



International Journal of Medical Research & Health Sciences

www.ijmrhs.com

Volume 3 Issue 2 (April - Jun)

Coden: IJMRHS

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ISSN: 2319-5886

Received: 25th Jan 2014

Revised: 24th Feb 2014

Accepted: 28th Feb 2014

Research Article

STUDY ON THE PREVALENCE AND UNDERLYING FACTORS OF MYOPIA AMONG THE STUDENTS OF A MEDICAL COLLEGE IN KERALA

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ABSTRACT

Background: Few decades earlier, wearing spectacles was a province of adults over 40 years of age. Now we see more children and adolescents with spectacles/contact lenses. Various studies in Asian population show a dramatic increase in refractive error, especially myopia among school and college students. More advanced levels of education like medical education that involves extensive near work such as reading and writing have been repeatedly associated with greater myopia prevalence. **Objective:** To study the prevalence and the underlying factors of myopia in MBBS students of a Medical college in Kerala. **Research methodology:** One hundred and sixty two MBBS students (2009 - 2012 batches) were examined. 40 students were selected from each class by systematic random sampling technique, their visual acuity was checked using Snellen's Chart and Diopters were obtained. Details of factors were obtained using a questionnaire. **Results:** Prevalence of myopia was observed as 39.5%. First and second year students had a greater percentage of myopia with 40% & 52.5% respectively. 40.6% of myopics had positive family history of myopia ($p = 0.003$). Duration of TV watching and computer use showed a significant relation with myopia. ($p = 0.033, 0.009$). Reading hours, type of light used, playing or texting with cell phone and sleeping habits of students were not significant. **Conclusion:** Prevalence of myopia was high among medical students (39.5%). Significance of genetic predisposition was well appreciated in our study.

Keywords: Myopia, refractive error, visual acuity

INTRODUCTION

Myopia is the most prevalent ocular disorder throughout the world.¹ The myopic rate is 0.12% to 3.8% in Africa, 24% to 27.8% in Europe, 30% in Japan 40% in Egypt, 30% in the United States and 33% in China (more than 300 million people).^{2,3,4} The prevalence of myopia in places such as Hong Kong and Singapore is even higher and has been documented to be 60% to 80%.^{5,6,7}

Myopia (nearsightedness or short-sightedness) is one of the three commonly detected refractive errors; the other two being hypermetropia (long-sightedness) and astigmatism. Refractive errors occur when the rays of light entering the eye are not focused correctly onto the retina. In myopia, light rays entering the eye fall in front of the retina and as a result near objects may be seen clearly but objects in the distance appear blurred. This most commonly occurs when the

eyeball is abnormally long or the cornea does not properly bend the light rays entering the eye.

There has been a dramatic increase in myopia prevalence rates over the past few decades in different parts of Asia⁸. The increase in rates has been remarkable in very young Asian children, too, suggesting that early lifestyle risk factors may have a large impact on the early myopia development and the overall population prevalence rate of myopia⁹. Specifically, the lifestyle factors which may play a role in myopia development include reading for pleasure¹⁰, variations in lighting,¹¹ watching television and playing video games,¹² uses of the computers,¹³ time spent indoors, and less time spent in sport.¹⁴

In addition, some reports, published at the end of the last century created an alarming response to show that the academically active professionals are the major sufferers of this disease¹⁵. Prominent among the hypothesized myopia risk factors is a role for close up work, such as reading and related visual tasks¹⁶. It is generally believed that myopia is more commonly seen in highly educated persons compared to those who are not myopic¹⁷. Medical students are particularly such a select group which spends prolonged periods of time on reading and near work required by their intensive study regimen that spans many years¹⁸. Myopia is the most common vision condition affecting approximately 50 % of European medical students¹⁹ and around 90 % of Chinese medical students in Singapore²⁰ and Taiwan²¹. The prevalence rate of myopia is 50.3% in Norwegian medical students.²²

It is estimated that 49.3 million of those aged < 15 years may have refractive errors and under corrected refractive error is the most common cause of reversible blindness in India²³. As there are no studies reported among the medical students in Kerala, we made an attempt to find out the prevalence of myopia among the medical students.

