Original Research Article

Prevalence of visual disturbances among medical undergraduate students of a tertiary care teaching hospital in South Kerala

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ABSTRACT

Background: Uncorrected errors of refraction are the leading cause of moderate to severe visual impairment. This study helps to determine the risk factors and prevalence of refractive error among medical students and to evaluate the uncorrected visual acuity among them. Aim was to study the prevalence and risk factors of visual disturbances among medical undergraduate students.

Methods: A cross sectional study was conducted among 200 undergraduate medical students. Data on socio-demographic characteristics, type of refractive errors, risk factors for refractive errors and frequency of eye examinations were collected through questionnaires. Uncorrected visual acuity was detected using Snellens chart and near vision was tested using jaeger's chart. Appropriate statistical tests were applied and data was analysed using statistical package for the social sciences (SPSS) version 21.

Results: Out of the total 200 study participants, majority were females (61.5%), mean age of the study participants was 21.51±1.33, 11.5% were examined for the first time through this study, 51% were suffering from some sort of visual disturbance among which 80% were having myopia, 50% of the study participants spent more than two hours per day reading books, 72.5% had habit of reading in dim light. Uncorrected visual acuity was seen among 22% of the study subjects and 15% with positive family history of refractive errors showed uncorrected visual acuity.

Conclusions: This study was an effort to identify the risk factors and determine the prevalence of refractive errors, 22% of subjects had uncorrected visual acuity; myopia was the common refractive error observed among the study participants followed by hypermetropia and astigmatism.

Keywords: Refractive error, Uncorrected visual acuity, Risk factor, Myopia

INTRODUCTION

Uncorrected errors of refraction are the leading cause of moderate to severe visual impairment. Significant improvement can be achieved by correction of refractive error among school children in terms of the educational potential and quality of the life.[1]

Refractive error, also known as refraction error is a problem with focusing light accurately on the retina due to shape of the eye and cornea. A total of 153 million people in the world suffer from uncorrected refractive errors, which account for a prevalence of 2.67%, 39.31 million people in India are affected with the same accounting to 4% prevalence.[2]

About 13 million children worldwide (0.97%) in the age group 5-15 years is found to have visual impairment from uncorrected refractive errors; 27 million (1.11%) in the age group 16-39 years; 18.4 million (2.43%) in the age group of 40-49 years; 95 million (7.83%) in the above fifty age group. Similarly, in the Indian context; the corresponding frequency and prevalence are 1.61 million (0.63%), 2.69 million (0.63%), 4.04 million (3.39%), 30.97 million

(18.70%) respectively. Refractive error was found to be more in students who spend more hours in reading, female gender, more screen time and in those with a family history of refractive error.[2]

Worldwide, myopia (short sightedness) is the most common refractive error. The other common refractive errors being hypermetropia (long sightedness) and astigmatism. The prevalence of myopia in India was 7-11% among children less than fifteen years of age and 35% among adults in the year 2013.[3]

Although the prevalence of uncorrected visual acuity in the age group of 15-49 years is higher in the country; there has been less literature on the same. Medical students who spend a significant amount of time in reading are at increased risk of refractive errors and only little is known about the prevalence of refractive error in the same group.

This study was a humble effort to determine the risk factors and prevalence of refractive error among medical students in a tertiary care hospital in south Kerala, India and to evaluate the uncorrected visual acuity among study participants; the results of which can help in planning tailored measures for preventive and control measures against refractive errors.

METHODS

This was a cross sectional study conducted in a tertiary care teaching hospital in south Kerala, India. Study was carried out during the period from October to November 2022. Undergraduate medical students (2018 to 2021 batches) of Travancore Medical College, Kollam were included in the study.

Sampling method employed was simple random sampling. Sample size was calculated based on a similar study conducted by Malhotra et al and accounted to 200.[4] Study included 200 undergraduate students of age >18 years from first year to final year by random selection. Those who were not willing for the study were excluded. A validated self-administered questionnaire was administered among the study participants for collecting information on socio-demographic characteristics, type of refractive errors, most common refractive errors, risk factors for refractive errors, frequency of eye examinations and frequency of use of prescribed spectacles/contact lenses. Uncorrected visual acuity was detected using Snellens chart and near vision was tested using jaeger's chart. A person who can read N6 line in Jaegers chart has normal near vision. Visual acuity ≥6/9 was taken as altered distant vision /myopia. In our study, uncorrected visual acuity was defined as people having vision ≥6/9 by Snellens chart. Ethical clearance obtained from institutional ethical committee.

