National Journal of Physiology, Pharmacy and Pharmacology

RESEARCH ARTICLE

Prevalence of refractive errors and determinants of myopia among students in GMERS Medical College, Patan, Gujarat, India

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Received: April 21, 2019; **Accepted:** May 14, 2019

ABSTRACT

Background: Myopia is being more and more common in young age, particularly in higher academic group. Medical curriculum involves extensive and long duration near work including reading, writing, and working with microscope. Along with the use of gadgets, medical students go through more hours of reading. Along with this, certain aggravating factors such as using excessive mobiles, computers, playing video games, improper lighting while reading, watching television (TV), and more time spent indoor rather than outdoor are also responsible for refractive errors. **Aims and Objectives:** The objectives of this study were as follows: (a) To access the prevalence of refractive errors among medical students and (b) to find out determinants of myopia among medical students. **Materials and Methods:** A cross-sectional study was conducted among 248 M.B.B.S students in GMERS Medical College, Patan, after getting permission from the institutional ethics committee. After written informed consent, pre-tested questionnaire was given to fill it. Data regarding various determinants of myopia were collected such as reading duration, reading timing, using mobiles, watching TV, using computer, their outdoor activities, and familial history of refractive errors. Those students who denied consent and absent during data collection day were excluded from the study. **Results:** Refractive error was observed in 120 students (48.3%). The most common RE was myopia (90.0%) followed by astigmatism (10%) and hypermetropia (0%). The prevalence of myopia was significantly higher among those who usually read at night, sleep after 12 am, and use night lamp during sleep. However, more reading hours were not associated with myopia. Positive family history and preference of indoor activity during leisure time were significantly associated with myopia. Duration of watching TV and computer and mobile use was significantly more among myopic students as compared to students with normal refraction. Sleeping hour is also less in myopic students (5.9 ± 0.8 h) than other students (6.8 ± 1.5 h). **Conclusion:** The prevalence of RE (refractive error) was 48.3% among medical students, and myopia was the most common RE. Myopia was significantly associated with positive family history, reading at night, preference of supine position during reading, late night sleep, duration of TV watching, computer use, and playing with mobile, less outdoor activities.

KEY WORDS: Myopia; Determinants; Mobile

Access this article online	
Website: www.njppp.com	Quick Response code
DOI: 10.5455/njppp.2019.9.0517514052019	

INTRODUCTION

We have four special senses, vision, hearing, smell, and taste, of which, vision is highly used in day-to-day work. Therefore, it is at more risk to develop problem. In refractive error, the parallel rays of light coming from distance are focused either behind or in front of retina. If rays are focused in front of

retina, it is known as myopia. This usually happens when eyeball is abnormally long. If the rays are focused behind retina, it is known as hypermetropia. Of this, myopia is being more and more common in young age, particularly in higher academic group.[1]

In the 21st century, there is remarkable increase in the use of technology in the various forms of gadgets such as computer, tablets, and mobile in young generation. Medical curriculum involves extensive and long duration near work including reading, writing, and working with microscope.[2] Along with the use of gadgets, medical students go through more hours of reading. It is documented that the development of myopia and its progression in adulthood is related to the duration of near work.[3,4] Therefore, they are more prone to develop refractory error, particularly myopia.

In India, the prevalence of myopia is 7–11% in 15 years old and 35% in adults.[5] MBBS students in India are also reported to have a high prevalence.[6,7] Nowadays, both heredity and environment factors contribute in progression of refractive errors.[3] Along with this, certain aggravating factors such as using excessive mobiles, computers, playing video games, improper lighting while reading, watching television (TV), and more time spent indoor rather than outdoor are also responsible for refractive errors.[8] The severity of myopia is directly associated with diseases such as retinal detachments, glaucoma, cataract, and macular degeneration. With regard to this, we have conducted this study among medical students of GMERS Medical College, Patan.

Aim and Objectives

The objectives of this study were as follows:
(a) To access the prevalence of refractive errors among medical students and (b) to find out determinants of myopia among medical students.

MATERIALS AND METHODS

A prospective, cross-sectional, observational study was undertaken in GMERS Medical College and Hospital, Patan, after getting permission from the institutional ethics committee. This study was conducted on total of 248 M.B.B.S students of the 1st and 2nd years during January–April 2019. The students were explained regarding purpose of study and they were given assurance that their identity will remain confidential. After written informed consent, pre-tested questionnaire was given to fill it. The questionnaire has two sections; one section included characteristics of students such as year of admission, age, height, and weight and another section included determinants of myopia such as reading duration, reading timing, using mobiles, watching TV, using computer, their outdoor activities, and familial history of refractive errors. The students using spectacle or lens were considered having refractive errors. In students not using spectacle or lens, visual activity was checked using Snellen's chart. Each eye was tested separately. Those students who denied consent and absent during data collection day were excluded from the study.