MATERIAL AND METHODS

The study was conducted on 162 MBBS students (45 males and 117 females) of Azeezia Medical College. The study was conducted in four batches, admitted in the years from 2009 to 2012. After getting informed consent from each student, they were examined for their height, weight and visual acuity. The anthropometric scale and weight machine

were used to collect the data about height and weight of the individual student and represented in centimeters and kilograms, respectively. The body mass index was calculated using the formula as follows. Body Mass Index = Height (m²) /Weight (Kg). Snellen's chart was used to test the visual acuity for distant vision. The refractive values were collected based on the information furnished by the students themselves or collected from their current spectacle prescription, wherever available. Newly diagnosed students were sent to ophthalmology department and their power was checked. Students were asked to fill up a questionnaire regarding their different habits. The family histories pertaining to refractive errors in their parents were also collected by individual interrogation of each student.

Statistical analysis was carried out by Chi square test and student's 't'-test. One way ANOVA was also done. P value of <0.05 was considered statistically significant.

RESULTS

One hundred and sixty two (162) medical students (45 males and 117 females) were examined. The prevalence of myopia came out to be 39.5 % in medical students. Second year students had a greater percentage of myopia with 52.5% of the students being myopic.

33 students, developed myopia 2 – 5 years back, whereas 11 students developed it 6 – 10 years back and only 15 students developed it one year back. There was a strong relation with years after diagnosing myopia (p=0.000) which indicates that majority of them developed myopia in less than 5 years (figure 3). Out of 64 myopic students, 26 had positive family history (history of parental myopia), whereas 38 myopics did not show any family history. Among the 26 myopic students with positive family history, for 7 students both the parents were myopic and for 19 students single parent was myopic. Statistically it showed a strong significant relationship (p 0.003) (table 1). 23 students with myopia had siblings with myopia which was statistically significant (p=0.004).

64% of the students watched television for more than 1 hour to 5 hours per day 9% more than 5 hours per day and only 27% watched for less than 1 hour/day. Among the myopics, 29 students used to watch TV for more than 2 hours and 22 students for 1-2 hours

and only 13 students for less than 1 hour. Statistically it showed a significant relationship (p 0.033). Similarly, our study showed a significant relationship between the duration of computer use and myopia (p=0.009). 47% of the students were using computer for <1 hour , 40 % between 1-2 hours, 10% for 3-5 hours , 1.2 % for >5 hours /day and 1.8% were not using computer at all. 43% (28 students) of the myopics were reading for 2-3 hours/day, 45% (29) for 4-5 hours /day 12% (7) for >5 hours/day. But our study did not show any significant statistical relationship between reading hours per day , type of lights used during reading, playing or texting with cell phone and sleeping habits of students (p =0.470, 0.663, 0.332 and 0.274) .

Visual acuity by snellens chart 6/9 is taken as altered distant vision/ myopia. 64 students (39.5%) had myopia (figure 1). As per the lens power the students were divided into three groups of mild myopia (power< -2 diopters), moderate myopia (power >-2to-5 diopters) and high myopia (power > -5 diopters). Among 128 eyes of 64 myopic students, 128 eyes showed myopia. Of these, 78 eyes (39 students both eyes) had low myopia (24.1%), 40 eyes (20 students both eyes) had moderate myopia (12.3%) and 10 eyes (5 students both eyes) had high myopia (3.1%) (Figure 2)

Out of total 64 students suffering from myopia 11 students were in 2009-10 batch (27.5%), 15 students in 2010-11batch (37.5%), 21 students in 2011-12batch (52.5%) and 17 students in 2012-13 batch (40.5%) (Figures 4,5,6,7). The percentage of students

with myopia is more in the 2011 and 2012 admission, which indicates a definite increase in no. of students in the recent years. But there was no significant difference in the occurrence of myopia and batches of MBBS students by one way ANOVA (p 0.149). When 2009 -10 batch is compared with batch 2010-11and 2012-13 there was no significant difference in the occurrence of myopia between these batches by t test (p= 0.346, 0.220) but there was a significant difference with batch 2011-12 (p= 0.022). When batch 2010 compares with 2011-12 and 2012-13 batches, there was no significant difference (p=0.182, 0.786). Similarly, there was no significant difference between batch 2011-12 and 2012-13batches (p=0.281)

