Original Article

Risk Factors for Myopia in Pediatric Age Group Presenting at Tertiary Care Hospital

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ABSTRACT

Objective: To evaluate the risk factors associated with myopia in the pediatric age group presenting to a tertiary care hospital.

Study Design: A descriptive cross-sectional study

Place and Duration of Study: This study was conducted at the Ophthalmology unit, Hayatabad Medical Complex, from January 2025 to June 2025.

Methods: Non-probability consecutive sampling was used to include 1534 children aged 5-16 years with a diagnosis of myopia. Myopia was considered to be a sphere equivalent of 0.50 diopters and below in either eye. A structured proforma was used to gather data on demographic characteristics, family history, near work, screen time and outdoor activity. Visual acuity, cycloplegic refraction, subjective refraction, and fundus examination were conducted on all subjects. The analysis of data was conducted with SPSS 26.

Results: The mean age was 11.2 ± 3.1 years. Positive family history of myopia was present in 612 (39.9%) children, near work >2 hours/day in 1018 (66.4%), screen time >2 hours/day in 874 (57.0%), and outdoor activity >2 hours/day in 412 (26.9%). Myopia severity was greatly linked to family history, prolonged near work and more screen time whereas outdoor activity was considered to have a protective link.

Conclusion: Family history, a longer duration of near work, more screen time, and less outdoor activity were found to have a significant association with pediatric myopia. Early screening, parental education, near work and screen time regulation, decreased screen time and encouragement of outdoor activities can be used to alleviate the burden of myopia among children.

Key Words: Myopia, Paediatric, Risk factors, Screen time, Near work, Outdoor activity.

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INTRODUCTION

One of the most frequently seen refractive errors in children is myopia or shortsightedness. It has become a significant public health issue in the world, with its growing incidence and chronic ophthalmological complications[1]. Nearly half of the world's population is predicted to have myopia by 2050, with a sizable portion of the population getting extreme myopia, which increases their chance of developing vision-threatening conditions such retinal detachment, glaucoma, and myopic maculopathy[2]. Myopia usually develops at the school-going age and in this case, early detection of risk factors would be essential in preventing and controlling this condition.

Myopia etiology is multifactorial because it is a complex interaction of genetic predisposition and environmental exposures[3]. There is solid evidence that children born to myopic parents face a much greater risk and it becomes even more likely when both parents have the condition[4,5]. However, genetic predisposition cannot be used to explain the recent increase in prevalence alone, and the relevance of modifiable environmental determinants.

Among environmental influences, there is a consistent finding that a greater involvement in near-work activities, including longer reading, writing, and screen time, is correlated with increased risk of developing myopia[6,7]. The decreased outdoor activity has become also a critical factor and various studies have shown the protective effect of more time spent outdoors which could be explained by the higher level of light and less accommodative stress[8,9]. Moreover, the contemporary changes in lifestyle, such as the overuse of digital devices and reduced physical activity also add to the increasing burden of pediatric myopia[10].

The other risk factors are age, ethnicity, level of education, sleep habit, and nutritional status, all of which have demonstrated the different levels of

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association with the development of myopia[11,12]. Children who are referred to tertiary care hospitals are usually more progressive or symptomatic, and such a setting would be useful in understanding the relative contribution of these risk factors in clinical populations. These determinants should be well comprehended to implement specific preventive measures and inform successful clinical management. However, although the worldwide burden of pediatric myopia is steadily rising, local statistics on its risk factors are scarce, especially those concerning tertiary care hospitals in Khyber Pakhtunkhwa. The bulk of available evidence is based on school-based or international research which is not necessarily representative of the clinical profile, lifestyle patterns and environmental exposures of children presenting to hospitals in this region. Thus, the purpose of this study was to evaluate the risk factors related to myopia in children who are admitted to a tertiary care hospital.

METHODS

This descriptive cross sectional study was conducted at Department of Ophthalmology, Hayatabad Medical Complex, Peshawar from January 2025 to June 2025. Thus, the sample size formula of WHO was used to calculate a single population proportion with a 95% confidence level, a margin of error of 2.5%, and an estimated prevalence of 30% for pediatric myopia as shown in published literature [13]. The sample size needed was around 1291. Given the large number of patients in the outpatient department during the study period and to enhance accuracy of estimates, the final sample size was expanded to 1534 children.

