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Prevalence of Refractive Error among the Students of Medical College of Northern Border Region KSA

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Abstract: Background: Refractive errors (REs) represent a significant global public health challenge as a leading global cause of vision impairment and the second most frequent cause of treatable blindness. These conditions arise when the axial length or corneal curvature of the eye disrupt the precise focus of light on the retina. Despite their high prevalence, data regarding the distribution of specific refractive error types among medical students in the Northern Border region of Saudi Arabia remain limited. **Objective:** To determine the prevalence of refractive errors and evaluate their association with demographic factors (age and gender) among medical students at Northern Border University (NBU), Kingdom of Saudi Arabia. **Materials and Methods**: A cross-sectional study was conducted between March and April 2025. Data were collected via a validated electronic questionnaire distributed to male and female medical students at Northern border university. The survey assessed demographic characteristics and the prevalence of specific refractive conditions, including myopia, hypermetropia, and astigmatism, along with their respective dioptric severities. Data were managed in a spreadsheet and analysed via IBM SPSS. Categorical variables are expressed as frequencies and percentages, while normally distributed continuous data are presented as mean ± standard deviation. Statistical associations between categorical variables were assessed using Chi-square tests. **Results:** A total of 257 students participated (36.6% male, 63.4% female). The overall prevalence of refractive error was 59.1% (n=152), while 40.9% (n=105) of the cohort reported no refractive issues. Myopia was the most frequent refractive error, affecting 28% (n=72) of the total sample and accounting for 49.7% of all diagnosed cases. This was followed by myopia combined with astigmatism (17.1% total; 30.3% of RE cases), isolated astigmatism (8.2% total; 13.8% of RE cases), hypermetropia (4.3% total), and hypermetropia combined with astigmatism (1.7% total). In this specific sample, neither gender nor age group showed a significant correlation with the presence of myopia. The distribution of vision status appeared to be relatively uniform across the provided demographic groups. However, there was a highly significant association between myopia and astigmatism ($p<0.001$), and between the error of refraction and the use of electronic devices ($p = 0.0015$). Furthermore, significant associations were found between the error of refraction and family history ($p = 0.001$), as well as between the error of refraction and the methods of correction. Medical glasses were the dominant correction method for all errors. **Conclusion:** With nearly three-fifths of medical students (59.1%) in this study experiencing refractive errors, there is a pressing requirement for better eye care initiatives. Given the academic demands of medical education, early detection and correction are essential to prevent further ocular complications and optimize visual performance. We recommend the implementation of routine vision screening programs and targeted awareness campaigns within the university to facilitate early diagnosis and management of these conditions.

Key Words: Myopia, Hypermetropia, Astigmatism, Visual Screening, Refractive Status, Medical Students

INTRODUCTION

The refractive status of the human eye is defined by the physiological relationship between its dioptric components and the anatomical position of the retina. This state is fundamentally classified into emmetropia, characterized by an ideal alignment between the eye's focal point and the retinal plane, and ametropia, where a focal discrepancy exists [1].

Refractive errors represent a leading global cause of visual impairment across all demographics, including young adults. This condition comprising myopia, hyperopia, astigmatism, and presbyopia stem from optical abnormalities that prevent light from focusing precisely on the retina [2]. These conditions result from imperfections in the eye's ability to focus light properly on the retina, leading to blurred vision and, if uncorrected, can significantly impact academic performance and quality of life [3]. Rising rates of refractive error among students globally are frequently linked to environmental factors. Specifically, the combination of restricted outdoor exposure and a surge in near-focus activities, like extended screen use, has accelerated this public health concern. [4,5].

Medical students appear particularly vulnerable to these conditions due to the rigorous nature of their curriculum, which necessitates prolonged periods of reading and digital device usage alongside limited natural light exposure [6]. While myopia has reached epidemic proportions in various Asian regions [7].

In the Kingdom of Saudi Arabia (KSA), while epidemiological studies have documented escalating rates of refractive errors among university students, a critical regional disparity exists in the current literature. Medical students are particularly vulnerable due to a curriculum requiring prolonged near-work and digital device usage [8,9]. However, most existing Saudi data is concentrated in major metropolitan hubs, leaving a significant research gap regarding the refractive profiles of students in the northern regions of the Kingdom.

