



THE PREVALENCE OF REFRACTORY ERRORS & IT'S ASSOCIATION WITH DIGITAL SCREENS AMONG MEDICAL STUDENTS

Physiology

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ABSTRACT

Introduction: Ammetropia, commonly called as refractive error is a type of physical handicap which affects the planning of career especially in jobs for navy, military, railway and aviation etc. **Objectives:** To evaluate the type of refractive error, prevalent in medical students and presence or association of digital screens to refractory errors. **Materials and Methods:** The present study was a questionnaire based observational study. A total 240 students (150 of first year and 90 of second year) after clearly explaining the purpose and procedure of the study were enrolled in the study. A questionnaire was used to assess socio-demographic data. Students, who were using glasses, lens or had taken any surgery for correction of refractory error, were taken as having refractive errors and the refractive errors was assessed by asking students the amount of current close up work, which included usage of digital screens like mobile, TV, laptop and computer work given in hours per day. **Conclusion:** Among the various type of refractory errors, Myopia was the most common refractory error affecting 47.5% of students and the high prevalence of myopia in category 1 (0 to -2) followed by category 2 (-2 to -4) category 3 and 4. It was also found that Majority of students i.e. 132 (55%) spent 2-4 hours on digital screen and it shows statistically significant ($p=0.004$) relationship of digital screen work with myopia.

KEYWORDS

Refractory errors, Medical students, Myopia, Hypermetropia, Digital screens

INTRODUCTION

Ammetropia, commonly called as refractive error is a type of physical handicap which affects the planning of career especially in jobs for navy, military, railway and aviation etc.¹ The prevalence of refractive errors is more in highly educated people as they may have an over exposure to technology or more near vision activity. It has been seen that uncorrected refractory error remains the second commonest cause of global visual impairment; next only to cataract.² Students, the easiest prey to these errors, usually do not complain of defective vision and may not even be aware of this condition. They try to adjust the problem of defective vision by sitting in front row of benches or holding of the book close to their eye thus accommodating eyes. The earliest sign of refractory errors is strain in the eyes with or without redness by evening, accompanied with watering or headache or both.³ Poor vision in students has a negative influence on their future life as it affects productive performance in education thus in long term affecting the economic burden of country.⁴ Uncorrected refractive errors create a significant impact on learning and academic success. Very little is known about the prevalence of refractive errors in medical students, who are at a higher risk of contracting a refractory error due to long hours of study and much exposed to digital media.

OBJECTIVES

1. To evaluate the type of refractory error, prevalent in these students.
2. To determine the presence or association of digital screens to refractory errors

MATERIAL AND METHOD

The present study was designed to be a questionnaire based observational study, conducted in Department of Physiology, Geetanjali medical college and Hospital, Udaipur, Rajasthan.

This study was conducted on the medical students of first and second MBBS, after obtaining the permission from Human Research Ethical Committee of Geetanjali University.

The study was initially proposed to be conducted on 250 medical students (125 from each batch), where each of them had to fill an anonymous questions. This questionnaire was prepared and validated before implementing it on the students.

A total 240 students (150 of first year and 90 of second year) after clearly explaining the purpose and procedure of the study were enrolled in the study. A questionnaire was used to assess socio-demographic data. Students, who were using glasses, lens or had taken any surgery for correction of refractory error, were taken as having refractive errors. The refractive errors was assessed by asking students

the amount of current close up work, which included usage of digital screens like mobile, TV, laptop and computer work given in hours per day.

We have categorized refractive errors: Myopia, Hypermetropia and Astigmatism.

The main cause of myopia is axial lengthening of the eyeball, known as **axial myopia**. It is the most common form. **Curvature myopia**, it occurs due to increased curvature of cornea, lens or both. Mostly near sightedness is caused by a natural change in the shape of the eyeball that makes it egg shaped rather than round. This causes light to focus in front of the retina rather than directly on it. This is called '**simple myopia**'. Myopia further categorized according to Diopter power, Category 1: from -0D to -2D, Category 2: -2D to -4D, Category 3: -4D to -6D, Category 4: >-6.

