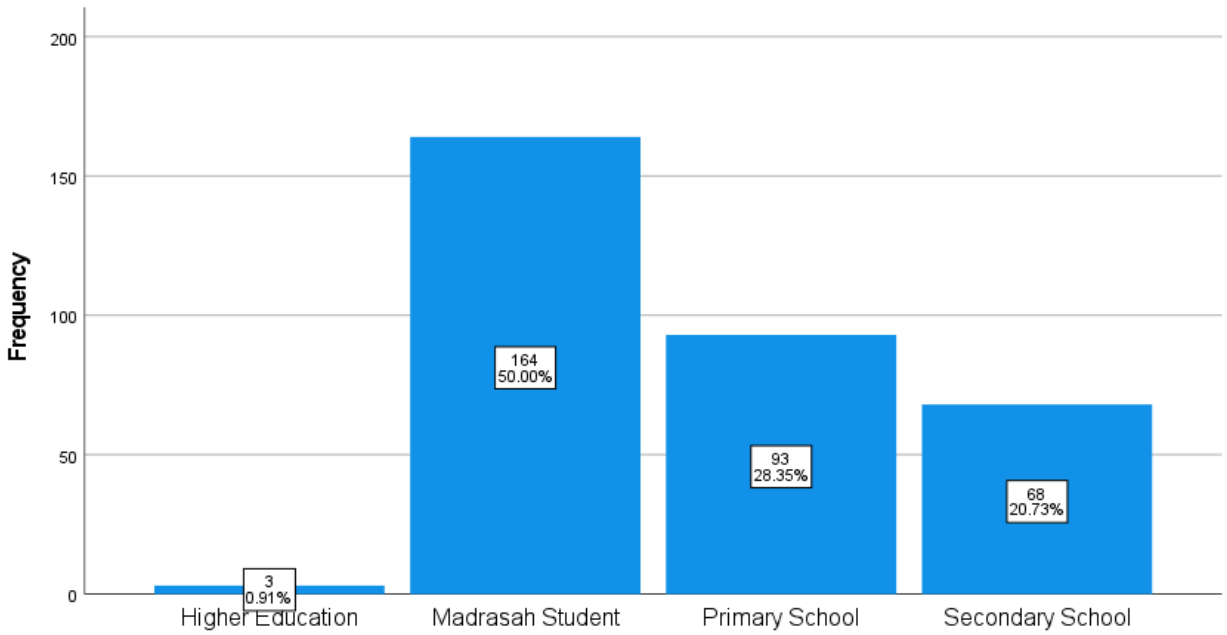

Figure No. 2: Education Level of Study Participants

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Table No. 1: Comparison of Myopia Prevalence Between School and Madrassa Students (Right Eye)

		Groups		Total	P-value
		School	Madrassa		
Myopia (RE)	No	85 (57.8%)	100 (63.7%)	185	0.119
	Yes	64 (42.2%)	79 (46.3%)	143	
Total		164	164	164	
Odds Ratio		1.452			

Table 1 above shows the comparison of myopia prevalence in the right eye between school and Madrassa students. Among school students, 64 (42.2%) were found to have myopia, whereas among Madrassa students, 79 (46.3%) were myopic. The remaining 85 (57.8%) school students and 100 (63.7%) Madrassa students did not have myopia. Although the prevalence of myopia was slightly higher among Madrassa students compared to school students, the difference was not statistically significant ($p = 0.119$). The odds ratio of 1.452 indicates that Madrassa students had approximately 1.45 times higher odds of having myopia in the right eye than school students; however, this difference does not reach statistical significance.

Table No. 2: Comparison of Myopia Prevalence Between School and Madrassa Students (Left Eye)

		Groups		Total	P-value
		School	Madrassa		
Myopia (LE)	No	70 (42.7%)	112 (68.3%)	182	<0.001
	Yes	94 (57.3%)	52 (31.7%)	146	
Total		164	164	328	
Odds Ratio		2.892			

According to Table 2, it shows that among school students, 94 (57.3%) were myopic, while 52 (31.7%) madrassa students had myopia. On the other hand, 70 (42.7%) school students and 112 (68.3%) madrassa students were found to be non-myopic. The difference in myopia prevalence between the two groups was statistically significant ($p < 0.001$), indicating a considerably higher prevalence of myopia among school students as compared to madrassa students. The odds ratio of 2.892 suggests that school students were nearly 2.9 times more likely to have myopia in the left eye than madrassa students.

Table No. 3: Comparison of Myopia Prevalence Between School and Madrassa Students (Either Eye)

		Groups		Total	P-value
		School	Madrassa		
Myopia	No	88 (53.7%)	91 (55.5%)	179	0.825
	Yes	76 (46.3%)	73 (44.5%)	149	
Total		164	164	328	
Odds Ratio		1.077			

Table 3 compares the myopia prevalence in either eye among school and Madrassa students. In the school group, 76 (46.3%) students had myopia in at least one eye, while 73 (44.5%) Madrassa students were myopic. Non-myopia was observed in 88 (53.7%) school students and 91 (55.5%) Madrassa students. The difference in prevalence between the two groups was not statistically significant ($p = 0.825$). The odds ratio of 1.077 indicates that school students had only a slightly higher, but statistically insignificant, likelihood of developing myopia in either eye compared to Madrassa students.

