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Research Article

**PREVALENCE AND DETERMINANTS OF
NEARSIGHTEDNESS (MYOPIA) AMONG THE STUDENTS
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Abstract:

Background and Introduction: Myopia is characterized by an impaired ability to see distant objects clearly while all near objects can be visualized. The reason is either an increased size of the eyeball or an increased curvature of the lens and/or cornea, or both. In both cases, light rays from distant objects come to focus at a point in front of the retina – hence the refractive error.

Materials and Methods: A descriptive study was conducted at Gujranwala Medical College, Gujranwala from 28th June to 28th July 2016, to assess the prevalence and determinants of myopia among medical students. In this regard we used semi-structured, pre-tested questionnaire to get responses from 100 GMC students by non-probability convenient sampling, and then data was analyzed by SPSS version 21 software.

Results: 51% students reported positive for myopia, out of which 3.9% were positive for high myopia. The mean dioptric value was -2.0D. Increased use of electronic gadgets (90.2%) and positive family histories (88.2%) were found to be the main predisposing factors.

Conclusions: Myopia is the most common refractive error of the eye among medical students, and as myopia is preventable cause of permanent visual impairment, regular eye checkup, control of chronic diseases (such as diabetes), protection of the eyes from the sun, prevention of injuries to the eye, consumption of healthy foods (rich in vitamin A and omega-3 fatty acids), and avoidance of smoking are some measures one can take to control myopia.

Keywords: Myopia, nearsightedness, refractive error, Gujranwala Medical College.

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INTRODUCTION:

The most common refractive error of the eye, nearsightedness (myopia) is the difficulty experienced while seeing or reading distant objects and signs, without a problem during viewing of objects closer to the eye. Along with this, a person with myopia may experience squinting, eye strain, headaches and night blindness. [2] The reason behind this refractive error is an increased length of the eyeball as compared to the refractive power of the cornea and the lens, as a result of which light rays from a distant object come to focus at a point *in front* of the retina instead of *on* the retina as they normally should. On the contrary, myopia can also occur in a person with a normal sized eyeball but with an increased curvature of the cornea and/or the lens. It can also be a combination of both factors. [14]

Usually beginning in childhood, the chances of myopia are especially high in persons with a family history of the disease. Excessive reading habits and a lack of time spent outdoors are also two other risk factors associated with the condition. Consequently, it may either stabilize during adulthood or even progress further. [2]

Since myopia leads to a reduced quality of life, eye strain impaired safety and other eye problems such as glaucoma, it needs to be treated. Glasses or contact lenses are the first options to consider for the treatment of myopia, followed by refractive surgeries, such as PRK, LASIK, and IOL transplantation. [14]

A severe progressive variant of myopia is referred to as pathological (or malignant) myopia, and requires only surgical intervention for its treatment; as such patients are at increased risk for cataracts, retinal detachment, and blindness. [2]

Regular eye checkup, control of chronic diseases (such as diabetes), protection of eyes from the sun, prevention of injuries to the eye, consumption of healthy foods (rich in vitamin A and omega-3 fatty acids), and avoidance of smoking are some measures one can take to control myopia, as this is a disease that cannot be prevented. [14]

According to population-based cross-sectional studies, the prevalence of myopia in the world is about 49.8% and that of high myopia is 9.8%. [6]

There is a considerable regional difference in the prevalence from one country to the other and even within the same geographical area. East Asian and Southeast Asian countries report higher prevalence rates than the rest of the world. [5]

The prevalence of myopia and high myopia in Pakistan is estimated to be 36.5% and 4.6% respectively. [13]

With the objective to study the prevalence of myopia and associated risk factors in local medical students, a cross sectional study conducted between January 2015 and August 2015, studied 500 medical students (347 females and 110 males) through eye testing and questionnaires and found that 43.7% students were myopic and 18.1% high myopic. 80% had a positive family history, 64.2% associated their myopia to electronic gadget use, 50.2% had it due to increased reading habits and 56.3% complained of worsening in their myopia. [10]

