

## ORIGINAL ARTICLE

**Prevalence of Refractive Errors among Medical Students and Identification of Associated Factors**Saadia Maqbool<sup>\*</sup>, Abdul Rehman Rizwan, Iram Manzoor, Ali Qais, Aleena Furqan, Abdul Rehman**ABSTRACT**

**Objective:** To determine the prevalence of refractive errors among medical students and identify associated factors.

**Study Design:** Analytical, cross-sectional study.

**Place and Duration of Study:** The study was conducted in the Department of Community Medicine at Akhtar Saeed Medical and Dental College, Lahore from September 2020 to December 2020.

**Materials and Methods:** The study included 300 medical students using convenience sampling technique. A self-structured pre-tested questionnaire was used. All medical students including MBBS, BDS, Pharm –D and allied health sciences were included in the study. Those students who did not give consent were excluded from the study. Data analysis was done with SPSS version 23. Chi square test of significance was applied to find association between the variables and  $p$ -value  $< 0.05$  was considered statistically significant.

**Results:** Refractive error was observed in 203 students (67.7%). The commonest refractive error was myopia (37%) followed by hypermetropia (23.7%) and astigmatism (7%). The prevalence of refractive errors was significantly associated with positive family history ( $p$  value  $= < 0.001$ ), family income per month ( $p$  value  $= 0.01$ ) and mobile use per day ( $p$  value  $= 0.001$ ). Higher percentage of refractive error (70.6%) was reported by participants who were comfortable with light in which they study ( $p$  value  $= 0.03$ ).

**Conclusion:** The prevalence of refractive error was 67.7% among medical students, and myopia was the most prevalent refractive error. Refractive errors were significantly associated with positive family history, family income and mobile use per day.

**Key Words:** Myopia, Medical Student, Refractive Error, Risk Factors.

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**Introduction**

Globally, refractive errors are the prevalent cause for vision impairment and the second most common cause of blindness.<sup>1</sup> According to World Health Organization (WHO), one billion people have a vision impairment. Uncorrected refractive error has been documented as one of the root causes of moderate or severe vision impairment or blindness in 123.7 million individuals.<sup>2</sup> Magnitude of refractive errors is

quite high in our country and about 27.1 million persons aged 16-39 years are suffering from refractive errors.<sup>3</sup>

Globally, the prevalence of refractive errors, specifically myopia, is increasing at an alarming pace. Myopia is affecting 27% of the world population, with an incidence of 32.9% in adult population of Asia.<sup>4</sup> In Pakistan, myopia affects 36.5% of adults and 42.2% of the pediatric population.<sup>5</sup> The global incidence of hypermetropia is recorded as 30.6%, with regional incidence of 38.9% in Asia.<sup>6</sup> It has an occurrence of 10.14% among Pakistani adults.<sup>7</sup> In Southeastern Asia, the EPP of astigmatism is about 44.8%.<sup>6</sup>

Uncorrected refractive errors are known to have many social consequences in addition to the health risks. The social ramifications may include isolation,

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reduced educational and employment opportunities, increased morbidity, economic distress and overall quality of life.<sup>8</sup>

Prevention or corrective treatment is possible in 80% of the causes of visual impairment. The WHO and 20 International Non-Governmental Organizations (INGOs) launched the global initiative, "Vision 2020," for reducing preventable blindness. Refractive errors are a priority for this global initiative Vision 2020: the Right to Sight.<sup>9</sup>

Academically active professionals are some of the prime candidates for this condition.<sup>10</sup> This group encounters increased electronic display screens and spends long hours in reading and doing work with focused eyes. For any developing country, medical students are regarded as a valuable future human resource. The ocular health of the young generation is paramount to their development and by extension, to the future of the nation. The increasing frequency of refractive errors in the young population threatens to add to the economic burden.<sup>11</sup> Therefore, knowledge about the influencing factors of refractive errors would be helpful in planning a public health strategy for the prevention.

In Pakistan, refractive errors are often neglected. There is paucity of data on the current situation in medical students in Pakistan. This study aimed to assess the burden of refractive errors in students of the medical profession and related factors.

## Materials and Methods

This analytical cross-sectional study was conducted in the Department of Community Medicine at Akhtar Saeed Medical and Dental College, Lahore from September 2020 to December 2020. Raosoft sample size calculator was used for sample size estimation. Calculated sample size was 259, keeping prevalence of refractory errors as 21.8%, margin of error at 5% and confidence level at 95%.<sup>12</sup> After 10% increase to cover missing data and rounding off, final sample size came out to be 300 participants. Approval from ethical review board was taken (IRB certificate no M-18/047/-CM). Convenience sampling technique was used. Students from various medical programmes (MBBS, BDS, Pharma-D and Allied Health Sciences), both male and female who were willing to participate were included. Those who denied giving consent were excluded. A self-constructed,

pretested questionnaire was used which included the socio-demographic variables (age, gender, medical programme, family income per month and family history of refractory errors). Frequency of exercise, time spent on using computer and mobile and watching television, no of hours spent per day in reading/studying, comfort with light in which participants study and type of light used were also considered. Research questionnaire was designed after extensive literature search based upon questions used in previous studies. After review by two public health specialists and a biostatistician, it was pilot tested on 20 students and modified accordingly.