Table No. 4: Comparison of Visual Acuity, Refraction, and Ocular Biometric Parameters Between School and Madrassa Students

	Madrassa	School	P-value
Distance VA (LogMAR) Right Eye	0.41±0.17	0.37±0.18	0.142
Distance VA (LogMAR) Left Eye	0.37±0.18	0.34±0.18	0.126
Subjective/Non-cyclo Spherical Refraction (RE, D)	-0.93±0.41	-0.83±0.48	0.042*
Subjective/Non-cyclo Spherical Refraction (LE, D)	-0.86±0.43	-0.79±0.42	0.138
Cylindrical Refraction (RE, D)	-0.50±0.46	-0.69±0.82	0.379
Cylindrical Refraction (LE, D)	-0.35±0.19	-0.39±0.25	0.523
Cylinder Axis (RE, degrees)	118.03±58.88	130.13±53.94	0.480

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Cylinder Axis (LE, degrees)	22.84±51.52	15.67±45.59	0.183
Retinoscopy (OD, D)	-0.92±0.39	-0.86±0.46	0.234
Retinoscopy (OS, D)	-0.91±0.38	-0.83±0.42	0.089
Autorefraction (OD, D)	-0.91±0.36	-0.89±0.40	0.523
Autorefraction (OS, D)	-0.87±0.43	-0.84±0.40	0.584
Cycloplegic Refraction (OD, D)	-0.92±0.36	-0.87±0.43	0.251
Cycloplegic Refraction (OS, D)	-0.90±0.36	-0.22±0.57	0.273
Axial Length (OD, mm)	25.98±1.63	26.38±1.00	0.007*
Axial Length (OS, mm)	26.03±1.29	26.41±0.88	0.002*
Keratometry K1 (OD, D)	42.58±0.40	42.52±0.53	0.277
Keratometry K1 (OS, D)	42.46±1.69	42.37±2.38	0.571
Keratometry K2 (OD, D)	43.14±0.53	43.18±0.72	0.570
Keratometry K2 (OS, D)	42.91±2.42	42.72±3.41	0.571
Anterior Chamber Depth (OD, mm)	3.35±0.13	3.35±0.16	0.881
Anterior Chamber Depth (OS, mm)	3.31±0.15	3.31±0.15	0.862
Lens Thickness (OD, mm)	4.30±0.17	4.26±0.23	0.102
Lens Thickness (OS, mm)	4.24±0.58	4.16±0.82	0.351
IOL Power (OD, D)	19.08±1.41	18.90±1.68	0.270
IOL Power (OS, D)	18.96±1.36	18.67±1.63	0.071
Spherical Equivalent Right Eye (D)	-0.99±0.43	-0.90±0.49	0.056
Spherical Equivalent Left Eye (D)	-0.94±0.43	-0.86±0.45	0.110

Table 4 summarizes the comparison of visual acuity, refractive status, and ocular biometric parameters between madrassa and school students. Mean distance visual acuity (LogMAR) was slightly poorer in madrassa students for both right and left eyes compared to school students. Still, the differences were not statistically significant ($p = 0.142$ and $p = 0.126$, respectively). Subjective/non-cycloplegic spherical refraction showed a statistically significant difference in the right eye ($p = 0.042$), with madrassa students having a slightly higher myopic spherical value. No significant differences were observed in cylindrical refraction, cylinder axis, retinoscopy, autorefraction, or cycloplegic refraction between the two groups. Axial length was significantly longer in school students for both right and left eyes ($p = 0.007$ and $p = 0.002$, respectively). Keratometry readings (K1 and K2), anterior chamber depth, lens thickness, and intraocular lens (IOL) power showed no statistically significant differences. Spherical equivalent values were slightly more myopic in madrassa students, but these differences were not statistically significant for either eye ($p = 0.056$ and $p = 0.110$).

DISCUSSION

In this study, a total of 328 participants were enrolled, of whom 181(54.85%) were females and 149(45.15%) were males, as shown in Figure No. 1. Overall average age in this study was 11.51±3.70 years, ranging from 05-21 years. The average age of school students was 10.68±3.40 years, ranging from 5-18 years, and the average age of madrassa students was 12.34±3.80 years, ranging from 5-21years. The normality of the data was assessed through the Shapiro-Wilk test. Results indicated that the data were normally distributed ($P > 0.05$). The cohort was predominantly myopic, with a mean spherical equivalent of around −1.2 D (OD) and −1.1 D (OS), an axial length was approximately 26.6 mm, and a mean distance visual acuity was approximately 0.39–0.51 logMAR. Fisher's exact test and the Independent Sample T-Test were utilized to ascertain the importance of categorical and continuous variables considering the groups' divisions. As in the past study, the number of participants and distribution of gender remained unchanged, with females marginally greater in number; the average age of the participants in the present study is 11.51±3.70 years, which is in line with the earlier study, thus suggesting that the age profile of the studied population has remained the same. [35] From an education perspective, school students were younger on average (10.68±3.40 years) than students attending madrassas (12.34±3.80 years), which is consistent with the expectations regarding the difference in enrollment and age distribution between the groups. This seems to confirm the prior study in suggesting the age profile of students in school and madrassa settings has remained similar over time. The age profiles and spans in the two groups suggest that the sample was representative of the intended population, which consists of children and young adults. Furthermore, no significant deviation relative to age trends was apparent between the two studies. [15]