In our Study the age of the myopic students ranged between 18 and 25 years (mean age 20.8± 1.454). For the 2012-13 batch, there was a statistically significant relationship between their age and myopia (p=0.007). Their mean age was 19.1 ± 0.906. Mean age of 2011-12 batch was 20.53 ±0.877, 2010-11 batch 21.4±0.841and batch 2009-10 batch 22.25±0.809. Years after diagnosing myopia also showed a very high significant relationship with myopia in the same batch (p=0.000) means that majority of them developed myopia in 2-5 years.

There was no significant relationship between BMI and myopia in all the medical students (p= 0.111). On the other hand, batch wise analysis showed a significant relationship between myopia and BMI in 2011-12 batch of students (p= 0.041).

Table 1: Different variables in myopics and emmetropes

VARIABLES		No.of students with myopia	Emmetropes	Total	P Value
Year of admission	2012 (I st year)	17	25	42	0.149
	2011 (II nd year)	21	19	40	
	2010 (III rd year)	15	25	40	
	2009 (Final year)	11	29	40	
Age of students	18-19 years	20	16	36	0.129
	20-21 years	29	42	71	
	22-23 years	14	39	53	
	24-25 years	1	1	2	
	Total	64	98	162	
Years after diagnosing Refractive error	< 1 year	15	92	107	0.000*
	2-5 years	33	5	38	
	6-10 years	11	1	12	
	> 10 years	5	0	5	
Family H/O myopia	Yes	26	17	43	0.003*
	No	38	71	109	
	Total	64	88	152**	

VARIABLES		No.of students with myopia	Emmetropes	Total	P Value
Educational qualification of father	Illiterate	2	4	6	0.222
	10 th standard	10	27	37	
	12 standard	8	15	23	
	Degree	29	41	70	
	Post graduation	15	11	26	
Educational qualification of Mother	Illiterate	0	2	2	0.490
	10 th standard	10	33	43	
	12 standard	20	24	44	
	Degree	25	32	57	
	Post graduation	9	7	16	
Occupation of father	No job	4	3	7	0.158
	Labourer / Farmer	4	21	25	
	Govt. Employee	18	32	50	
	Business	21	28	49	
	Professionals in private sector	13	10	23	
	NRI	4	4	8	
Occupation of Mother	No job	45	71	116	0.259
	Labourer / Farmer	0	1	1	
	Govt. Employee	10	23	33	
	Business	4	0	4	
	Professionals in private sector	5	3	8	
	NRI	0	0	0	
H/O parental myopia	Neither myopic	37	81	118	0.007*
	Only father myopic	9	5	14	
	Only mother myopic	10	3	13	
	Both myopic	7	9	16	
Reading hours per day	2-3 hrs	28	55	83	0.470
	4-5 hrs	28	32	60	
	6-7 hrs	7	10	17	
	> 7 hrs	1	1	2	
Types of light used	Dim light	2	1	3	0.663
	Moderate	38	57	95	
	Bright	24	40	64	
Duration of T V watching	<1 hr	13	30	43	0.047*
	1-2 hrs	22	45	67	
	3-5 hrs	20	17	37	
	> 5 hrs	9	6	15	
Duration of computer use	<1 hr	31	45	76	0.009*
	1-2 hrs	22	42	64	
	3-5 hrs	9	8	17	
	> 5 hrs	1	1	2	
Duration of play / Texting with cell phone	Not done	4	16	20	0.332
	< 30 min.	22	30	52	
	30 min to 1 hr	24	31	55	
	2-3 hrs	8	13	21	
	> 3 hrs	6	8	14	
Total duration of sleep	< 6 hrs	5	19	24	0.274
	6 hrs	27	25	52	
	7 hrs	17	30	47	
	8 hrs	12	15	27	
	> 8 hrs	3	9	9	