Because refractive patterns are heavily influenced by local environmental factors and regional lifestyle habits, the lack of localized data in the North hinders the development of targeted screening programs. To address this, the present study evaluates the prevalence and patterns of refractive errors among medical students in Northern Saudi Arabia. Establishing this local baseline is essential not only to provide immediate corrective interventions but also to create regional public health strategies that enhance academic performance and prevent long-term visual complications

METHODS

An electronic-based cross-sectional survey was implemented over a two-month period (March–April 2025). The study sample included male and female participants from the Faculty of Medicine at Northern Border University. Arar, Kingdom of Saudi Arabia.

Inclusion Criteria

The study population consisted of male and female medical students across all academic levels (Years 1–6) currently enrolled at Northern Border University. Participants were included based on their voluntary consent to complete an electronic survey and their access to the university's official social media platforms, such as WhatsApp and Facebook.

Exclusion Criteria Included

Individuals not enrolled in the Faculty of Medicine, questionnaires with incomplete data and students with pre-existing organic ocular pathologies (e.g., cataracts, glaucoma, or retinal diseases) that could confound refractive error measurements.

The questionnaire was validated by two expert optometrists (including one co-author) to ensure professional accuracy. We employed a forward-backward translation method to translate the content from English to Arabic, ensuring consistent medical terminology and linguistic equivalence between both versions. The data section is one of the limitations of this study because only one medical college present in the Northern Border region, so Sampling method appears to be convenience-based rather than random or stratified

The study evaluated demographic profiles and the distribution of refractive conditions—specifically myopia, hyperopia, and astigmatism—measured by dioptric power. Investigators also analysed hereditary patterns and the frequency of daily screen time among participants. Furthermore, information was gathered on existing vision correction strategies and the barriers preventing patients from choosing laser surgery. The questionnaire used is attached to the manuscript. Notably, the study population was characterized by uniform daily routines, professional responsibilities, and time spent outdoors.

Questionnaire Design

The questionnaire was designed and administered using a premium Google Forms account. It consisted of ten systematic and accurate questions. Two questions addressed demographics, including gender and age (categorized as 'less than 18 years', '18–20 years', '21–23 years', '24–25 years', and 'more than 25 years').

The subsequent sections identified the presence and type of refractive errors (myopia, hyperopia, astigmatism, or combinations thereof). Furthermore. The duration of the refractive error was recorded in ranges of 'less than 2 years', '3–5 years', and 'more than 5 years.

Participants indicated their family history and daily electronic device usage (none, less than 2 hours, or more than 2 hours). Treatment methods were categorized into spectacles, contact lenses, laser refractive surgery, or no correction. For those who had not undergone surgery, the specific reasons (cost, lack of interest, or other) were obtained. Participants also selected their academic year (1st through 6th year).

After the survey was developed, it was distributed digitally through restricted Facebook and WhatsApp groups dedicated to medical student cohorts at Northern Border University. Access to these groups was strictly limited to verified students. Collected responses were organized in a spreadsheet and analysed using IBM SPSS software. We reported categorical data as frequencies and percentages, while continuous variables with a normal distribution were presented as mean ± standard deviation. To evaluate the relationships between categorical variables, we utilized the Chi-square test to determine statistical significance.

Sample Size Calculation

Finally, the sample size was confirmed by the Slovin's formula which is the most common method used when you have a well-known, finite population and want a standard margin of error (usually 5%).

$$n = N/1+N(e^2)$$

Where

- N : Sample size
- N : Total population (803 medical students according to the web site of Faculty of Medicine, Northern Border University)
- E : Margin of error (0.05 for a 95% confidence level), $e^2 = 0.0025$
- N : 803/1+803(0.0025)
- N : 803/1+2.0075=266.999

The sample size of 257 is sufficient and strong for a population of 803 (total number of students), as it aligns almost perfectly with the standard requirements for a 95% confidence interval and a 5% margin of error.

Results

Participants included 257 students from the College of Medicine, of whom 63.4% (n =163) were female and 36.6% (n = 94) were male. according to the web site of the college of medicine, Northern Border University, Saudi Arabia the number of male students 415 while the total number of female students 388 so the response of student to the study in male about 22.5% and in female about 42% (Table 1).

