

REFRACTIVE ERRORS AND ITS ASSOCIATED FACTORS AMONG UNDERGRADUATE MEDICAL STUDENTS IN KATHMANDU

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ABSTRACT

Refractive error is a defect in the optical system of the eye which prevents light from being brought to a single point focus on the retina, thus reducing normal vision. This optical defect is the second most common cause of visual impairment globally as well in Nepal. At present, there are 285 million visually impaired people in the world. An estimated 4 out of 5 visual impairment (80%) can be prevented or cured, uncorrected refractive errors are the leading cause (42%) followed by cataract (33%). A descriptive cross sectional study was conducted to determine the proportion of undergraduate medical students with refractive errors in Nepal Medical College, and to identify factors associated with it. A total of 210 medical students volunteered for this study, with 100 males (47.6%) and 110 females (52.4%). The age of these students were between 18 to 26 years, with an average of 20.5 years. The proportion of medical students with refractive error was slightly more than half (51.4%), with simple myopia being the leading type (42.9%), followed by astigmatism (7.1%) and simple hypermetropia (1.4%). Parental history of refractive error was observed to be significantly associated with that of the medical students. There was also a significant association between refractive error and the daily use of mobile phones and laptops. However, years spent in medical education were not observed to be significant.

KEYWORDS

Associated factors, astigmatism, medical students, myopia, refractive error

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INTRODUCTION

Refractive error is a defect in the optical system of the eye which prevents light from being brought to a single point focus on the retina, thus reducing normal vision.¹ Refractive errors are the second most common cause of visual impairment globally as well in Nepal.^{2,3}

At present, there are 285 million visually impaired people in the world. Four out of 5 such impairment can be prevented or cured. Uncorrected refractive errors are the leading cause accounting for 42%, followed by cataract accounting for 33%.² Refractive errors are becoming more of a problem in many societies, with prevalence rates of myopia in many Asian countries reaching epidemic proportions.³ Though correctable, using spectacles and contact lenses, refractive errors present a reasonably large economic burden. Poor vision in students has an adverse influence on their future life, as it affects productive performance in education, thus in long term affecting the economic burden of the country.

In the past few decades, numerous epidemiological studies have provided information on the prevalence and risk factors for refractive errors. Majority of studies on refractive errors have however, focused more on school going children and the general population. Studies on refractive errors among the medical students have been conducted, but to a lesser degree than the school children. The prevalence rate of myopia in Singapore medical students was 82%, while that of astigmatism was more than 70%.⁴ Another study in Taiwan showed that more than 90% of Taiwanese medical students were myopic.⁵ In contrast, similar studies on medical students in Denmark and Norway yielded relatively-low prevalence rates of myopia accounting for 50% and 50.3%, respectively.^{6,7} Medical students in India are reported to have a high prevalence of refractive errors ranging from 54% to 74%.⁸⁻¹⁶

In Nepal, a small majority of these studies have been conducted on school children and the general population. A population based study carried out among school children in Mechi, East Nepal showed that 2.9% had some amount of visual morbidity with refractive error accounting for 56% of that morbidity.¹⁸ A study on ocular morbidity among school children in Kathmandu, showed refractive error as the commonest ocular morbidity accounting for 8.1%.¹⁹ Similar study on ocular morbidity among private school children showed refractive error as the most common morbidity with 21.9%.²⁰ A study on refractive error in urban and rural children showed refractive errors as 19.8%.²¹ A hospital based cross sectional study on refractive error showed simple myopia as the most prevalent type of refractive error accounting for 27% of all cases.²²

In Nepal, there has been no comparable study available in the specialized group of medical students, who are subjected to a lot of visual stress

of higher education. In addition, no study that attempts to identify the factors associated with refractive errors has been conducted till date. Hence, this study was conducted to determine the proportion of undergraduate medical students with refractive errors in Nepal Medical College, and to identify factors associated with it.

MATERIALS AND METHODS

This was a descriptive cross sectional study conducted at the Ophthalmology department of Nepal Medical College Teaching Hospital, from September to December 2018. A complete enumeration of the undergraduate medical students of 1st year, 3rd year and final year was performed. Ethical approval was taken from the Institutional Review Committee of Nepal Medical College (NMC-IRC). Informed and verbal consent of each participant was obtained before the study after informing the participants of the purpose of the study and confidentiality of results.