Data collected was entered in Microsoft excel and was analyzed using IBM statistical package for social sciences (SPSS) 21, Bangalore, Karnataka, India. Data was expressed as percentages and proportions. Chi square test

was employed to assess the association between the refractive errors and various risk factors, p<0.05 was considered statistically significant. Confidentiality and the anonymity of the data was ensured throughout the entire study.

RESULTS

According to Table 1, total participants included in the study was 200. Majority of the study participants (56.5%) belonged to the age group of 20 to 22 years followed by forty-five study participants in the age group of 18-19 years which accounted for 22.5%. Mean age of the study participants was 21.51±1.33.

Of the 200 participants, majority were females which was 123 in number (61.5%), 99% of the study participants were unmarried. Most of the students were residing in urban area which accounted for 66.5%.

Out of 200 study participants, 147 (73.5%) belonged to Muslim religion. The frequency and percentage of students studying in first year, second year, final year part one and final year part two were thirty-eight (19%), eighty-seven (43.5%), fifty-five (27.5%) and twenty (10%) respectively (Table 1).

Table 1: Socio-demographic characteristics of study population (n=200).

Socio demographic characteristics	Frequency (%)
Age (in years)	
18-19	45 (22.5)
20-22	113 (56.5)
23-24	38 (19)
>24	4 (2)
Gender	
Female	123 (61.5)
Male	77 (38.5)
Marital status	
Married	2 (1)
Unmarried	198 (99)
Residence	
Rural area	67 (33.5)
Urban area	133 (66.5)
Religion	
Christian	4 (2)
Hindu	46 (23)
Muslim	147 (73.5)
Others	3 (1.5)
Year of study	
First year	38 (19)
Second year	87 (43.5)
Final year Part 1	55 (22.5)
Final year Part 2	20 (10)

Majority of the study participants 63 (31.5%) had no symptoms. Headache was the leading symptom which was present in forty-one study subjects which accounted for 20.5 % followed by eye pain which was present in thirty-four of the students. Blurring of vision was another complaint which accounted for 30 (15%), followed by eye irritation 15 (7.5%), watering of eyes 14 (7%), redness of eye 2 (1%) and double vision 1 (0.5%).

Assessment of previous eye examination among the study participants (n=200)

Among the study participants, 177 (88.5%) had at least an eye examination earlier in life. Twenty-three (11.5%) of the study participants were examined for the first time through this study. Of the 177 students, 117 (66 %) of them had undergone eye checkup within the last one year; thirty-four (19%) of them had checkup within past 1 to 3 years and the remaining twenty-six (15%) of them had eye check-up three years back.

Ninety-eight (49%) of the study participants were found to have normal vision, 102 (51%) of the remaining study participants were detected with some sort of visual disturbance in their life.

Usage of spectacle/contact lenses by those with previously diagnosed refractive error

Among the participants, 177 (88.5%) of the study participants had at least an eye examination earlier in life. Twenty-three (11.5%) of the study participants were examined for the first time through this study. Of the 177 students, 117 (66 %) of them had undergone eye check-up within the last one year; thirty-four (19%) of them had check-up within past 1 to 3 years and the remaining twenty-six (15%) of them had eye check-up three years back.

Those study participants who were already diagnosed with refractive error and prescribed for using either spectacles or contact lens were 102 (51%). Fifteen among them (14.7%) were prescribed more than ten years earlier; twenty-six study participants (25.5%) were prescribed more than five years ago and within the last ten years. Forty-five of them (44.1%) were prescribed more than two years ago and within the last five years and the remaining sixteen study participants (15.7%) were prescribed to use spectacles/contact lens in the last one year.

Among those who were already prescribed of using spectacles/contact lenses, only 78 (76.4%) were regularly using as prescribed, 21 (20.5%) were using occasionally and 3 (2.9%) were not using. Among the 51% using spectacles/contact lenses, 47% were using spectacles alone and 4% were using both spectacles and contact lenses for correction.