The study analyzed a total sample of 257 students. Among the participants, 105 individuals (40.9%) exhibited no refractive errors, while 152 (59.1%) were found to have some form of refractive impairment. The most prevalent condition was myopia, identified in 72 students (28.0%), followed by myopia combined with astigmatism in 44 students (17.1%). Other conditions included isolated astigmatism (n = 21, 8.1%), hypermetropia (n =11, 4.2%), and hypermetropia combined with astigmatism (n = 4, 1.7%) (Table 2).

Regarding lifestyle habits, a significant majority of the cohort (n = 238, 92.6%) reported using electronic devices for more than two hours per day, compared to only 3.1% (n=8) who used them for less than two hours. Ultimately, these results indicated that myopic conditions represented the highest proportion of refractive errors within this population.

Among the students with refractive errors, 118 (45.9%) used glasses for correction, while 6 (2.3%) used contact lenses. Additionally, 24 students (9.3%) with refractive errors did not use any form of correction. Out of the 257 medical students, only 13 (5.1%) had undergone laser refractive surgery. Regarding the duration of their conditions, 52 students (20.2%) stated their refractive errors were diagnosed less than two years ago, 51 (19.8%) were diagnosed five years ago, and 46 (17.9%) were diagnosed between three and five years ago. Finally, regarding family history, 128 students (49.8%) reported a positive family history of refractive error.

Association between Sex and Error of Refraction

There was no statistically significant association between sex and the type of refractive error (p = 0.9066). Because the p-value was well above 0.05, the Chi-square test indicates that these variables are independent within this study (Table 3).

Association between Age and Error of Refraction

Data were organized into five age groups. With a p-value of 0.9395, the results indicate that the type of refractive error is independent of the age group, as no significant association was observed (p>0.05) (Table 4).

Table 1: Demographics Details of Studied Subjects

Subjects	n	Percentage
Age		
18 -20 years	162	62.6
21-23 years	82	31.9
24 years	7	2.7
Less than 18	2	1.2
More than 25	4	1.6
Gender:		
Males	94	36.6
Females	163	63.4
Academic year		
1st year	67	26.1
2nd year	70	27.2
3rd year	56	21.8
4th year	32	12.5
5th year	19	7.4
6th year	13	5.1
1st year	67	26.1
2nd year	70	27.2

Table 2: Errors of Refraction and Related Variables among the Studied Students

Variables	N	Percentage
Presence of refractive errors		
Yes	152	59.1
No	105	40.9
Type of refractive errors		
Myopia alone	72	28
Myopia and astigmatism	44	17.1
Astigmatism alone	20	7.8
Hyperopia alone	10	3.9
Hyperopia and astigmatism	4	1.7
Time per day of electronic device use		
0 hours	11	4.3
less than 2 hours	8	3.1
more than 2 hours	238	92.6
Method of correction (out of 257)		
Spectacles	118	45.9
Contact lens	6	2.3
Laser refractive surgery	13	5.1
No correction	4	1.6
Time of refractive error		
less than 2 years	51	18.5
between 3 and 5 years	44	16.
5 years	50	18.2
Family history		
Positive family history of refractive error	128	49.8
Negative family history of refractive error	129	50.2

Table 3: Association between Sex and Error of Refraction

Sex	Normal	Myopia	Myopia + Astigmatism	Astigmatism	Hypermetropia	Hyper. + Astigmatism.
Female	66	47	31	13	6	3
Male	39	25	13	8	5	1

Table 4: Association between Age and Error of Refraction

Age Group	Normal	Myopia	Myopia + Astigmatism.	Astigmatism	Hypermetropia	Hyper. + Astigmatism.
from 18-20 years	67	45	25	16	7	3
from 21-23 years	31	24	16	5	4	1
24 years	2	2	3	0	0	0
more than 25 years	3	1	0	0	0	0
less than 18	2	0	0	0	0	0

Table 5: Association between Sex and Myopia

Sex	No Myopia	Myopia (Yes)	Total
Female	85	72	163
Male	56	38	94
Total	141	116	257

Table 6: Association between Age and all Cases of Myopia Including Myopia with Astigmatism

Age Group	No Myopia	Myopia (Yes)	Total
<18	2	0	2
18-20	93	70	163
21-23	41	40	81
24+	5	6	11
Total	141	116	257