A non-probability consecutive sampling was used to enroll children aged 5–16 years that visited outpatient ophthalmology department. Children with a diagnosis of myopia (spherical equivalent of -0.50 D or less in both eyes) were all studied. Children with pathological myopia, congenital or acquired ocular diseases (cataract, glaucoma, retinal disease) or history of ocular trauma or previous ocular surgery and systemic disease that affects vision were excluded.

Ethical approval was obtained from the hospital institutional review board before collection of data began, and informed consent was obtained from all children's parents/guardians in the form of a written consent. A pre-tested proforma was used to collect the data. Demographic data was collected such as age, gender and place of residence. The duration and kind of near work (reading and screen time), amount of time spent outdoors, degree of education, and family history of myopia were all noted as potential risk factors.

A detailed ophthalmic assessment was carried out on all children's. Snellen chart was used to measure visual acuity. Cycloplegic refraction was performed using cyclopentolate (1%) and then retinoscopy and subjective refraction were used to ascertain the final refractive error. The funduscopic examination was carried out to rule out any underlying pathological causes of myopia.

The operational definition of near work was defined as working within a range of less than 3040 cm and doing so for at least two hours every day. The operational definition of outdoor activities was defined as spending time outside during the day. The data was entered and analyzed using the Statistical Package of Social Sciences (SPSS) version 26. Frequencies and percentages were used to describe qualitative factors, whereas mean ± standard deviation was used to express quantitative data like age and time spent near work. The relationship between different risk factors and myopia was examined using the Chi-square test. Significant importance was defined as a p-value of less than 0.05.

RESULTS

Mean age of participant was 11.2 ± 3.1 years (ranged 5-16 yeras). There were 692 (45.1%) females and 842 (54.9%) males. 38.7% of participants were from rural areas, whilst 61.3% of participants were from metropolitan areas.

Table No. 1: Demographic Characteristics of Study Population (n = 1534)

Variable	n (%)
Age Group (years)	
5–8	402 (26.2%)
9–12	648 (42.3%)
13–16	484 (31.5%)
Gender	
Male	842 (54.9%)
Female	692 (45.1%)
Residence	
Urban	941 (61.3%)
Rural	593 (38.7%)

A positive family history of myopia was observed in 612 (39.9%) children. Regarding behavioral factors, near work for more than 2 hours/day was reported in 1018 (66.4%) participants, while screen time exceeding 2 hours/day was noted in 874 (57.0%) children. Only 412 (26.9%) children reported outdoor activity of more than 2 hours/day. Table-2

Table No. 2: Distribution of Risk Factors Among Participants (n = 1534)

Variable	n (%)
Family History of Myopia	
Present	612 (39.9%)
Absent	922 (60.1%)
Near Work (>2 hours/day)	
Yes	1018 (66.4%)
No	516 (33.6%)
Screen Time (>2 hours/day)	

Variable	n (%)
Yes	874 (57.0%)
No	660 (43.0%)
Outdoor Activity (>2 hours/day)	
Yes	412 (26.9%)
No	1122 (73.1%)

On stratification, family history of myopia, prolonged near work, and increased screen time showed a statistically significant association with myopia severity ($p < 0.05$). Conversely, increased outdoor activity demonstrated a protective effect, with children spending more than 2 hours outdoors showing lower severity of myopia ($p = 0.01$). Table-3

Table No. 3: Association of Risk Factors with Myopia Severity (n = 1534)

Risk Factor	Mild Myopia	Moderate Myopia	High Myopia	p-value
Family History				
Present	248 (40.5)	262 (42.8)	102 (16.7)	0.02
Absent	462 (50.1)	356 (38.6)	104 (11.3)	
Near Work >2 hrs/day				
Yes	438 (43.0)	438 (43.0)	142 (14.0)	0.01
No	272 (52.7)	180 (34.9)	64 (12.4)	
Screen Time >2 hrs/day				
Yes	364 (41.6)	380 (43.5)	130 (14.9)	0.03
No	346 (52.4)	238 (36.1)	76 (11.5)	
Outdoor Activity >2 hrs/day				
Yes	244 (59.2)	130 (31.6)	38 (9.2)	0.01
No	466 (41.5)	488 (43.5)	168 (15.0)	

DISCUSSION

These results of our study are mostly in line with the multifactorial model of myopia where inherent predisposition and adjustable environmental exposures both play a role in the development and progression of myopia.

