Correlation of parental and childhood myopia in children aged 5–16 years in North India

Manisha Rathi, Sargam Chhabra, Sumit Sachdeva, Inder M Rustagi¹, Dixit Soni, Sweety Dhania

Purpose: The aim of this study was to determine the correlation of parental and childhood myopia among school children aged 5–16 years in North India. Methods: This study included a total of 1400 children aged 5–16 years in a district in North India. Visual acuity was measured using a Snellen’s chart. Children with myopia after retinoscopy were worked up in detail in our institute and a history of parental myopia was taken. Results: A total of 1400 students studying in class 5–10, aged between 5 and 16 years, were screened. A total of 487 students had myopia. Of the 487 myopes, 220 (45.2%) had parental myopia, of which 115 (30.1%) had myopia in both parents, 64 (19.3%) had mothers with myopia, and 41 (13.3%) had fathers with myopia. The prevalence of paternal (P = 0.001) and maternal (P = 0.002) myopia in myopes compared to parental myopia in emmetropes was found to be highly significant. There was a highly significant statistical correlation between maternal myopia and myopia in the child, when compared to the presence of myopia in both the parents (P = 0.007). Conclusion: There was a statistically significant correlation between myopia in the parents and children, which was more significant in the mothers of the children.

Key words: Childhood Myopia, hereditary myopia, visual acuity

Myopia is largely undiagnosed in childhood in most developing nations and is the leading cause of avoidable blindness in India[1]. The World Health Organization (WHO) launched an initiative to identify the burden of uncorrected refractive errors, as a part of which refractive error studies were conducted in children aged 5–15 years worldwide, including India. In 2001, the prevalence of myopia as a cause of uncorrected refractive errors was 7.45% at an urban location and 4.1% at a rural location in India.[2] Liang et al.[3] in their cross-sectional study conducted in 2004 on 185 normal subjects, 170 mild, 140 moderate, and 392 high myopes, showed that family history was strongly associated with parent’s refractive status. When there was at least one highly myopic parent, the odds ratios (ORs) of developing mild or moderate myopia were between 2.5 and 3.7 (95% confidence interval [CI]: 1.1–6.5) and the OR of having high myopia was >5.5 (95% CI: 3.2–12.6). There was a strong positive correlation between high myopia in parents and onset of myopia in their children. This study, however, showed weaker association with a myope sibling.

A Sydney myopia study conducted by Ip et al.[4] in 2007 on 2353 children showed the prevalence of myopia in children with myopic parents. It was 7.6% in children with no myopic parent, 14.9% in children with one myopic parent, and 43.6% in children with two myopic parents. Children with myopic parents had longer mean axial length.

There has been no study evaluating the correlation of childhood and parental myopia in our area. Hence, we undertook this study to screen 1400 children aged 5–16 years in our state in North India to assess this problem to help in the prevention of avoidable visual impairment due to myopia in childhood.

Methods

This prospective, interventional study was carried out in schools in a district in North India and included a total of 1400 children of either sex aged 5–16 years, studying in classes 5–10. Permission was taken from principals/head of schools after explaining the aim and benefits of this procedure. Screening for refractive errors was carried out in the school with the help of teachers. The visual acuity of each eye of each child was measured at a distance of 6 m. The students were asked to read the letters on the chart, which were both in English and Hindi and were used according to the student’s preference. The visual acuity test was followed by dry retinoscopy. Detailed study proformas were filled for each child. The students who were provisionally diagnosed to have myopia were called to our institute with their parents, where retinoscopy was repeated and appropriate spectacles were prescribed to the child. The parental history of myopia was confirmed. A history of spectacle use by siblings of myopes was taken. The collected

Department of Ophthalmology, Regional Institute of Ophthalmology, Pt. B.D. Sharma, PGIMS, Rohtak, Haryana, 1Department of Ophthalmology, World College of Medical Sciences and Research, Jhajjar, Haryana, India

Correspondence to: Dr. Inder M Rustagi, World College of Medical Sciences and Research, Jhajjar, Haryana, India. E-mail: imrustagi1970@gmail.com

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data was then entered in MS Excel sheet and evaluated using Statistical Package for the Social Sciences (SPSS) software.

Results

A total of 1400 students studying in class 5–10 of different schools in a district in North India were screened. The total number of females was 711 (51%) and males was 689 (49%). The total number of myopes was 487, emmetropes was 876, and hypermetropes was 37.