All students who volunteered for this study were requested to provide demographic data. Medical students suffering from any ocular diseases (glaucoma, ocular injury, or who had undergone refractive surgery LASIK) were excluded from the study. A detailed history, including previous history of refractive error, spectacle/contact lens use, and parental history of refractive error were taken. History about the working activities of the students, daily use of electronic gadgets (laptops/desktops) and mobile phones was taken. Visual acuity was recorded monocularly, on an internally illuminated standard Snellen's chart at 6 meters. Retinoscopy was performed in a dark room at a working distance of 50cm, with the patient fixing on a target at 6metre. Streak retinoscopy was performed. Those students having visual acuity of less than 6/6 on Snellen's chart were subjected to subjective refraction. Cycloplegics were not used. Diagnosis of refractive error was made when the magnitude of refractive error was equal to or more than 0.50DSph. Those errors which required only cylindrical correction were considered as simple astigmatism.

Data were entered in Excel worksheet and analyzed using SPSS version 16. Association between refractive errors and explanatory variables were determined using Chi square test. A p value of < 0.05 was considered significant.

RESULTS

A total of 210 undergraduate medical students participated in this study, with 100 males and 110 females comprising 47.6% and 52.4% respectively. The age of these students varied from 18 to 26 years, the average being 20.5 years (Table-1). Of the total, 80 students (38.9%) were in the first year, 67 (31.9%) were in the third year and 63 (30.0%) were in the final year of MBBS studies (Table-2).

Table-1: Demographic profile of the MBBS students

Age (years)	Males		Females	
	n	%	n	%
18-20	34	16.2	34	16.2
21-23	62	29.5	75	35.7
24-26	4	1.9	1	0.5
Total	100	47.6	110	52.4

Table-2: Academic year of the MBBS students

No of students	Males		Females	
	n	%	n	%
1 st year	41	19.5	39	18.6
3 rd year	30	14.3	37	17.6
Final year	29	13.8	34	16.2
Total	100	47.6	110	52.4

Table-2 shows the total number of students who volunteered for this study and the breakup of students from each academic year. Approximately one out of 5 of the total students were male students from the first year (19.5%), followed by a similar percentage (18.6%) of females from the first year.

Table-3: Frequency of errors of refraction of the MBBS students

Type of refractive error	n	%	P value
Simple Myopia	90	42.9	0.02
Simple Hypermetropia	3	1.4	
Astigmatism	15	7.1	
Total	108	51.4	

Table-3 reveals the frequency of errors of refraction. Slightly more than half of the students (51.4%) had some form of refractive error, with the most common being simple myopia which accounted for 42.9 %, followed by simple astigmatism of 7.1%. Simple hypermetropia accounted for only 1.4% of all cases. Thus, the types of refractive error were not uniformly distributed. This finding was consolidated by Chi square test. (p value=0.02)

Table-4: Types of refractive error according to the academic year

Students	Simple myopia		Simple hypermetropia		Astigmatism		P value
	n	%	n	%	n	%	
	1 st year	26	12.4	3	1.4	7	
3 rd year	37	17.6	0	0	4	1.9	
Final year	27	12.9	0	0	4	1.9	
Total	90	42.9	3	1.4	15	7.1	

The most common refractive error was simple myopia accounting for 42.9% of all cases, followed

by simple astigmatism 7.1% and hypermetropia 1.4%. Slightly more than half of the students had some sort of refractive errors (51.4%). The students of the third year had the maximum number of myopes (17.6%), followed by final year and first year students who had similar percentage of 12.9% and 12.4 % respectively (Table-4). The association between simple myopia and years spent in present medical education was not statistically significant.

Table-5: Students' refractive error and parental history

Students with refractive error	Parents with refractive error		P value
	Presence	Absence	
Presence	98	10	0.001
Absence	26	76	

Of the total 108 students with refractive error, 98 students were those whose parents also had the same problem. Among 76 parents who had no refractive error, only 26 students had refractive error. (Table-5)The association between refractive error and parental history was observed significant.

Table-6: Refractive errors and use of mobile phones

Average use of mobile phones daily (hours/day)	Students with refractive errors		P value
	Present	Absent	
	n	n	
≤ 2 hours	32	26	0.02
2- 3 hours	68	62	
≥4 hours	8	14	

It was observed that almost an equal number of students with or without refractive errors used mobile phones for 2-3 hours daily (Table-6). Refractive error was significantly associated with the daily use of mobile phone (hours/day).

