Prevalence of Myopia among Medical Students in King Khalid University and its Effects on Academic Performance

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ABSTRACT

Background: Refractive errors REs are defined as a condition, in which the optics of the no accommodating eye are unable to take parallel light rays to concentrate on the retina. REs are now prevalent and continue to increase globally, particularly myopia. The risk of myopic complications, such as cataracts, glaucoma, retinal detachment, and blindness, is increasing as well. Students had a higher prevalence of myopia in comparison with others. The exposure and use of the computer with study for long times are associated with the development and progression of myopia.

Aim: To assess prevalence of myopia among medical students at King Khalid University and its related factors with effect on students' academic performance.

Methodology: A descriptive cross-sectional approach was used targeting King Khalid University medical and dental students during the academic year 2020-2021. Data were collected using electronic questionnaire. The questionnaire included student's demographic data, myopia, related factors, and its effect on students' academic life.

Results: The study included 309 students from different health colleges in King Khalid University. Most of the respondents were from college of medicine 193 62.5%. Exact of 149 48.2% of the respondents had myopia. Myopia was bilateral among 84 56.4% of the affected students while on left eye among 37 24.8%. Exact of 122 81.9% students wear glasses and 27 18.1% wear lenses. Myopia was reported among 56.3% of male students compared to 43.7% of females with recorded statistical significance P=.033. Exact of 52.3% of myopic students had difficulty performing daily activities during study compared to 37.5% of normal students with statistically significant difference P=.009. Also, 51% of myopic students had difficulty performing exams containing graphs and pictures versus 25.6% of other students P=.001.

Conclusions: In conclusion, the current study revealed that about half of the medical students at King Khalid University complained of myopia which is consistent with the local and global estimated levels. Myopia was higher among college of medicine students. Also, male students were affected than females. Myopia significantly affected students' daily activities, and performing academic tasks.

Keywords: Myopia, Refractive errors, University, Medical students, Prevalence, Risk factors, Effect

INTRODUCTION

Myopia is considered as one of the most frequent refractive error which is defined as a refractive error spherical caused by extreme refractive power relative to corneal curvature and thickness lens and / or increased anteroposterior diameter of the eyeball, causing a light refraction to a focal point in front of the retina[1,2]. Globally, in 2010, the uncorrected refractive error was leading cause of distance vision impairment, reported among 108 million people, and the second most common cause of blindness[3]. The annual financial burden of uncorrected refractive error, mainly due to myopia, was assessed to be US$202 billion[4]. There is a necessary challenge for disregarding uncorrected myopia and other refractive errors[5]. Recently, studies showed high prevalence of myopia during last few years. In the prevalence of myopia, especially in Asian countries, which is why multiple studies trying to find the factors that produce these changes[6-8].

Myopia related causes are Multifactorial, numerous studies have assessed many factors associated with occurrence or progression of myopia in different inhabitants which indicated that myopia is the result of a multifaceted interface between genetic predisposition and other environmental factors, including physical activity, outdoor activities, hours of sleep, weight and height[9-11].

Students had a higher prevalence of myopia in comparison with others. The exposure and use of the computer with study for long times are associated with the development and progression of myopia[12,13]. Medical students showed higher risk relative to other students as a consequence of spending a lot of hours reading, doing vision work nearby and using electronic devices. Thus, medical students consider themselves population with a high predisposition to myopia[14]. The current study aimed to assess prevalence of myopia among medical students at King Khalid University and its related factors with effect on students' academic performance.

METHODOLOGY

A descriptive cross-sectional approach was used targeting King Khalid University students at health colleges during the academic during the

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period from June 2021 to August 2021. Data were collected using electronic questionnaire which was developed by the researchers after intensive literature review and expert's consultation. A panel of 3 experts reviewed the questionnaire for content validity and all suggested changes were applied till the final questionnaire form was approved. The questionnaire was uploaded online using social media platforms by the researchers and their friends in the university community. All eligible students who received the questionnaire were invited to fill after explaining the main objectives and confirming their data confidentiality. Questionnaire included student's demographic data, faculty nature, academic grade, student's myopia status, side, wearing visual aids, and visual assessment. Also, academic performance of students was assessed based on difficulty in exams with using microscopes, performing daily activities, and students GPA. A pilot study included 35 students was conducted to assess tool reliability for attitude items and its alpha Cronbach's was 0.76.

