

# Prevalence of Uncorrected Refractive Errors among Adults Attending at a Tertiary Care Hospital – A Retrospective Study

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## ABSTRACT

**Background:** This hospital-based study was done to estimate the prevalence of uncorrected refractive errors in adults attending to our outpatient department (OPD).

**Aims and Objectives:** 1. To estimate the prevalence of uncorrected refractive errors in adults attending to our OPD. 2. Effects of uncorrected refractive errors on education, social life, job, psychological impact. **Materials and Methods:** In this hospital-based retrospective study, 570 refractive error patients above 18 years of age were included. All known cases of refractive error, not using glasses, were also included in this study. As per the WHO criteria, visual acuity  $<6/18$  of Snellen visual acuity chart was taken as visually impaired while legal blindness was defined as visual acuity of 6/60 or less. Those who had ocular or any kind of systemic illness were excluded from this study. Manual retinoscopy followed by subjective verification, detailed slit lamp examination, and dilated fundus evaluation was done in all cases at the time of presentation. Postmydriatic refraction was mandatory in all who were below 21 years of age. All statistical analysis later on conducted in SPSS version 27 retrospectively. **Results:** Out of 570 patients with refractive error analyzed, 55.81% ( $N = 317$ ) were found males and 44.19% ( $N = 251$ ) were females. Refractive error was 50.18% ( $N = 285$ ) among Hindu population whereas in the Muslim population, it was found 49.82% ( $N = 283$ ). Refractive error was mostly encountered in students (46.65%,  $N = 265$ ) followed by housewives (31.87%,  $N = 181$ ). The most common cause of hospital visit was headache (71.48%,  $N = 406$ ). The most common refractive error was compound myopic astigmatism (43.56%,  $N = 248$ ). The prevalence of refractive error was 3.8% with a legal blindness of 39.40% ( $N = 99$ ) in male and 37.10% ( $N = 118$ ) in female. A total of 435 (76.58%) patients were freshly diagnosed in our study. A total of 20.25% ( $N = 115$ ) patients refused to wear glasses because of social factors. A total of 2.10% ( $N = 12$ ) patients were rejected for various jobs, whereas among 10.56% ( $N = 60$ ) of cases, refractive error had the social and psychological effect in their life. Poor performance in education was found among 11.27% ( $N = 64$ ) of cases. **Conclusions:** Adult screening for uncorrected refractive errors should be incorporated into the health-care system, especially for housewives, and always wearing a glass in cases of refractive error should be encouraged and campaigned.

**KEYWORDS:** Astigmatism, hyperopia, myopia, refractive error

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## INTRODUCTION

Uncorrected refractive errors are a leading cause of avoidable visual disability globally, and no age, gender, or ethnic group is exempt from its visually disabling effects.<sup>[1,2]</sup> The global initiative for the elimination of avoidable blindness sets a

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major challenge to work relentlessly to avoid the preventable blindness. This initiative will also require both government and private sector's commitment to allocate more budgets to increase significantly the provision and uptake of eye care services. Refractive errors have been listed, along with cataract, trachoma, onchocerciasis, and childhood blindness, among eye problems whose prevention and cure should provide enormous savings and facilitate societal developments.<sup>[1,2]</sup> The number of visually impaired persons in the world is about 259 millions. This estimate includes 98 million persons with visual impairment due to uncorrected refractive error.<sup>[3]</sup> Lack of refractive correction bears important consequences for the individual and the community in terms of lost education and employment opportunities, compromised quality of life, and decreased socioeconomic productivity. Therefore, refractive errors have been identified as a priority area of the global initiative for the prevention of avoidable blindness under the "Vision 2020 right to sight" program.<sup>[4]</sup> Refractive errors (emmetropias) are not eye diseases; they are disorders in which the dioptric power of the eye has changed so that the parallel rays of light from infinity, with the accommodation at rest, are focused either in front or behind the retina with the result either the vision is impaired or the asthenopic symptoms develop in the patient. The global survey on the prevalence of blindness and its causes reported refractive errors as a major cause of visual loss throughout the world. Results of various surveys showed that in eyes with visual acuity of  $<6/18$  refractive errors caused as much visual loss as cataract.<sup>[5]</sup> Uncorrected refractive errors are an important cause of visual impairment in many countries. In a study conducted in New Delhi, refractive error was the cause in 81.7% of eyes with vision impairment.<sup>[6]</sup> Refractive errors have been shown to affect approximately one-third of those aged 40 years and above in the US and Western Europe and one-fifth of the Australians in the same age group.<sup>[7]</sup> This study was conducted to estimate the prevalence of refractive errors in the adult population, which is also a hidden burden on society.