Statistical analysis

Data were entered into Microsoft office Excel 2007 and analyzed with Epi-info 7.1 software. Qualitative data were described in frequency with percentage and quantitative data were described in mean ± standard deviation. Comparison of qualitative variables was analyzed by Chi-square test and Z test was used to compare quantitative data. $P < 0.05$ was considered as statistically significant.

RESULTS

Of 300 medical students, 248 students participated in the study. Therefore, response rate was 82.6%. Characteristics of participants are shown in Table 1. Mean age was 17.8 ± 1.82 years. More than half of the students were from the 1st year (53.2%), 17–18 years old (56.0 %), and male (54.8%). Majority of students were hostel residents (94.8%).

Table 1: Characteristics of students (*n*=248)

Variable	Frequency (%)
Age group	
17–18	139 (56.0)
19–20	109 (44.0)
Gender	
Male	136 (54.8)
Female	112 (45.2)
Year	
First	132 (53.2)
Second	116 (46.8)
Present residence	
Hostel	235 (94.8)
Localite	13 (5.2)
Total	248 (100.0)

Table 2: Prevalence of refractive error in medical students

Variables	Frequency (%)
Type of refractive error (n=120)	
Myopia	108.0 (90.0)
Astigmatism	12 (10)
Hypermetropia	0 (0)
Total	120 (100.0)
Degree of myopia (n=108)	
Mild (0–3 D)	81 (75.0)
Moderate (3–6 D)	23 (21.3)
High (> 6D)	4 (3.7)
Total	108 (100.0)

Refractive error was observed in 120 students (48.3%). The most common RE was myopia (108, 90.0%) followed by astigmatism (12, 10%) and hypermetropia (0, 0%). Of the total myopics, two-third students (71, 75.0%) were having mild myopia and pathological (high) myopia was observed in only 4 students (3.7%). Mean age of diagnosis of myopia was 14.5 years while onset of pathological myopia (8.7 year) was early than mild myopia (15.6 year).

In the present study, proportion of hypermetropia and astigmatism was very low so comparison of different variables could be done between myopic students (108) and students with normal refraction (128). Myopia was commonly seen in female students (57.0%) than male students (36.5%). As shown in Table 2, the prevalence of myopia was significantly higher among those who usually read at night, sleep after 12 am, and use night lamp during sleep. However, more reading hours were not associated with myopia. Positive family history and preference of indoor activity during leisure time were significantly associated with myopia ($P < 0.05$). Duration of watching TV and computer and mobile use was significantly more among myopic students as compared to students with normal refraction ($P < 0.05$). Sleeping hour is also less in myopic students (5.9 ± 0.8 h) than other students (6.8 ± 1.5 h) Table 3.

Some of the variables were higher among myopic students but statistically not significant such as (a) myopia was proportionally higher in the 2nd year students (45.7%) as compared to the 1st year (41.7%), (b) students preferring supine position (52.4%) during reading as compared to sitting position (42.2%), and (c) who used light (52.2%) during reading as compared to moderate light (41.8%) but statistically not significant ($P > 0.05$) Table 4.

DISCUSSION

In the present study, prevalence rate of RE among medical students of GMERS Medical College, Patan, was 48.3% and the most common RE was myopia (90.0%). One-fourth students (75.0%) had mild myopia followed by moderate (21.3%) and pathological myopia (3.7%). Students developed

Table 3: Comparison of qualitative variable between students with myopia and normal refraction

Variable	Normal refraction (*n*=128) (%)	Myopia (*n*=108) (%)	Total n (%)	χ^2 value and *P* value
Year				
First	77 (58.3)	55 (41.7)	132 (100.0)	χ^2=0.25 *P*=0.61
Second	51 (54.3)	53 (45.7)	104 (100.0)	
Gender				
Male	82 (63.5)	47 (36.5)	129 (100.0)	χ^2=9.12 *P*=0.002
Female	46 (43.0)	61 (57.0)	107 (100.0)	
Preferred position during reading				
Supine	39 (47.6)	43 (52.4)	82 (100.0)	χ^2=1.86 *P*=0.17
Sitting	89 (57.8)	65 (42.2)	154 (100.0)	
Light used during reading				
Moderate	85 (58.2)	61 (41.8)	146 (100.0)	χ^2=2.04 *P*=0.15
Dim	43 (47.8)	47 (52.2)	90 (100.0)	
Reading time				
Early morning	42 (66.7)	21 (33.3)	63 (100.0)	χ^2=13.12 *P*=0.001
Evening	23 (71.9)	9 (28.1)	32 (100.0)	
Night	63 (44.7)	78 (55.3)	141 (100.0)	
Night lamp used during sleep				
Yes	38 (44.7)	47 (55.3)	85 (100.0)	χ^2=4.28 *P*=0.03
No	90 (59.6)	61 (40.4)	151 (100.0)	
Sleep onset				
Before 12 am	88 (57.9)	64 (42.1)	152 (100.0)	χ^2=1.90 *P*=0.03
After 12 am	40 (47.6)	44 (52.4)	84 (100.0)	
Activity preferred during leisure time				
Outdoor	86 (67.2%)	57 (52.8%)	143 (100.0)	χ^2=4.51 *P*=0.03
Indoor	42 (32.8%)	51 (47.2%)	93 (100.0)	
Family history of refractive error				
Present	15 (43.2)	25 (56.8)	40 (100.0)	χ^2=4.65 *P*=0.03
Absent	113 (57.6)	83 (42.3)	196 (100.0)	