DATA ANALYSIS

After data were extracted, it was revised, coded, and fed to statistical software IBM SPSS version 22SPSS, Inc. Chicago, IL. All statistical analysis was done using two tailed tests. P value less than 0.05 was statistically significant. Descriptive analysis based on frequency and percent distribution was done for all variables including students' demographic data, college, academic year age, family history of myopia. Also, myopia status, clinically relevant data, and factors associated were shown. Cross tabulation was used to assess distribution of myopia by students related bio-clinical data and effect of myopia on students' academic performance. Relations were tested using exact probability test for small frequency distributions.

RESULTS

The study included 309 students from different health colleges in King Khalid University. Most of the respondents were from college of medicine 193 62.5%, Others from faculty of nursery 11.3%; 35, Radiologic science 7.8%; 24, pharmacy 7.1%; 22, and physiotherapy 7.1%; 22, and Dentistry 4.2%; 13. Students ages ranged from 18 to 27 years old with mean age of 22.3 4.9 years. Exact of 197 63.8% students were females and 179 57.9% were at their pre-clinical years. Family history of myopia was reported among 141 45.6% and 104 33.7% of the students had dietary supplements regularly but irregular intake was reported among 83 26.9%.

Regarding prevalence of myopia among medical students in King Khalid University **Figure 1**, exact of 149 48.2% of the respondents had myopia.
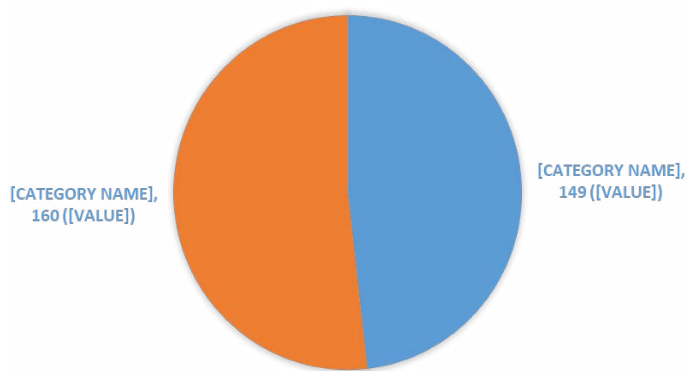

Figure 1: Prevalence of Myopia among medical students in King Khalid University, Saudi Arabia

(**Table 1**) shows clinical data of myopia among medical students in King Khalid University, Saudi Arabia. Myopia was bilateral among 84 56.4% of the affected students while on left eye among 37 24.8%. Exact of 122 81.9% students wear glasses and 27 18.1% wear lenses. Wearing visual aids for the whole day was reported among 76 51% students while 36 24.2% wear aids for most of the day and 37 24.8% were aids occasionally. Reading distance of > 15 cm was reported by 58 38.9% students. Also, 110 73.8% reported that they undergo visual assessment every year while 39 26.2% do it every 6 months.

