Original Article

Study of Risk Factors Associated with Myopia in Medical Students: A Case-Control Study

Jamila Bibi[1], Haddaya Umar[2], Ayesha Azhar[3], Ammarah Tariq[4], Muhammad Rizwan Khan[5], Faud Ahmed Khan Niazi[6]

[1,2,3,4] Fourth year MBBS Student, Rawalpindi Medical University, Rawalpindi.
[5] Senior Registrar, Department of Ophthalmology, Holy Family Hospital, Rawalpindi.
[6] Head of Department, Department of Ophthalmology, RMU and Allied Teaching Hospitals, Rawalpindi.

Author's Contribution
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[1,2,3,4] *Facilitation and Material analysis*

Corresponding Author
Mr. Jamila Bibi,
Fourth year MBBS Student,
Rawalpindi Medical University,
Rawalpindi
Email: jamrwp@gmail.com

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Abstract

Background: Myopia has emerged as a serious vision-threatening disease globally. Due to its increasing prevalence in the last few decades, it is now considered that along with genetics, environmental and lifestyle factors are also playing some role in the development of myopia. Thus, this study was planned to evaluate the effects of various risk factors in the development and progression of myopia by comparing them with people without myopia.

Materials and Methods: A case-control study was conducted on 330 medical students (males=140 and females=190) of a public institute from April to September 2019. Cases included students who were diagnosed with myopia and used wear glasses or contact lenses for it. Whereas controls were the students without any visual defect. Data were collected through non-probability convenience sampling from participants between 18 to 25 years from all five years of MBBS. Those with vision defects other than myopia, like hypermetropia, keratoconus, glaucoma, etc., were excluded. Data were entered and analyzed using Statistical Package for Social Sciences (SPSS) version 25 by applying the non-parametric tests and descriptive statistics.

Results: Among 330 participants, 185 (56%) had myopia, which increased rapidly between the age of 15 to 20 years in the majority (58.4%) of them. 52.5 % of myopics had a positive family history of myopia. Males were less likely to develop myopia than females (OR=0.65). There was no statistically significant difference in sleeping hours (p-value=0.46), screen exposure time (p-value=0.78) or study hours (p-value=0.15) between myopics and non-myopics. Both groups often took breaks during the study. However, non-myopics were significantly more physically active than myopics (p-value=0.025.

Conclusion: There is not any significant effect of sleeping hours, screen exposure time, study hours, or breaks during the study on myopia. Myopia is more prevalent in females, people with a family history of myopia, and those with little physical activity.

Keywords: Myopia, Risk Factors, Medical Students, Prevalence.

Introduction

Myopia is a global public health problem leading to visual impairment and blinding complications.[1] Myopia is the most common ophthalmic condition globally, with an estimated 22.9% of the world population being affected.[2] Although genetic factors play a role in the development of myopia, the rapid rise in prevalence is likely attributable to environmental and lifestyle factors.[3] Prior studies have demonstrated an association between myopia and near-work activities such as studying, reading, and screen time among children.[3,4]

A study conducted in Ireland showed that myopia is significantly prevalent among children aged 12 to 13 years, with screen exposure time >3 hours/day, sedentary lifestyle, frequent reading/writing, and less light exposure.[5] A survey conducted in Scotland showed that variable sleep duration and short sleep latency are positively associated with myopia.[6] Another study conducted on Chinese children showed that sleep duration and bedtime are not associated with either progression of myopia or axial elongation.[7] A study conducted in Australia showed that lower daily light exposure is significantly associated with myopia, while physical activity does not show any association with it.[8] Myopics carry higher risks of important causes of ocular morbidity, including retinal detachment, glaucoma, myopic macular degeneration, and cataracts.[9] Parental myopia has a significant positive association with a child having a risk of developing myopia.[10]

Little work is done on the effects of lifestyle on myopia in our population. By having deep insight into various factors associated positively with the onset and progression of myopia, we will be able to bring about various preventive methods or lifestyle modifications and thereby contribute to reducing the incidence or progression of myopia. Hence the objective of this study is to evaluate the effects of different risk factors in the development and progression of myopia by comparing them with people without myopia.

Materials and Methods

A case-control study was conducted on medical students from a public medical institution in Rawalpindi from May to September 2019 after obtaining ethical approval from the Institutional Research Forum. Data were collected from 330 medical students through non-probability sampling by using a self-designed questionnaire. Students from all five years of MBBS were included in this study after obtaining informed consent from them. Those with vision defects other than or along with myopia, such as keratoconus, hypermetropia, cataracts, amblyopia, or any other medical or surgical pathology suspected of affecting the vision, were excluded from the study.

Participants were divided into two groups based on whether they were myopics (case) or non-myopics (control). Myopics or cases included those who wear spectacles or contact lens and were diagnosed by a certified ophthalmologist. Whereas control included students without any visual defect. Both myopic and non-myopic students included in the study were 18 to 25 years of age. A research questionnaire was developed after an extensive literature review related to risk factors and predictors of myopia. Risk factors include a family history of myopia, sleeping hours at night, screen exposure time, physical activity, study hours and breaks during the study. The questionnaire included different questions on patient demographic details, myopia progression, study and sleep routine, and outdoor physical activity. The questionnaire was disseminated online and in-hand to medical students. The anonymity of participants was ensured and they were voluntarily asked to participate in the study.

Data were entered and analyzed using the Statistical Package for the Social Sciences (SPSS), version 25. Descriptive statistics, non-parametric tests, and odds ratio were used to analyze the data. A probability value of less than 0.05 was considered statistically significant.

