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Research Article

DETERMINANTS OF UNCORRECTED REFRACTIVE ERRORS AMONG MEDICAL STUDENTS AT A PUBLIC MEDICAL UNIVERSITY IN A DEVELOPING COUNTRY

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Abstract:

Refractive errors occur when changes in shape of the eye and crystalline lens prevent light from focusing directly on the retina. Approximately 500 million people worldwide suffer from visual impairment or blindness due to uncorrected refractive error.

***Objective:** To find the determinants of uncorrected refractive errors among students of all MBBS classes at King Edward Medical University.*

***Materials and methods:** A cross-sectional study was conducted on 101 subjects, with uncorrected refractive errors. Study was done at King Edward Medical University, Lahore for a duration of 6 months. Data was collected on visual function questionnaire after obtaining informed consent. Data was analyzed using SPSS V24 to calculate frequencies of self-reported determinants by the students.*

***Results:** Students belonged within the age group 18-24 years. Among the questioned students 45.5% were male and 54.5% were female. 86.1% reported significant improvement in vision with visual aids. A majority of students cited cosmetic reasons (68.9%) or being careless (84%) as a cause for not using spectacles. While 32.7% were uncomfortable with spectacles, and 4% reported financial reasons. Being unaware of risks associated with not wearing glasses was reported by 25.8% of students.*

***Conclusion:** Cosmetic reasons, negligence and discomfort with spectacle use were most frequently responsible for medical students having uncorrected refractive errors.*

***Keywords:** Uncorrected refractive errors, medical students, determinants.*

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INTRODUCTION:

Refractive errors occur when changes in shape of the eye and crystalline lens prevent light from focusing directly on the retina.^[1] Causes of refractive errors include changes in the length of the eyeball whether decreased or increased, changes in the shape of cornea, or aging of lens.^[2] Myopia is a condition in which the visual images come to focus in front of the retina when the accommodation is at rest resulting in a defective vision of distant objects.^[3] Hyperopia means farsightedness and is when image of a near object is formed behind the retina. This could be because the eye is too short or the cornea or the crystalline lens does not refract the light enough.^[3] Astigmatism is characterized by failure of light to come to focus on a single point on the retina to produce clear vision. Instead multiple focal points occur, either in front of retina or behind or both.^[4] Presbyopia is a visual condition which becomes apparent especially in middle age and in which loss of elasticity of the lens of the eyes causes defective accommodation and inability to focus sharply for near vision.^[5]

The global initiative for the Elimination of Avoidable Blindness requires identification of most common causes of preventable and treatable blindness and efficient work to reduce these cases to minimum. Uncorrected refractive errors are one of the commonest avoidable causes of blindness. If blindness were to be defined as presenting visual acuity rather than best-corrected distance visual acuity, refractive errors would become the second most common cause of blindness behind only cataracts.^[6] An estimated 12.3% of total blindness is due to uncorrected refractive errors.^[7] As a cause of visual impairment refractive errors are much more prevalent. According to an estimate approximately 500 million people worldwide suffer from visual impairment or blindness due to uncorrected refractive errors. Most of these cases are from developing countries.^[8] Other researches assessing the global impact of uncorrected refractive errors include one by Holden BA and another by Resnikoff S which places the number of people with impaired near vision at 517 million and those with impaired distant vision at 153 million respectively.^{[9][10]} A study in Chile revealed refractive errors to be most common cause of visual impairment in children at 56%. More than 7% of these needed spectacles for better vision.^[11] Prevalence of uncorrected refractive errors in Pakistan among different populations varies between 2% to 24% depending upon age, sex, geography, ethnicity and socioeconomic status.^{[12][13][14][15][16][17]} Refractive errors although a less common cause of blindness are the most common cause of moderate visual impairment in

certain groups in Pakistan.^[18] Rural populations are generally more severely affected and show less spectacle coverage with Balochistan showing highest prevalence.^[19] Most of these cases can be treated by measures as simple as spectacles.

The purpose of this research is to provide a detailed analysis of the prevalence and determinants of uncorrected refractive errors (URE). We will assess the effect of URE on quality of life and academic performance. We aim to find out what the reasons are behind uncorrected refractive errors, their relationship to age, sex and family history, the awareness among students of complications arising from URE, the social stigma behind wearing spectacles and how to counter these problems in order to eliminate URE, one of the biggest causes of preventable blindness.^[7] Our study will be valuable in identifying the prevalence of uncorrected refractive errors which is correlated with eye care services, health literacy and socioeconomic status in a community. Subsequent identification of specific causes will help in putting together the most appropriate measures in reducing uncorrected refractive error as cause of preventable visual impairment.