## MATERIALS AND METHODS

The study was conducted at our hospital from May 2020 to December 2020. It was a single-centered hospital-based survey. People aged 18 years and above who attended at our outpatient department (OPD) for any ocular complaints were included in the study. A total of 15,000 patients attended to our OPD during that period. All those whose presenting visual acuity was found to be  $<6/6$  on the Snellen visual acuity chart were included

in this study. All those who were earlier diagnosed as a case of refractive error were also included in this study. Those who had known corneal pathology, uveitis, glaucoma, pterygium, pupillary abnormality, cataract, dry eyes, eyelid pathology, convergence weakness, amblyopic, posterior segment pathology, or any known systemic illness were excluded. The WHO criteria of visual acuity  $<6/18$  were taken as visually impaired while  $<3/60$  was taken as blindness. Legal blindness was defined as visual acuity of  $6/60$  or less.<sup>[8]</sup> Visual acuity was done through the Snellen chart for distance vision. Objective refraction (manual retinoscopy) followed by subjective verification was done in all cases. Detailed slit lamp examination and dilated fundus evaluation were done in all cases. Postmydriatic refraction was performed in all who were below 21 years of age. Refractive errors requiring a correction of more than 0.25 D (plus/minus/cylindrical lenses) were classified as refractive errors and were further categorized as myopia, hypermetropia, and astigmatism. Myopia was classified as low to moderate ( $<-5.00$ D), high myopia ( $>-5.00$  to  $-10.00$ ), and extreme high myopia ( $>-10.00$ D).<sup>[9]</sup> Astigmatism was measured in minus cylinders. If the required minus cylinder was at  $180^\circ/0^\circ \pm 15^\circ$ , then the astigmatism was termed as with-the-rule (WTR); if the axis of the minus cylinder was  $90^\circ \pm 15^\circ$ , then it was termed as against-the-rule (ATR) astigmatism; and if the axis was  $20^\circ-70^\circ$  and  $110^\circ-160^\circ$ , i.e. between that of WTR and ATR, then it was classified as oblique astigmatism.<sup>[10]</sup> All the data later on entered into SPSS version 27 (Statistical Package for the Social Sciences IBM(International business Machine), Chicago, United state) and analyzed. Chi-square test was used to observe the association of the refractive error with respect to age, sex, education of father, occupation, and ethnicity.  $P < 0.05$  was considered significant.

## RESULTS

Out of 570 eye patients with refractive error included, 55.81% ( $N = 317$ ) were found males and 44.19% ( $N = 251$ ) were females. Refractive error was found more prevalent among Hindu population 50.18% ( $N = 285$ ) whereas in the Muslim population, it was 49.82% ( $N = 283$ ). Refractive error was mostly encountered among students (46.65%,  $N = 265$ ) followed by housewives (31.87%,  $N = 181$ ). The most common cause of hospital visit was headache (71.48%,  $N = 406$ ) [Table 1].  $P$  value and mean deviation of visual acuity at presentation and after correction have been shown in Table 2. The prevalence of refractive error was 3.8%. Mean age of the patients was 26.545 in male and in the female, it was 28.562. The prevalence of visually disabling/impairment (LogMAR

