

**Influence of Parental Myopia on Myopia Among School Aged Children: A Cross –Sectional Study**

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Abstract

Background: Myopia is one of the leading causes of visual impairment among school-aged children, with both genetic and environmental factors contributing to its development. Understanding the influence of parental myopia is essential for identifying children at high risk and planning targeted screening strategies.

Methods: A hospital-based prospective cross-sectional study was conducted among children aged 6–17 years attending the ophthalmology outpatient department. Of 351 children diagnosed with myopia, 220 fulfilling the inclusion criteria were enrolled. Detailed ocular examination was performed for both children and their parents, including visual acuity assessment, cycloplegic refraction, slit-lamp examination, intraocular pressure measurement, and fundus evaluation. Children were

assessed for age of presentation, severity, visual outcome, amblyopia, and association with parental myopia.

Results: The overall proportion of myopia was 15.72% (351/2232). Mild myopia was the commonest type (50%), followed by moderate (29.5%) and severe (20.45%). The highest prevalence occurred in the 9–11-year age group (33.18%). Good visual acuity (BCVA 6/6–6/9) was achieved in 71.3% of children, while 19.1% had amblyopia. Parental myopia was present in 30.4% of cases. A significant association was observed between parental myopia and severity of myopia in children ($p = 0.020$). Among children with both parents affected, 73.3% had moderate-to-severe myopia, demonstrating a cumulative genetic influence.

Conclusion: Myopia among school-aged children is increasing and shows a strong association with parental myopia, particularly when both parents are affected. Early identification of high-risk children and family-based screening may facilitate timely intervention and help reduce progression of myopia and its complications.

Keywords: Myopia, Parental Myopia, School-Aged Children, Refractive Error, Amblyopia, Visual Outcome

Introduction

Myopia is the most common refractive error and an important cause of ocular morbidity especially affecting school going children and young adults.¹ Uncorrected myopia has huge social, economic, psychological and developmental implications¹. The prevalence of myopia in rural regions of India did not change much over the last two decades, a significant increase in myopia prevalence was noted in urban school children aged 5-15 years, rising from 4.5% in 1999 to 21.1% in 2019.² The increasing prevalence of myopia especially in children is alarming because the earlier onset holds the risk of developing high myopia in adulthood, which is associated with visually debilitating ocular conditions.² There is strong evidence that both heredity and environment play a role in the development of myopia.³ High myopia is particularly prevalent and represents a major causes of social blindness, especially in East Asian countries.⁴ It is characterized by axial elongation of the eye ball and is associated with various complications, including cataract formation, retinal detachment due to peripheral retinal tears, myopic foveoschisis, macular hole with or without retinal detachment, peripapillary deformation, scleral thinning, myopic choroidal neovascularization and glaucoma.⁴ In addition to its impact on ocular health, myopia adversely affects self-perception, occupational opportunities, and

daily activities, and remains one of the leading causes of visual impairment worldwide. The rising prevalence of myopia has emerged as a significant global public health challenge, reaching epidemic proportions in certain regions. Childhood myopia particularly when it manifests early, is of major concern as it increases the risk of developing complications such as amblyopia, cataract, glaucoma, retinal detachment and myopic macular degeneration. There is compelling evidence supporting the role of both genetic and environmental factors in the development and progression of myopia⁵. Understanding these influences is crucial for determining the appropriate age for screening, especially among children with a parental history of myopia, to enable early detection and timely intervention.

Aims and Objectives of the Study

1. To determine the proportion of myopia among children between 6-17 years old.
2. To determine the type, age of presentation, severity and Visual outcome (BCVA) of myopia among children and their parents.
3. To compare the myopic profile of the children with and without myopic parents.

Material and Methods

Patients fulfilling the inclusion criteria were recruited into the study. The aims and objectives of the study were clearly explained to the participants, and informed consent was obtained. Patient data were recorded using a structured proforma. A detailed ophthalmological evaluation was performed, including slit lamp examination of anterior segments, assessment of uncorrected visual acuity (UCVA), best-corrected visual acuity (BCVA), measurement of intraocular pressure (IOP) using a non-contact tonometer (with central corneal thickness correction), and fundus examination

using indirect ophthalmoscopy with scleral indentation. These evaluations were conducted for both children and their parents. Children were subsequently categorized according to parental myopia status into those with myopic parents and those without myopic parents for comparative analysis of the influence of parental myopia on the severity and visual outcomes of childhood myopia

Sample size

It was a prospective, cross sectional comparative study.