MATERIALS AND METHODS:

Myopia was considered when the measured objective refraction was more than or equal to -0.50 spherical equivalent diopters in one or both eyes.^[24] *Hyperopia* was considered when the measured objective refraction was more than or equal to $+0.50$ spherical equivalent diopters in one or both eyes.^[25] *Astigmatism* was defined as at least a 1.00-D difference between the 2 principal meridians.^[26] *Uncorrected Refractive Error* was defined as the number of subjects who had a visual acuity worse than 6/12 in the better eye without correction and could achieve 6/12 or better in the better eye with correction, but either went without spectacles or did not achieve such correction with their present spectacles.^[27] *Determinant* is a factor which decisively affects the nature or outcome of another variable. In this research determinants are all the factors linked with incidence of uncorrected refractive errors and include socioeconomic status, cosmesis, ignorance and other personal reasons.

A cross-sectional study was conducted to find the determinants of uncorrected refractive errors. Duration of study was 6months. Following criteria was used to select students.

- Students of MBBS at King Edward Medical University, Lahore.
- Diagnosed with myopia, hyperopia or astigmatism with visual acuity less than 6/12 without correction in one or both eyes.

- Do not correct the refractive errors with spectacles or lenses.

Written consent was taken from all the students. Data was collected from every student using a questionnaire. Students reported their particular reasons for not using spectacles. Data entry and analysis were done with the help of SPSS V24. Each determinant was entered as a different variable and frequencies of various determinants

responsible for not using spectacles were calculated.

RESULTS:

101 students meeting the inclusion criteria were questioned. Students belonged within the age group 18-24 years. Among the questioned students 46 were male and 55 were female.

Table 1: Gender and age distribution of subjects

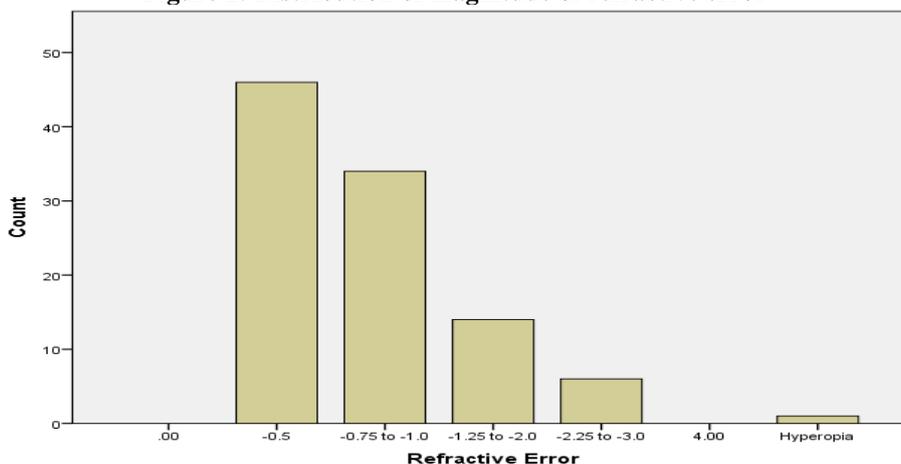
Variant	Values	Number	Percent
Sex	Male	46	45.5
	Female	55	54.5
Age	18	5	5.0
	19	7	6.9
	20	15	14.9
	21	28	27.7
	22	34	33.7
	23	10	9.9
	24	2	2.0

More than half of the students had a refractive error of -0.75 or higher. Distribution of different magnitudes of refractive errors was,