The main cause of hypermetropia is axial shortening of the eyeball. This is known as **axial hypermetropia**. About 1mm shortening of the anteroposterior diameter of the eyeball results in 3D of hypermetropia. Due to change in the curvature of cornea, lens or both, this is known as **curvature hypermetropia**. About 1mm increases in the radius of curvature results in 6D of hypermetropia. Another cause of hypermetropia is aphakia. **Aphakia** means absence of crystalline lens either congenitally or acquired following surgical removal.

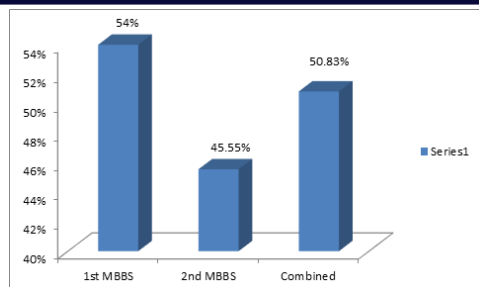
The students who were presenting organic defects in eye such as corneal opacity, fundus pathology and who were not willing to participate were excluded from study.

This study is an attempt to determine the overall prevalence of refractory errors, the distribution of individual type of refractory error and to find out correlation with screen usage Statistical analysis for significance of digital screen usage was carried out by Pearson's Chi square test and P values less than 0.05 was considered statistically significant.

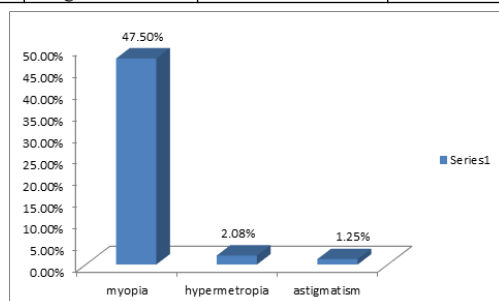
OBSERVATION AND RESULT

TABLE: 1
Prevalence of total refractory errors

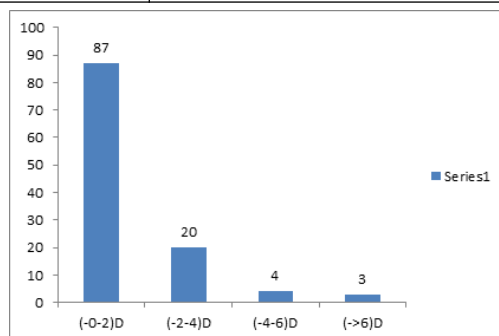
Total no of Students	Total no of Students With Refractive Errors	Prevalence of total Refractive Errors
First MBBS(150)	81	54%
Second MBBS(90)	41	45.55%
Combined(240)	122	50.83%

**Table: 2 Prevalence Of The Individual Type Of Refractory Error**

S.No.	Type of Refractive Error	Total no. of students with Refractive Error	Prevalence of Refractive Errors
1.	Myopia	114	47.5%
2.	Hypermetropia	5	2.08%
3.	Astigmatism	3	1.25%

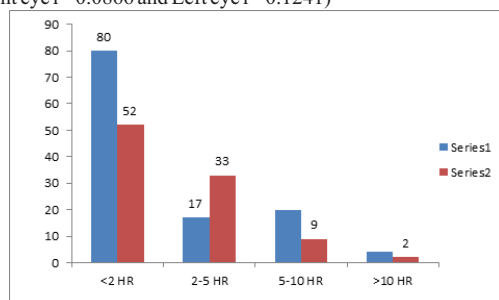
**Table: 3 Classification Of Myopia According To Dioptric Power**

Category	Total no of myopic students
(-0-2)D	87
(-2-4)D	20
(-4-6)D	4
(>-6)D	3
TOTAL	114

**Table: 4 Exposure To Digital Screens**

Time spend on digital screen (hr)	No of students with refractory errors	No of students without refractory errors	Total students	P VALUE
<2 hr	80	52	132 (55%)	0.004
2-5 hr	17	33	50 (20%)	
5-10 hr	20	9	29 (12%)	
>10 hr	4	2	6 (2.5%)	

(Right eye $r=0.0866$ and Left eye $r=0.1241$)



(The P value 0.004 is lesser than 0.05. The difference is considered significant. Therefore, there is association between refractory errors and time spent on digital screens.)