Estimation of sample size:

The Sample size was calculated based on previously published studies. An Indian study reported a myopia prevalence of 13.1% among school going children. Considering a prevalence of 13% and a margin of error of 5%, the minimum required sample size was estimated to be 174 children.

However Out of 351 children initially identified after considering exclusion criteria 220 were recruited for the study to enhance the reliability of the findings.

Inclusion criteria

1. Myopic children aged 6-17 years
2. Both Parents of the enrolled myopic children

Exclusion criteria

The following participants were excluded from the study:

1. Patients who did not provide informed consent
2. Children below 5 years and above 17 years
3. Patients with ocular media opacities precluding accurate refraction and fundus examination
4. Children with significant Birth history

Result

Table 1: proportion of myopia among children aged 6-17.

Category	OPD Attendees
Total no. of patients (6-17)	2232

Number of Myopic Patients	351
Number of non myopic patients	1881
Percentage of myopia	15.72

A total of 2232 children aged 6–17 years attended the OPD during the study period.

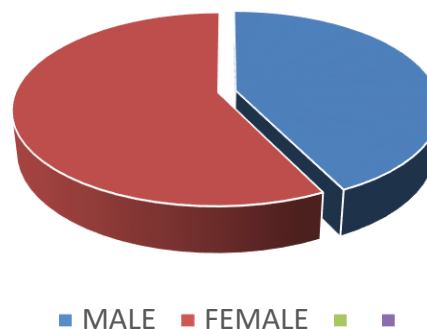
Among them, 351 were found to have myopia, while 1881 were non-myopic.

The overall proportion of myopia in the study population was 15.72%.

Table 2: Gender Distribution.

Gender	Number of patients	Percentage
Male	94	42.7
Female	126	57.27
Total	220	100

FIGURE 1: GENDER DISTRIBUTION



Among 220 children, 126 (57.27%) were females and 94 (42.7%) were males, showing a higher prevalence among females.

Table 3: Percentage of myopic and non myopic parents.

	Number(n)	Percentage(%)
Myopic parents	67	30.4
Non myopic parents	153	69.5
Total	220	100

In our study, 67 children (30.4%) had myopic parents, while 153 (69.5%) did not.

Table 4: Types of myopia in children (classified according to severity).

Severity	Total	Percentage(%)
Mild(<-3ds)	110	50.0
Moderate (-3ds To -6ds)	65	29.5
Severe(>= -6ds)	45	20.45
Total	220	100

Figure 2: Types of myopia (severity classification)

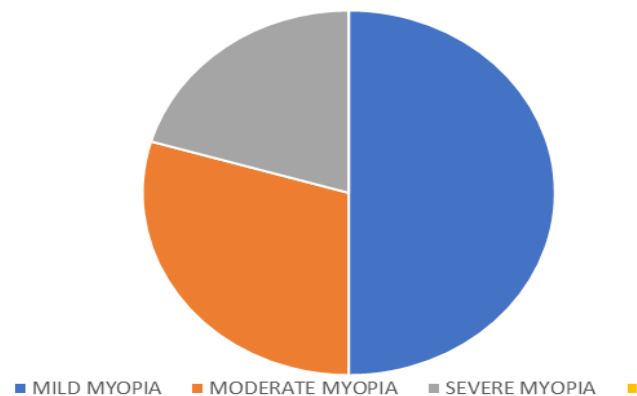


Figure 3: Distribution of severity of myopia based on parental myopia status

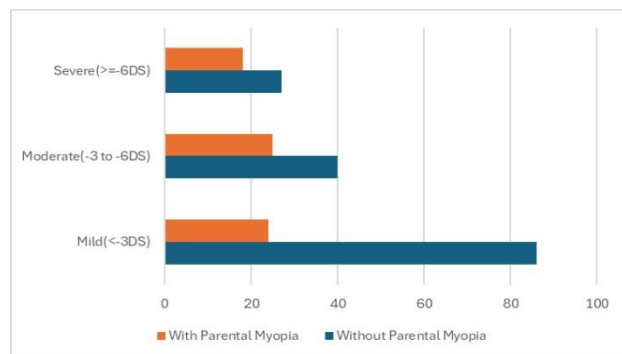


Table 6: Association of severity of myopia in children and parental myopia (n =220).