Out of the 1400 students, 463 students had history of myopia in parents. Among the 876 emmetropes, 233 (26.6%) had parental myopia; 97 (13.1%) had myopia in both the parents, 46 (6.7%) had myopia in fathers, and 90 (12.3%) had myopia in mothers. Among the 487 myopes, 220 (45.2%) had parental myopia; 115 (30.1%) had myopia in both parents, 41 (13.3%) had myopia in fathers, and 64 (19.3%) had myopia in mothers. Among the 37 hypermetropes, 10 (27%) had parental myopia; one child (3.6%) had myopia in both parents, three (10%) had myopia in fathers, and six (18.2%) had myopia in mothers. The distribution of myopes when compared to emmetropes according to the prevalence of myopia in both parents was found to be highly statistically significant ($P = 0.001$). The difference in the prevalence of paternal ($P = 0.001$) and maternal ($P = 0.002$) myopia between the myopes and emmetropes was also found to be highly significant, which correlated with the prevalence of myopia in their children [Table 1].

Of the total 220 myopes who had positive parental history, 115 had myopia in both parents, 64 had myopia in their mothers, and 41 had myopia in their fathers. There was a highly significant statistical correlation between maternal myopia and myopia in the child, when compared to the presence of myopia in both the parents ($P = 0.007$). However, no statistical correlation was found between paternal myopia versus myopia in both parents ($P = 0.179$) or myopia in mother versus father ($P = 0.393$) [Table 2].

Out of the total 1400 students screened in this study, 909 (64.9%) had history of spectacle use in their siblings. Among the emmetropes, 269 (30.7%) had history of spectacle use in their siblings. Among the myopes, 211 (43.3%) had history of spectacle use in their siblings. Among the hypermetropes, 11 (29.7%) had history of spectacle use in their siblings and 26 (70.3%) did not have it. Thus, there was a statistically highly significant positive correlation between the prevalence of myopia and spectacle usage by the siblings ($P = 0.0003$). Furthermore, when compared with emmetropes, a statistically significant positive correlation was found between spectacle usage by the siblings and the prevalence of myopia ($P < 0.01$) [Table 3].

Discussion

A total of 1400 school-going children between the ages of 5 and 16 years were screened for myopia. Those who were myopic were called to our institute, where they underwent refraction and were prescribed appropriate spectacles. They were accompanied by their parents, and parental myopia was documented. A history of spectacle use by their siblings was recorded.

The present study showed the importance of parental myopia in the prevalence of myopia in the students. Parental history of myopia was present in 220 (45.2%) myopes. Among the myopes, 52.27% had both parents who were myopes, 29.09% had only maternal myopia, and 18.6% had only paternal myopia. The distribution of myopes when compared to emmetropes according to the prevalence of myopia in both parents was found to be statistically highly significant ($P = 0.001$). The prevalence of paternal ($P = 0.001$) and maternal ($P = 0.002$) myopia was also found to be highly significant, which correlated with the prevalence of myopia in their children. There was also a statistically highly significant positive correlation between the prevalence of myopia and spectacle usage by the siblings ($P = 0.0003$).

This is in accordance with the study by Wakode et al. in Nagpur, which showed a positive correlation between myopia and family history. Liang et al. showed that there was a strong positive correlation between high myopia in parents and onset of myopia in their children. A study in Ireland conducted by Harrington et al. showed that there was a significant relation between parental myopia and myopia in their children. A cross-sectional study conducted by Xie et al. in Chongqing showed that children with paternal myopia or maternal myopia had a higher risk of myopia than those without myopic parents.
Table 3: Spectacle use by siblings of myopes and emmetropes

| Do your siblings use spectacles? | Total  | Emmetropes | Myopes | Hypermetropes | P-value among myopes | Emmetropes versus myopes (P) |
|---------------------------------|--------|------------|--------|---------------|---------------------|----------------------------|
| No (Group 1)                    | 909 (64.9%) | 607 (69.3%) | 211 (43.3%) | 26 (70.3%) | Group 1 versus 2=0.0003 | 0.001 (E>M) |
| Yes (Group 2)                   | 491 (35.1%) | 269 (30.7%) | 276 (56.7%) | 11 (29.7%) | 0.0007 (M>E)          |                             |
| Total                           | 1400 (100%) | 876 (100%) | 487 (100%) | 37 (100%)   |                     |                             |

A study conducted in the Netherlands by Tideman et al. proved parental myopia to be important in the causation of myopia in the children. Gou et al. showed in their study that the prevalence of myopia was directly proportional to number of parents having myopia. When compared with emmetropes, a statistically highly significant positive correlation was found between spectacle usage by the siblings and the prevalence of myopia (P < 0.01). Guggenheim et al. in their Singapore cohort study of risk factors for myopia, suggested that prevalence of myopia was highly correlated between siblings. In a recent study, parental myopia had a positive correlation with early-onset myopia in certain ethnic populations with myopia, like Asian, Hispanic, non-Hispanic white, and African American children.

