

# Risk Factors for Myopia in Medical Students

N. S. Wakode<sup>1</sup>, S. L. Wakode<sup>2\*</sup>, D. D. Ksheersagar<sup>3</sup>

{<sup>1</sup>Assistant Professor, <sup>3</sup>Professor and Head} Department of Anatomy, N. K. P. Salve Medical College, Nagpur, Maharashtra, INDIA.

<sup>2</sup>Assistant Professor, Department of Physiology, Government Medical College, Nagpur, Maharashtra, INDIA.

\*Corresponding Address:

[santoshwakode@gmail.com](mailto:santoshwakode@gmail.com)

## Research Article

**Abstract: Aim and introduction:** Today in India, with increasing level of education and living standard, the prevalence and severity of myopia appear to be an upward trend. High incidence and progression rates of myopia have been reported in individuals who spend long hours in near work activity. Besides several other factors, possible genetic factor and occurrence of myopia was also determined. **Material and method:** The present study was carried on 222 MBBS students of NKP Salve Medical College and government medical college Nagpur. Student completed questionnaire that include age, sex, age of appearance of refractive error, parent history, reading hours, computer using, television watching, playing videogame, scoring in common entrance, extra achievement in carrier and sport. Data was analyzed using SPSS frequency, percentage, mean and standard deviation was calculated accordingly. Chi-square test was applied wherever applicable and P value <0.05 was considered statistically significant. **Result:** Assessing genetic component, 81(66.39%) myopic student parent show positive family history whereas 41 myopic student parent, (33.60%) did not have positive family history. Statistically it showed strong significant relationship. (P= 0.001). Average continuous reading hours of myopic student were about 25hrs/ wk and 10hrs/ wk for emmetropic student. It was statistically significant (P=0.001). Strong significant association was found in myopic student for scoring achievement in carrier other than regular study as compared to emmetropic (P=0.001). Total hours of work on computer, watching television and playing video games were statistically significant for myopic. **Conclusion:** Myopia is a predominant refractive error among the first year medical students. Majority of myopic students score highest marks in common entrance, achievement in carrier other than syllabus study. The prevalence of myopia shows association with computer, videogame and TV. Majority of the parents of myopic medical students are also found to be myopic.

**Key Words:** Myopia, Emmetropic, Reading hours, refractive error.

## Introduction

Today in India, with increasing level of education & living standard, the prevalence & severity of myopia appear to be an upward trend. Myopia is a common cause of visual impairment in developing countries. Refractive error may be defined as a state in which the optical system of the non-accommodating eye fails to bring parallel rays of light to focus on the retina. Especially myopia has become a very common problem. Myopia is a refractive error in which eye fail to see distant objects properly. [1]. The prevalence rates in Asian countries vary from 50% in Chinese children [1] to 84% in Taiwan

& Hongkong [8]. The prevalence rates vary from 30.3% in middle aged adults & 35% in young adults in Norway [11] 53% in Norwegians medical student [3]. Various explanation have been proposed for this rise in prevalence, including the advent of electric lightening & television but the most plausible theory links the development of myopia with introduction of formal education, & in particular with reading in childhood. Study conducted in Turkey medical student, the prevalence & ages of onset were determined. Out of 207 student 32.9% was found to be myopic. [20] The ideas that, close visual work might cause or promote myopia have been mooted for many years. It is supported by the documented association between short sight & educational attainment. [9] There has long been a concern that blindness & visual impairment from myopia will lead to major public health problem for many countries in Asia [18]. Although blindness registry data indicate that myopia is the fourth leading cause of blindness in Singapore [17] this data is not representative of general population. Beyond the medical implication, myopia incurs significant socioeconomic costs. Direct cost related to the correction of myopia, including refractive eye power & surgery, is estimated to be in excess 150 million dollars a year. [16] High incidence & progression rates of myopia have been reported in individuals who spend long hours in near work activity, such as carpet weavers, visual display terminal workers & microscopes. Several environmental risk factors for myopia, including higher educational attainment, higher socioeconomic status & increased amount of near work activities are well documented in children [27]. However exact mechanism of how these factors induce the development of myopia remains controversial.