Data were analyzed using SPSS Version 23. Frequencies and percentages were used to present qualitative data. Mean and standard deviation were calculated for quantitative data. Chi square test of significance was applied to find association between independent and dependent variables. A *p*-value of < 0.05 was considered statistically significant.

## Results

The mean age of the study participants was  $21.8 \pm 1.79$  years. Among total participants, 197 (65.7%) were MBBS students, 45 (15%) were BDS students, 37 (12.3%) were Pharm -D students and 21 (7%) were Allied Health Sciences students. Out of the 300 study participants, 203(67.7%) participants had refractive errors. The most prevalent refractive error was Myopia, reported by 111 (37%) students. Hypermetropia was reported by 71 (23.7%) and astigmatism by 21 (7%) students.

Prevalence of refractive errors was higher among females as 81(72.9%) had refractive error as compared to 122 (64.5%) males. Highest percentage (76%) of refractive errors was observed in those whose family income was more than one million per month (*p* value =0.01). Significant association was observed between presence of refractive errors and positive family history (*p* value =< 0.001). About 76.6% participants having refractive errors, had family members who use glasses or contact lens. Parents of 74% students with refractive errors, use glasses or lens.

Participants with refractive errors were found to be more conscious about light in which they study. Higher percentage of refractive errors was noted in participants (70.6%) who were comfortable with

light in which they study ( $p$  value = 0.03). Refractive error was more common in students who study in bulb light, as compared to those who study in tube light or LED light, although it was not statistically significant.

Those who use mobile for more than 3 hours per day, have more chances of refractive errors. Among students who used mobile for more than 3 hours per day, 74.7% students had refractive errors. Statistically significant association was observed ( $p=0.001$ ) between both variables. Results are shown in Table no 1 and 2.

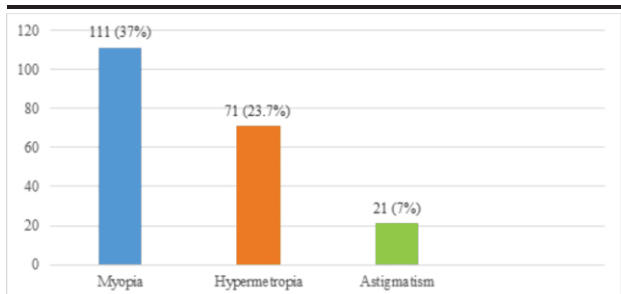
**Table No 1: Socio-demographic details of study participants**

	Frequency (n)	Percentage (%)
<b>Age</b>		
Up to 20 years	74	24.7
21 – 24 years	211	70.3
25 years or more	15	5
<b>Medical programme</b>		
MBBS	197	65.7
BDS	45	15
Pharm-D	37	12.3
Allied Health Sciences	21	7
<b>Area of residence</b>		
Urban	243	81
Rural	57	19
<b>Presence of Refractory Error</b>		
Absent	97	32.3
Present	203	67.7

**Table No 2: Presence of refractive errors in relation to different factors**

Factors	Frequency (%)	Presence of Refractive Errors	p value
<b>Gender</b>			
Female	111(37)	81(72.9)	0.13
Male	189(63)	122(64.6)	
<b>Family income per month</b>			
100000 – 300000	141(47)	105(74.4)	0.01
>300000-500000	92(30.7)	50(54.3)	
>500000-1000000	42(14)	29(69)	
1000000 More than 1000000	25(8.3)	19(76)	
<b>Family history of refractory error</b>			
Present	209(69.7)	160(76.6)	<.001
Absent	91(30.3)	43(47.3)	
<b>Frequency of exercise</b>			
Daily	45(15)	29(64.4)	0.54
2 days in a week	49(16.3)	31(63.3)	
3 days in a week	46(15.3)	35(76)	
Never	160(53.3)	108(67.5)	