Table 1: Clinical data of myopia among medical students in King Khalid University, Saudi Arabia

Relevant data	No	%
Affected eye with refractive error		
Bilateral	84	56.4%
Left	37	24.8%
Right	28	18.8%
Wearing vision aids		
Glasses	122	81.9%
Lenses	27	18.1%
Period of wearing vision aids		
All the day	76	51.0%
Most of the day	36	24.2%
Occasionally	37	24.8%
Reading distance		
< 15 cm	91	61.1%
> 15 cm	58	38.9%
Frequency of visual assessment		
Every 6 months	39	26.2%
Every year	110	73.8%

(**Table 2**) illustrates distribution of myopia among medical students by their bio-demographic data in King Khalid University, Saudi Arabia. Myopia was reported among 56.3% of male students compared to 43.7% of females with recorded statistical significance P=.033. Also, 55.3% of the students in their clinical years had myopia in comparison to 38.5% of younger students at the pre-clinical years P=.003. Myopia was prevalent among 54.4% of students at college of medicine versus 37.9% of students at the other health colleges P=.005. Exact of 69.5% of students with family history of myopia had the disease compared to 36.5% of those without P=.001. Also, 56.7% of students who had dietary supplements were myopic versus 48.4% of others who did not P=.031.

Table 2: Distribution of Myopia among medical students by their Bio-demographic data in King Khalid University, Saudi Arabia

Bio-demographic data	Total No	Total %	Myopia No	Myopia %	Normal No	Normal %	p-value
Age in years							
18-20	82	26.5%	31	37.8%	51	62.2%	.049* #
21-25	204	66.0%	104	51.0%	100	49.0%	
>25	23	7.4%	14	60.9%	9	39.1%	
Gender							
Male	112	36.2%	63	56.3%	49	43.8%	.033*
Female	197	63.8%	86	43.7%	111	56.3%	
Academic year							
Pre-clinical years	130	42.1%	50	38.5%	80	61.5%	.003*
Clinical years	179	57.9%	99	55.3%	80	44.7%	

College						
College of medicine	193	62.5%	105	54.4%	88	45.6%	.005*
Other health colleges	116	37.5%	44	37.9%	72	62.1%	
Family history of myopia						
Yes	141	45.6%	98	69.5%	43	30.5%	.001*
No	85	27.5%	31	36.5%	54	63.5%	
Don't know	83	26.9%	20	24.1%	63	75.9%	

P: Pearson X² test   # Exact probability test
* P < 0.05 significant

(**Table 3**) reveals factors associated with myopia among medical students in King Khalid University, Saudi Arabia. Exact of 50.6% of students who study for more than 6 hours daily had myopia compared to 52.2% of those who study for 0-2 hours with no statistical significance P=.902. A total of 68.4% of students who take rest for more than 6 hours had myopia compared to 48.4% of those who take rest of study for 0-2 hours P=.029. Exact of 56.7% of students who had dietary supplements had myopia versus 48.4% of those who did not P=.031. Also, 56.9% of those who use appropriate light for studying were myopic in comparison to 39.7% of those who did not use P=.003. Other factors regarding duration of Laptop use, practicing exercises, time on electronic games, and practicing eye exercises were insignificantly associated with having myopia.

(**Table 4**) demonstrates effect of myopia among medical students on their academic performance in King Khalid University, Saudi Arabia. Exact of 52.3% of myopic students had difficulty performing daily activities during study compared to 37.5% of normal students with statistically significant difference P=.009. Also, 51% of myopic students had difficulty performing exams containing graphs and pictures versus 25.6% of other students P=.001. Exact of 46.3% of students with myopia had difficulty using microscope during exams in comparison to 26.3% of non-myopic P=.001. As for GPA, 49% of myopic students had GPA of 4-5 versus 55% of non-myopic with no significance P=.503.

DISCUSSION

The current study was conducted to assess prevalence of myopia among medical students at King Khalid University and its related factors with effect on students' academic performance. To author's knowledge, there is no information regarding myopia among medical students at King Khalid University. Also, worldwide, the prevalence of myopia is increasing, so studies have been initiated to essay the likely factors associated with myopia. Though the mechanisms of myopia continue undefined, both genetic and environmental factors have been documented as determinants of myopia. Family history of myopia is associated with the occurrence of myopia[15,16].

