Original Research

# Prevalence of refractive errors among dental scholars and supporting auxiliary staff in a Government Hospital of Kashmir- A cross-sectional study

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Received August 03, 2016. Accepted August 24, 2016

**Abstract**

**Background:** The untreated refractive errors have a substantial effect on learning and academic achievement of students other than being a personal issue. Visual disorders due to refractive errors are the most common diseases among the students and the second principal cause of blindness worldwide. The literature available reporting refractive errors in dental students in India is inadequate.

**Objectives:** The aim of this study was to determine the prevalence of refractive errors among dental students in Kashmir, a city in the North of India.

**Material and Methods:** This cross-sectional institutional based study was conducted in June 2016 among dental students and interns. Students and Interns at Government Dental College and Hospital, Srinagar, Jammu and Kashmir, India were examined. All the subjects were assessed for refractive errors using auto-refractometer (TOPCON RM-8000B, TOPCON Corporation, Tokyo, Japan). The ophthalmologic examination was carried by an Ophthalmologist. SPSS Statistical Software 20.0 was used and significance of differences between the groups (gender and age) was sought using Mann-Whitney U-tests.

**Results:** A total of 432 available subjects which including 155 males and 277 females were examined, of whom only 14.59% did not show any type of refectory error. Myopia was highly prevalent followed by Hypermetropia (Hyperopia) and Astigmatism.

**Conclusion:** The results of the present study showed more than 75% students had refractive errors. Most of these students were unaware of the defects. Thus, more attention must be given to students for the treatment of these refractive errors.

**KEY WORDS:** Dental students, Myopia, Hyperopia, Astigmatism, Refractive errors, Visual acuity.

## Introduction

Globally, refractive errors are the second major cause of visual impairment after cataract.[1,2] The unattended and untreated refractive errors have a substantial effect on learning and academic achievement of students in any field.[3] Other than being personal issues, the treatment and rectification of refractive errors inflict high costs and problem on the community and the health system.[4] Lately, many studies have discussed the prevalence of these errors throughout the world.[5-8] In 2000, the protocol of the Refractive Error Study in Children (RESC) was presented and was designed to standardize the methodology used to obtain prevalence data on childhood refractive errors. Visual disorders due to refractive errors are most common diseases of the students and the second principal cause of blindness worldwide.[9] The prevalence of myopia reported from East Asian countries is highest,[10,11] while the prevalence at other places has been reported from less than 1% to 16% in children and from 20%

| Access this article online | |
|---|---|
| Website: http://www.ijmsph.com | Quick Response Code: |
| DOI: 10.5455/ijmsph.2017.03082016623 | |

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to more than 70% in older ages.[12,13] Though racial and ethnic variances are common reasons for differences in prevalence, alterations in lifestyle such as the quantity of near-vision-tasks has also amplified the global variation in the prevalence of refractive errors.[14,15]

In diverse parts of India, studies on refractive errors have chiefly focused on school going children.[16,17] According to the education system in India, most medical and dental students and graduates are in the foundation stages and usually have to perform work causing stress on vision. Therefore, visual problems and refractive errors are very common in this population. The high occurrence of refractive errors was seen among medical students and they are usually ignorant about it.[18] There are inadequate studies that have reported refractive errors in dental students. In light of the rareness of information in this group in India and particularly in Jammu and Kashmir State, this study was done to determine the prevalence of refractive errors among dental students in Kashmir, a city in the North of India.

## Materials and Methods

This cross-sectional institutional based study was conducted in June 2016 among the Third and Final year students and interns in Government Dental College and Hospital, Srinagar, Jammu and Kashmir, India. The available population for sampling for this study was 488, which included 181 males and 307 females. These included all students and interns enrolled in the institute. All the subjects were informed about the research and their participation was voluntary. Ethical Clearance was obtained from the concerned Medical college and Hospital. Out of the total 488 study population, only 432 agreed to participate in the study, which included 155 males and 277 females. Age groups were categorized as 18-23 years, 24- 29 years and 30- 35 years.