Severity	Non myopic parents	Percentage	Myopic parents	Percentage	Total
Mild(<-3ds)	86	56.2	24	35.8	110
Moderate (-3DS to -6DS)	40	26.1	25	37.3	65
Severe(>= -6ds)	27	17.6	18	26.8	45
Total	153	100	67	100	220

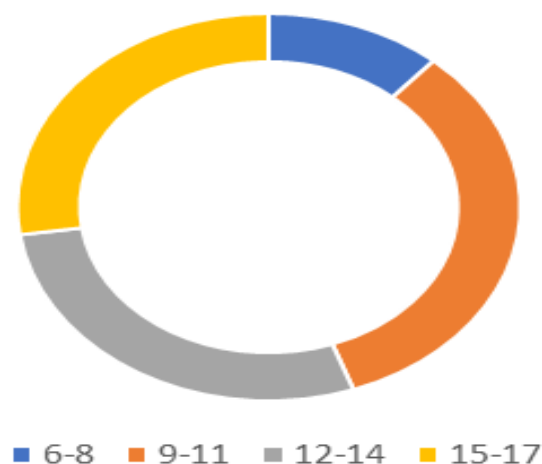
Mild: 24/110 (35.8%) had parental myopia, Moderate: 25/65 (37.3%), Severe: 18/45 (26.8%) Statistically significant (p = 0.020)

Among 220 children: 110 (50%) had mild myopia 65 (29.5%) had moderate myopia 45 (20.45%) had severe myopia

Table 5: Age group distributions.

Age group(y)	No. Of patients	Percentage
6-8	25	11.36
9-11	73	33.18
12-14	62	28.18
15-17	60	27.27
Total	220	100

FIGURE 4: AGE GROUP DISTRIBUTION



Maximum cases were seen in 9–11 years (33.18%), followed by 12–14 years (28.18%). followed by 15-17 years (27.27) Followed by 6-8(11.36).

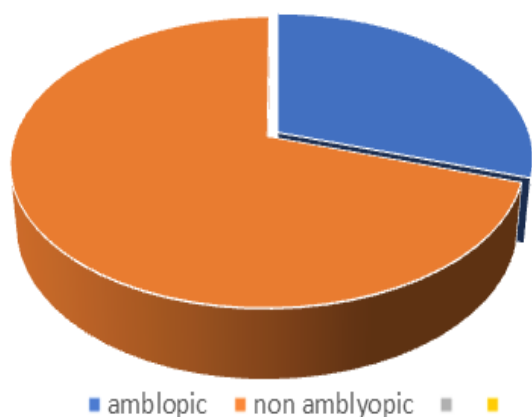
Table 7: Visual outcome in children.

BCVA	NUMBER	PERCENTAGE
6/6-6/9	144	65
6/12- 6/18	67	30.45
6/24- 6/60	8	3.63
<6/60	1	0.45

Table 8: Visual outcome-amblyopia outcome.

Age group	No. of patients	No of students with amblyopia	Percentage
6-8	25	4	9.5
9-11	73	14	33.3
12-14	62	11	26
15-17	60	13	30.9
TOTAL	220	42	100

FIGURE 5: AMBLYOPIA OUTCOME



Out of 220 children, 42 had amblyopia, most common in 9–11 years (33.3%).

Table 9: Distribution of parental myopia.

Severity of myopia	Total patients	Total patients with parental myopia	Maternal myopia	Paternal myopia	both parents myopic
Mild myopia	110	24	14	14	4
Moderate myopia	65	25	16	15	6
Severe myopia	45	18	13	10	5
Total	220	67	43	39	15

Among 220 children: 43 maternal, 39 paternal, 15 both parents myopic

Table 10: Visual outcome of parents.

