

## Original Research Article

# Prevalence and associated risk factors of refractive errors among medical students in Western Odisha: a cross-sectional study

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## ABSTRACT

**Background:** prevalence of refractive errors among medical students pursuing higher studies is very high. Very little data about the prevalence of refractive errors among medical students in western Odisha is available. So, this Present study was undertaken with an objective were to estimate the prevalence of refractive errors among medical students of VIMSAR, Burla, Western Odisha, India and to study the association between various risk factors with the prevalence of refractive errors.

**Methods:** A cross-sectional study was conducted among undergraduates i.e. (from 1<sup>st</sup> year to final year) students of VIMSAR, Burla for a period of 2 months i.e. February to March 2020 with sample size of 200. A pre-designed, semi-structured questionnaire was prepared and distributed to students. To assess refractive errors among study population auto refractometer was used.

**Results:** The overall prevalence of refractive errors in our study was 65%. Most common type of refractive error was Myopia i.e. 113 (86.92%) among the medical students followed by Astigmatism (10.77%) and Hypermetropia (2.31%) respectively. It was observed in our present study that the prevalence of refractive errors was highly associated within crease in study duration, use of electronic gadgets such as smartphones and computers and with the presence of family history this group difference was found to be significantly associated with chi-square=9.4183, 78.9173, 114.235 and 56.1899 respectively with P<0.05.

**Conclusion:** High prevalence of refractive errors was found among medical students of VIMSAR, Burla which emphasis on the need for routine ophthalmological evaluation and their proper assessment and management.

**Keywords:** Refractive errors, Medical students, Prevalence, Myopia, Near work, Risk factors

## INTRODUCTION

Refractive errors remain the second commonest cause of global visual impairment next to cataract which had created a significant impact on learning and academic success.<sup>1</sup> High prevalence rate of refractive errors was seen among medical students and they were unaware about it.<sup>2</sup> Studies in Singapore and Taiwan have shown a prevalence of refractive errors more than 80% among medical students.<sup>3,4</sup> However European, Caucasian population seems to have less prevalence compared to Asian.<sup>5,6</sup>

But studies on refractive errors have primarily focused on school going children in different parts of India and had been seen that the prevalence of refractive errors is of 25% or less.<sup>7</sup>

For any developing country, medical students are considered as an academically dynamic population and a powerful future for the human resource. But with the increasing incidence of refractive errors in these individuals, they could add to the economic burden. Therefore, awareness about the risk factors leading to refractive errors would be of support in its prevention and

planning of public health strategy.<sup>8</sup> However in our setup studies among medical students are lacking.

Racial and ethnic variances are common reasons for difference in prevalence, but alteration in lifestyle such as the quantity of near-vision tasks like studying habit, daily usage of digital screen devices and family history have also amplified the global variation in the prevalence of refractive errors.<sup>2</sup>

So, this study was undertaken with an objective were to estimate the prevalence of refractive errors among medical students of VIMSAR, Burla, Western Odisha, India and to study the association between various risk factors with the prevalence of refractive errors.

**METHODS**

A cross-sectional study was conducted among undergraduates i.e. (from 1<sup>st</sup> year to final year) students of VIMSAR, Burla for a period of 2 months i.e. February to March 2020.

**Sample size**

Sample size was determined by the formula-  

$$N=4pq/d^2$$

Where, N=sample size, assuming the prevalence (p) of refractive errors as 56.90%.<sup>2</sup>

Taking absolute precision as 7%, the sample size was 201 which was rounded up-to 200.

Data was collected from first year to final year medial students including male and female in a ratio of 1:1 and 40 students from each year were included through simple random sampling by using computer generated random number table. A pre-designed, semi-structured questionnaire was prepared and distributed to students. There was no potential risk to participants as the study did not involve any intervention.

Students who were using powered spectacles, contact lens or who gave any history of surgical intervention were considered as having refractive errors while others were asked to assess for refractive errors using auto refractometer in ophthalmology department of VIMSAR, Burla which is located in the vicinity of the hospital. The ophthalmologic examination of the available sample was done in 2months. Each day 3-4 students were examined to get the required sample size. Ethical clearance was obtained from VIREC committee of VIMSAR, Burla.

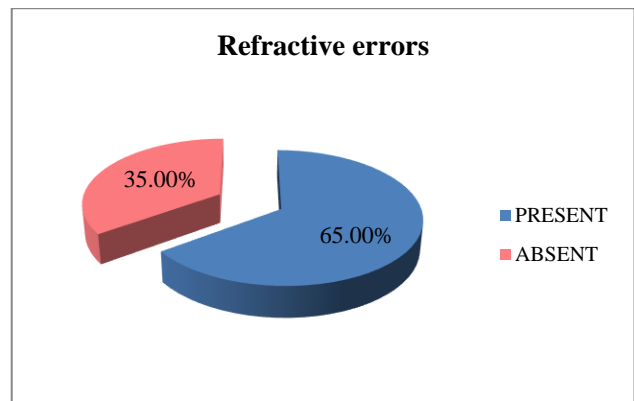
**Operational definition**

Refractive errors were categorized as myopia, hypermetropia, and astigmatism in the following ways:

Myopia is the word used to refer to the condition in which the posterior principal focus thus formed lies in front of the retina, while hypermetropia defines a reverse situation in which this focus lies hypothetically behind the retina. However, a third condition exists in which the posterior principal focus fails to form a point focus and this is denoted as astigmatism.