Students who were using powered spectacles, contact lens or who gave a history of surgical intervention, were considered as having refractive errors while all others were assessed for refractive errors using auto-refractometer (TOPCON RM-8000B, TOPCON Corporation, Tokyo, Japan). The ophthalmologic examination was carried by an ophthalmologist from Ophthalmology Department of Shri Maharaja Hari Singh (SMHS) Hospital, Srinagar, located in the vicinity of the hospital. The ophthalmologic examination of the available sample was done in 15 days, examining approximately 30 subjects per day.

Refractive errors were categorized as myopia, hyperopia and astigmatism, in the following way. Category: 1 from 0.25 to 0.99 D, Category: 2 from 1.0 to 2.99D, Category: 3 from 3.00 to 5.99D and Category: 4 from 6D and above.

### Statistics

The data were analyzed using each subject as a unit. The primary analysis included all students who attended the ophthalmologic examination. Data were entered into an Excel Sheet database (MS Office Excel 2000; Microsoft Corporation, Redmond, WA, USA). The Data was analyzed using SPSS Statistics 20.0. The significance of differences between the groups (gender and age) was sought using Mann-Whitney U-tests with significance level set at ≤0.05.

## Results

The available target sample population included students and interns enrolled in the Government Dental College and Hospital, Srinagar. A total of 432 available subjects which included 155 males and 277 females were examined. Table 1 presents the distribution of the refractory errors in the studied population in respect to the genders. Out of the total population only 14.59% did not show any type of refectory error, while the rest 85.41% presented one of the three errors. Out of the total male population of 155 males 138 subjects presented refectory errors with the highest number (48.38%) of subjects having myopia followed by hypermetropia and astigmatism. Myopia was more prevalent in females which affected 56.67% of the population. There was a statistically significant difference ($p \leq 0.0435$) between the genders when compared for different refractive errors. While astigmatism was least prevalent in females with a prevalence of 8.30%. Overall the prevalence of myopia was recorded to be 53.70% which was highly prevalent in comparison to the other refectory errors within the studied population.

Table 2 presents the distribution of the subjects according to power in relation to age and gender. Among the age

**Table 1:** Distribution of refractive errors

| Refractive errors | Male (*N*=155) | % | Female (*N*=277) | % | Total (*N*=432) | % |
|---|---|---|---|---|---|---|
| Myopia | 75 | 48.38 | 157 | 56.67 | 232 | 53.70 |
| Hypermetropia | 42 | 27.09 | 51 | 18.41 | 93 | 21.52 |
| Astigmatism | 21 | 13.54 | 23 | 8.30 | 44 | 10.18 |
| Total | 138 | 89.03 | 231 | 83.39 | 369 | 85.41 |
| *P value* | 0.0435 | | | | | |

*Using Mann-Whitney U-test, Significance level ≤0.05*

**Table 2:** Prevalence of power in relation to age and sex (*n*=432)

| SEX | AGE | POWER | | | | TOTAL | *P* value |
|---|---|---|---|---|---|---|---|
| | | 0.25 to 0.99 D | 1.0 to 2.99D | 3.00 to 5.99D | 6D and above | | |
| Male | from 18-23 | 40 | 22 | 4 | 3 | 69 | 0.062 |
| | from 24-29 | 16 | 20 | 10 | 3 | 49 | |
| | from 30-35 | 4 | 12 | 3 | 1 | 20 | |
| | Total | 60 | 54 | 17 | 7 | 138 | |
| Female | from 18-23 | 45 | 48 | 16 | 1 | 110 | |
| | from 24-29 | 26 | 42 | 13 | 4 | 85 | |
| | from 30-35 | 7 | 18 | 8 | 3 | 36 | |
| | Total | 78 | 108 | 37 | 8 | 231 | |
| Total | from 18-23 | 85 | 70 | 20 | 4 | 179 | |
| | from 24-29 | 42 | 62 | 23 | 7 | 134 | |
| | from 30-35 | 11 | 30 | 11 | 4 | 56 | |
| | Total | 138 | 162 | 54 | 15 | 369 | |

*Using Mann-Whitney U-test, Significance level ≤0.05*

groups, subjects within age group 18-23 presented the highest deviation from normal followed by subjects from 24-29 years. Power 1.0 to 2.99D was more prevalent in the studied population within all the age groups. A Higher number of females with power 1.0 to 2.99 D were present in comparison to males. Though the results were not statistically significant ($p \geq 0.062$) when compared within the genders. It was also observed that females presented deviation from normal in higher number than males.