The current study showed that nearly half of the sampled medical students reported having myopia. This was in higher than what

Table 3: Factors associated with myopia among medical students in King Khalid University, Saudi Arabia

Factors		Have myopia				p-value
		Myopia		**Normal**		
		No	**%**	**No**	**%**	
Study hours / day	0-2	12	52.2%	11	47.8%	.902
	3-4	50	45.9%	59	54.1%	
	5-6	46	47.9%	50	52.1%	
	> 6	41	50.6%	40	49.4%	
Rest hours / day	0-2	62	48.4%	66	51.6%	.029*
	3-4	38	46.3%	44	53.7%	
	5-6	23	37.7%	38	62.3%	
	> 6	26	68.4%	12	31.6%	
Average time spent on electronic gadgets	0-2	25	39.7%	38	60.3%	.428
	3-4	45	47.9%	49	52.1%	
	5-6	34	50.7%	33	49.3%	
	> 6	45	52.9%	40	47.1%	
Average time spent on computers/ laptop	0-2	61	45.9%	72	54.1%	.745
	3-4	37	46.8%	42	53.2%	
	5-6	23	54.8%	19	45.2%	
	> 6	28	50.9%	27	49.1%	
Time of reading books	< 5 hours	116	50.2%	115	49.8%	.227
	> 5 hours	33	42.3%	45	57.7%	
Practicing sports	Regularly	45	48.4%	48	51.6%	.832
	Irregularly	86	49.1%	89	50.9%	
	None	18	43.9%	23	56.1%	
Intake of dietary supplements	Yes	59	56.7%	45	43.3%	.031*
	No	59	48.4%	63	51.6%	
	May be	31	37.3%	52	62.7%	
Use of appropriate light for studying	Yes	87	56.9%	66	43.1%	.003*
	No	62	39.7%	94	60.3%	
Practice of eye exercises	Yes	42	45.2%	51	54.8%	.480
	No	107	49.5%	109	50.5%	
Eye wash at night	Regularly	38	47.5%	42	52.5%	.953
	Irregularly	49	49.5%	50	50.5%	
	None	62	47.7%	68	52.3%	

P: Pearson X² test
* P < 0.05 significant

Table 4: Effect of myopia among medical students on their academic performance in King Khalid University, Saudi Arabia

| Academic performance | Have myopia | | | | p-value |
| | Myopia | | Normal | | |
	No	%	No	%	
Have difficulty performing daily activities during study					
Yes	78	52.3%	60	37.5%	.009*
No	71	47.7%	100	62.5%	
Have difficulty performing exams containing graphs and pictures					
Yes	76	51.0%	41	25.6%	.001*
No	73	49.0%	119	74.4%	
Have difficulty using microscope during exams					
Yes	69	46.3%	42	26.3%	.001*
No	80	53.7%	118	73.8%	
GPA					
< 3.0	24	16.1%	25	15.6%	.503
3.0-3.49	19	12.8%	22	13.8%	
3.5-3.99	33	22.1%	25	15.6%	
4-5	73	49.0%	88	55.0%	

P: Pearson X^2 test
* P < 0.05 significant

reported by Abuallut II et al[17]. who assessed that the overall prevalence of myopia among medical students in Jazan University was 33.8%. Other studies reported similar prevalence as Studies that had been conducted in Qassim, Aljouf, and Riyadh reported relatively high myopic prevalence among the students[18-20]. Among Qassim and Riyadh students, studies estimated that about 50% of the students were myopic. Worldwide, In Norway, Midelfart A et al[21]. reported that the prevalence of myopia among medical students was found to be 50.3% which is nearly as the current study estimated prevalence. A higher prevalence was reported by Mozolewska-Piotrowska K et al[22]. who showed that Myopia was found in 75% of ametropic eyes. Follow up for two years revealed that there was a statistically significant progression of refractive error in 50% of myopic students. Myopia developed in 13% of initially emmetropic students.