Among the 102 study participants who had been diagnosed previously to have refractive error, eighty-two of them

(80%) were having myopia (near sightedness); hypermetropia or long sightedness was diagnosed in nine of the study participants (9%) with refractive error. Astigmatism was present for two study participants (2%) and the remaining nine study participants (9%) with refractive error was identified with both astigmatism and myopia (Figure 1). As per the lens power, mild myopia, (power of ≤2 diopters) was present for 45 (22.5%), moderate myopia (power >2 to 4 diopters) among 27 (13.5%) and high myopia (power ≥5 diopters) among 10 (5%) participants was seen.

According to Table 2, the major risk factors identified was the family history of refractive error which was present in 138 of the study participants which accounted for 69%. Among family history, risk factor for refractive error; highest was seen in parents; which accounted for 37% followed by the presence of refractive error in siblings which accounted for 10 % and the presence of refractive error in both parents and siblings accounted for 22%. Hundreds of the study participants spent more than two hours per day reading books which accounted for 50% followed by fifty-one students (26%) who used to read between one and two hours per day.

Table 2: Risk factors for refractive error among study population (n=200).

Risk factor	N (%)
Family history of refractive error	
Yes	138 (69)
No	62 (31)
Screen time per day (smartphone, television)	
30 min	5 (2.5)
30 min-1 hour	24 (12)
2-3 hours	53 (26.5)
>3 hours	118 (59)
Time spent reading books per day	
30 min	26 (13)
30 min-1 hour	23 (11.5)
1-2 hours	51 (25.5)
More than 2 hours	100 (50)
Reading in dim light	
Never	19 (9.5)
Sometimes	145 (72.5)
Often	31 (15.5)
Always	5 (2.5)
Hours of sleep per day	
<5	29 (14.5)
6-7	140 (70)
8	28 (14)
>9	3 (1.5)

Among participants, 145 of them used to read in dim light sometimes which accounted for 72.5%. One forty of the study participants used to sleep around six to seven hours which accounted for 70 %. Study participants who used to sleep less than five hours was found to be twenty-nine

(15%) (Table 2).

Near vision reading according to Jaegers chart showed that 191 (95%) participants had normal near vision of N6.
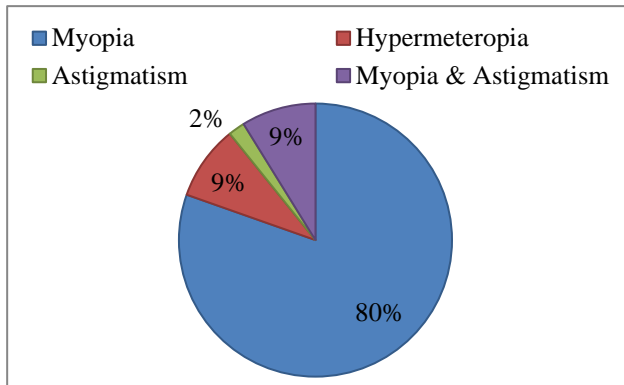

Figure 1: Distribution of study participants based on the previously diagnosed refractive error.

Visual acuity ≥6/9 was taken as altered distant vision /myopia according to Snellens chart. Most of the study participants had normal visual acuity when assessed by Snellen's chart which accounted for 30%. Corrected visual acuity was observed in forty of the study participants which accounted for 20%, 22% of the study subjects had uncorrected visual acuity and the remaining fifty-six participants had refractive error corrected earlier by spectacles, but power changed recently which accounted for 28% (Table 3).

Thirty of the study participants who had family history of refractive error had uncorrected visual acuity which

accounted for 15%. Similarly, forty-one of the students (20.5%) who had a positive family history of refractive error had refractive error corrected previously, yet changed recently. The association between the family history and the visual acuity according to Snellen's chart was found to be significant (p value less than 0.01). Hundred out of 200 study participants spent time in reading books more than two hours a day. The study participants who spent more than two hours per day reading books who had uncorrected visual acuity and refractive error previously corrected, yet changed recently was found to be eighteen (9%) and thirty-three (16.5%) study participants respectively (Table 4).