Analysis of previous research in relation to the current study shows the same and different things regarding attitudes towards refractive errors in children and adolescents.The previous analysis found that mean spherical equivalent refraction (SER) showed variation over a 3-year interval. During this time, younger children (3-6 years) were predominantly hyperopic, 7-year-olds were beginning emmetropization, and myopia was seen in older children and adolescents (8-18 years). In reference 36, a myopic shift was noted as mean SER values were 8 to 10 and 13 years were significant as well as the older 8 to 18 year age groups. In regard to myopia, the current analysis presents a cohort that is chiefly myopic at all ages, with a mean SER of around −1.2 D (OD) and −1.1 D (OS), axial length of roughly 26.6 mm, and moderate distance visual acuity of 0.39-0.51 logMAR. There was a normal distribution of

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this variable, which serves as a measure of the data's trustworthiness. Both sets of analysis show myopia in older children and adolescents, the current analysis being of a wholly myopic cohort as opposed to the previous which illustrated a more flowing hyperopia to myopia transition with age. The disparity may arise from the populations chosen, the time of measurement, and refractive development influenced by lifestyle and environmental factors. Reference 16.

The trends with regard to factors influencing myopia are consistent with the previous research.Associations with factors related to age and lifestyle demonstrate the prevalence of myopia in the two studies. The earlier study reported the influence of sleeping hours on myopia and stated that prolonged sleep hours helped in myopia reduction ($p = 0.000$). The earlier study also stated that the use of screens and study hours negatively impacted myopia prevalence ($p = 0.000$). [37] Furthermore, increased age was related to significant prevalence of myopia ($p = 0.01$). The differences in the prevalence of myopia between genders were observed but were not significant (girls 12.8% vs boys 10.4%, $p = 0.096$). Likewise, in the present study, the prevalence of myopia was also extremely high among students of both the school and the madrassa, with 97–98% of participants affected in at least one eye. Comparisons of the study groups demonstrated that the differences in the prevalence of myopia for either eye were not statistically significant ($p = 0.750$ for left and right eyes; $p = 0.685$ for overall prevalence). The relative differences between school and madrassa students were also minor according to the odds ratios. This suggests that the factors leading to high myopia in students are the same, regardless of the school setting. This points toward more generalized factors of lifestyle and the environment, as well as ubiquitous screens or studying activity.The literature identifies behavior and age as the key determinants of the prevalence of myopia, while other variables, such as gender and educational setting, play a comparatively lesser role. [17]

The current study findings extend and enhance prior studies focusing on myopia prevalence and factors associated with myopia among students. Previous research study highlighted that behavioral and lifestyle factors significantly influenced myopia, with near working distance ($p < 0.000$), screen use time ($p = 0.000$), study hours in madrassas ($p = 0.000$), and sleep duration ($p = 0.000$) all showing strong associations, while gender differences were not statistically significant (girls 12.8% vs boys 10.4%, $p = 0.096$), and outdoor activity up to two hours had no significant effect ($p = 0.255$). Age was also a prominent factor, with the prevalence of myopia increased as the students became older ($p = 0.01$). [37] However, the current study was emphasized in the comparison of visual acuity, refractive status, and ocular biometric parameters between students in a madrassa and students in a school. The madrassa students' mean distance visual acuity was a little poorer, but the differences were not statistically significant ($p = 0.142$ for right eye, $p = 0.126$ for left eye) and the students in the madrassa did have a slightly higher myopic spherical value and right eye $p = 0.042$. The rest of the refractive components namely the cylindrical refraction, the cylinder axis, retinoscopy, autorefraction, and the cycloplegic refraction, showed no significant difference. The students in the school though, on average had a significantly longer axial length for both eyes ($p = 0.007$ and $p = 0.002$). This suggests some subtle refractive status differences that may be the result of differences in structure. Other biometric components of the eye, namely the keratometry readings, anterior chamber depth, lens thickness and intraocular lens power were similar between the groups. These studies indicate the influences on myopia. The influences that were documented were behavioral, environmental, and ocular structural had a combination effect. With the previous study focusing on modifiable lifestyle risks like screen time, duration of study, and sleep, the current research advocates for the consideration of biometry, more specifically, axial length, in differentiating students for grouped analysis. This synergistic view implies that myopia preventative strategies should include the assessment of potential high risk children in conjunction with behavioral changes. [17]

CONCLUSION

Results showed the occurrence of myopia varied for students in schools versus students in Madrasas. Compared to Madrasas, students in schools had a greater likelihood of myopia, and this was more pronounced in the left eye. However, the difference was marginal for the right eye and for the analysis of both eyes. Overall, school students displayed a greater tendency for myopia in comparison to students in Madrasas.

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