*P < 0.05 - significant, *p < 0.05 significant, ** 10 parents of emmetropes had hypermetropia

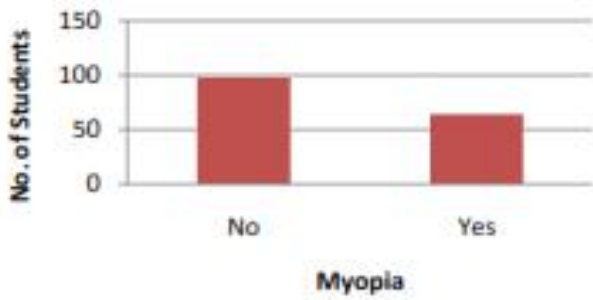


Fig 1: Frequency of Myopia among medical students

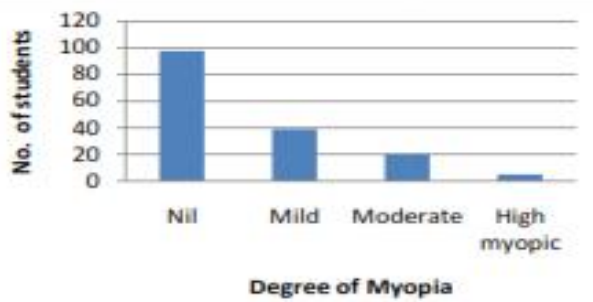


Fig 2: Degree of Myopia among medical students

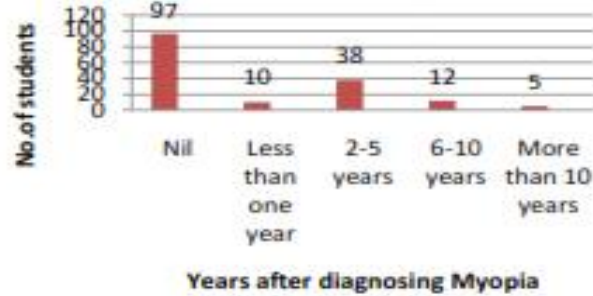


Fig 3: Relationship of Myopics with years after diagnosing Myopia

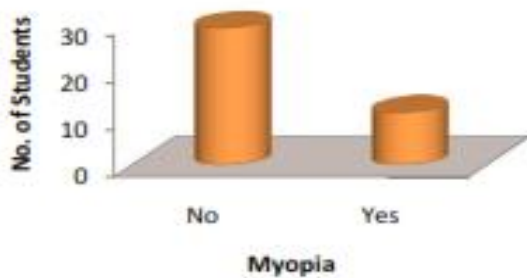


Fig 4: Frequency of Myopia in 2009 batch
Percentage of Myopia in 2010 batch

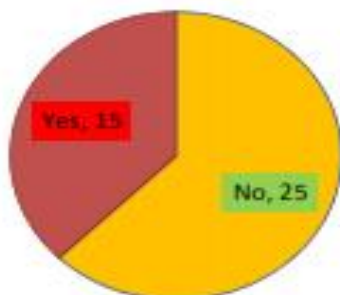


Fig 5: Percentage of Myopia in 2010 Batch

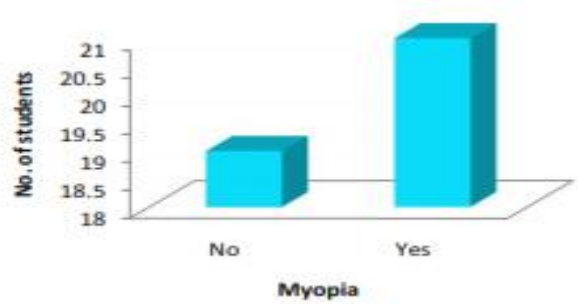


Fig 6: Frequency of Myopia in 2011 Batch

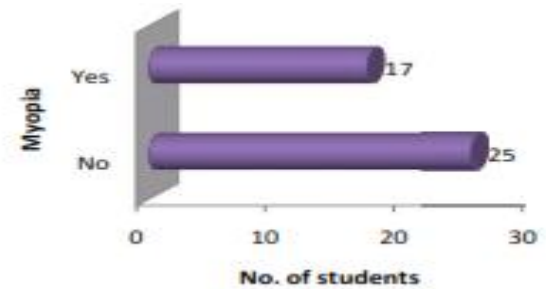


Fig 7: Frequency of Myopia among 2012 Batch Students

DISCUSSION

Myopia, a common type of ametropia is one of the leading causes of vision loss around the world²⁴. Present study was conducted amongst 162 medical students to know the prevalence among medical students who are a high risk population for the development of myopia. Out of these 64 (39.5%) were myopic. A previous study done in 128 Singapore medical students revealed that 82% of these students were having myopia.⁵ Similarly, a study of 345 medical students in Taiwan showed a prevalence rate of more than 90%, whereas a prevalence rate of 50% was seen in a study on 147 medical students in Denmark and 50.3% in a Norwegian study on 140 medical students^{19,22}. These differences in myopia prevalence rates in medical students across different countries may be attributable to ethnic variations and different genetic predispositions

The range of myopia among all medical students in our study was from -0.5 to -6.0 D. Mean age of students was 20.8 years with a standard deviation of ± 1.45 years; minimum 18 and maximum 25 years. An age group of 20 – 22 years had maximum number of students with myopia. In a study conducted by medical students in Norway, a clear relationship was detected between myopia and the age of onset of myopia.²²

There are studies showing a relationship between height, obesity and several eye conditions^{25,26}. In a

previous study in Israeli military recruits, no relationship was detected between anthropometric measurements and myopia²⁷. In another study, myopic Finnish males were found to be taller than nonmyopics²⁸. In a study, Saw *et al*²⁹ observed that obese children have more tendencies for hypermetropia, and had shorter vitreous chambers. Thus the gender as well as body measurements may have some contribution in respect to refractive errors. But in the present study, we did not get any significant relationship between myopia and BMI.