DISCUSSION

We observed that the prevalence of refractive errors in first MBBS students was 54% whereas it was 45.55% in the second MBBS students with the overall prevalence of 50.83%. Similarly, Shaikh SA (2015) stated that prevalence of refractive errors were significantly higher ($p=0.03$) in medical students than non-medical students with percentages of 61.3% and 49.4% respectively among female students of King Saud University (KSU) ⁵. Many of the other studies also evaluated the prevalence of refractory errors and found them significantly higher in medical students ^{6,7}. In contrast, Patel R (2013) found that prevalence of refractory errors among Gujarat, Indian medical students was significantly lower than other Asian population i.e. Singapore (89.85%), Taiwan (92.8%) ⁸. These variations may be attributed to ethnicity and different genetic predispositions. Gopalakrishnan SA (2011) also stated that prevalence of refractory errors among medical students of AIMST University, Malaysia was only 32.24% ⁹.

In the view of fact that prevalence of refractory errors is higher in medical students because medical students have to spend long hours on studies and spend their long hours in front of digital screens and they are also subjected extensively to work where near vision is used.

In the present study, **Myopia** is the most prevalent type of refractory error among the various types of refractive errors affecting 47.50% of medical students. Similarly, Onal S et al (2007) found that myopia one of the most common type of refractory error with the prevalence of 32.9% in the Turkish medical students. ¹⁰ Filho ARG (2013) reported that 70.8% of medical students from Universidade Estadual de Londrina had some type of refractive error, and myopia was the most prevalent, with 40.4% of students. ⁷

Similarly, Megbelayin EO (2014) found 63.6% of medical students of Calabar University, Nigeria were myopic ⁶. Sood RS et al also observed that myopia is quite prevalent among the medical students in Western India. ¹¹ Mehta P et al (2014) evaluated the prevalence of myopia in southern Rajasthan and found myopia is highly prevalent (62.66%) refractive error among the medical students. Low myopia (-0.25 to -3) D, moderate myopia (-3.25 TO -5) D and high myopia was (>-5.25) D found in 68 (75%), 19 (20.21%) and 7 (7.44%) students respectively. High prevalence of low myopia followed by moderate myopia in both the sexes. ¹² In contrast to our finding hypermetropia was more prevalent, with 7.7% of the children whereas myopia in 7.4% of children aged 5-15 years in urban population of New Delhi. This study was carried out by Murthy GVS et al (2002) ¹³. In a study of refractory errors in Hong Kong, it was found that the prevalence of myopia increased from 30% at ages 6-7 years, to 70% at age's 16-17 years ¹⁴. Therefore myopia is least common in school children whereas hypermetropia is more prevalent among children.

Myopia is one of the most common refractory errors among medical students. Near work can be most important associated environmental risk factor for myopia and also associated with parental history of myopia.

We had classified Myopia according to dioptric power where Category 1: from (-0D to -2D), Category 2: (-2D to -4D), Category 3: (-4D to -6D), Category 4: (>-6). Our study reports the high prevalence of myopia in category 1 (0 to -2) followed by category 2 (-2 to -4) in both the sexes. However, it was observed the high refractive error of category 3 is least common in girls (1.63%) whereas category 4 is least common among boys (1.88%). Similarly Mehta P (2014) found low myopia (-0.25 to -3.00) is more common in the medical students of Southern Rajasthan in the both male and female students and followed by moderate (-3.25 to -5.00) and high myopia (>-5.00).