Table-7: Refractive errors and use of laptop/desktop

Average use of laptop/desktop daily (hours/day)	Students with refractive errors		P value
	Present	Absent	
	n	n	
≤2 hours	77	59	0.004
2- 3 hours	18	17	
≥4 hours	13	26	

Majority of the students (64.7%) spent less than 2 hours daily on their laptops/desktops. Refractive error was observed to be significantly associated with the use of laptops/desktop. (Table-7)

DISCUSSION

Studies on refractive errors among medical students have been conducted in different parts of the globe. This study estimated that slightly more than half (51.4%) of the undergraduate medical students of Nepal Medical College had refractive errors. This result is in accordance with studies in the Scandinavian countries, where the prevalence rate of refractive errors among the medical students was 50.3%,^{6,7} and in India, where it varied from 54-73%.⁸⁻¹⁶ However there was a much higher prevalence of 80-90% among medical students in Singapore⁴ and Taiwan.⁵

Among the students who had refractive errors (51.4%), the leading type was simple myopia seen in 42.9 %, followed by simple astigmatism in 7.1 % and simple hypermetropia in 1.4%. These findings are consistent with various studies done in different parts of India. A cross-sectional study done to assess myopia in medical students in South India showed that the prevalence rate of myopia was 58%.⁸ A risk factor based study on myopia conducted by Wakode estimated prevalence of myopia as 54.9% of the study population.¹⁰ A study on refractive errors among medical students in Baroda, India estimated the prevalence of refractive error as 54.6%, with myopia accounting for 51.9%.¹² A similar study in Odisha, India estimated a similar prevalence of refractive error as 56%, with myopia accounting for 54.5% followed by astigmatism 31.3%.¹⁴ A study of refractive errors among medical students in Lucknow, done by Garg *et al*¹⁶ reported the prevalence of refractive error as 54%, with a higher prevalence of myopia accounting for 77.7%. Studies on medical students in Denmark and Norway yielded a relatively- low prevalence rates of myopia accounting for 50% and 50.3%, respectively.^{6,7} A similar study of refractive errors among medical students in Saudi Arabia, also reported a similar prevalence of refractive error as 58.6%, with myopia accounting for 53.7%.²³ Most of these studies have reported that myopia is the most prevalent refractive error among the students. This could be due to the intensive studying and exposure to performing near work that a medical curriculum requires.

A Singapore based study among medical students reported the prevalence rate of myopia was 8 out of 10 (82%), while 7 out of 10 had astigmatism (70%).⁴ Another study of 345 medical students in Taiwan showed that 9 out of 10 (90%) of Taiwanese medical students were myopic.⁵ The higher prevalence of myopia among the Chinese people could be due to their ethnicity.

This study estimated that slightly more than half of the students (51.4%) had some form of refractive error, with the most common being simple myopia which accounted for 42.9%, followed by simple astigmatism of 7.1%. This is in accord with similar studies in India where the prevalence of myopia ranged from 51.9 to 77.7%.⁸⁻¹⁶ The distribution of the types of refractive error were found to be statistically significant ($p < 0.05$). This study revealed that simple

hypermetropia accounted for only 1.4% of all cases. This is consistent with a study in Saudi Arabia where a similar prevalence of hypermetropia was reported.²⁴ This differed from other studies where hypermetropia had a higher prevalence.^{15,16}

Of the total 108 students with refractive error, 98 students were those whose parents also had the same problem. Among 76 parents who had no refractive error, only 26 students had refractive error. The association between refractive error and parental history was also observed to be significant. Similar association was found in a study of refractive errors among medical students performed in Manipal, India as reported by Jessica and Kamath²⁵ and in a study of prevalence of refractive errors and its associated factors among female university students as reported by Shaikh in Saudi Arabia.²⁴

It was observed that almost an equal number of students with refractive errors and without used mobile phones for 2-3 hours daily. Refractive error was significantly associated with the daily use of mobile phones and use of laptops/desktop. This is consistent with the study among female university students conducted in Saudi Arabia.²⁴

In conclusion, myopia was the most prevalent refractive error among the medical students. The distribution of the types of refractive error was statistically significant. However, the association between simple myopia and years spent in medical education was not statistically significant.

There was a significant association however between the refractive error status of the students and parental history of refractive error. Refractive error was also significantly associated with the daily use of mobile phones and use of laptops/desktop.

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