In a study published in 2022, it was emphasized that the diversity in India causes different prevalence rates of myopia. A lack of public awareness exists, which needs further research and policies to overcome the limitations in the management of myopia, which is a major public health problem worldwide. Screening for myopia in children and prescription of spectacles are not enough, as compliance to the use of spectacles among primary school children is not ideal. We need more surveys and studies to analyze the contributing factors and optimize the management of childhood myopia. In our district, this study was conducted over a period that included the time of the pandemic, with increased screen time and near work faced by the children.

Conclusion

Childhood myopia is an issue that needs to be addressed. Despite data available globally, most parents of school-going children, including those who themselves have myopia, do not get the vision of their children tested. Schools generally do not get the ophthalmological examination of children securing admission. There are regional differences in the incidence and prevalence of childhood myopia in different parts of the world and within India. The results of our study clearly emphasize the need for screening of refractive errors in children, especially those in whom the parents have myopia.

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Conflicts of interest

There are no conflicts of interest.

References

1. Singh NK, James RM, Yadav A, Kumar R, Asthana S, Labani S. Prevalence of myopia and associated risk factors in school children in north India. Optom Vis Sci 2019;96:200–5.
2. Murthy GV, Gupta SK, Ellwein LB, Muñoz SR, Pokharel GP, Sanga L, et al. Refractive error in children in an urban population in New Delhi. Invest Ophthalmol Vis Sci 2002;43:623-31.
3. Liang CL, Yen E, Su JY, Liu C, Chang TY, Park N, et al. Impact of family history of high myopia on level and onset of myopia. Invest Ophthalmol Vis Sci 2004;45:3446-52.
4. Ip JM, Huynh SC, Robaei D, Rose KA, Morgan IG, Smith W, et al. Ethnic differences in the impact of parental myopia: Findings from a population-based study of 12-year-old Australian children. Invest Ophthalmol Vis Sci 2007;48:2520–8.
5. Wakode NS, Wakode SL, Ksheersagar DD. Risk factors for myopia in medical students. Int J Recent Trends Sci Technol 2013;8:9-11.
6. Harrington SC, Stack J, O’Dwyer V. Risk factors associated with myopia in schoolchildren in Ireland. Br J Ophthalmol 2019;103:1803-9.
7. Xie Z, Long Y, Wang J, Li Q, Zhang Q. Prevalence of myopia and associated risk factors among primary school students: The Beijing children eye study. PLoS One 2017;12:e017592. doi: 10.1371/journal.pone.0175921.
8. Tideman JWL, Polling JR, Jaddoe VWV, Vingerling JR, Klaver CCW. Environmental risk factors can reduce axial length elongation and myopia incidence in 6- to 9-year-old children. Ophthalmology 2019;126:127–36.
9. Guo Y, Liu LJ, Tang P, Lv YY, Feng Y, Xu L, et al. Outdoor activity and myopia progression in 4-year follow-up of Chinese primary school children: The Beijing children eye study. PLoS One 2017;12:e017592. doi: 10.1371/journal.pone.0175921.
10. Guggenheim JA, Pong-Wong R, Haley CS, Gazzard G, Saw SM. Correlations in refractive errors between siblings in the Singapore cohort study of risk factors for myopia. Br J Ophthalmol 2007;91:781-4.
11. Jiang X, Tarczy-Hornoch K, Cotter SA, Matsumura S, Mitchell P, Rose KA, et al. Association of parental myopia with higher risk of myopia among multiethnic children before school age. JAMA Ophthalmol 2020;138:501-9.
12. Pujari A, Modaboyina S, Agarwal D, Saluja G, Thangavel R, Rakheja V, et al. Myopia in India. Clin Ophthalmol 2022;16:163-76.
13. Shukla P, Vashist PS, Suraj S, Gupta V, Gupta N, Wadhwani M, et al. Assessing the inclusion of primary school children in vision screening for refractive error program of India. Indian J Ophthalmol 2018;66:935-9.