Table 3: Refractive error classification based on the Snellen's chart reading (n=200).

Variables	Frequency (%)
Normal visual acuity	60 (30)
Corrected visual acuity	40 (20)
Uncorrected visual acuity	44 (22)
Refractive error corrected previously yet power changed recently	56 (28)

Fifty-three (26.5%) of the study participants used to have screen time for two to three hours per day. Among 118 study participants (59%), screen time was more than three hours per day. Twenty-six of them (13%) had uncorrected refractive error and thirty-four (17%) had refractive error corrected previously, yet changed recently and 145 of the study participants (72.5%) used to read in dim light. Out of which thirty-four and thirty-nine study participants had uncorrected refractive error and refractive error corrected previously; but changed recently respectively (Table 4).

Table 4: Association of risk factors and the visual acuity findings among the study participants (n=200).

Risk factor	No refractive error, N (%)	Corrected visual acuity N (%)	Uncorrected visual acuity N (%)	Refractive error corrected previously; yet changed recently N (%)	Chi square value	P value
Family history of refractive error						
Yes	31 (15.5)	36 (18)	30 (15)	41 (20.5)	17.153 df: 3	0.001
No	29 (14.5)	4 (2)	14 (7)	15 (7.5)		
Time spent reading books per day						
<30 minutes	11 (5.5)	2 (1)	6 (3)	7 (3.5)		
30 minutes-1 hour	5 (2.5)	3 (1.5)	7 (3.5)	8 (4)	11.630 df: 9	0.235
>1 hour-2 hours	17 (8.5)	13 (6.5)	13 (6.5)	8 (4)		
>2 hours	27 (13.5)	22 (11)	18 (9)	33 (16.5)		
Screen time per day						
<30 minutes	1 (0.5)	0 (0)	3 (1.5)	1 (0.5)		
30 minutes-2 hours	13 (6.5)	1 (0.5)	5 (2.5)	5 (2.5)	14.394 df: 9	0.109
>2 hours-3 hours	14 (7)	13 (6.5)	10 (5)	16 (8)		
>3 hours	32 (16)	26 (13)	26 (13)	34 (17)		
Reading in dim light						
Never	6 (3)	4 (2)	4 (2)	5 (2.5)		
Sometimes	43 (21.5)	29 (14.5)	34 (17)	39 (19.5)	1.439 df: 9	0.998
Often	10 (5)	6 (3)	5 (2.5)	10 (5)		
Always	1 (0.5)	1 (0.5)	1 (0.5)	1 (0.5)		

DISCUSSION

Present study was conducted among randomly selected two hundred undergraduate medical students of a tertiary medical college in south Kerala for assessment of prevalence and risk factors of refractive errors. No similar studies have been conducted in this area among the medical students for this particular objective.

The age group of the study participants ranged from eighteen to thirty years in our study with majority of the participants in the age group of 20 to 22 years accounting for 56.5 %. Majority of the students (61.5%) were females. Only two of the study subjects were married. Among the participants, 66.5% resided in urban area and vast majority (73.5%) of the subjects were belonging to Muslim religion. In a similar study conducted by Megbelayin et al at Nigeria in 2010, they have included eighty-three undergraduate medical students which was much lower than our study population.[5] Males were predominant (66.3%) study population in their study which was contrary to our study population. The age group range included was almost similar to our study.

Refractive error among the total study participants in our study accounted for myopia in 41.5% and hypermetropia in 4.5%. While a similar study conducted in Kerala by Shiny et al among medical students, 87.6% were found to be myopic and 7.3% was identified as having hypermetropia.[3] In our study, of the participants who already had refractive error (n=102), 80 percentages of them were diagnosed with myopia and nine percentages were diagnosed with hypermetropia.

Family history of refractive error in our study was observed in 69 percentage of the study participants. This was similar to a case-control study conducted by Neelam Kumar et al[2] among M.B.B.S students in Haryana during 2017; where fifty-four percentage of the study participants had a positive family history of refractive error. Family history of refractive error has been identified as an important risk factor for causation of abnormal visual acuity for the study participants in our study.