Relationship with year of study was significant among second year medical students. Out of total 40 second year students, 21 students were myopic (52.5%). The percentage was statistically significant ($p = 0.02$). This was followed by first year students who had 40% myopics. From this it is evident that students recently joining M.B.B.S have more frequency of myopia than the students who joined 3 - 4 years back.

Similarly, occupation of father and mother was not related to myopia among their children studying in the medical college ($p = 0.07$ and 0.242 respectively). 50.4% of the myopics developed myopia 2 – 5 years back, whereas 40.2% developed it 6 – 10 years back and only 8.4% developed it one year back. In a similar study carried out in Istanbul, Turkey, adult onset myopia group comprised 14.7% of all myopia cases.³⁰ It shows that development of myopia occurs mostly in school going children during adolescent age and with the passage of time, reporting of new myopia cases decreases.³¹ However, adult onset myopia is not an infrequent occurrence. Out of 64 myopic students, 26 (40.6%) had positive family history whereas 38 (59.4 %) myopics did not show any family history. Statistically it showed a strong significant relationship ($p = 0.003$). A strong genetic role is evident from the racial differences in myopia prevalence between different countries and, in Singapore, between different racial groups.³² Apart from that a consistent association between a parental history of myopia and development of myopia has been documented.³³ And also data from twin studies show significantly greater concordance in myopia rates among monozygotic compared to dizygotic twins.³⁴ Finally, genetic studies have identified several loci for certain pathological variants of myopia³⁵. Similarly the results of our study also suggest a strong familial predisposition of myopia.

The reading hours per day of the myopics and students with no ocular disease was statistically insignificant ($p = 0.470$). Duration of watching television and computer working showed a significant statistical relationship with myopia. ($p=0.047, 0.009$). Several environmental risk factors for myopia, including higher educational attainment, higher socioeconomic status and increased amount of near work activities like in carpet weavers, visual display terminal workers and microscopists are well – documented.^{36,22} However, the exact mechanism of how these factors induce the development and progression of myopia remains controversial.