## Material and methods

The present study was carried on 222 MBBS students of NKP Salve medical college & government medical college Nagpur. Informed oral consent was obtained from each student after nature of study was explained to them individually. None of the student had any known ocular disease, an insult such as history of prematurity,

retinopathy, genetic disease. Student completed questionnaire that include age, sex, age of appearance of refractive error, reading hours & Scores in common entrance. Hours of computer using, television watching & playing videogames. We also asked whether the student received extra achievement in carrier other than syllabus study. The onset of myopia was assessed by asking when student first wore spectacles for nearsightedness (Myopia). Information about refractive error of parents, outdoor activity like sport was gathered through interviewing these medical students. Data was analyzed using SPSS frequency, percentage & mean & SD was calculated accordingly. Chi- square applied & P value <0.05 was considered statically significant.

**Result**

Two hundred & twenty two student were assessed, out of these 122 student found to be myopic (69 females & 53males). 98 were emmetropic (41 females& 57 males). The prevalence of myopia came out to be 54.95% among first year medical student. The range of Refractive error was from -0.5 to -4.5D, out of which 33.7% were - (0.5 to 1.5 D), 14% were – (1.75 to 3 D) & 7.4% were – (3.25 to 4.5D). (Table-1)

**Table 1:** Percentage of myopic students according to number of diopters

Diopter Number	Frequency	Percent
0.5-1.5	74	33.63%
1.75-3	31	14.09%
3.25-4.5	17	7.72%
<b>Emmetropic</b>	98	44.54%
<b>Total</b>	220	100.0%

Around 59.83% myopic student age of appearance of refractive error is between 16-20 years, 23.77% have 11-15 years & 16.39% have 5-10yrs. Thus increasing trend of myopia with age is seen. (Table-2)

**Table 2:** Frequency of appearance of myopia and recent refractive error change

Age of appearance of myopia (Total=122)	Frequency	Percent
5-10 yrs	20	16.39%
11-15 yrs	29	23.77%
16-20 yrs	73	59.83%
<b>Recent change in refractive error</b>	<b>60</b>	<b>49.18%</b>

Assessing genetic component, 81(66.39%) myopic students show positive family history whereas 41 myopic students (33.60%) do not have positive family history. Statistically it showed strong significant relationship (P=0.001).

**Table 3:** Myopia and its determinants by statistical analysis

Variables	Myopic	Emmetropic	Chi. square	P value
<b>Parent h/o</b>				
Yes	81	34	20.7267	0.001
No	41	64		
<b>Reading</b>				
10hrs/wk	7	38	84.8384	0.001
11-20hrs/wk	33	52		
21-30hrs/wk	82	08		
<b>Television</b>				
7hrs/wk	91	55	14.08	0.001
8-14hrs/wk	02	00		
>14hrs/wk	02	00		
No	27	43		
<b>Videogame</b>				
7 hrs/wk	23	11	6.9708	0.031
8-14hrs/wk	05	00		
> 14hrs/wk	00	00		
No	94	87		
<b>Computer</b>				
7hrs/wk	40	10	57.89	<0.001
8-14hrs/wk	30	01		
> 14hrs/wk	02	00		
No	50	87		
<b>Sport</b>				
Yes	50	35	0.6365	0.425
No	72	63		
<b>Score of entrance exam.</b>				
50-75%	00	16	35.1540	<0.0001
75% -90%	37	61		
>90%	85	21		
<b>Extra Achievement</b>				
Yes	27	05	12.6790	<0.0001
No	95	93		

Average continuous reading hours of myopic student were 25hrs/ wk whereas emmetropic student continuous reading hours were near about 10hrs/ wk. This difference was statistically significant. (P=0.001). Total hours of work on computer (myopic 30 hrs/wk, emmetropic 20 hrs/wk), watching television (myopic 30 hrs/wk, emmetropic 28 hrs/wk), & playing video games (myopic 30 hrs/wk, emmetropic 20 hrs/wk), were found to be statistically significant. (P < 0.05) Strong significant association was found in myopic student, by scoring achievement in carrier other than regular study. (P=0.0001) To further clarify intelligence& education, we have taken % of common entrance test marks of students, about 85myopic student score more than 90% marks, while 61 emmetropic score 75%-85%. It was also statistically significant. (P=0.001) Our study did not show any statistically significant relationship with sport activity. (P=0.425) (Table-3)