Hours spent watching TV per day			
Less than one hour	155(51.7)	106(68.4)	0.45
1-2 hours	81(27)	52(64.1)	
3-5 hours	35(11.7)	22(62.9)	
More than 5 hours	29(9.7)	23(79.3)	
Hours spent on computer per day			
Less than one hour	61(20.3)	44(72.1)	0.78
1-2 hours	73(24.3)	50(68.5)	
3-5 hours	95(31.7)	61(64.2)	
More than 5 hours	71(23.7)	48(67.6)	
Hours spent reading/studying per day			
Less than one hour	61(20.3)	44(72.1)	0.78
1-2 hours	73(24.3)	50(68.5)	
3-5 hours	95(31.7)	61(64.2)	
More than 5 hours	71(23.7)	48(67.6)	
Comfortable with light used for study			
Yes	235(78.3)	166(70.6)	0.03
No	65(21.7)	37(56.9)	
Type of light used while studying.			
Bulb	50(16.7)	36(72)	0.71
Tube light	113(37.7)	74(65.5)	
LED light	137(45.7)	93(67.9)	
Mobile Use per day			
1-2 hours	49(16.3)	23(46.9)	0.001
2-3 hours	89(29.7)	59(66.3)	
More than 3 hours	162(54)	121(74.7)	



**Fig 1: Types of refractive errors**

## Discussion

This study estimated that about 203 (67.7%) undergraduate students of Akhtar Saeed Medical & Dental College have refractive errors. The finding is comparable to a study carried out in India, in which

prevalence of refractive error was estimated to be 70.7% among medical students.<sup>13</sup> Another study conducted at West Bengal, India found that refractive errors were present in 56.9% medical students.<sup>14</sup> High prevalence of refractive errors (68.2%) was also observed in a study conducted at Dow Medical College, Karachi.<sup>15</sup>

Myopia was the most common refractive error reported by 111(37%) students, hypermetropia was reported by 71(23.4%) while astigmatism by 21(7%) medical students. These results are quite similar to a study conducted at Northern Border University, KSA which shows that 67.1% participants had refractive error with same order of prevalence of various refractive errors. The commonest error of refraction was observed to be myopia which was found in 53.9% subjects while hypermetropia was found in 6.6% and Astigmatism in 6.6% study participants.<sup>16</sup> In another study conducted at Western Region of Saudi Arabia researchers found that commonest error of refraction was myopia (40.7%) followed by hyperopia (13%) and astigmatism (3.5%).<sup>17</sup>

Refractive errors were more common among female students as 72.9% of female student have refractive errors as compared to 64.6% male students having refractive errors. Salih AA in his study at Al-Mustansiriya Medical College Iraq also described that the incidence of myopia was greater in females than in males in all cohorts.<sup>18</sup>

In this study, refractive error prevalence was highest in student having family income more than one million per month. Findings of a study conducted in Beijing also reflected higher odds (OR = 1.37) of myopia in students having high family income.<sup>19</sup> Higher prevalence of refractive errors in young adults having high family income may be due to high level of BMI, because obesity is a common occurrence in high socioeconomic groups.

Positive family history may be a contributory factor in the development of refractive error. In this study, 160 (78.8%) students with refractive errors, reported that at least one member in their family wore glasses or use lens due to weak eye sight. Parents of 74% students who have refractive errors, use glasses or lens. In a study conducted at Karachi, positive history of refractive error was present in 72.1% participants having myopia.<sup>20</sup> Study conducted at Nepal Medical College Kathmandu revealed

somewhat different results, among total 108 students with refractive error, 90.7% told that their parents also had problem of eye sight.<sup>21</sup> This difference may be explained on the basis of different ethnicity.

In new generation, computer and cell phones have replaced reading. Therefore, reading hours were not significantly associated with myopia in this study. It was found that mobile usage for more than 3 hours significantly increases the risk of refractive errors. Refractive errors were present in about 74.6% students who spent more than three hours in using cell phones. Similar finding was observed with use of mobile, cases were using mobile for long hours as compared to controls.<sup>22</sup>

Higher percentage of refractive error (70.6%) was reported by participants who were comfortable with light in which they study. It reflected that students who have refractive errors are more conscious about the appropriateness of study light.

Most of the students use LED light for study, however some study in tube light and bulb light. Refractive errors are more common in those students who study in bulb light. About 72% of students who study in bulb light reported to have refractive error. Researchers described in the study conducted at Kolkata that refractive errors were more among those who used dim light like low voltage bulb while reading and less among those who study in moderate light.<sup>23</sup>

In this study refractive errors were more prevalent in those students who do exercise 3 days per week as 76% reported this. Shaik et al, described in their research that only 14.7% participants who do exercise 3 days per week while 56.5% participants who never do exercise have refractive error.<sup>24</sup> Prevalence and associated factors may vary in different communities.

This study gives a small insight of refractive errors in medical students. However more research is still needed on a broader scale to recommend modifications in life style and environmental factors responsible for causing refractive errors.

## Conclusion

Prevalence of refractive error was 67.7% among medical students, and myopia (37%) was the most commonly reported refractory error. Refractive errors were more common in females as compared

to males. Refractive errors were significantly associated with positive family history, high family income and mobile use per day.

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