Table 3 shows the power in relation to the refractive error, power 0.25 to 0.99 D was more prevalent in subjects having hypermetropia. It was recorded that only 2.43 % population who were having refractive errors had a power of 6 D and above. It was seen that out of the 125 subjects having myopia, 53.87 % subjects had a power of 1.0 to 2.99D. Furthermore out of the 93 subjects having hypermetropia, 67.74% subjects presented a power of 0.25 to 0.99 D. It was also observed that out of the 44 subjects having astigmatism, 50% subjects had a power of 0.25 to 0.99 D. The results also show that power 6 D and above was seen in the least number of subjects.

## Discussion

The overall occurrence of refractive errors in the present study was 85.41%, myopia being the most common type with a prevalence of 53.7% and higher in females (56.67%). The prevalence of refractive errors was found to be higher in the studied population. The prevalence of myopia in the present study was 53.7% with, a higher number of females (56.67%) affected. The prevalence of hypermetropia in this study was lesser than myopia and astigmatism, with a total prevalence of 21.5% affecting more males (27.09%) than females (18.41%). In the present study, it was also seen that 10.18 % students in had astigmatism.

These findings of the present study in relation to the prevalence of all refractive errors are similar to the results of a study done on medical students in Pakistan who exhibited a prevalence of approximately 60%,[19] and this prevalence was also similar to other countries where the prevalence was found to be more than 50% as in Norway and Copenhagen.[20,21] More than half of the examined students in this study had

**Table 3:** Distribution of refractive errors in relation to power

| Power | Myopia | % | Hypermetropia | % | Astigmatisms | % | Total | % |
|---|---|---|---|---|---|---|---|---|
| 0.25 to 0.99 D | 54 | 23.27 | 63 | 67.74 | 22 | 50 | 139 | 37.66 |
| 1.0 to 2.99D | 125 | 53.87 | 27 | 29.03 | 13 | 29.54 | 165 | 44.71 |
| 3.00 to 5.99D | 44 | 18.96 | 3 | 3.22 | 9 | 20.45 | 56 | 15.17 |
| 6D and above | 9 | 3.87 | 0 | 0 | 0 | 0 | 9 | 2.43 |
| Total | 232 | 62.87 | 93 | 25.20 | 44 | 11.92 | 369 | 85.41 |