**RESULTS**

In our study Figure 1 illustrates that the prevalence of refractive errors among the medical students was 130 (65%).



**Figure 1: Prevalence of refractive errors among study population (n=200).**

**Table 1: Distribution of different types of refractive errors (n=130).**

Refractive errors types	Number	Percentage (%)
<b>Myopia</b>	113	86.92
<b>Hypermetropia</b>	3	2.31
<b>Astigmatism</b>	14	10.77
<b>Total</b>	130	100%

**Table 2: Gender wise distribution of different refractive errors among study population (n=200).**

Refractive errors	Male (n=99)		Female (n=101)		Total (n=200)	
	N	%	N	%	N	%
<b>Myopia</b>						
Present	54	54.55	59	58.41	113	56.5
<b>Hypermetropia</b>						
Present	0	0	3	2.97	3	1.5
<b>Astigmatism</b>						
Present	9	9.09	5	4.95	14	7

In the present study it was seen that myopia is the most common type of refractive error i.e. 113(86.92%) among the medical students followed by Astigmatism (10.77%) and hypermetropia (2.31%) respectively.

Table 2 demonstrate that out of 200 study population 130 had refractive errors. Overall refractive error is more prevalent among females 67 (51.53%) compared to males 63 (48.46%). Among the total cases of myopia, 54 i.e. (54.55%) were males and females were 59 i.e. (58.41%). Hypermetropia was found to be prevalent exclusively among 2.97% of females whereas astigmatism was more prevalent among males (9.09%).

**Table 3: Association between daily activities and refractive errors.**

Daily activity (in hrs)	Refractive errors		Total (n=200)	Chi-Square P value
	Present (n=130)	Absent (n=70)		
<b>Studying activity</b>				
0-5	54 (41.54)	45 (64.29)	99 (49.5)	X <sup>2</sup> =9.4183 P=0.002148**
6-10	76 (58.46)	25 (35.71)	101 (50.5)	
<b>Mobiles usage</b>				
0-3	10 (7.69)	47 (67.14)	57 (28.5)	X <sup>2</sup> =78.9173 P=0.0001**
>3	120 (92.31)	23 (32.86)	143 (71.5)	
<b>Computers usage</b>				
0-3	9 (6.92)	57 (81.43)	66 (33)	X <sup>2</sup> =114.235 P=0.0001**
>3	121 (93.08)	13 (18.57)	134 (67)	
<b>Sleep duration</b>				
<6	89 (68.46)	5 (7.14)	94 (47)	X <sup>2</sup> =116.597 P=0.001**
6-8	31 (23.85)	7 (10)	38 (19)	
>8	10 (7.69)	58 (82.86)	68 (34)	

Out of total 200 students 101 (50.5%) were seen studying between 6-10 hrs, out of which 76 i.e. (58.46%) were having refractive errors whereas those students who were spending 0-5hrs time on studying among them 54 (41.54%) had refractive errors. Hence it seems that the refractive error was more prevalent among students studying more than 5 hours this group difference was found to be significant with chi-square value =9.4183 and p value <0.05. 143 (71.5%) and 134 (67%) were using mobile phones and computer for more than 3 hours respectively, out of which 120 (92.31%) and 121 (93.08%) developed refractive errors in contrast to those who were using less than 3 hrs. This difference was found to be significant with chi-square value 78.9173 and 114.235 respectively with P-value<0.05.

Students sleeping more than 8hours had less refractive errors (7.69%) as compared to those who sleep 6-8 hrs and <6 hours i.e. (23.85% and 68.46%) respectively. Sleeping habit and refractive error was found to be

significantly associated with each other with p value <0.05.

**Table 4: Association between family history and refractive errors.**

Family history	Refractive errors		Total	Chi-square P value
	Present (n=130)	Absent (n=70)		
Present	87 (66.92)	8 (11.43)	95 (47.5)	X <sup>2</sup> =56.1899 P=0.0001*
Absent	43 (33.08)	62 (88.57)	105 (52.5)	
<b>Total</b>	130 (100)	70 (100)	200 (100)	

Table 4 shows that most of the students having refractive errors had a family history i.e. 87 (66.92%). So, the association between family history and refractive error was found to be significant with chi-square value 56.1899 and p<0.05.

**DISCUSSION**

The overall prevalence of refractive errors in our study was 65% out of which 99 i.e. (49.5%) were males and 101 (50.5%) were females.