According to another research that studied myopia as a significant public health problem and its increasing prevalence over time, the prevalence and incidence of myopia within a sampled population often varies with age, country, sex, race, ethnicity, gender, occupation, environment, and other factors. The growth of myopia is under a combination of genes and their products in time and space to complete the coordination role of the guidance. About 70 genetic loci have been identified as myopia-related genes, with many more yet to be identified. Treated with spectacles or lenses, the most common surgical procedure for its correction is LASIK (Laser In-Situ Keratomileusis). [15]

Myopia is a significant public health problem and its increasing prevalence over time among medical students, the prevalence and incidence of myopia can vary with age, sex, country, race, ethnicity, gender, occupation, environment and other factors and by using simple measures we can control myopia. So there is a need to provide awareness and to educate students to adopt those measures that can control myopia. [16]

The study in question aims to determine the prevalence of myopia among the medical students of Gujranwala Medical College, and study the factors associated with myopia among them.

MATERIALS AND METHODS:

- **Methodology**
- **Study Design:** Descriptive Study
- **Study Area:** Gujranwala Medical College, Gujranwala
- **Study Population (N):** Students of Gujranwala Medical College, Gujranwala
- **Study Duration:** 1 month
- **Inclusion Criteria:** Students of Gujranwala Medical College with nearsightedness.
- **Exclusion Criteria:** Subjects outside Gujranwala Medical College with nearsightedness.
- **Ethical Clearance:** All subjects were explained the purpose, process, and benefits of the study. Assurance was given to protect the privacy and dignity of human study subjects.
- **Sampling**

- **Size:** The sample size was calculated via the EpiInfo Version 2 software. We had the following data for the calculation:

Population size (for finite population correction factor [fpc]) (N): 500

Hypothesized % frequency of outcome factor in the population (p): 64.2% +/- 5

Confidence limits as % of 100 (absolute +/- %) (d): 5%

Design effect (for cluster surveys – $DEFF$): 1
These values were substituted in the following formula:

$$\text{Sample size } (n) = \frac{[DEFF * N * p * (1-p)]}{[(d^2 / Z^2) * 1.96 * (N-1) + p * (1-p)]}$$

The formula helped us calculate our sample size (n), with a confidence interval of 95%, meaning a 5% margin of error, to be 208.

- **Technique:** Non-probability convenient sampling
- **Data Collection and Analysis Plan**
- **Data Collection Tool:** Semi-structured, pre-tested questionnaire survey was used for data collection.
- **Data Analysis Plan:** SPSS Version 21 Software

RESULTS:

This study was conducted among the medical students of Gujranwala Medical College, Gujranwala for the assessment of prevalence and determinants of near-sightedness. A semi-structured, pre-tested questionnaire was used for data collection. We questioned a total of 208 students, 144 females and 64 males, the result of which was:

The myopic students were then asked to fill out our questionnaire, with the results as follows.

Descriptive Variables

Age	19 years	20 years	21 years	22 years	23 years
	3.94%	9.8%	25.49%	31.37%	29.41%
Gender	Males			Females	
	29.4%			70.6%	
Residence	Rural			Urban	
	5.9%			94.1%	
Day Scholar/Hostelite	Day Scholars			Hostelites	
	31.4%			68.6%	

Variables Regarding Myopia

Sample size (n): 84 out of 208 who were nearsighted (myopic).

Diagnosed with High Myopia	Positive			Negative	
	3.9%			96.1%	
Age of Myopia Diagnosis	1-5 years	6-10 years	11-15 years	16-20 years	>20 years
	1.9%	11.8%	35.3%	41.2%	9.8%
Degree of Myopia	Between 0.0 and -2.0D	Between -2.0 and -4.0D	Between -4.0 and -6.0D	>-6.0D	Uncertainty about degree
	45.09%	27.45%	7.84%	3.92%	13.72%
Condition of Myopia since GMC Admission	Worsened		Decreased	Unchanged	
	43.1%		7.8%	49%	
Ophthalmologist Visiting Frequency	Every 3 months	Every 6 months	Every year	Every 2 years or more	Never
	5.9%	15.7%	39.2%	9.8%	29.4%

