ORIGINAL ARTICLE

Correlation of vitamin D levels with Myopia in Children: A Cross-Sectional Survey at a Tertiary Care Hospital in Rawalpindi.

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Abstract:

Objectives: To assess the link between vitamin D levels and myopia in children.

Methods: From August 2023 to January 2024, a cross-sectional survey was conducted at Farooq Hospital in Rawalpindi. The trial included 100 children with vitamin D levels <10 ng/mL, ages 3–12, after obtaining parental consent. Children with a history of refractive problems, ocular illnesses, or systemic ailments were excluded from the study. Serum vitamin D levels were measured, and cycloplegic and noncycloplegic refractions were performed. SPSS version 23 was used to do the statistical analysis, and the student's t-test was used, and significance was indicated by $p<0.05$.

Results: Of the 100 children,38 (38%) had myopia. mean age was 7.04 ± 2.38 years. The sample consisted of 54 females (54%), and 46 boys (46%). Myopia and vitamin D deficiency had no significant association (p=0.115). However, myopia was linked to older age (p=0.005). It was more common in females than males (55.3%).

Conclusion: This study raises the possibility that a vitamin D deficit may not substantially raise the prevalence of childhood myopia. Further research must look at various genetic and environmental factors that affect the development of myopia. *Al-Shifa Journal of Ophthalmology 2025; 21(2): 76-81. © Al-Shifa Trust Eye Hospital, Rawalpindi, Pakistan.*

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Introduction:

Myopia, also referred to as nearsightedness, is characterized by difficulty seeing distant objects clearly while maintaining close vision.[1] It is the most common cause of refractive error in the pediatric age group.[2] High myopia increases the risk of pathologic ocular changes such as cataracts, glaucoma, retinal detachment, and myopic macular degeneration, all of which can lead to blindness.[3,4] The global myopia prevalence has increased from 28.3% in 2010 to 35.8 % in 2023 & this prevalence is expected to reach 39.80% by 2050.[5,6] It is more than 2 times higher in East Asians than in white people. Various local studies revealed a prevalence of 19-41% among schoolchildren in Pakistan.[5] With its potential to negatively affect quality of life and link to a higher risk of significant eye disorders later in life, the rapidly rising frequency of myopia worldwide, especially among youngsters and most drastically in East Asia, has aroused serious public health concerns. Low vision puts the child and his or her family in danger of poverty and ill health. This finally leads to major concerns regarding national and international development. Low vision will undoubtedly imperil the achievement of two critical global indices of development, education, and health.[5] Therefore, understanding the underlying causes of myopia is critical for developing effective management and prevention strategies.

According to recent studies, environmental and lifestyle factors such as excessive near work and extended screen time have a considerable role in the initiation and progression of myopia. [2,6] The importance of vitamin D has gained increased recognition among these factors. Potential vision damage is one of the many health problems that have been connected to vitamin D insufficiency. There is growing evidence that low vitamin D levels may be linked to an increased risk of myopia development in children. Though the precise nature and extent of this association are still being investigated, [7,8,9] few studies have suggested that vitamin D affects the axial length of the eye & vitamin D levels are inversely associated with axial length.[10]

Vitamin D is synthesised in the skin in response to ultraviolet B (UVB) radiation from sunlight, and deficiency is commonly related to decreased outdoor activity and limited sun exposure—both of which are linked to myopia.[11] Some studies have reported that sunlight exposure is more correlated with reducing axial length than vitamin D by affecting the release of dopamine in the retina.[12] Other factors have also been in research for myopia as atropine and defocus hypothesis.[13,14]

Given the growing concern about vitamin D insufficiency and its possible effects on eye health, understanding the link between vitamin D levels and childhood myopia could help develop preventive strategies and interventions, thus saving future generations from the most serious complication of blindness as it is the easiest way to control this growing epidemic in future. Despite extensive research in the West, the role of vitamin D in myopia development is still debatable, and various studies have shown controversial results. The authors were able to locate very few local studies on this crucial topic after a thorough review of the local literature. This cross-sectional survey seeks to look into the link between childhood myopia and vitamin D levels. By analyzing the association between these variables, this study aims to contribute to the better understanding of myopia's etiology and to influence future public health programs aimed at lowering the prevalence of this refractive error, as this is an easily preventable and treatable cause.