Results

Out of 330 participants, 185 (56%) were myopics, and 145 (43.9%) were non-myopics. Participants were 18 to 25 years old, having a mean age of 20.87±1.42 years. About 52.5% of myopics had a family history of myopia. Males were less likely to develop myopia than females (OR=0.65). Details about case and control with respect to gender are mentioned in Table-I.

Table-I Association between gender and myopia

		Case (myopia)	*Control (non-myopic)*	*Total*
Gender	**Male**	70 (37.8%)	70 (48.2%)	140 (42.4%)
	Female	115 (62.1%)	75 (51.7%)	190 (57.5%)

Total	185 (56%)	145 (43.9%)	330

Most of the cases were diagnosed with myopia between 3 to 22 years (mean 14.57 ± 3.93. A rapid increase in myopia was observed during 15 to 20 years of age by 58.4% of the cases. Whereas 23% reported a change in vision during 10 to 15 years of age, 10.8% during 20 to 25 years, and only 7% observed it when they were less than ten years old. There was no statistically significant difference between cases and controls on the basis of sleeping hours, screen exposure time, study hours and break during the study, indicating no role played by them in developing myopia. Further details are shown in Table-II.

Table-II Role of different factors in the development of myopia

Factors	*Case (myopic) n=185*	*Control (non-myopic) n=145*	*P-value*
Sleeping Hours at Night			0.46
Less than 1 hour	06 (3.2%)	06 (4.1%)	
1 to less than 4 hours	86 (46.4%)	73 (50.3%)	
4 to 8 hours	76 (41.0%)	59 (40.6%)	
More than 8 hours	17 (9.1%)	07 (3.7%)	
Screen Exposure Time			0.78
Less than 1 hour	07 (3.7%)	05 (3.4%)	
1 to less than 4 hours	88 (47.5%)	63 (43.4%)	
4 to 8 hours	54 (29.1%)	50 (34.4%)	
More than 8 hours	36 (19.4%)	27 (18.6%)	
Study Hours			0.15
Less than 1 hour	67 (36.2%)	54 (37.2%)	
1 to less than 4 hours	90 (48.6%)	78 (53.7%)	
4 to 8 hours	23 (12.4%)	13 (8.9%)	
More than 8 hours	05 (2.7%)	00	
Breaks during Study			0.15
Always	46 (24.8%)	45 (31.0%)	
Often	64 (34.5%)	58 (40.0%)	
Occasionally	59 (31.8%)	35 (24.1%)	
Never	16 (8.6%)	07 (4.8%)	

The role of physical activity in the development of myopia was also studied by comparing daily hours of physical activity (walk, workout, outdoor sports, etc.) in cases and controls. It was seen that 83.7% of myopics were engaged in physical activity for up to 2 hours/day, while 89.6% of non-myopics spent their 2 hours daily in any sort of physical activity. Further details regarding physical activity are shown in Table-III.

Table-III Physical activity in myopics and non-myopics

Outdoor Activity	*Case (myopic) n=185*	*Control (non-myopic) n=145*
Less than 2 hours	155 (83.7%)	130 (89.6%)
2 to 4 hours	29 (15.6%)	11 (7.5%)
More than 4 hours	01 (0.5%)	04 (2.7%)

Non-myopics were significantly more physically active than myopics (p-value=0.025), showing that low physical activity is associated with the development of myopia.

Discussion

The knowledge and awareness of myopia are very crucial, especially for a developing country like Pakistan, where myopia affects 36.5% of the population and 11.5% of blindness is attributed to it.[11] The development and progression of myopia depend on various factors, including genetics and the daily lifestyle of a person. The results that our study has generated is consistent with other literature studies relevant to risk factors that develop myopia over a long period of time.

The current study suggests that the amount of time medical students spend in near work (reading, screen exposure time) is unlikely to have any meaningful effect on the development of myopia. This could be explained by a 23-year follow-up study conducted in Finland, which states that the time spent on close work and study affected the progression of myopia in children but not in adults.[12] Thus, our study showed no significant differences in cases and controls on the basis of myopia.

A study conducted on older adults in China stated a significant association between the prevalence of myopia and sleep during nighttime.[13] However, our study did not show any significant differences between cases and controls on the basis of sleep routine. Similar results are shown by another study on Chinese children, according to which bedtime and sleep duration have no significant effect on the progression of myopia.[14]

This study shows that non-myopic were more physically active than myopics stating that low physical activity might play some role in developing myopia. An inverse interrelation between time spent outdoors (pertaining to physical activities) and incident myopia diagnosed during childhood was evaluated in a clinical study highlighting the importance of physical activity as an essential predictor of myopia progression.[15] Another study aims to reassure the significance of outdoor activities (sport and leisure activities) in protecting against myopia, whereas indoor activities did not affect myopic progression.[16] The possible explanation for this is given by Yuval Cohen, Edna Peleg, et al., who hypothesized that light stimulates the release of dopamine, which antagonizes myopia development. This experiment was conducted on six illumination groups of newly hatched chicks based on exposure to varying intensities of light.[17] This has been supported by several studies that show outdoor activity inhibits myopia, potentially through dopamine-mediated mechanisms.[18,19]

Limitations of our study are that convenience sampling made it difficult to generalize our results, especially those parameters (screen exposure time, near work time) for which no significant relation could be drawn but exists as based on previous clinical literature. There is a strong need to conduct similar surveys, preferably in other communities and age groups, as conclusions based on our study are impossible to generalize over the entire myopic population of our country but can help highlight the lifestyle modifications associated with myopia.

Conclusion

There is no significant effect of sleeping hours, screen exposure time, study hours, or breaks during the study on myopia as both myopic and non-myopic medical students have similar habits. Myopia is more prevalent in females, people with a family history of myopia, and those with little physical activity.

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