The results of our study revealed a significant relationship between lifestyle factors like duration of TV watching and Myopia. In our study around 9.3% students, developed myopia after their admission in medical college (1 year back) whereas majority of the students developed it before their admission in medical college. The intensive study regimen of medical college involves extensive near work activity and it can lead to progression of myopia in medical students who have already developed the condition. But our students did not show more frequency of high myopia. This can also be due to the fact that as age advances, myopic progression slows down and the refractive status of the individual gets stabilized.

CONCLUSION

Prevalence of myopia was high among our students (39.5%) even though not as much as in other countries like Singapore, Taiwan, Norway and Denmark. 1st and 2nd year students had a greater percentage indicating that it is increasing in the younger age group. This indirectly depicts that excessive work which newer students have to undertake when they enter the professional course leads to early development of myopia. Besides, the significance of genetic predisposition was well appreciated in our study. Amount of near work involved in reading did not show any significant relationship with myopia. It may be due to stabilization of the refractive status of the majority of the students who developed the error many years back.

Relatively high prevalence of myopia among medical students is alarming. Further studies are required in this regard as it is going to be a threat to the nation in future.

ACKNOWLEDGEMENT

We acknowledge the immense help received from the scholars whose articles are cited and included in references of this manuscript.

REFERENCES

1. Tan DTH. The future is near: focus on myopia. *Singapore Med J* 2004; 45: 451-55
2. Kempen JH, Mitchell P, Lee KE, Tielsch JM, Broman AT, Taylor HR, et al. The prevalence of refractive errors among adults in the United States, Western Europe, and Australia. *Archives of Ophthalmology* 2004; 122(4) : 495–505
3. Wang FR. Myopia. Shanghai: Publishing House of Shanghai Medical University, 1996.
4. Sperduto RD, Seigel D, Roberts J, Rowland M. Prevalence of myopia in the United States. *Archives of Ophthalmology* 1983; 101(3):405–407
5. Chow YC, Dhillon B, Chew PT, Chew SJ. Refractive errors in Singapore medical students. *Singapore Medical Journal* 1990; 31(5) :472–73
6. Edwards MH, Lam CS. The epidemiology of myopia in Hong Kong. *Annals of the Academy of Medicine Singapore* 2004; 33(1) :34–38
7. Matsumura H, Hirai H. Prevalence of myopia and refractive changes in students from 3 to 17 years of age. *Survey of Ophthalmology* 1999; 44 (S1) :109–15
8. Lin LL, Shih YF, Tsai CB, Chen CJ, Lee LA, Hung PT et al. Epidemiologic study of ocular refraction among schoolchildren in Taiwan in 1995. *Optom Vis Sci* 1999 ;76 : 275-81
9. Saw SM, Chua WH, Hong CY, Wu HM, Chan WY, Chia KS et al. Nearwork in early-onset myopia. *Invest Ophthalmol Vis Sci* 2002; 43: 332-39
10. Simensen, B , LO Thorud . Adult-onset myopia and occupation. *Acta Ophthalmologica Scandinavica* 1994; 72 : 469–471.
11. Tan NWH, Saw SM, DSC Lam, Cheng HM, Rajan U, Chew SJ. Temporal variations in myopia progression in Singaporean children within an academic year', *Optometry & Vision Science* 2000; 77: 465-72
12. Ting, PWK, CSY Lam, MH Edwards, KL Schmid. Prevalence of myopia in a Group of Hong Kong microscopists. *Optometry & Vision Science* 2004; 81: 88-93
13. Von Noorden, GK, RA Lewis. Ocular axial length in unilateral congenital cataracts and blepharoptosis, *Investigative Ophthalmology and Visual Science* 1987; 28: 750-52
14. Wildsoet CF, Schmid KL. Optical correction of form deprivation myopia inhibits refractive recovery in chick eyes with intact or sectioned optic nerves. *Vision Research* 2000; 40: 3273-82
15. Kinge B, Midelfart A. Refractive changes among Norwegian university students. A three year longitudinal study. *Acta Ophthalmol Scand* 1999; 77: 302-305.
16. Richler A, Bear JC. Refraction, nearwork and education: a population study in Newfoundland. *Acta Ophthalmol (Copenh)* 1980; 58: 468-78.
17. Saw SM, Katz J, Schein OD, Chew SJ, Chan TK. Epidemiology of myopia. *Epidemiol Rev* 1996; 18:175–187
18. Shulkin DJ, Bari MM. Deteriorating vision: an occupational risk for the medical student. *Arch Ophthalmol* 1986; 104:1274
19. Fledelius HC. Myopia profile in Copenhagen medical students 1996–1998. Refractive stability over a century is suggested. *Acta Ophthalmol Scand* 2000; 78:501–505
20. Woo WW, Lim KA, Yang H, Lim XY, Liew F, Lee YS et al. Refractive errors in medical students in Singapore. *Singap Med J* 2004; 45:470–74
21. Lin LK, Shih YF, Lee YC, Hung PT, Hou PK. Changes in ocular refraction and its components among medical students. A 5- year longitudinal study. *Optom Vis Sci* 1996; 73:495–98
22. Midelfart A, Aamo B, Sjøhang KA, Dysthe BE. Myopia among medical students in Norway. *Acta Ophthalmol (Copenh)* 1992; 70 (3):317–22
23. Dandona L, Dandona R , Naduvilath TJ. Refractive errors in an urban population in Southern India: The Andhra Pradesh Eye Disease Study. *Invest Ophthalmol Vis Sci* 1999; 40: 2810-18
24. Fredrick DR . Myopia. *British Medical Journal* 2002, 324:1195-99
25. Mori K, Ando F, Nomura H, Sato Y , Shimokata H. Relationship between intraocular pressure and obesity in Japan. *Int J Epidemiol* 2000; 29: 661-66