The current study showed that a significantly higher proper ions of those having myopia were old, aged students > 25 years, male students, college of medicine students, and those with family history of myopia. Additional studies found that environmental factors, including a higher level of education, more near-work, and lesser outdoor activities, may be associated with myopia[23-29]. Besides, the high use of computers and smart phones is universal and extensive in daily life. The use of these equipment also plays a role in the development of myopia[30]. Highly educated population are found to have higher prevalence of myopia[5]. Near-work, particularly continuous reading without rests, has been shown to lead to myopia[31,32].

Regarding effect of myopia on students' daily life and education progress, the current study showed that myopic students were significantly affected with reported difficulty performing their daily life activities and educational tasks. Also, myopic students had insignificantly lower GPA than normal group. This was in concordance with other literature studies focused on effect of myopia on students' life[33-35].

CONCLUSIONS AND RECOMMENDATIONS

The current study revealed that about half of the medical students at King Khalid University complained of myopia which is consistent with the local and global estimated levels. Myopia was higher among college of medicine students who had more study duration and reading times. Also, male students were affected than females. Myopia significantly affected students' daily activities, and performing academic tasks. Improving awareness among medical students of refractive errors in total especially myopia as a common disorder with periodic screening for early detect and management of refractive errors is crucial to prevent its progression and burden.

REFERENCES

1. Fredrick DR. Myopia. BMJ 2002;324(7347):1195-9.
2. Morgan IG, Ohno-Matsui K, Saw SM. Myopia. The Lancet 2012;379(9827):1739-48.
3. Bourne RR, Stevens GA, White RA, et al. Causes of Vision Loss Worldwide, 1990-2010: a Systematic Analysis. Lancet Glob Health 2013;1(6):339-49.
4. Smith TS, Frick KD, Holden BA, et al. Potential Lost Productivity Resulting from the Global Burden of Uncorrected Refractive Error. Bull World Health Organ 2009;87(6):431-7.
5. Fricke TR, Holden BA, Wilson DA, et al. Global cost of correcting vision impairment from uncorrected refractive error. Bull World Health Organ 2012;90(10):728-38.
6. Holden BA, Fricke TR, Wilson DA, et al. Global Prevalence of Myopia and High Myopia and Temporal Trends from 2000 through 2050. Ophthalmol 2016;123(5):1036-42.
7. Theophanous C, Modjtahedi BS, Batech M, et al. Myopia Prevalence and Risk Factors in Children. Clin ophthalmol 2018;12:1581-87.

8. Nakao SY, Miyake M, Hosoda Y, et al. Myopia Prevalence and Ocular Biometry Features in a General Japanese Population: The Nagahama Study. Ophthalmol 2021;128(4):522-31.

9. De Jong PT. Myopia: its historical contexts. Br J Ophthalmol 2018;102(8):1021-7.

10. Ohno-Matsui K. What is the Fundamental Nature of Pathologic Myopia? Retina 2017;37(6):1043-8.

11. Zhang J, Deng G. Protective Effects of increased Outdoor Time against Myopia: a Review. J Int Med Res 2020;48(3):0300060519893866.

12. Chen M, Wu A, Zhang L, et al. The Increasing Prevalence of Myopia and High Myopia among High School Students in Fenghua City, Eastern China: a 15-year Population-Based Survey. BMC Ophthalmol 2018;18(1):159.

13. Huang L, Kawasaki H, Liu Y, et al. The Prevalence of Myopia and the Factors Associated with it among University Students in Nanjing: A Cross-Sectional Study. Medicine 2019;98(10):e14777.

14. Polkinghorne PJ, Craig JP. Northern New Zealand Rhegmatogenous Retinal Detachment Study: Epidemiology and Risk Factors. Clin Exp Ophthalmol 2004;32(2):159-63.

15. Mutti DO, Mitchell GL, Moeschberger ML, et al. Parental Myopia, Near Work, School Achievement, and Children's Refractive Error. Invest Ophthalmol Vis Sci 2002;43(12):3633-40.

16. You QS, Wu LJ, Duan JL, et al. Factors Associated with Myopia in School Children in China: the Beijing childhood Eye Study. PLoS One 2012;7(12):e52668.

