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The Environmental and Social Risk Factors for Myopia in Children and Adolescents in Bangladesh

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Abstract **Original Research Article**

Background: The seriousness of myopia is still underappreciated by the general population. One in five occurrences of blindness may be traced back to uncorrected refractive error (The discrepancy between the patient's vision at presentation and their best-corrected vision). ***Objective:*** In this study our main goal is to evaluate the environmental and social risk factors for myopia in children and adolescents in Bangladesh. ***Method:*** This prospective cohort research conducted at a major medical center to investigate prenatal through adult risk factors for poor health and noncommunicable illnesses in young people. The study began in July 2020, and 100 people have been asked to participate in yearly follow-ups for two years. The majority of the people living there are from the Dhaka metropolitan area. Schools, daycares, community clinics, general practices, public health agencies, and collaborative research projects are just few of the places where participants are sought for recruitment. ***Results:*** During the study, 60% were in 11-18 years age group, 55% were male and 35% were in middle income group. 10% myopia had 3-10 years age group and 21% myopia in 11-18 years age group. 80% patients had everyday outdoor frequency, followed by 50% had 1-2 hours outdoor frequency, 60% had everyday near work frequency. There was a significant associations of myopia with low outdoor activity frequency, high near work duration and low near work frequency. Outdoor activity duration was not significantly associated with myopia. ***Conclusion:*** The results of our study indicate that regular sun exposure and limiting the amount of time spent in constant close work may help prevent the development of eye diseases. Furthermore, our cohort found that children of higher socioeconomic status were less likely to be myopic. Strategy development for myopia prevention in children of all ages should be prioritized in light of the massive economic burden imposed by the condition and the apparent cost-effectiveness of intervention.

Keywords: Myopia, risk factor, environmental.

INTRODUCTION

Myopia is still not taken as seriously as it should be by the general population. Uncorrected refractive error (the discrepancy between the patient's vision at presentation and their best-corrected vision) was the primary cause of moderate or severe visual impairment in 2010 [1].

A loss of worldwide productivity equal to USD 202 billion per year is attributed to impaired distant vision due to uncorrected refractive error, as estimated by Fricke *et al*., [2].

Myopia has become a major health issue across the world in recent decades. Myopia prevalence increased from 25.6% in 2000 to 32.3% in 2010 [3], according to a meta-analysis by Holden *et al*., that included 145 papers published since 1995. Children in nations with "high-pressure educational systems," such as South Korea, China, Taiwan, and Singapore [3], have been accustomed to spending more time indoors, away from natural light, and working closely to electronic devices as part of their schoolwork.

Myopia prevalence was reported to have increased from 36.7% in 1983 to 60.7% in 2000 by a

notable research from Taiwan [4]; among adolescents aged 16-18, prevalence increased to 84% in 2000.

Prevalence estimates place the number of persons with myopia worldwide at at 49.8 percent in 2050, with as many as 5 billion people potentially impacted [3]. The level of a person's household's income can be used as a proxy for social class (SES).

Multiple studies have demonstrated a strong association between socioeconomic status (SES) and myopia [15, 23–26]. SES is comprised of three interrelated components: educational attainment, income, and employment. Among German individuals aged 18–35, the prevalence of myopia has been found to be 41.3% [5]. The risk of an exaggerated finding exists since this study evaluated myopia using noncycloplegic self-reports.

Understanding the mechanisms involved in myopia initiation is vital if we intend to respond correctly to future shifts in prevalence or even reduce the existing incidence of myopia, even though this prevalence remains lower than in several Asian nations.

Objective

To assess the environmental and social risk factors for myopia in children and adolescents in Bangladesh.

METHODOLOGY

This is a prospective cohort research conducted at a major medical center to investigate prenatal through adult risk factors for poor health and noncommunicable illnesses in young people.

The study began in July 2020, and 100 people have been asked to participate in yearly follow-ups for two years.

The majority of the people living there are from the Dhaka metropolitan area. Schools, daycares, community clinics, general practices, public health agencies, and collaborative research projects are just few of the places where participants are sought for for recruitment.

A competent interdisciplinary team follows established protocols to get the information needed.

Most of the youngsters taking part in the study have never moved from their home country. Information utilized in this work was collected during routine eye exams performed on study participants aged 3-18. Noncycloplegic autorefraction measurements were taken of each subject's eyes three times at a pupil size of 3 mm and a vertex distance of 12 mm.

However, the local Ethics Committee did not permit the use of cycloplegics for the purpose of determining refractive status. The degree of refractive error in each participant's eyes was recorded for further examination.

Here is how we characterized the refractive error: The standard error (SE) was first computed using the formula SE=sphere+cylinder/2, and then the median SE value was chosen from the three individual SE values.

RESULTS

Table-1 shows demographic status of the patients where 60% were in 11-18 years age group, 55% were male and 35% were in middle income group.