0.6 [6/24]) was 18.30% ( $N = 46$ ) in males and 21.10% ( $N = 67$ ) in females. The prevalence of visually disabling/impairment (LogMAR 0.8 [6/36]) was 21.10% ( $N = 53$ ) in males and 23.30% ( $N = 74$ ) in females. The prevalence of visually disabling/impairment (LogMAR 1 [6/60]) was 39.49% ( $N = 99$ ) in males and 37.10% ( $N = 118$ ) in females. The most common refractive error was found compound myopic astigmatism (43.56%,  $N = 248$ ) followed by simple myopia (27.64%,  $N = 157$ ) [Table 3]. A total of 435 (76.58%) patients were freshly diagnosed, whereas 135 (23.77%) patients had known refractive error. A total of 433 (76.23%) patients were not using glasses without any cause (casual), whereas 0.7% ( $N = 04$ ) did not wear because of professional factor. A total of 115 (20.25%) patients did not wear glasses because of social factor [Table 4]. A total of 2.10% ( $N = 12$ ) patients were rejected for various jobs because of their refractive error, whereas in 10.56% ( $N = 60$ ) of cases, refractive error had the social and psychological effect

in their life. Poor performance in education was found among 11.27% ( $N = 64$ ) of cases [Table 5].

## DISCUSSION

Refractive error is the most common ocular disorder. This hospital-based cross-sectional study focused on the prevalence and distribution of uncorrected refractive errors in the adult attending to our OPD. In the present study, the prevalence of refractive error was 3.8% with a legal blindness of 39.40% ( $N = 99$ ) in male and 37.10% ( $N = 118$ ) in female. Criteria for legal blindness was 6/60 or less as recommended by Kalikivayi *et al.*<sup>[11]</sup> Study results are in agreement with the result of Kalikivayi *et al.*<sup>[11]</sup> and Nepal *et al.*<sup>[12]</sup> There are marked differences in the prevalence of certain refractive errors among various racial and ethnic groups. These differences probably reflect the unique genetic make-up of these various groups, whereas population-based studies from the United States<sup>[13,14]</sup> and Australia<sup>[10,15]</sup> have reported a prevalence of myopia ranging from 15% to 76% in adults. The prevalence has reported to be significantly higher in Singapore 35%.<sup>[16]</sup> Asian countries in particular have also been experiencing a dramatic increase in the prevalence of myopia. Here, in this study, simple myopia was found in 27.64% ( $N = 157$ ) of cases. In most of the epidemiological studies, auto refractometer was used,<sup>[17]</sup> but this study employed the manual refraction with subjective verification.<sup>[10]</sup> There was a remarkable increase in the prevalence of refractive errors with the increasing age which correlates with other studies as well.<sup>[17-19]</sup> For the analysis of refractive errors, data pertaining to the right eye were used because no significant difference was noted between the two eyes and it has been reported as a valid strategy employed by other investigators.<sup>[20-22]</sup> In our study, most common refractive error was found compound myopic astigmatism (43.56%,  $N = 128$ ), followed by simple myopia (27.64%,  $N = 157$ ) and simple myopic astigmatism (16.14%,  $N = 92$ ). This is similar to studies from Sumatra,<sup>[23]</sup> Singapore,<sup>[16]</sup> India,<sup>[20]</sup>

**Table 1: Demographic distribution and presenting complaints**

	<i>n</i> (%)
Sex	
Female	317 (55.81)
Male	251 (44.19)
Religion	
Hindu	285 (50.18)
Muslim	283 (49.82)
Occupation	
Carpenter	2 (0.35)
Farmer	13 (2.29)
Housewife	181 (31.87)
Job	91 (16.02)
Student	265 (46.65)
Unemployed	16 (2.82)
Presenting complaints	
Headache	406 (71.48)
Medical	4 (0.70)
Reduced vision	158 (27.82)