In our study overall hypermetropia was found to be second common refractory error (2.08%) after the myopia (47.5%) and Sastigmatism was the least common refractory error affecting 1.25% of medical students.

Similarly, Kinge B et al (1998) compared the refractive state in a population sample to that among university students of Norway. They reported that the population sample had significantly ($p=0.001$) higher

prevalence of hypermetropia than the university students¹⁵. Das A et al (2007) also found that hypermetropia was next common refractive error after myopia in school children aged 5-10 years in Kolkata. In this study hypermetropia was found in 7.16% and astigmatism was in 3.93%.¹⁶

In contrast to our findings, He M et al (2004) observed that astigmatism was next common refractive error affecting 33.6% of children after the myopia (7.31%) in the urban area of southern China¹⁷. These variations in the prevalence of various types of refractory errors are probably due to difference in the study protocols.

Basu M, et al (2016) found astigmatism as second common refractory error in 9.38% of medical students after the myopia in 87.50% medical students of Kolkata.

They found near work is a risk factor of myopia. Excessive study curriculum of medical school involves intensive near work such as reading and writing which can cause myopia as well as its progression¹⁸.

The time spent on digital screens like mobile, tablets, TV and computer were consistent with prevalence rate of refractory errors. Majority of students i.e. 132 (55%) spent 2-4 hours on digital screen and 6 students (2.5%) spent more than 10 hours on digital screens and 29 (12%) spent 5-10 hours/day. These results show weak positive correlation (right eye ($r=0.0866$) and left eye ($r=0.1241$) but statistically significant ($p=0.004$) relationship of digital screen work with myopia.

Similarly, the study conducted amongst medical students in Kerala; the association of computer work with myopia was significant ($p=0.009$) but not so with reading hours.¹⁹

In contrast to our findings, there are studies which report a statistically non significant ($P=0.499$) relationship of electronic screens usage with myopia amongst medical students²⁰. However, a Norwegian study shows no association between watching TV and working with video display terminals²¹.

There was no statistically significant relationship of computer working ($P=0.266$) and reading ($P=0.910$) with myopia amongst medical students of AIMC, Lahore²². Basu M et al also observed that duration of TV watching ($p=0.88$), computer use ($p=0.70$), and playing/texting with cell phone ($p=0.05$) had no significant relation with refractory errors.¹⁸

AIMC suggests that although near work activities do not show any significant relationship with myopia, they could affect the age of onset of myopia. Most of the medical students of AIMC acquired myopia in late childhood.²²

Present study shows a strong evidence ($P=0.004$) of association of hours spent on digital screens with prevalence rate of myopia, but an absolute conclusion can only be made after evaluating other factors like age of onset of myopia, distance and light under which these activities were performed.

CONCLUSION

- In present study, overall prevalence of refractory errors was found to be 50.83% among the medical students.
- Among the various type of refractory errors, Myopia was the most common refractory error affecting 47.5% of students and the high prevalence of myopia in category 1 (0 to -2) followed by category 2 (-2 to -4) category 3 and 4.
- It was observed that overall hypermetropia was the next common refractory error (2.08%) and astigmatism was the least common refractive error (1.25%).
- It was found that Majority of students i.e. 132 (55%) spent 2-4 hours on digital screen while 20% spent 2-5 hours, 12% spent 5-10 hours and only 2.5% spent >10 hours. These results show weak positive correlation [right eye ($r=0.0866$) and left eye ($r=0.1241$)] but statistically significant ($p=0.004$) relationship of digital screen work with myopia.

This study shows a strong evidence of association of hours spent on digital screens with prevalence of myopia and we can make it more effective after evaluating other factors like age of onset of myopia, distance and light under which these activities were performed. The

limitation of the study in calculating the prevalence and implicating the hours spent on digital screens is a risk factor in development of refractory errors. It is suggested that further studies be conducted among different profession related with digital screens usage besides medical students across the globe to get exact trend in prevalence of refractory errors.

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