Table-1: Demographic status of the patients

Age distribution	**Percentage (%)**
3-10 years	40%
11-18 years	60%
Gender	
Male	55%
Female	45%
Socio economic	
Good	30%
Middle income	35%
Average	25%
Poor	25%

Figure-1 shows myopia prevalence according to age where 10% myopia had 3-10 years age group and 21% myopia in 11-18 years age group.

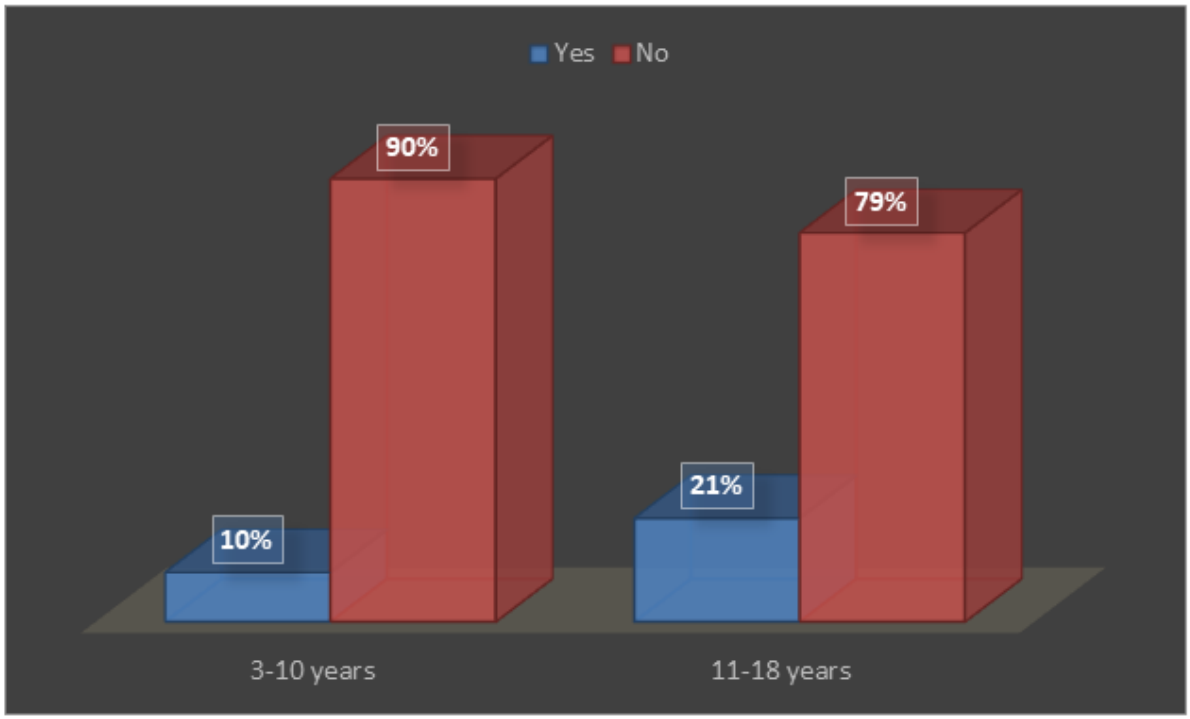

Figure-1: Myopia prevalence according to age

Table-2 shows Population characteristics where 80% patients had everyday outdoor frequency, followed by 50% had 1-2 hours outdoor frequency, 60% had everyday near work frequency.

Table-2: Population characteristics

Population characteristics	Percentage (%)
Time outdoors frequency	
Every day	80%
Every two day	9%
Two days per week	7%
Once per week	4%
Time outdoors duration	
<1h	10%
1-2 hour	50%
3-4 hour	20%
>4 hour	20%
Near work frequency	
Every day	60%
Every two day	20%
Two days per week	15%
Once per week	5%
Near work duration	
<1h	65%
1-2 hour	15%
3-4 hour	16%
>4 hour	4%

Table-3 shows Univariate logistic regression analysis correlating myopia with leisure time activities and the socioeconomic status. It shows significant associations of myopia with low outdoor activity frequency, high near work duration and low near work frequency. Outdoor activity duration was not significantly associated with myopia.

Table-3: Univariate logistic regression analysis correlating myopia with leisure time activities and the socioeconomic status

Leisure time activities and the socioeconomic status	Odd ratio	P value
Time outdoors frequency		
Every day		
Every two day	0.90	0.70
Two days per week	0.71	0.25
Once per week	0.73	0.46
Time outdoors duration		
<1h		
1-2 hour	1.92	0.01
3-4 hour	2.55	<0.01
>4 hour	4.08	<0.01
Near work frequency		
Every day		
Every two day	2.08	<0.01
Two days per week	4.48	<0.01
Once per week	7.63	0.03
Near work duration		
<1h		
1-2 hour	1.37	0.20
3-4 hour	1.45	0.20
>4 hour	2.63	<0.01

Figure-2 shows both low outdoor activity frequency and long near work duration are significantly associated with myopia, even after adjusting for each other as well as for age, sex and SES.