BCVA	Number	Percentage
6/6-6/9	157	71.3
6/12- 6/18	36	16.36
6/24- 6/60	21	9.55
<6/60	6	2.73

Most parents had moderate visual impairment (6/12–6/18: 43.9%) (Parents of one child are taken as one entity)

Table 11: Myopia severity in parents.

Child myopia Severity	Parental myopia	SEVERITY	
Mild(110)	Maternal (14)	Mild myopia	14
		Moderate myopia	-
		Severe myopia	-
	PATERNAL (14)	Mild myopia	14
		Moderate myopia	-
		Severe myopia	-
Moderate(65)	Maternal (16)	Mild myopia	13
		Moderate myopia	2
		Severe myopia	1
	PATERNAL (15)	Mild myopia	14
		Moderate myopia	-
		Severe myopia	1
Severe(45)	Maternal (13)	Mild myopia	5
		Moderate myopia	4
		Severe myopia	4
	Paternal (10)	Mild myopia	5
		Moderate myopia	2
		Severe myopia	3

In our study, Table 11 demonstrates the relationship between severity of myopia in children and severity of myopia in either parent (maternal/paternal). Among children with mild myopia, all cases with parental myopia showed only mild myopia in parents (maternal = 14, paternal = 14), with no moderate or severe parental myopia. Among children with moderate myopia,

parental myopia was predominantly mild, with a smaller proportion showing moderate (maternal = 2) and severe (maternal = 1, paternal = 1) myopia. Among children with severe myopia, there was a clear increase in moderate and severe parental myopia, with maternal cases showing 5 mild, 4 moderate, and 4 severe, and

paternal cases showing 5 mild, 2 moderate, and 3 severe myopia.

This table shows a trend of increasing parental myopia severity with increasing severity in children.

Table 12: Myopia severity in children with both parents having myopia.

Severity of myopia of child	Both parents myopic	Maternal	Paternal
Mild myopia(110)	4	Mild	Mild
		Mild	Mild
		Mild	Mild
		Mild	Mild
Moderate myopia (65)	6	Mild	Mild
		Moderate	Mild
		Mild	Mild
		Moderate	Mild
		Mild	Moderate
		Moderate	Moderate
Severe myopia(45)	5	Moderate	Moderate
		Severe	Mild
		Moderate	Moderate
		Severe	Mild
		Mild	Mild
Total	15		

Table 12 evaluates children in whom both parents are myopic (n = 15). Among these, 4 children had mild myopia, 6 had moderate myopia, and 5 had severe myopia. The majority of children with moderate and severe myopia had parents with moderate or severe of myopia, rather than mild. This indicates that when both parents are myopic, there is a higher likelihood of the child developing moderate to severe myopia.

Discussion

The present cross-sectional study was conducted to evaluate the proportion, type, age distribution, severity, visual outcomes, and influence of parental myopia among school-aged children (6–17 years).

The overall prevalence of myopia in this study was 15.72% (351/2232), indicating a moderate but

significant burden among school-aged children. A meta-analysis by Agarwal et al. (2020) reported an overall prevalence of 7.5% among children aged 5–15 years over the past four decades. Earlier Indian studies, such as those by Dandona et al. (2002) and Murthy et al. (2002), reported prevalence rates of approximately 4.1% and 7.4%, respectively, which are considerably lower than the prevalence observed in the present study. This finding suggests a rising trend in myopia prevalence over the past two decades.

With respect to age of presentation, the highest proportion of myopia was observed in the 9–11 years age group (33.18%; 73/220), followed by 12–14 years (28.18%; 62/220), 15–17 years (27.2%; 60/220), and 6–8 years (11.36%; 25/220), indicating an increase in

prevalence with advancing age. This age-related trend is consistent with the findings of Dandona et al. (2002), who reported a progressive increase in myopia prevalence from 2–3% in younger children (5–10 years) to 6–7% in older children (11–15 years).