at least one type of refractive error. These findings specify the prominence of refractive errors in this particular strata and age group. As it has been previously documented that uncorrected refractive errors are one of the greatest vital causes of visual impairment in the world, refractive errors in this age range justify special consideration[22] though a lower prevalence of refractive errors has been reported from the studies done in Turkey at 32.9%.[23] On the contrary, the prevalence of refractive errors reported in the present study was much lower than that which has been reported from Taiwan at 93%[24] and Singapore at 90%,[25] but comparable to China at 71%[26] and parts of Iran.[13,27] The present study associates with the findings of, refractive errors in southern India (70%)[28] but has reported higher than 55% prevalence from central[29] 56% and 45% in western Indian regions.[30,31] Too much near-work, as a risk factor for myopia is emphasized by the findings of the study that has been published in 1969.[32] The most probable causes in the higher prevalence of these errors in the selected population can be attributed to the higher reading time in these students and can also be attributed to near-work which these students do. The inexperience of these young dental students can increase these chances and can also be due to their improper seating positions. The high prevalence of myopia in the present study shows refractive errors should be given more attention in university students because myopia is the most common cause of the uncorrected refractive error. It seems that studying hard for the university exam, which enforces a high burden of near activity, is the reason for the high prevalence of myopia in this group. In a previous study among Ophthalmology students, who perform extensive near-work, were noticed to have been at risk of developing myopia. Their myopic development was connected to the high strains for near-work and could be slowed in holidays while near-work decreased.[33] Since the dentistry students have a lot of pre-clinical work which puts stress on the vision or eyes can be a reason for this. Other than this long study patterns in artificial lights can also be a reason for the same. Other studies have also shown that this age group coincides with the onset of myopia.[34] In general, it seems that both biometric and environmental factors play an important role in the increased prevalence of myopia in this age group. The most common causes of increased myopia in this age group are probably due to the increase in axial length with age and secondly an increase in near-work in dentistry students.[34] The prevalence of hyperopia in this study was lesser than myopia and astigmatism, with a total prevalence of 21.5%. The detected rate is similar to that stated in previous studies from North eastern Iran[35] among schoolchildren in Shiraz, Iran[36] and Mashhad.[37] Based on previous studies, hyperopia is more common than myopia among Iranians.[35] However the present figures are less than the results of other studies on the prevalence of hyperopia in university students elsewhere[5,23,38] It was also seen that females had more prevalence of hypermetropia than males in the present study while many studies have not found a difference in the prevalence rates in the two genders.[39] Since short axial length is linked to hyperopia, the shorter axial length in females can be the cause for the greater prevalence of hyperopia in them.[40] Hyperopia and myopia are optically contrary to each other, the myopic transition in university students is the reason for the low prevalence of hyperopia. The reduction in hyperopia and increase in myopia from childhood to adolescence have been described in several studies which are assumed to result from the deviations in the ocular structure, especially the axial length.[35] It seems that environmental factors, especially near-work, are the utmost important cause in this concern. It should be noted that the growing trend of the prevalence of myopia with age is seen up to the fourth decade of life since a number of studies have shown a hyperopic shift after forty years of age due to changes in the lens structure.[41] Nevertheless, there are reports of the increase in the prevalence of myopia after forty years of age mostly due to nuclear cataract; hence, this finding cannot be generalized to healthy populations.[42,43] In the present study 10.18 % students in our study had astigmatism. It is rather difficult to debate astigmatism in university students since a restricted number of studies have inspected astigmatism in this age group. However, our findings showed that the prevalence of astigmatism was similar to the prevalence as seen in university students and lower than elderly people.[35] The prevalence of astigmatism is also comparatively lower in this study as compared to previous studies in Iran.[13,35] While higher astigmatism prevalence rates have only been reported from some East Asian countries, especially China (23.5%) and Singapore (58.7%).[44,45] Furthermore, there are reports that astigmatism has been linked to ethnicity and genetics.[46] Earlier many studies have reported that prevalence of astigmatism amplified significantly with age. This finding has been reported in other cross-sectional and cohort studies, as well. Previous literature suggests that the changes in the prevalence of astigmatism with age were mainly due to corneal changes and steepening of its curvature and it was also reported that lens astigmatism did not change significantly with age.[47,48] The findings of the present study did not show any major difference in the prevalence of astigmatism between male and female students. Although there are contradictory reports regarding the correlation of the gender and astigmatism prevalence while the majority of the studies have found no relationship.

In summary, established on the results of the present study, more than 75% students had refractive errors though all of these students were not aware of the defects and most of these were not under treatment for refractive errors. The prevalence of myopia is significantly high amongst dental students of the concerned Dental College. One of the limitations of the present study was that the study was cross-sectional

in nature which prohibited the ability in drawing inferences about the causal relationships. Furthermore, the role of certain confounding factors such as watching television, studying under different types of light sources, duration of working in front of computer screens and any familial history were not recorded in the present study. In view of the drawbacks, further studies involving larger populations of similar subjects in a controlled manner shall be carried out. It is further recommended that there should be screening programs to find the unnoticed cases of myopia in such Institutes due to the importance of this refractive error and the large amount of near-work in them. In light of the prominence of faultless visual acuity in this age group, the health system should give priority to ascertain affected students and correcting their refractive errors. It is believed that information obtained from this study will help in generating future planning and execution of better ophthalmologic care services. Subsequently, oral health students are the upcoming caretakers of the oral health-related problems, the present study points to the window of opportunity accessible to establish possible preventive measures against refractive errors before it becomes an epidemic in such population.

## Conclusion

The results of the present study showed more than 75% students had refractive errors. Most of these students were unaware of the defects. Thus, more attention must be given to students for the treatment of these refractive errors.

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**How to cite this article:** Shah AF, Yousuf A, Ahmed R, Suhail Jan SM, Siddiq M, Baba IA. Prevalence of refractive errors among dental scholars and supporting auxiliary staff in a Government Hospital of Kashmir- A cross-sectional study. Int J Med Sci Public Health 2017;6:359-364

**Source of Support:** Nil, **Conflict of Interest:** None declared.