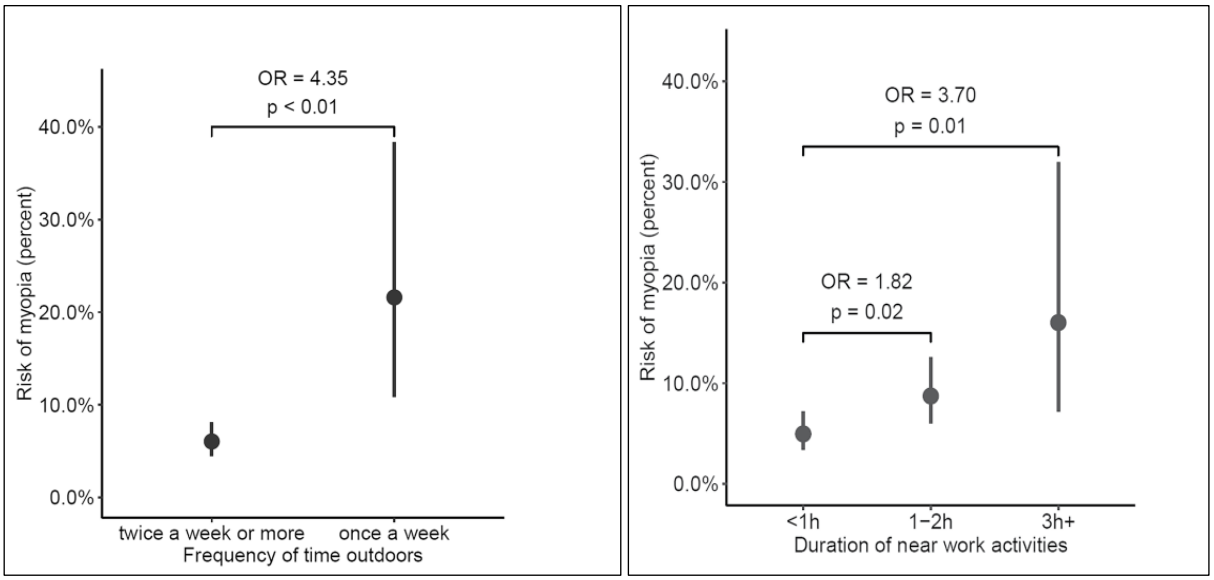

Figure-2: Rate of myopia plotted against reported frequency of outdoor time and near work activities (days per week)[6]

DISCUSSION

Similar to the findings of Schuster *et al*., in another German cohort, where they estimated 5.4% of 3- to 10-year-olds and 21.1% of 11- to 17-year-olds were myopic [7], we found 60% were in 11-18 years age group.

When comparing our population to that of Schuster *et al*., [7], we find that children from higher socioeconomic backgrounds are disproportionately represented, making up 43.8% of the younger cohort and 32.1% of the older cohort, respectively, while children from lower socioeconomic backgrounds make up only 10.6% of the younger cohort and 15.3% of the older cohort.

Despite this, we were able to recruit over 120 kids from low-income families, providing sufficient data for research.

Older children had a greater frequency of myopia than younger ones. This trend may be attributable to a decline in older children's exposure to natural environments, a shift in how they use their free time, or both. Increasing school and homework loads, as well as a shift in how older children spend their remaining free time, are all plausible explanations.

Adolescents spend more time on (social) media than younger youngsters do. Several additional research, such as Gao *et al*., [8], Shah *et al*., [9], and Enthoven *et al*., [10], support the idea that children's outside time decreases in length and frequency as they become older.

Since we classified near work as reading, writing, and drawing, and children often don't begin to read until they're six, the increased frequency with which younger children engage in near work is perplexing. For children less than 10 years old, whose parents filled out the questionnaires, the social desirability bias is likely to be severe.

To determine which part of leisure behavior is more essential with regard to myopia, we differentiated between the length per day and the frequency per week of activity, whether it was spent outdoors or near work.

Our results suggests that the frequency of exposure to sunshine is more significant than its length in determining myopia onset in multivariate analyses. Time spent outside daily as a whole was not substantially linked to myopia.

Our data does not allow us to determine whether or not the time spent outside was exposed to sunshine. It's very uncommon for kids to play outside in the winter without ever seeing the sun.

Also, kids who spent more time outside each week were less likely to develop myopia than their indoor-only counterparts. This study demonstrates that, when done on a regular basis, even a short stimulation of sunshine could restrict eye development and go along with a decreased myopic shift. Which was supported by other studies [11-14].

On the basis of these and other observational studies, He et al. conducted a cluster-randomized intervention controlled trial to investigate the efficacy of preventative strategies in primary school-aged Chinese students [15].

CONCLUSION

The results of our study indicate that regular sun exposure and limiting the amount of time spent in constant close work may help prevent the development of eye diseases. Furthermore, our cohort found that children of higher socioeconomic status were less likely to be myopic. Strategy development for myopia prevention in children of all ages should be prioritized in light of the massive economic burden imposed by the condition and the apparent cost-effectiveness of intervention.

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