26. Caulfield LE, West SK, Barron Y and Cid-Ruzafa J. Anthropometric status and cataract: the Salisbury Eye Evaluation project. *Am J Clin Nutr* 1999; 69: 237-42
27. Rosner M, Laor A, Belkin M. Myopia and stature: findings in a population of 106,926 males. *Eur J Ophthalmol* 1995; 5:1-6
28. Teikari JM. Myopia and stature. *Acta Ophthalmol* 1987; 65: 673-76
29. Saw SC, Chua WH, Hong CY, Wu HM, Chia KS, Stone RA et al. Height and its relationship to refraction and biometry parameters in Singapore Chinese children. *Invest Ophthalm Vis Sci* 2002; 43: 1408-13
30. Zadnik K, Manny RE, Yu JA. Ocular component data in students as a function of age and gender. *Optom Vis Sci* 2003; 80: 226-36
31. Zadnik K, Satariano WA, Mutti DO, Sholtz RI, Adams AJ. The effect of parental history of myopia on children's eye size. *JAMA* 2009; 271: 1323-27
32. Wu HM, Seet B, Yap EP, Saw SM, Lim TH, Chia KS. Does education explain ethnic differences in myopia prevalence? A population-based study of young adult males in Singapore. *Optom Vis Sci* 2005; 78: 234-39
33. Wong TY, Foster PJ, Ng TP, Tielsch JM, Johnson GJ, Seah SK. Variations in ocular biometry in an adult Chinese population in Singapore: the Tanjong Pagar Survey. *Invest Ophthalmol Vis Sci* 2005; 42: 73-80
34. McBrien NA, Adams DW. A longitudinal investigation of adult onset and adult progression of myopia in an occupational group. Refractive and biometric findings. *Invest Ophthalmol Vis Sci* 2008; 38: 321-33
35. Saw SM, Zhang MZ, Hong RZ, Fu ZF, Pang MH, Tan DT. Near work activity, night lights, and myopia in the Singapore-China study. *Arch Ophthalmol* 2006; 120: 620-27
36. Quinn GE, Shin CH, Maguire MG, Stone RA. Myopia and ambient lighting at night. *Nature* 2009; 399: 113- 14