Table 2: Distribution of magnitude of refractive error

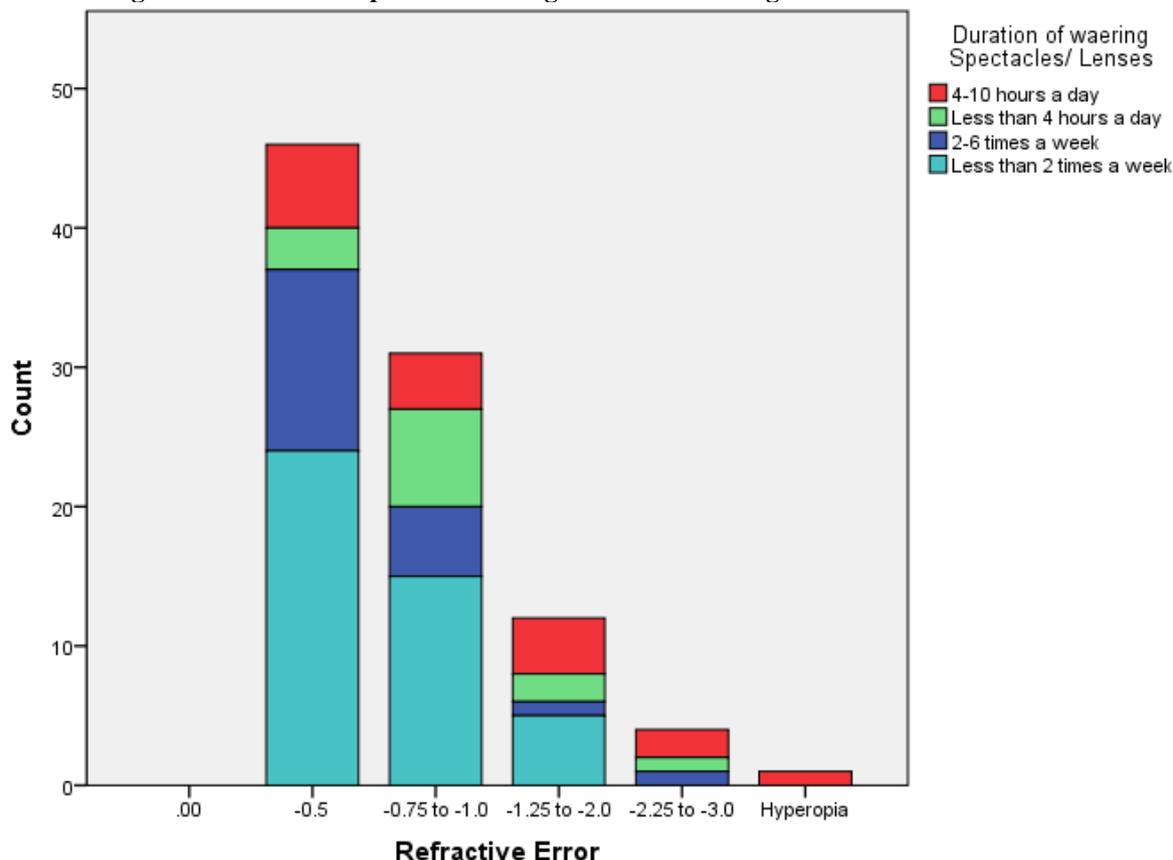
Refractive Error	Frequency	Percent
Myopia		
-0.5	46	45.5
-0.75 to -1.0	34	33.7
-1.25 to -2.0	14	13.9
-2.25 to -3.0	6	5.9
Hyperopia	1	1.0

Figure 1: Distribution of magnitude of refractive error



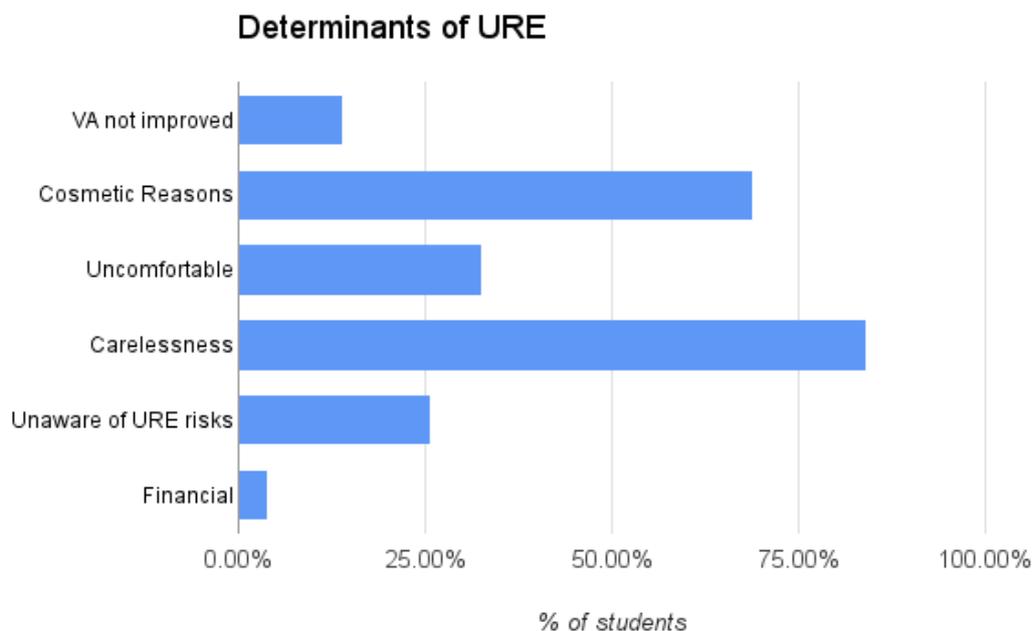
Duration of wearing spectacles varied among students based on the magnitude of their refractive errors. 48.8 % of the students with refractive error ≤ 1.0 wore spectacles less than 2 times a week while only 25% of those with refractive error >1.0 did so.