**Table 2: Visual acuity**

Group statistics				
	Sex	<i>n</i>	Mean±SD	<i>P</i>
Uncorrected visual acuity right eye LogMAR	Male	251	0.709±0.269	0.034
	Female	318	0.755±0.252	
Uncorrected visual acuity left eye LogMAR	Male	251	0.754±0.247	0.902
	Female	318	0.756±0.234	
BCVA right eye LogMAR	Male	247	0.038±0.085	0.175
	Female	316	0.048±0.089	
BCVA left eye LogMAR	Male	251	0.035±0.082	0.08
	Female	318	0.048±0.089	

SD: Standard deviation, BCVA: Best corrected visual acuity, logMAR=Logarithm of the minimum angle of resolution

**Table 3: Type of refractive error**

Type of refractive error	n (%)
Compound myopic astigmatism	248 (43.66)
Myopia simple	157 (27.64)
Simple myopic astigmatism	92 (16.14)
Hypermetropic astigmatism	16 (2.80)
Hypermetropia simple	27 (4.75)
Compound hypermetropic astigmatism	10 (1.76)
Mixed astigmatism	10 (1.76)
Simple astigmatism	6 (1.06)

**Table 4: Factors associated with refractive error**

	n (%)
First time diagnosed	435 (76.58)
Earlier diagnosed	135 (23.77)
Factors associated (why not using glass)	
Feeling shame (social factor)	115 (20.25)
Professional reason	4 (0.70)
Casual	433 (76.23)

**Table 5: Affects of refractive error on life**

	n (%)
Affect on education	
Nil	504 (88.73)
Poor performance	64 (11.27)
Affect on job	
Nil	558 (98.24)
Poor performance	2 (0.35)
Rejected for job	12 (2.10)
Yes	4 (0.70)
Social affect	
Feeling shame	60 (10.56)
Normal	508 (89.44)
Psychological affect	
Normal	508 (89.44)
Present	60 (10.56)

and Bangladesh<sup>[18]</sup> in which myopia was the most common refractive error. The Eye Disease Prevalence Research group<sup>[7]</sup> also found myopia to be greater than hypermetropia in the US, Western Europe, and Australian population. In this study, refractive error was found to be more in female than men (55.9% in female and 44.1% in males;  $P = 0.034$ ) and it does not correlate with the findings reported by Bourne *et al.*<sup>[18]</sup> and Hyams *et al.*<sup>[24]</sup> In the Indian study,<sup>[20]</sup> no significant correlation between gender and prevalence of myopia was noted while a Finish study done in rural population showed a higher prevalence of myopia in females. In our study, myopia up to -6D was found in 99.29% ( $N = 566$ ) of cases, whereas in 04 cases (0.70%), myopia was found pathological. In a study from the US, the prevalence of high myopia was 3.2% and that of extreme high myopia

0.2%. In the Melbourne Visual Impairment Project, the prevalence of high myopia was 2% and extreme myopia 0.3%.<sup>[24]</sup> The prevalence of high myopia in the studies from Bangladesh (1.8%), Singapore (Indian population 2.1%), and India (4.5%) was higher than the prevalence in this study while it is comparable to a study from Saw *et al.* from Sumatra (0.6%).<sup>[23]</sup> The prevalence of hypermetropia was 10.14% in our study population. The lower prevalence of hypermetropia in 30–40-year age group and peaking in the 51–60-year group is similar to the pattern observed in the studies from Bangladesh<sup>[18]</sup> India,<sup>[20]</sup> Singapore,<sup>[16]</sup> and Indonesia.<sup>[23]</sup>

## CONCLUSIONS

Uncorrected refractive errors still account for a large proportion of subnormal vision, blindness, and visual impairment in our community. Keeping in view, the avoidable nature of visual impairment caused by refractive errors, effective measures for screening, and correction of refractive errors should be taken on a priority basis for adults, especially for housewives. Patients own health awareness play a key role in managing this family burden, social burden, and national and the global burdens.

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## Conflicts of interest

There are no conflicts of interest.

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