17. Abuallut II, Alhulaibi AA, Alyamani AA, et al. Prevalence of Refractive Errors and its Associated Risk Factors among Medical Students of Jazan University, Saudi Arabia: A Cross-sectional Study. Middle East Afr J Ophthalmol 2020;27(4):210-17.

18. Al-Rashidi SH, Albahouth AA, Althwini WA, et al. Prevalence Refractive Errors among Medical Students of Qassim University, Saudi Arabia: Cross-sectional Descriptive Study. Open Access Maced J Med Sci 2018;6:940-3.

19. Alruwaili WS, Alruwaili MS, Alkuwaykibi MK. Prevalence and Awareness of Refractive Errors among Aljouf University Medical Students. Egypt J Hosp Med 2018;70(1):29-32.

20. Ahmed AY, Bakhamees WH, Alkhudaydi AS, et al. The Prevalence and Risk factors of Myopia among Medical Students of King Saud University, Riyadh City, Saudi Arabia.2013-2014. EC Ophthalmol 2014;2:42-54.

21. Midelfart A, Aamo B, Sjøhaug KA, et al. Myopia among Medical Students in Norway. Acta ophthalmol 1992;70(3):317-22.

22. Mozolewska-Piotrowska K, Stepniewska J, Nawrocka J. Frequency and incidence of myopia among medical students. Klinika oczna 2005;107(9):468-70.

23. Sun J, Zhou J, Zhao P, et al. High prevalence of Myopia and High Myopia in 5060 Chinese university students in Shanghai. Invest Ophthalmol Vis Sci 2012;53(12):7504-9.

24. He M, Xiang F, Zeng Y, et al. Effect of Time Spent Outdoors at School on the Development of Myopia among Children in China: a Randomized Clinical Trial. JAMA 2015;314(11):1142-8.

25. French AN, Ashby RS, Morgan IG, et al. Time Outdoors and the Prevention of Myopia. Exp Eye Res 2013;114:58-68.

26. Lin Z, Vasudevan B, Jhanji V, et al. Near Work, Outdoor Activity, and their Association with Refractive Error. Optom Vis Sci 2014; 91(4):376-82.

27. Guo YH, Lin HY, Lin LL, et al. Self-reported Myopia in Taiwan: 2005 Taiwan National Health Interview Survey. Eye 2012;26(5):684-9.

28. Huang L, Shinkai M, Kobayashi T. Visual Acuity and its Related Factors of Primary School Students in Japan. Invest Ophthalmol Vis Sci 2016;57(4):1564.

29. Huang L, Kawasaki H, Yasuda R, et al. Relationship between Visual Acuity and lifestyle: a Cross-Sectional study in Japanese Children. Hiroshima J Med Sci 2018;67(4):105-11.

30. Fernandez-Montero A, Olmo-Jimenez JM, Olmo N, et al. The Impact of Computer uses in Myopia Progression: a Cohort Study in Spain. Prev Med 2015;71:67-71.

31. Ip JM, Saw SM, Rose KA, et al. Role of near Work in Myopia: Findings in a Sample of Australian School children. Invest Ophthalmol Vis Sci 2008;49(7):2903-10.

32. You X, Wang L, Tan H, et al. Near work Related Behaviors Associated with Myopic Shifts among Primary School Students in the Jiading District of Shanghai: a school-based One-Year Cohort study. PLoS One 2016;11(5):e0154671.

33. Yang Y, Li R, Ting D, et al. The Associations of High Academic Performance with childhood Ametropia Prevalence and Myopia Development in China. Ann Transl Med 2021;9(9):745.

34. Saw SM, Tan SB, Fung D, et al. IQ and the Association with Myopia in children. Invest Ophthalmol Vis Sci 2004;45(9):2943-8.

35. Prema N. Impact of Myopia Correction on Academic Achievement of VII Std Students. Int J Sci Res 2013;2(8):122-3.