Table 7: Association between Myopia and Astigmatism

Myopia Status	No Astigmatism	Has Astigmatism	Total
No Myopia	116	25	141
Has Myopia	72	44	116
Total	188	69	257

Table 8: Association between the Refractive Error and Correction Method

Refractive Error	Glasses	LASIK	Contacts	None/Other	Total
Normal	0	0	0	105	105
Myopia	53	8	4	7	72
Myopia + Astigmatism	34	3	1	5	44
Astigmatism	19	1	0	2	21
Hypermetropia	8	1	1	1	11
Hypermetropia + Astigmatism	4	0	0	0	4
Total	118	13	6	120	257

Table 9: Association between Refractive Error and time spent in front of Screen

Refractive Error	None	Less than 2 Hours	More than 2 Hours	Total
Normal	20	13	72	105
Myopia (Nearsighted)	1	1	70	72
Myopia + Astigmatism	2	4	38	44
Astigmatism	1	1	19	21
Hypermetropia (Farsighted)	1	2	8	11
Hypermetropia + Astigmatism	0	1	3	4
Total	26	21	210	257

Association between Sex and Myopia

The p-value (0.4999) is higher than the standard significance level of 0.05, There is no statistically significant association between Sex and Myopia in this dataset (Table 5).

Association between Age and all Cases of Myopia Including Myopia with Astigmatism

The p-value (0.4002) is greater than 0.05. Therefore, there is no statistically significant association between Age Group and Myopia in this dataset (Table 6).

Association between Myopia and Astigmatism

p-value: 0.0005, There is a highly significant association between myopia and astigmatism ($p<0.001$). Individuals with myopia are significantly more likely to have astigmatism compared to those without myopia (Table 7).

Association between the Refractive Error and Correction Method

There is a Highly statistically significant between the refractive error and the use of glasses p-value:<0.00001, so the medical glasses are the dominant correction method for all errors (Table 8).

Table 10: Association between the Error of Refraction and the Family History

Vision Category	Family History: Yes	Family History: No	Total
Refractive Error	107	45	152
Normal Vision	21	84	105
Total	128	129	257

Association between Refractive Error and Time Spent in Front of Screen

This analysis tests if the type of eye condition is related to the amount of time spent on electronic devices. p-value: 0.0015, Since p<0.05, there is a statistically significant association (Table 9).

Association between the error of refraction and the family history

p-value: <0.0001, There is a highly significant statistical association between refractive error and family history in this dataset. Individuals with a family history are significantly more likely to have a refractive error compared to those without (Table 10).

DISCUSSION

The current study revealed that the prevalence of refractive errors in medical students in northern border faculty of medicine was high 56.4%. This high frequency may be to the intensive near-work activities and prolonged study hours characteristic of medical education. 45% of them was suffered from myopia (with or without astigmatism) so the myopia was the most common type of refractive error. Interestingly, our analysis showed a highly significant association between myopia and astigmatism (p<0.001). Individuals with myopia are significantly more likely to have astigmatism compared to those without myopia, this finding is supported by many other studies [10-12]. Which found high prevalence of refractive error in the medical students in different countries also in different regions inside the same country [7,8,10] so there is no specific cause or specific environmental factor in the region of this study but it's a general causes that present everywhere, which it may be anatomical, genetic or environment factors [13]. the specific environment of a medical college like the academic demands may act as a uniform pressure across all demographic factors.

Despite the high prevalence of refractive errors, our statistical analysis revealed no significant association between refractive errors and demographic variables such as age (p = 0.9395) and gender (p = 0.9066). While some studies suggest a higher prevalence of myopia in females due to earlier physiological maturation or different lifestyle habits [14,15].

The age of students in the current study ranges from 18 to 25years from all academic years, the female (163 students) more than of male (94 students) due to the high response of female students while other similar studies in Saudia Arabia showed the sharing of male medical students was more than that of females [16].