Table 4: Comparison of quantitative variable between students with myopia and normal refraction

Variables	Normal refraction (*n*=128) mean±SD	Myopia (*n*=108) Mean±SD	*P*-value*
Height (cm)	157.3±3.42	164.3±2.32	<0.05
Duration of close work (h/day)			
Reading	4.9±1.8	5.2±1.5	>0.05
Watching TV	1.3±0.8	1.6±1.3	<0.05
Computer use	0.7±0.3	0.8±0.4	<0.05
Mobile use	3.5±1.8	4.3±1.1	<0.05
Sleeping time	6.8±1.5	5.9±0.8	<0.05

**P* value was calculated using Z test. TV: Television

RE at mean age of 14.5 years. Onset of pathological myopia (8.7 years) was found early than mild myopia (15.6 years). Female had more prevalence of myopia than male students. Reading and sleeping habits were quiet stringent in myopic students. Myopic students usually read at night, sleep after 12 am for short time, and use night lamp during sleep. However, reading hours and reading in dim light were not significantly associated with myopia. Duration of watching TV and computer and mobile use was significantly more among myopic students as compared to students with normal refraction. Positive family history and preference of indoor activity during leisure time were significantly associated with myopia.

In the present study, the prevalence rate was lower than study Gujarat (55.6%) by Kathrotia *et al*.,[7] Maharashtra (54.95%) by Wakode *et al*.,[9] and Baroda (54.06%) by Rajdeep and Patel.[10] Various study reported that myopia was the most common RE.[7-9] In the study conducted by Onal *et al*.,[11] mild, moderate, and high myopia were observed in 81%, 17.6%, and 1.4% of students, respectively, which was similar to our study. Kshatri *et al*. reported that the mean age of RE diagnosed was 16.4 years.[12] Similar to the present study, onset of pathological myopia was also found early (9.8 years) in the study of Jyothirmai *et al*.[13] Reports by Gopalakrishnan *et al*.[14] and Woo *et al*.[2] revealed that myopia was more prevalent in female students than male students. Various studies documented that increased height was associated with higher length of eyeballs which contribute to myopia.[15,16] Similar association between height and myopia was observed in the present study. Read at night, late night sleep, use night lamp during sleep, and excessive use of computer and mobile were observed as potential risk factors for the development and progression of myopia in various studies.[7,9,17] In new generation, computer and cell phones have replaced reading as the main close work. Therefore, reading hour was not significantly associated with myopia in our study. The extensive close work as well as the long and intensive course in medical colleges may lead to the high prevalence of myopia among medical students.[2,18] Mehdizadeh *et al*. reported a significant contribution of family history and computer use among myopics.[19] Kathrotia *et al*.[7] and Wakode *et al*.[9] also supported this finding.

This study was a cross-sectional, institution-based study so cohort studies or community-based randomized clinical trials should be carried out to search determinants of myopia. Data were collected from medical college only so it cannot be generalized.

CONCLUSION

On the basis of the present study, it was concluded that the prevalence of REs was 48.3% among medical students, and myopia was the most common RE. Myopia was significantly associated with positive family history, reading at night, preference of supine position during reading, late night sleep, duration of TV watching, computer use, and playing with mobile, less outdoor activities. Duration of such activities should be cut short. School eye screening program should be implemented effectively as the mean age of diagnosis is around 14 years.

ACKNOWLEDGMENTS

I am thankful to the study participants without whom this study would have been impossible.

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How to cite this article: Patel DK, Desai RM, Ramavat M. Prevalence of refractive errors and determinants of myopia among students in GMERS Medical College, Patan, Gujarat, India. Natl J Physiol Pharm Pharmacol 2019;9(7):652-656.

Source of Support: Nil, **Conflict of Interest:** None declared.