## Discussion

The result of present study are consistent with others in showing that prevalence of myopia increases among groups exposed to high educational demands during their student year [2],[4-7],[9]. Various research studies also shows that, the kind of near work like reading does influenced the development of myopia [14], [25], [27]. During Near work eyeball is in accommodation. Accommodation raises intraocular pressure that leads to myopia through elongation of eyeball. [24]. It can be hypothesized that reading scientific literature is more intensive & implies longer period of near focus than when doing calculation tasks & reading magazines, newspaper,& fiction literatures. Education is strongly associated with myopia at Kaohsiung medical college, where 88.3% of student survey appeared to be myopic [9].Such finding also seen in Chinese & Singapore medical student. [21- 22]. Factor associated with reading like high score in common entrance examination may play a part in myopic development in student. [28]. Further comparison of different measure like extra achievement in carrier other than regular syllabus, may helped to clarify which of the related factor are casually related to myopic prevalence. The prevalence& severity of myopia continuously progressed with education level & age. Most medical students find themselves to be under great stress as they go through a highly competitive environment, spending on average more than 25hrs/wk reading& studying. Such long periods of near work may possibly contribute to the significant prevalence of myopia among first year medical students of Nagpur. If accommodation is important in pathogenesis of short sight, then progression of myopia might be arrested in some children by prescription of bifocal lenses or multifocal lenses. A non randomized trial has suggested that bifocal lenses might be of some benefit [13]. Around 59.83% myopic student age of appearance of refractive error is between 16-20 years, 23.77% have 11-15 years & 16.39% have 5-10yrs. This increased trend of myopia with age is similar to findings seen among schoolchildren in Taiwan [8]. In our study around 49.18% myopic students change their refractive error after their admission in medical college. So the medical college is a surrogate factor for near work activity & it can lead to progression of myopia in myopic students. High myopia has a higher risk of cataract, glaucoma, myopic macular degeneration & retinal detachment. [10] Similar to other reports, we found association between time spent in front of computer & playing videogame [9], [15].

## Conclusion

(1) Myopia is the predominant refractive errors among the medical students studying in this college. In this regard, the importance of rigorous academic hard work in

the previous years to qualify the admission test related to medical study is one of the risk factor.

(2) Majority of myopic students score highest marks in common entrance, achievement in carrier other than syllabus study.

(3) The prevalence of myopia increased with hours of work on computer, playing videogames & watching television.

(4) Majority of the parents of myopic medical students are also found to be myopic. Thus genetic factor may play a more substantial role in the development of myopia.

This data could help health care professionals to develop targeted myopic control policies for the population of students in medical field & insure the policies are more rational, useful, & effective.