Correction of Myopia

Article Used for Correction	Spectacles		Contact Lens		Both of them		None of them		
	58.8%		0%		33.3%		7.8%		
Duration of Spectacle Use	2-4 years		4-6 years		6-8 years		8-10 years		>10 years
	28.6%		24.5%		16.3%		16.3%		14.3%
Frequency of Spectacle Use	All the time				Only when needed				
	49%				51%				
Frequency of Spectacle Removal while Reading	Never		Rarely		Frequently		Always		
	28.6%		30.6%		14.3%		26.5%		
Duration of Contact Lens Use	2-4 years		4-6 years		6-8 years		8-10 years		>10 years
	54.2%		29.2%		12.5%		0%		4.1%
Frequency of Contact Lens Use	All the time			Only when needed			Only when going out		
	0%			28%			72%		
Frequency of Contact Lens Removal while Reading	Never		Rarely		Frequently		Always		
	52%		16%		8%		24%		
Contact Lens Replacement by Spectacles while Reading	Yes			No			Sometimes		
	37.5%			41.7%			20.8%		

Refractive Surgeries, Medications, Exercises and Coexisting Ocular Conditions

History of Refractive Surgery	Positive				Negative				
	6%				96%				
Medications Prescribed for Myopia	Yes				No				
	7.8%				92.2%				
Frequency of Use of Medications	Never		Rarely		Frequently		Always		
	56.3%		25%		6.2%		12.5%		
Medications Used for Myopia	None		Vitamin A Tablets		Vitamin D Tablets		Multivitamins		
	21.56%		3.92%		1.96%		5.88%		
Performance of Eye Exercises	Yes			No			Sometimes		
	9.8%			76.5%			13.7%		

Associated Risk Factors of Myopia

Family History of Myopia	Positive			Negative	
	88.2%			11.8%	
Academic Performance at GMC	Excellent	Good		Satisfactory	Poor
	1.96%	41.2%		52.9%	3.92%
Use of Sunglasses Outdoors	Never	Rarely		Frequently	Always
	31.4%	47.1%		17.6%	3.92%
Time Spent Outdoors	<4 hours	<8 hours	<12 hours	<16 hours	<20 hours
	56.9%	19.6%	21.6%	1.96%	0%
Exposure to Electromagnetic Sources	Low		Moderate		High
	58.8%		41.2%		0%
Time Spent on Electronic Gadgets	<5 minutes	5-15 minutes	15-30 minutes	30 minutes-1 hour	>1 hour
	0%	0%	1.96%	7.8%	90.2%
Time Spent in Reading	<1 hour	1-3 hours	3-5 hours	5-7 hours	>7 hours
	25.5%	52.9%	11.8%	3.96%	5.9%
Time Spent in Resting while Reading	<5 minutes	5-15 minutes	15-30 minutes	30 minutes-1 hour	>1 hour
	13.7%	29.4%	25.5%	19.6%	11.8%
Experience of Double Vision while Reading	Never	Rarely		Frequently	Always
	64.7%	29.4%		5.9%	0%
Average Reading Distance	<15 cm	15-30 cm	30-60 cm	60-100 cm	>100 cm
	13.7%	64.7%	15.7%	5.97%	0%
Adequate Amount of Light for Reading	Equivalent to 1 lightbulb	Equivalent to 2 lightbulbs	Equivalent to 3 lightbulbs	Equivalent to 4 or more lightbulbs	
	15.7%	58.8%	21.6%	3.96%	

Our research on myopia revealed a 51% prevalence of the condition among GMC students – 70.5% females and 29.5% males – with a mean dioptric value of about -2.0D, 3.9% prevalence of high myopia, and an increased use of electronic gadgets (such as mobile phones, computers and televisions (90.2% for >1 hour) and a positive family history (88.2%) as the leading risk factors predisposing to the disease. Our results are comparable to other studies conducted on the same topic as ours in other parts of the world.