The amount of hours/day of electronic device use by medical students was impressive. More than 92% of students use these devices more than 2 h/day, p. value 0.001 statistically significant. In the current the participants with normal vision represent the largest group of users who report none for screen time, whereas those with Myopia are almost exclusively more than 2 hours for screen time.This may indicate that new technology may have a role as risk factor for refractive errors in medical students and in the general population or increase the chance for discovering these refractive errors this findings align with Kumar, et al (2018) they found that the refractive error was found statistically significant among females, students spending more reading hours, watching television, mobile use [17,18]

The correction of the refractive error can be done by many methods but the glasses remain the first easy choice for the correction of the refractive errors, in this study There is a Highly statistically significant between the refractive error and the use of glasses p-value:<0.00001, so the medical glasses are the dominant correction method for all errors. This may be due to fear of undergoing surgery or other methods of correction [19]

In our report, family history of refractive errors was present in 128 students, representing 49.8% of the total group, p-value:<0.0001, There is a highly significant statistical association between refractive error and family history in this dataset. Individuals with a family history are significantly more likely to have a refractive error compared to those without this finding supported by many studies found a positive association between the family history and refractive error [10,20-22].

This research explores the multifaceted causes of refractive errors, emphasizing the interplay between genetic predispositions and environmental influences. The findings reinforce the correlation between prolonged near-work activities and an increased prevalence of refractive conditions, particularly myopia. This relationship is notably evident among medical students, who serve as a primary demographic for high-intensity near-work habits. Furthermore, despite the advancements and accessibility of refractive surgery, this study indicates that corrective lenses remain the most popular option, utilized by 45.9% of the surveyed students.

CONCLUSION

This study demonstrates a high prevalence of refractive errors (59.1%) among medical students at Northern Border University, with myopia being the predominant type. A significant correlation was established between myopia and astigmatism, suggesting a complex refractive profile in this population. While age and gender did not significantly influence the type of error, the high prevalence of positive family history and extensive electronic device usage are notable.

Given the correlation between visual health and academic success, the following measures are recommended:

- **Preventative Screening:** Establish mandatory vision checks for all first-year medical students
- **Digital Wellness:** Launch awareness campaigns focused on reducing the strain of prolonged screen time
- **Targeted Intervention:** Prioritize early correction for nearly 10% of students with refractive errors to optimize their performance and long-term well-being

Limitations

This study is limited by its reliance on self-reported data and its cross-sectional design, which precludes the establishment of a temporal relationship between electronic device use and the onset of refractive errors. Additionally, the higher response rate among females (42%) compared to males (22.5%) may introduce a degree of selection bias.

Scientific Responsibility Statement

The authors declare full responsibility for the scientific content of this work. This includes involvement in the study's conception, data analysis, manuscript preparation, and a thorough review of the final text prior to submission

Ethical Approval

The local committee of bioethics (AHP-09-043) at Northern Border university has issued decision no.(37/25/H) dated 17/3/2025 concerning the approval of this research

Animal and Human Rights Statement

All experimental protocols followed the ethical standards of the national research committee and the 1964 Helsinki Declaration, including its later amendments.

Conflict of Interest

The authors declare that there is no conflict of interest.

REFERENCES

[1] Karki, P. *et al.* "Refractive errors among medical students." *Nepalese Medical Journal*, vol. 1, no. 1, 2018, pp. 21–23. https://doi.org/10.3126/nmj.v1i1.20395

[2] Yuan, Q. *et al.* "Global, regional, and national differences in the burden of refraction disorders among children, adolescents, and older adults." *BMC Public Health*, vol. 25, no. 1, 2025, pp. 2653. https://doi.org/10.1186/s12889-024-20925-z

[3] Pascolini, D. and Mariotti, S.P. "Global estimates of visual impairment: 2010." *British Journal of Ophthalmology*, vol. 96, no. 5, 2012, pp. 614–618. https://doi.org/10.1136/bjophthalmol-2011-300539

[4] Morgan, I.G. *et al.* "The epidemics of myopia: aetiology and prevention." *Progress in Retinal and Eye Research*, vol. 62, 2018, pp. 134–149. https://doi.org/10.1016/j.preteyeres.2017.09.004

[5] Kinge, B. and Midelfart, A. "Refractive changes among Norwegian university students." *Acta Ophthalmologica Scandinavica*, vol. 77, no. 3, 1999, pp. 302–305. https://doi.org/10.1034/j.1600-0420.1999.770311.x

[6] Basnet, A. *et al.* "Refractive error among medical students: a cross-sectional study in Nepal." *Journal of College of Medical Sciences–Nepal*, vol. 17, no. 1, 2021, pp. 18–23. https://doi.org/10.3126/jcmsn.v17i1.33230

[7] Gopalakrishnan, S. *et al.* "A study of refractive errors among medical students in AIMST University, Malaysia." *Indian Medical Journal*, vol. 105, 2011, pp. 365–367.