## Bibliography

1. Churg KM, Mohidin N, Prevalance of visual disorders in Chinese. *Optom Vis Sci*: 2006; 73:695-700.
2. DR. Parekh Paras. Comparitive study of prevalance of myopia in medical students & students of arts stream. *Indian J of Applied Basic Med. Sci.* 2013 vol. 15a (20).
3. Guggeheim JA, Hill C, Yam TF, Myopia, genetics, & ambient lightening at night in a UK sample. *Br. J Opthmolo*, 2007; 87; 521-6.
4. Jenny M, Seang-Mei Saw. Role of near work in myopia: Finding IOVS, July 2008, vol 49, no.7 2903-2910.
5. Kinge B, Midelfort A, Jacoben G, Rystad L. The influence of near work on development of myopia among university student. A three year longitudinal study aming engineering student in Norway. *Acta Ophthalmol Scand* 2000; 78:269.
6. Lin LL-K, Shih Y-f, Lee Y-C, Hung Pt HOU P-K (1996). Changes in ocular refraction & its components among medical students-a 5 year longitudinal study. *Optom. Vis Sci.* 73: 495-498.
7. LLLK Lin prevalance of myopia in Taiwanese school children 1983 to 2000.*Ann Acad Med Singapore* 2004; 33:27-33.
8. Luke L-K Lin Epidemiological study of the prevalance & severity of myopia among schoolchildren 2000 Taiwan *J Formos Med Asso* 2001 vol100. No. 10.
9. L. Wong, D Coggon, M Cruddas, C H Hwang. Education, reading, & familial tendency as risk factors for myopia in Hong Kong fisherman. *J. Epidemiology. Comm. Hea.* 1993; 47: 50-53.
10. Mitchell P, Hourihan F, Sandbach J, Wang JJ. The relationship between glaucoma & myopia. The blue mountain eye study. *Ophthalmology* 1999; 106:2010-5.
11. Midelfort A, Aamo B, Sjøhaug KA, et al. Myopia among medical students in Norway. *Acta Ophthalmol Scand*, 2007; 70,312-22.
12. Multti DO & Zadnik (1996). Is computer use a risk factor for myopia? *J. Am Optom Assoc* 67:521-530.
13. Ookey KH, Young FA, Bifocal control of myopia. *Optometr. Physio. Optics.* 1975; 52:758-64.
14. Pan CW, Rammurthy D, Saw SM. Worldwide prevalence & risk factors for myopia. *Ophthalmic physio opt* 2012 Jan 32(1) 3-16. 1475-1313.2011.00884.

15. Richler A, Bear JC. Refraction, near work & education. A population study in Newfoundland. *Acta Ophthalmol (copenh)* 1980; 58; 468-78.
16. Saw SM, Gazzard G, Au Eong KG, Koh D. Utility values and muopia in teenage school students. *Br J Ophthalmol* 2005; 87: 341-5.
17. See JL, Wong TY, and Yeo KT. Trends in the pattern of blindness & major ocular diseases in Singapore & Asia. *Ann Acad Med Singapore* 2008; 27:540-6.
18. Seet B, Wong TY, Tan DT, Saw SM, Balakrishnan V, and Lee LK, et al. Myopia in Singapore: taking a public health approach. *Br J Ophthalmol* 2007; 103: 1721-6.
19. Lai CY, Huang WL, Sheu MM, Chen CW. Refractive satus of students in Kaohsiung Medical college. *Trans Soc Ophth Sinicae* 1983; 22:14-20.
20. Sumru Onal, Ebru Toker, Ziya Akingol, Gul Arslan et al. Refractive errors of medical students in Turkey: One year fallow –up of refraction & biometry. *Optometry & vision science*. March2007, 84(3)175-180.
21. Wu, Hui-Min, Seet Benjamin, Yap Eric Peng-Huat, et al. Does education explain ethnic differences in myopia prevalence? A population- based study of young adult males in Singapore. *Optometry & vision science* April 2001, vol-78(4), 234-239.
22. Lei Lv, Zhenghou Zhang Pattern of myopia progression in Chinese medical students: a two-year follow-up study *Graefes Archive for Clinical and Experimental Ophthalmology* (8 June 2012), pp. 1-6, doi:10.1007/s00417-012-2074-9 citeulike:10782873
23. Young TL, Ronan SM, Drahozal LA, Wildenberg SC, Alvear AB, Oetting WS, Atwood LD, et al Evidence that a locus for familial high myopia maps to chromosome 18p. *Am J Hum Genet.*2008 Jul; 63(1):109-19.
24. Young FA. The nature & control of myopia. *J Am Optometr Assoc* 1977, 48,451-7.
25. Yanyan Wu., He Yi, Risk factors for myopia in Inner Mongolia medical students in China. *OJEPi* vol. 2, no. 4, Nov. 2012.
26. T Y Wong, P J Foster, G J Johnson, S K L Seah. Education, socioeconomic ststus, & ocular dimensions in Chinese adults: The Tanjong Pagar Survey. *Br J Ophthalmol.* 2002 Sep; 86(9): 963-968.
27. Zadnik K, Mutti DO (1987) Refractive error chages in law students. *Am J Optom Phys Opt* 64: 558-561.
28. Mordechai Rosner, Michael belkin. Intelligence, education, & myopia in males. *Arch Ophthalmol.*1987; 105(11), 1508-1511.