When we compare our research with the Allama Iqbal Medical College research – which found the frequency of myopia to be high (57.6%), with a mean dioptric value of -2.12D; 61% females and 51.5% males; 71% with a positive family history, an average of 3.3 reading hours and 2.2 television hours per day; however, physical exercises, sleep patterns and computer working not having a significant relationship to their myopia^[4] – we find that our study differs from theirs in that our method of sampling was the non-convenient probability technique, though our prevalence and mean

dioptric values do not differ significantly. However, our research showed more females affected than males and a high positive family history plus electronic gadget use than theirs, which can be due to the differences in our data collection tools (questionnaires versus semi-structured questionnaires) and sample sizes (208 versus 202).

However, when we compare our research with that of Liaquat National Medical College – in which there was a prevalence of 47%, 73.4% females and 26.5% males; the average dioptric value between -0.5D and -1.75D, high myopia prevailing in 18.1%, 80% having positive family history, 64.2% reporting use of electronic devices for >1 hour; average reading distance being up to 30 cm, and computer use for >1 hour 32.3%^[11] – our prevalence and gender distribution values do not have a significant difference, though our mean dioptric values do, to some extent. The frequency of high myopia differed to a greater extent (3.9% versus 18.1%). Both researches identify positive family histories and use of electronic devices as the

leading risk factors. The reason for the differences in values could be: while our study was a descriptive one, this is a cross-sectional study. Sample sizes vary too (208 versus 500).

The research conducted in Yazd, Iran, with the results being 36.5% (33.6-39.4%) myopia while 2.3% (1.6-2.9%) high myopia; female subjects tending to be more myopic than male subjects [16], was different from ours in that the difference in our prevalence values can be owed to the difference in sample sizes (208 versus the whole population of Yazd) and sampling technique (non-probability convenient versus multi-stage random sampling).

Lastly, the population based study of Singapore – which concluded that its prevalence was higher in urban areas and in the Chinese population, though these variations tend to diminish in people once they cross the age of 40 years, and increased near work, lesser time spent outdoors, high education levels and parental histories of myopia were recognized to be the major predisposing factors [9] – differs from our descriptive study in that our research did not reveal a significant relationship between lesser time spent outdoors and an increased incidence of myopia.

In all of these researches, there has been one factor in common: the prevalence of myopia being higher in females than in males. The reasons contributing to this could be a greater female population in the areas where these national and international studies were conducted, lesser access to quality healthcare facilities owing to gender bias in the developing parts of the world, and probably some genetic components yet unidentified or undergoing investigations.

Another factor is the higher prevalence of myopia in urban than rural areas. The reason for this is quite understandable, as better quality education, increased near-work opportunities, which have been internationally declared as causative agents predisposing to the disease, are greater in the urban as compared to the rural areas.

We did face limitations during the course of study. The subjects of our research include the students of Gujranwala Medical College only making generalization of results difficult, where not all of our students were aware of the degree of the myopia, and some of our subjects had never visited an ophthalmologist or did so less frequently for the examination of their myopia.

CONCLUSION:

In view of the study conducted as shown above, the prevalence of myopia and high myopia among the medical students of Gujranwala Medical College, Gujranwala, is 51% and 3.9% respectively, with increased prevalence in females than in males

(70.5% versus 29.5%). Though increased use of electronic devices and positive family histories among others qualify as the leading risk factors for the condition, the main etiological factor for myopia to this date remains unidentified.

LIST OF ABBREVIATIONS

- **GMC** – Gujranwala Medical College
- **SPSS** – Statistical Package of Social Sciences
- **LASIK** – Laser In-Situ Keratomileusis
- **PRK** – Photorefractive Keratotomy
- **LASEK** – Laser Epithelial Keratomileusis
- **RLE** – Refractive Lens Exchange
- **ICR** – Intra-Corneal Ring Segments
- **AK** – Astigmatic Keratotomy
- **RK** – Radial Keratotomy

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