Methodology:

This cross-sectional survey was carried out at Farooq Hospital from August 2023 to January 2024. 100 children of both sexes, ages 3 to 12, who presented to paediatric OPD with vitamin D levels below 10 ng/ml were included in the trial after written parental agreement was obtained. The sample size was calculated using the formula $n=z^2$ lakP(1-P)/$d^{2,}$ keeping a confidence level of 95%, an anticipated population proportion of 80, and an absolute precision of 0.08 (14). Children less than 3 or more than 12 years, already having any other refractive error, cataract, glaucoma, corneal/retinal disorders or congenital malformation of the eye, systemic disorders like Diabetes Mellitus, connective tissue disorders (Marfan & Ehler Danlos syndrome), Downs syndrome, and vitamin D and calcium supplements were excluded from the study. The ethical review board of Akhtar Saeed Medical College, Rawalpindi, reviewed & approved the whole protocol. An ophthalmologist from Farooq Hospital conducted the eye examination of the patients in Eye OPD. All patients were subjected to noncycloplegic measurements of autorefraction for both eyes using Canon RK-F1 full autorefractor followed by cycloplegic refraction for the accurate diagnosis of myopia. Myopia was defined as ≤ - 0.5 DS. A pre-designed questionnaire was used to gather data. The patient's serum vitamin D (1,25 dihydroxycholecalciferol) levels were measured using 2 millilitres of blood, which was then forwarded to the laboratory at Farooq Hospital. With SPSS version 23, statistical analysis was carried out. Welch Two sample t-test was applied. A p-value less than 0.05 was considered significant.

Results:

The analysis was performed for the 100 patients, who had a mean age of 7.04 ± 2.38 years. There were 54 girls (54%) and 46 boys (46%) having vitamin D deficiency. Myopia was seen in 38 patients, while 62 patients were found to have normal refractive errors. Of the 38 myopic patients, 21 (55.3%) were girls, while 17 (44.7%) were boys (Figure 1). The association of myopia with age is evident from Figure 2 (p = 0.005). Lastly, there was no significant association between myopia and vitamin D deficiency (Figure 3). Both groups had an almost equal range of vitamin D levels, as shown in Table 1.

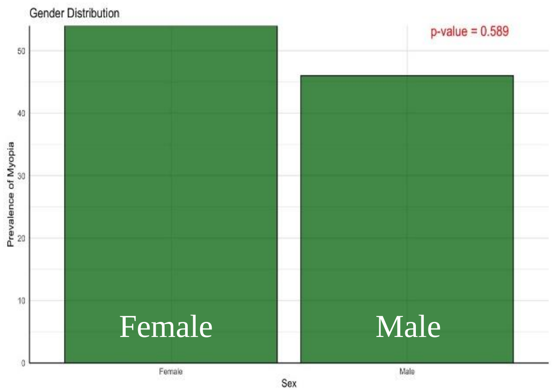

Figure 1: Gender distribution of myopic children

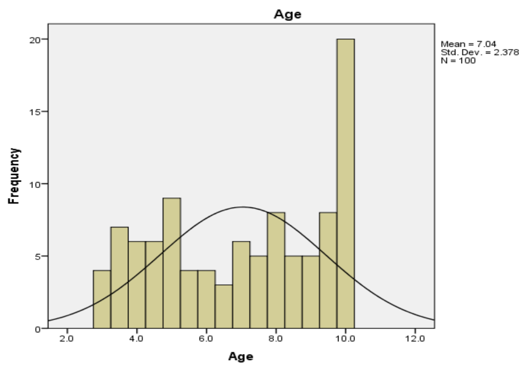

Figure 2: Age distribution of myopic patients (years)

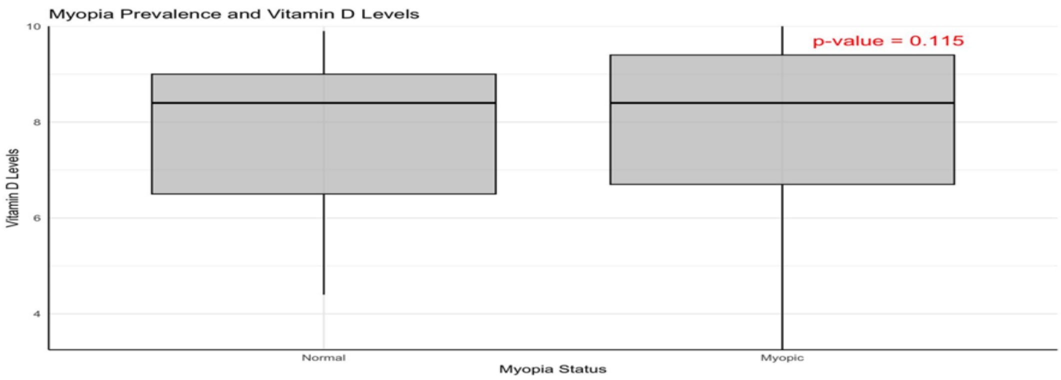

Figure 3: Association of vitamin D and Myopia

Table 1: Vitamin D levels in Myopic and normal children

	Vitamin D levels (ng/dl)	P value
Normal children	6.5-9	0.115
Myopic children	6.8-9.5	

