

# Effect of genetic predisposition on the age of onset and progression of myopia among medical students

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## ABSTRACT

**Background:** Nearsightedness, or myopia, one of the refractive errors of eye and it has become more prevalent in recent years. Heredity and visual stress are the two main factors responsible for the development of myopia. Medical students are more vulnerable to early onset of myopia. **Aims and Objective:** To analyze the commencement and progression of myopia with or without genetic predisposed medical students. **Material and Methods:** This study included 131 myopic students with the age range of 17–25 years. The subjects were grouped into genetically predisposed (with either of the parent or both parents myopic) and genetically non-predisposed (both parents non-myopic). The data regarding the age of onset, family history, and the refractory power at the onset and present were collected by validated questionnaire. **Result:** In genetically predisposed group, the early age of onset ( $11.03 \pm 3.40$  versus  $12.98 \pm 3.78$ ), refractive power (right eye:  $1.01 \pm 0.96$  versus  $0.91 \pm 0.57$ ; left eye:  $0.94 \pm 0.71$  versus  $0.80 \pm 0.62$ ) was significantly increased ( $P < 0.05$ ) when compared to the non-genetically predisposed group. Progression of refractive power showed a nonsignificant increase in the genetically predisposed group. **Conclusion:** Early age of onset and faster progression of myopia in genetically predisposed might be due to the combined influence of genetic predisposition and environmental factors


**KEY WORDS:** Myopia; medical students; genetic predisposed; onset of myopia; progression of myopia

## INTRODUCTION

Myopia or nearsightedness is one of the errors of refraction in which close objects are seen evidently, but faraway objects look blurred. The cause of the myopia is elongated eyeball and increased curvature of cornea due to which the parallel rays of light entering the eye is not focused in front of the retina because of this the far way objects look imprecise.<sup>[1]</sup> Literature survey

shows that myopia is hereditary.<sup>[2]</sup> Severe myopia might lead to the development of eye ailment in future, including detachment of the retina, glaucoma, and macular degeneration.<sup>[3]</sup> In the USA, about 33% adults have been affected by myopia and the epidemic proportions of adults is from 85% to 90% in the Asian cities.<sup>[4]</sup> Age, country, sex, ethnicity, environment, and other factors frequently varies with the frequency and occurrence of myopia in the sampled populations. Inconsistency in testing and data collection methods makes difficulty in associating incidence and advancement.<sup>[5]</sup> Prevalence of refractive errors has reached about 2.3 billion.<sup>[6]</sup> Literature survey shows that association of large a number of genetic syndromes might be a contributing factor for myopia.<sup>[7]</sup>

The impact of genetic predisposition and contributing environmental factors has been the subject of discussion.<sup>[7,8]</sup> Recent reports suggest an Asian trend of high prevalence of myopia among students, reaching 'epidemic' proportions.<sup>[9–11]</sup>

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Lately, MBBS students in India are also reported to have a high prevalence.<sup>[12-14]</sup> Refractive errors are frequently more prevalent among students pursuing higher education. This might be possibly due to the influence of formal education. It is believed that information obtained from this study will help in making future planning and rendering better eye care services. This study targets to explore the onset and progression of myopia with or without genetically prone medical students.

## MATERIALS AND METHODS

Study was initiated after obtaining the approval and clearance from the institutional ethics committee and with the written consent from all the study participants. A total of 131 myopic medical students (64 myopic females and 67 myopic male) participated in the study with the mean age ranging from 19.6 ± 1.6 years. Subjects with the history of surgeries for refractive error correction, neurological complaints, long-term medical treatments, and pathological ocular disorders were excluded. The subjects were grouped into genetically predisposed (with either of the parent or both parents myopic) and genetically non-predisposed (both parents non-myopic). The data regarding the age of onset, family history and the refractory power at the onset and present were collected by validated questionnaire. Subsequently the data were compiled and categorized based on the two groups of myopic students with genetic predisposition and without genetic predisposition.

**Statistical Analysis:** SPSS Version 17.0 of statistical package was used. The data were expressed as mean ± SD. Student unpaired test and X-test was used to do the analysis.  $P \leq 0.05$  was taken as the level of significance.

## RESULT

Age of commencement, refractive power at the beginning, and refractive power at the present were compared in between the two groups (Table 1). A statistically significant ( $P < 0.05$ ) early age of onset was in genetically predisposed group when compared to the non-genetically predisposed group. Refractive power was significantly ( $P < 0.05$ ) more at the age of onset in genetically predisposed group. But, the progression of refractive power was nonsignificantly high in the genetically

predisposed group when compared to the non-genetically predisposed group.

## DISCUSSION

Medical students have high prevalence of myopia, reaching epidemic proportions, in the recent studies. Medical students have to indulge in a lot of curricular near work, probably predisposing them to development of myopia.<sup>[15]</sup> Furthermore, excessive near work indulged by students might remain to be a recognizable risk factor for myopia. In this study results show that influence of age, refractory power, and progression of refractory power were more in the genetically predisposed group as compared to non-genetically predisposed group. Several studies support the evidence favoring to a potent genomic role.<sup>[7,8]</sup> Genetic predisposition is one of the main contributing factors for racial differences in myopia pervasiveness between different racial groups in different countries.<sup>[16]</sup> Increased frequency of myopia were seen in Chinese compared to Indian and Malaysian school children.<sup>[17]</sup> Even after controlling the analogous lifestyle practices in parents and children, a strong relationship was observed between the family history of myopia and development of myopia.<sup>[18]</sup> Greater incidence in myopia has been shown among monozygotic twins when matched with dizygotic twins.<sup>[19]</sup> Studies with genetic background show numerous evidences for certain pathological variants of myopia.<sup>[20]</sup> Results of this study contribute supportive evidence to the strong genetic predisposition of myopia. A number of environmental hazard factors for myopia, comprising of higher educational achievement and well-established socio-economic status. Extreme intelligence and intense studies which medical students have to undergo throughout their carrier might be an additional contributed factor for the progress of myopia. But, the exact mechanism for the factors inducing the occurrence and advancement of myopia remains as a matter of debate. With our established study results, we are in conclusion that early age of onset and faster progression of myopia in genetically predisposed may be due to the combination of genetic tendency and environmental influence.

Randomly selected study population which possibly avoided the bias was the strength of the study. Recall bias might be one of the limitations of our study. Inputs gained from this study might provoke the development of novel strategies. However, proper information and appropriate awareness programs on

**Table 1: Myopic determinants in between genetically predisposed group and non-genetically predisposed group**

Parameters	Genetically predisposed group	Non-genetically predisposed group
Age of onset	11.03 ± 3.4	12.98 ± 3.78*
Refractory power right eye	1.01 ± 0.96	0.91 ± 0.57*
Refractory power left eye	0.94 ± 0.71	0.80 ± 0.62*
Progression of refractory power right eye	2.90 ± 1.5	2.49 ± 1.68
Progression of refractory power left eye	2.90 ± 1.5	2.49 ± 1.68

\* $P < 0.05$ ; Genetically predisposed versus non-genetically predisposed.

development of myopia with its environmental risk factors may reduce its incidence to a major extent.

## CONCLUSION

Early age of onset and faster progression of myopia in genetically predisposed might be due to the combined influence of genetic predisposition and environmental factors.

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