Family history was found to be extremely related with severity of myopia in our study. This observation agrees with Ha et al[14] who found parental myopia as a significant non-modifiable risk factor, but its impact can be altered by the environmental exposures as near work and outdoor time. Similarly, Holden et al[15] defined myopia as a disorder that is brought about by genetic and environmental factors. This association in our population might be more pronounced since children who attend a tertiary care hospital will tend to represent symptomatic or clinically identified cases but not a population screened at schools.

In our study, prolonged near work was also found to have a significant relationship with the severity of myopia. This is in line with Pan et al[16] who established a strong relationship between near-work activities and myopia in children. Tideman et al[17] also established that the duration of homework and pressure to study in school were linked to myopia in school going children. Similar educational pressures, excessive reading hours and fewer visual breaks may be reflected in our findings among school going children in our environment. Myopia was significantly correlated with increased screen time in our study. Zhao et al.[18] have shown that increased screen time leads to myopia in children and adolescents, particularly computer-based screen time. Alshamlan et al[19] recently reported a dose-response effect between digital screen time and myopia, with each additional hour of daily screen time raising the risk of myopia. The similarity of our findings to these studies could be attributed to the growing adoption of smartphones, tablets, and online learning platforms by children. But the precise extent might vary since our research involved parent/child-reported screen time which could be influenced by recall bias.

The results of our study suggest that outdoor activities are protective against myopia and that the duration of outdoor time and the severity of myopia are inversely correlated. This is in line with the results from the IMI risk factor analysis by Chen et al.[20] who found that one of the most consistent environmental factors that protect against myopia is outdoor exposure. Another study by Alrasheed et al[21] also revealed that more outdoor activities on weekdays and weekends were linked with decreased risk of myopia. The protective effect can be associated with increased light intensity in the outdoors and decreased sustained accommodative requirement.

A number of differences with international studies can be attributed to the differences in the study setting, age group, diagnostic method, lifestyle, ethnicity, and the educational environment[22,23]. Our research was a hospital based study whereas most of the earlier studies were either school based or population based. Thus, children with more symptomatic or clinically significant refractive error may be part of our sample. Besides this, cycloplegic refraction in our study enhances the accuracy of the diagnosis as compared to other works in which non-cycloplegic autorefraction or

self-reported myopia was used. The results on the whole substantiate the importance of early screening, parental counselling, decreased exposure to continuous near work and screen time, and encouragement of frequent outdoor play in children.

There are certain limitations to this study that must be noted. The study was a single-center, hospital-based study, which might not be applicable in the general population of children because those who presented with refractive errors to a tertiary care hospital are more likely to have symptomatic or advanced refractive errors. The cross-sectional design does not allow determining the causal relationship between the identified risk factors and myopia but only assesses associations. Also, information about screen time, near work, outdoor activity, and family history were parentally or participant-reported, and thus there was a possibility of recall bias. Other vital variables like socioeconomic status, parental education, lighting conditions, nutritional status, sleep patterns and academic workload were not delved into in details and may affect the observed associations..

CONCLUSION

Positive family history, extended near work and less outdoor activity were significantly associated with pediatric myopia. The results of this study clearly show the synergistic effect of genetic susceptibility and environmental risk factors in the development and progression of myopia in children. In children, early screening, parent awareness, limiting continuous near work and screen time, and encouraging regular outdoor activity may be helpful for preventing or slowing myopia progression.

Author's Contribution:

Concept & Design or acquisition of analysis or interpretation of data:	Afzal Qadir, Waqas Ahmed
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Agreement to accountable for all aspects of work:	All the above authors

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