In terms of severity, 50% (110/220) of children had mild myopia, 29.5% (65/220) had moderate myopia, and 20.45% (45/220) had severe myopia, indicating a broad spectrum of disease. Visual outcomes in children were generally favorable, with 65% (144/220) achieving BCVA of 6/6–6/9, while 30.45% (67/220) had 6/12–6/18, 3.63% (8/220) had 6/24–6/60, and 0.45% (1/220) had <6/60. However, 19.1% (42/220) of children developed amblyopia, most commonly in the 9–11 years age group (33.3%; 14/42), indicating delayed detection and inadequate early correction. These findings are comparable with hospital-based pediatric studies, where amblyopia prevalence is higher than community-based estimates (~1–5%), likely due to referral bias and late presentation.

Following refractive correction, the majority of children achieved good visual acuity, indicating that myopia is largely correctable when detected early. However, the presence of amblyopia highlights the importance of early screening during the critical period of visual development.

In the present study, most parents had good visual acuity, with 71.3% (157/220) achieving BCVA of 6/6–6/9. A smaller proportion had moderate to severe visual impairment. These findings are consistent with adult population studies, where visual impairment is often attributable to uncorrected or under corrected refractive errors, particularly in developing countries. This is clinically relevant, as parental visual status may influence awareness, health-seeking behavior, and

compliance with spectacle use in children, thereby indirectly affecting the management of myopia within families.

A key objective of the study was to compare the myopic profile of children with and without parental myopia. In this study, 30.4% (67/220) of children had myopic parents, while 69.5% did not, suggesting that although genetic factors are important, environmental influences also play a significant role in the increasing prevalence of myopia. A statistically significant association ($p = 0.020$) was observed between parental myopia and the severity of myopia in children, with higher severity noted among children with myopic parents.

Furthermore, among children with both parents affected ($n = 15$), 73.3% (11/15) had moderate to severe myopia, demonstrating a strong cumulative genetic effect. Analysis of parental distribution showed that 19.5% (43/220) had maternal myopia, 17.7% (39/220) had paternal myopia, and 6.8% (15/220) had both parents affected, indicating a graded genetic influence.

A clear dose–response relationship was observed, wherein increasing severity of myopia in children was associated with increasing severity in parents. Similar findings have been reported by Wu et al. and Guggenheim et al., who demonstrated that both the presence and number of myopic parents are strongly associated with increased risk, earlier onset, and greater severity of myopia in children.

Additionally, children with both parents affected showed a higher likelihood of developing moderate to severe myopia, indicating strong familial aggregation. These findings support a multifactorial etiology, where genetic predisposition interacts with environmental factors to influence both the onset and progression of myopia.

Conclusion

The present study demonstrated a myopia prevalence of 15.72% (351/2232) among school-aged children, indicating an increasing burden compared to earlier Indian studies reporting a prevalence of 4–7%, thereby reflecting a clear upward trend over time. The majority of children had mild myopia (50%; 110/220), while a considerable proportion had moderate (29.5%; 65/220) and severe myopia (20.45% (45/220)). The highest prevalence was observed in the 9–11 years age group (33.18%; 73/220), suggesting early onset and progression during school years.

Visual outcomes were generally favorable, with 71.3% (157/220) achieving good visual acuity (6/6–6/9). However, the presence of amblyopia in 19.1% (42/220) of children indicates delayed detection and highlights the need for early screening. A statistically significant association ($p = 0.020$) was observed between parental myopia and the severity of myopia in children. Notably, 30.4% (67/220) of children had myopic parents, and among those with both parents affected (6.8%; 15/220), 73.3% (11/15) had moderate to severe myopia, demonstrating a strong cumulative genetic influence.

Overall, the findings suggest that myopia in children is a multifactorial condition, with a clear interaction between genetic predisposition and environmental factors influencing both its onset and severity. These results underscore the importance of early screening, timely refractive correction, and targeted interventions in high-risk children, particularly those with parental myopia, to

prevent disease progression and reduce long-term visual morbidity.

Implication of The Study

Early detection and timely intervention are essential to prevent progression of myopia and associated visual impairment. Targeted screening of children with a parental history of myopia is crucial for effective myopia control and for improving long-term visual outcomes.

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