Study conducted by Gopalkrishnan et al reported that out of 425 medical students, 137 i.e. (32.24%) were found to have refractive errors. Among students who had refractive errors, there is significant difference between the proportions of male and female which was in contrary to our study finding where we did not find any significant difference with the gender and occurrence of refractive error.<sup>9</sup>

In another study done by Rajesh et al in Gujarat, India reported that the prevalence rate of refractive error among medical students was 55.60%, which was nearly similar to our study finding.<sup>10</sup> Whereas, the prevalence rate among medical students of other Asian populations like in Singapore or Taiwan were (89.8%) and (92.8%) respectively.<sup>3,4</sup> These variations may be attributed to ethnicity and different genetic predispositions.

A study conducted in Andhra Pradesh by Krishnaiah et al observed that 36.5% of subjects were classified as myopic, 18.1% were classified as hyperopic, 38.2% subjects were having astigmatism and (13.6%) subjects were anisometropia.<sup>11</sup> In contrary we found out in our present study that the most common type of refractive error was myopia i.e. 113 (86.92%) among the medical students followed by Astigmatism (10.77%) and Hypermetropia (2.31%) respectively which was in agreement with the study conducted by Parveen et al and Sood et al.<sup>8,12</sup>

The higher rate of refractive errors in medical students was probably due to the high level of educational achievement, above average intelligence, long and exhaustive study schedule and prolonged near-work.

The most common causes of increase myopia in this age group were probably due to the increase in axial length with age and secondly an increase in near work in medical students.

Krishniah et al in his study found out that there was no statistically significant difference between the gender in the prevalence estimates of all refractive errors, except for hyperopia, in which the prevalence was significantly higher among women (13.3% vs 22.4%;  $p=0.0001$ ).<sup>11</sup> Whereas in our study we found out that the prevalence of hypermetropia was significantly lower than myopia and astigmatism with a total prevalence of 2.31% and present in females mostly but it is not significantly associated. The short axial length in females could be the cause for the greater prevalence of hypermetropia among them.

A study conducted in Burdwan by Dey et al. reported that long and rigorous study schedule of average 5 to 6 years predisposed the medical students for higher rate of refractive errors especially myopia which was similar with our study finding where we found out that the prevalence of refractive error was more among students studying between 6-10 hrs than those who spent 0-5 hrs in studying.<sup>13</sup> This group difference was found to be significantly associated with the prevalence of refractive errors with chi-square value=9.4183 with p value<0.05.

In another study by Parveen et al also observed that worsening of myopia with the medical studies and increase in study duration was present in 56.3% and 50.2% respectively.<sup>8</sup>

It was observed in our present study that the prevalence of refractive errors was highly associated with use of electronic gadgets such as smartphones and computers and the group difference was found to be associated significantly with chi-square value=78.9173 and 114.235 respectively with p value<0.05. This observation was in agreement with the findings of study conducted by Reddy et al. who also found out that more than 2 hours continuous use of computer was significantly associated with occurrence of symptoms of computer vision syndrome.<sup>14</sup> In another study conducted by Rajeev et al suggested that the prolonged use of computers is responsible for development of refractive error which was in consistent with our results.<sup>15</sup>

Richer et al reported in his study that the excessive near work had been identified as one of the predisposing factors for high myopic incidence in medical students.<sup>16</sup>

Students sleeping more than 8 hours had less prevalence of refractive errors (7.69%) as compared to those who had average sleep duration of 6-8 hrs followed by <6 hours

i.e. (23.85% and 68.46%) respectively. Sleeping habit and prevalence of refractive error was found to be significantly associated with each other with P-Value <0.05.

In our study we observed that those students having refractive errors among them, 87 (66.92%) had a parental history of refractive errors whereas those students without refractive errors among them only 8 i.e. (11.43%) had present parental history.

Chaudary et al and Goldschmidt et al in their study demonstrated that there was a strong genetic predisposition to myopia and the genetic effect was found to be significantly larger in subjects with a higher level of education.<sup>17,18</sup> In another study by Wakode, in Nagpur reported that 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 ( $p=0.001$ ).<sup>19</sup> This finding was similar with our present study where we also found out that the association between family history and prevalence of refractive error was significantly associated with chi-square value=56.1899 and  $p<0.05$ .

In Singapore a study conducted by Woo WW et al hypothesised that an underlying genetic predisposition may alter eye growth which affects the prevalence rates in medical students.<sup>3</sup>

## CONCLUSION

In this cross-sectional study, a high prevalence of refractive errors was found among medical students of VIMSAR, Burla. Myopic was the most common type of refractive errors. This might be due to rigorous academic hard work in the previous years to qualify the admission test related to medical profession. The increased usage of electronic gadgets like laptops, computers and smart phones, increased duration of study period was found to be the major associated risk factors for the occurrence of refractive errors along with the presence of family history.

## Recommendations

This highlights the need for routine ophthalmological evaluation and their proper assessment and management. This information will help health care professionals to develop targeted myopic control policies and ensure to implement the policies which would be more rational, useful, and effective. for the population of medical students.

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