Figure 2: Duration of spectacle coverage in relation to magnitude of refractive error



Determinants of uncorrected refractive errors were analyzed based on self reported causes by the students. 86.1% of the students reported significant improvement in their vision with appropriate refractive correction while only 23.8% were using visual aids regularly. 32.7% of students were uncomfortable wearing glasses i.e experienced headache or frame of the spectacles caused pain. 68.9% of student reported having cosmetic concerns with regarding the use of spectacles. Only 4% of the subjects reported hesitation in buying spectacles due to financial problems. 84% of students reported showing carelessness regarding their spectacles (forget them at home or show laziness in getting them repaired). Being unaware of risks associated with not wearing glasses was reported by 25.8% of students. Figure 3 shows most frequent determinants responsible for uncorrected refractive errors(URE) as reported by students.

Figure 3: Determinants of uncorrected refractive errors



DISCUSSION:

This research and study design was formulated to provide resourceful insight to the major factors responsible for medical students having uncorrected refractive errors. It is imperative to identify these factors in this population to prevent any loss of productivity.^[28] Majority of the students assessed in this study admitted to having better visual acuity when using spectacles. All of the subjects still reported using appropriate visual aids less than 10 hours a day. During the course of research it was ascertained that there are two main factors concerning uncorrected refractive errors. A significant number (84%) of medical students were careless regarding the correction of their refractive errors. Negligence was thus a major factor in prevailing uncorrected refractive error in this population and by extension a decrease in performance considering the fact the 50.5% of students reported that their daily activities were impaired when not using glasses. The second big factor in uncorrected refractive errors was cosmesis and cosmetic reasons. A huge 68.9% of the subjects reported having cosmetic concerns with spectacles. Cosmetic reasons can therefore be identified as second major factor leading to decreased spectacle use among medical students. Such concerns were more prevalent among females compared to equivalent male subjects. While some subjects alleviated this concern with the use of contact lenses in demanding situations like sports or social occasions, most left their refractive error uncorrected. So therefore, reflecting from our

research we categorized the issues as being either Category A) Careless Attitude or Category B) Cosmetic reasons. Most of the subjects had at least one of these concerns. Other minor factors can efficiently be classified under these two categories. 25.8% students don't know the risk of uncorrected refractive errors, and so will come under category A. 32.7% were uncomfortable with wearing glasses and that can be included, for the purpose of matching solution, in category B. Interestingly among this group some of the students experienced headache with the use of glasses that reduced their spectacle use remarkably. It raises the question of whether they were using correct visual aids with appropriate lenses and if their refractive error indeed had been diagnosed correctly.

It is concluded that all the issues discussed in this research can be easily dealt with two very simple measures. Solution for Category A factors would be Awareness programs and seminars, discussing the need to correct vision, the importance of visual aid and the consequences, both short term and long term, of uncorrected refractive errors. Whereas, solution to Category B factors would be better quality and ideally built glasses, personalized visual aid or more commonly the use of contact lenses which were preferred over spectacles by 36.6% of subjects in our research. Applying these two measures would greatly reduce the burden of uncorrected refractive errors, enhance the productivity and drastically reduce the

consequences that result from uncorrected refractive errors.

Other factors that became highlighted in this study were 1) Insignificant improvement of vision even with visual aid and 2) Financial reasons for not having corrected the refractive error. Their respective percentage were found to be 13.9% and 4%. These can be classified under a Category C. Those reporting little or no improvement in vision even with visual aids might benefit from a re-evaluation by an expert. It has long been a global target to eradicate uncorrected refractive due to poverty.^[28] It's importance is highlighted in this study by the fact that even medical students at a top medical college are not exempt from such a problem.

CONCLUSION:

Carelessness and cosmetic reasons were found most significant factors responsible for medical students leaving their refractive errors uncorrected. Discomfort with spectacle use is also an important, albeit less in frequency, determinant. Daily activities were impaired by uncorrected refractive error in many cases but the degree of loss of productivity produced by uncorrected error requires additional data.

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