[8] Alsaif, B.A. *et al.* "Refractive errors among Saudi college students and associated risk factors." *Clinical Ophthalmology*, vol. 13, 2019, pp. 437–443. https://doi.org/10.2147 /OPTH.S193213

[9] Almudhaiyan, T. *et al.* "The prevalence of refractive errors among Saudi adults in Riyadh, Saudi Arabia." *Saudi Journal of Ophthalmology*, vol. 34, no. 1, 2020, pp. 30–34. https://doi.org/10.4103/1319-4534.301297

[10] Alqudah, A.A. *et al.* "Refractive errors among medical students in Jordan." *Future Science OA*, vol. 9, no. 2, 2023, pp. FSO839. https://doi.org/10.2144/fsoa-2022-0078

[11] Woo, W.W. *et al.* "Refractive errors in medical students in Singapore." *Singapore Medical Journal*, vol. 45, no. 10, 2004, pp. 470–474.

[12] Megbelayin, E.O. *et al.* "Refractive errors and spectacle use behavior among medical students in a Nigerian medical school." *Journal of Advances in Medicine and Medical Research*, vol. 4, no. 13, 2014, pp. 2581–2589. https://doi.org/10.9734/BJMMR/2014/7328

[13] Harb, E.N. and Wildsoet, C.F. "Origins of refractive errors: environmental and genetic factors." *Annual Review of Vision Science*, vol. 5, 2019, pp. 47–72. https://doi.org/10.1146/annurev-vision-091718-014902

[14] Enthoven, C.A. *et al.* "Gender issues in myopia: a changing paradigm in generations." *European Journal of Epidemiology*, vol. 39, no. 12, 2024, pp. 1315–1324. https://doi.org/10.1007/s10654-024-01153-x

[15] Abuallut, I.I. *et al.* "Prevalence of refractive errors and associated risk factors among medical students of Jazan University." *Middle East African Journal of Ophthalmology*, vol. 27, no. 4, 2021, pp. 210–217. https://doi.org/10.4103/meajo.meajo_203_20

[16] Al-Rashidi, S.H. *et al.* "Prevalence of refractive errors among medical students of Qassim University." *Open Access Macedonian Journal of Medical Sciences*, vol. 6, no. 5, 2018, pp. 940–943. https://doi.org/10.3889/oamjms.2018.216

[17] Kumar, N. *et al.* "Risk factors associated with refractive error among medical students." *International Journal of Community Medicine and Public Health*, vol. 5, no. 2, 2018, pp. 634–638. https://doi.org/10.18203/2394-6040.ijcmph20180244

[18] Makhdoum, H. *et al.* "Prevalence of myopia and its related factors among university students in Madinah." *Cureus*, vol. 15, no. 11, 2023, pp. e49656. https://doi.org/10.7759/cureus.49656

[19] Alhibshi, N. *et al.* "Attitude toward refractive error surgery and other correction methods." *Annals of Medicine and Surgery*, vol. 72, 2021, pp. 103104. https://doi.org/10.1016/j.amsu.2021.103104

[20] Alsaadi, M.A. *et al.* "Factors associated with the prevalence of refractive errors among medical students in the United Arab Emirates." *F1000Research*, vol. 14, 2025, pp. 954. https://doi.org/10.12688/f1000research.151241.1

[21] Sandhu, H.K. *et al.* "Factors affecting prevalence of myopia among undergraduate medical students." *Indian Journal of Clinical and Experimental Ophthalmology*, vol. 10, no. 1, 2024, pp. 98–103. https://doi.org/10.18231/j.ijceo.2024.018

[22] Munoli, K. *et al.* "Prevalence of refractive errors among medical students of Raichur Institute of Medical Sciences." *Cureus*, vol. 16, no. 4, 2024, pp. e58915. https://doi.org/10.7759/cureus.58915