Discussion:

In this study, the authors tried to find out the association of myopia and vitamin D levels in a pediatric population. There was no discernable association of myopia and vitamin D deficiency. With a sample of 100 children (mean age 7.04 ± 2.38 years), the findings showed that 38 patients (38%) were myopic, while 62 patients had normal vision. These results are in contrast to a local study that reported a mean age of 10 years with a predominance of boys, and myopia was seen in 55.6% of the children.[15] Interestingly, 55.3% of the myopic youngsters in this study were female, which is consistent with findings from other studies that have shown a higher prevalence of myopia in females.[16] According to another study, 51% of the participants were males, and the average age was 11.7 years.[9] A study conducted in China reported the shift of age of myopia from 10 years in 2005 to 7 years in 2021.[5]

The lack of a significant relationship between vitamin D deficiency and myopia ($p = 0.115$) diverges from some existing literature that suggests a possible link between low vitamin D levels and an increased risk of myopia. For instance, a study by Tideman et al. (2016) reported that children with lower vitamin D levels had a higher prevalence of myopia.[10] The same findings are reported by other studies as well.[7,8,16] This lack of association could be because of several reasons such as limitations of the study design (such as cross-sectional data), confounding factors (such as outdoor activity, dietary intake of vitamin D or genetic predispositions), or insufficient power due to a small sample size. Moreover, there could be a threshold effect at play, where moderately low levels of vitamin D might have a different impact on myopia development compared to very low levels. It is plausible that the association between vitamin D and myopia is stronger at a certain threshold of deficiency but may not be as pronounced in cases of extreme deficiency, where other factors may overshadow any potential effects of vitamin D on ocular development. However, the authors found few studies that support the findings of the current study with no association between low vitamin D levels and myopia.[15,17-20] A study conducted in the UK found a significant relationship between myopia and fewer outdoor activities; however, they failed to find an association between low vitamin D levels and myopia, suggesting some unknown factor to be associated with outdoor activities that may have a protective effect.[22] Another study conducted in 2021 revealed that sunlight exposure affects the development of myopia by affecting the release of dopamine in retina.[12] A systematic review conducted in 2023 reviewed various studies done to correlate the effects of nutrition, including vitamin D, with myopia. This review also failed to find any significant role of vitamin D in the development of myopia.[23] The current study supports the notion that other factors may play a more crucial role in the development of myopia, particularly age. The significant correlation found between older age and myopia ($p = 0.005$) corroborates findings by Araj et al. (2022), which indicated that the progression of myopia is significantly associated with the age of onset, higher weight, and body mass index.[15] Similar results have been found in other studies that support the increasing prevalence of myopia with increasing age. It could be related to the increased growth rates causing a rapid increase in axial ocular length and environmental factors (increased screen time and more near work due to the heavy academic burden and fewer outdoor activities).[16,24]

The prevalence of myopia observed in our sample aligns with global trends. The rising incidence of myopia among children has been linked to lifestyle changes, including increased screen time and reduced outdoor activities.[19] These environmental influences may overshadow the potential impact of vitamin D levels, suggesting that factors such as genetic predisposition and visual behaviour are more critical in myopia development.

Limitations of the current study include a small sample size and preselection of the patients with severe vitamin D deficiency, which may reduce the statistical power and generalisability of the findings to the broader population. The study does not account for other environmental factors (e.g., outdoor activity levels, screen time, seasonal variations) that may also influence myopia development and other potential confounding factors, such as genetic predispositions or nutritional status, which may affect the relationship between vitamin D and myopia. The absence of a significant association in the current research shows the necessity for further research as prospective control studies with larger sample sizes and various demographics to evaluate the relationship between vitamin D and myopia as well as comparison with controls with normal vitamin D levels.

Conclusion:

Findings of the current study indicate that Vitamin D may not be a significant risk factor in the development of myopia in children. Future research, especially longitudinal multicentre studies, should take a multifactorial approach, taking into account environmental, genetic, and behavioural factors that may contribute to the rising rates of myopia in the paediatric population.

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