Majority of the study participants (88.5%) in our study had an eye examination earlier in life which was comparable to a study conducted by Chelliah et al among medical students in Chennai, where 79 % of the study population had undergone an eye examination earlier, 58.5% of our study participants had an eye checkup conducted within the last one year and; 17% had between past one to three years and remaining ten percentage had undergone an eye check-up before three years.[1] In the study by Chelliah et al 48.4% of study participants had undergone eye checkup in the past year; 17.2% checked within the one to two years and 34.4% of them undergone before three years.[1] Regular eye examination is necessary for early diagnosis and treatment of refractive error; which when not undergone or delayed can lead to permanent damage and disability. Prevalence of visual impairment in our study was 51%

which was comparable to this study were 69.4% participants had refractive error.

According to the cross-sectional study conducted by Gopalakrishnan et al among medical students in Malaysia, prevalence of refractive error was 32.24%, in our study 51% had abnormal visual acuity.[6]

According to the cross-sectional study conducted by Midelfart et al, among 140 medical students in Norway, showed prevalence of myopia to be 50.3% in the right eye and the cross sectional study by Alsaif et al showed 47.9% to be myopic, while in our study myopia was 80% among all refractive errors.[7,8]

Prevalence of visual impairment in our study was found to be 51% in the age group of eighteen years to thirty years which was found to be contrary to a population based cross-sectional study conducted at Haryana during 2014 by Malhotra et al; in which the prevalence of visual impairment was only 1.85% among the study subjects age group 15-49 years.[4] This can be attributed to the larger sample size in our study.

Among our study participants, 26.5% and fifty-nine percentage had screen time (smart phone/television) for two to three hours and more than three hours per day respectively. In a similar study conducted by Shiny et al among 162 medical undergraduate students; sixty-four percentage of the students used to watch television for more than one to five hours per day and 9% of them use to watch television more than 5 hours per day.[3]

In the study by Padhye et al in Maharashtra during 2004-2005, the prevalence of uncorrected refractive error was found to be 2.63% and 5.46% which was different from our study finding where it was 22% which can be due to the smaller sample size of our study.[9]

Prevalence of myopia was 19.39% in the study conducted by Dandona et al in Andhra Pradesh, while in our study 82 participants out of 102 had myopia.[10]

In the study by Kalikivayi et al in Hyderabad among among school children were mean age was 9.3±3.4 years, prevalence of astigmatism (10.3%), myopic astigmatism (7.6%) and myopia (8.3%) while in our study, mean age was 21.51±1.33, prevalence was astigmatism (2%), myopic astigmatism (9%) and myopia (80%) out of total refractive errors.[11]

Family history, though found as an important risk factor for the causation of refractive error is a non- modifiable risk factor and is the only significant association found in causation of abnormal visual acuity in the present study. Modifiable risk factors found in our study related to causation of refractive error was mainly the increased screen time, increased time in reading books, reading books in dim light and the inadequate sleep time.

Limitations

This study was conducted in a single study setting and the sample size was only two hundred due to the limitation of time. A mixed methodology study (quantitative followed by qualitative research) with large sample size among the study participants from different study settings along with Delphi technique/nominal group technique among randomly selected community health professionals and ophthalmology doctors from the state can help implement necessary action guidelines, prevention and tailored intervention measures.

CONCLUSION

The study identified the prevalence of refractive errors, common refractive errors and the risk factors among the medical students. Myopia was the most common refractive error observed among the study participants followed by hypermeteropia and astigmatism in our study. This study identified family history of refractive error as the risk factor for abnormal visual acuity findings followed by modifiable factors such as increased screen time, increased time spent for reading books as well as reading in dim light and inadequate sleep hours. All the study participants who were identified with abnormal visual acuity findings were referred to the ophthalmology department for further investigation, treatment and follow up.

Recommendations

This study recommends early screening, diagnosis and treatment for refractive errors at regular intervals especially in individuals with presence of higher risk factors like medical students. Interactive sessions and group discussions on the effect of increased screen time, reading in dim light, effects of inadequate sleep, importance of wearing prescribed spectacles/lens regularly which would impact the risk of causation of refractive errors is recommended based on the prevalence of disorder.

ACKNOWLEDGEMENTS

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