ORIGINAL ARTICLE

Myopia Onset during COVID-19 Pandemic: A Global Public Health Concern

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ABSTRACT

Aim: To determine the onset of myopia among age groups 4 to 24 years visiting a tertiary care hospital.
Study Design: Cross Sectional Study.
Duration and Settings of the Study: Department of ophthalmology Avicenna Medical Complex Islamabad. Study duration was 15 months from 1 April 2020 to 31 July 2021.
Methods: Participants were enrolled using consecutive sampling techniques. Sample size was calculated on time based concept. Those who fulfilling the inclusion criteria were included in the study. Myopia onset was defined as participants with Spherical Equivalent Refraction of at least -0.50DS or more on second follow-up after six month period. Ophthalmic examinations like visual acuity were done with LogMAR (Bailey Lovie Chart panel 53x60cm) and refractive status was evaluated using Retinoscopy on first visit and follow-up visit scheduled after six months of first visit for each participant. Cycloplegic refraction with Cyclopentolate 1% were performed when needed.
Results: A total of 420 subjects, including 52.62% female and 47.16% male. Pre-pandemic refractive status of all participants was 0 on first follow-up, and on second follow-up the magnitude of myopia -1.23±0.69DS. Likewise the mean corrected Visual acuity was 0.0 LogMAR (6/6) on second follow-up, while the mean uncorrected Visual acuity was 0.02 LogMAR. Statistically significant differences were observed with a CI level of 95% between the pre and post-pandemic refractive status of groups.
Conclusion: Myopia onset were acerbated by global pandemic Covid-19 and lockdown. Also the high magnitude of up to -3.50DS were observed on just 6 to 8 month follow-up which is alarming.
Keywords: COVID-19, Children, Log MAR, Myopia,

INTRODUCTION

Coronavirus pandemic is a serious threat to the mental and emotional health of children.[1] The most recent worldwide outbreak of the new Corona virus (SARS-CoV-2) is dangerous and spreads very quickly.[2] The effects of this pandemic is felt by people's mental and physical health.[3] Due to the widespread COVID-19 pandemic, many nations went into lockdown, with only life-saving services (such as food retail) accessible to the public. When possible, people were recommended to work from home, and homeschooling was put into place. Due to the lockdown situation in Pakistan, a large number of people were forced to spend a lot of time indoors with little access to natural light and an increase in screen-based activities.[4] since exposure to sunshine is recommended to reduce the onset of myopia, this could result in an increase in a child's myopic refraction.[5, 6] Myopia is a common cause of vision loss, and uncorrected myopia is the main reason why people all over the world have trouble seeing far away.[7] The prevalence of myopia (-0.50 D) is expected to rise from 28% (2 billion) of the global population in 2010 to approximately 50% (5 billion) of the global population by 2050, according to recent research from the Brien Holden Vision Institute. Therefore, high myopia worse than -5.00D is projected to rise from its current 4% (277 million) worldwide prevalence to over 10% (1 billion) by 2050 globally.[6] The rising prevalence of myopia around the world underscores the need for ongoing research to better define the visual dangers associated with the condition and develop effective treatments. Considering myopia a global public health issue, the International Myopia Institute (IMI) has published white papers that compile the most recent and comprehensive research on the topic from seven different committees of experts.[7] Though there has been a lot of new information uncovered about myopia in the last two decades, there is still a lack of consensus about the best way to treat it. Similarly, there is a dearth of reports of practitioners' perspectives in the literature.[8] The process by which an eye grows longer in its axial direction is not well understood. Myopia is not caused by genes alone, although a person's genetic make-up may affect how vulnerable they are to environmental influences that contribute to the condition. Numerous

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research on the effects of genetics on myopia have found that the condition is more common among identical than fraternal twins and that having more myopic parents increases one's likelihood of developing nearsightedness. The alarming increase of myopia in East Asia cannot be attributed solely to genetics. There is still a lot of confusion about why the number of people with myopia is going up, and different studies show that the number of people with myopia and extreme myopia varies by geography and ethnicity. Increased outdoor activity has been reported to prevent the onset of myopia, and there may be a dose-response association between time spent outdoors and the incidence of incident myopia. Because there has been a disturbing increase in the prevalence of myopia in East Asia.[8,9] However, there does not appear to be any correlation between the amount of time spent outside and a reduction in the advancement of myopia once it has begun. Myopia is becoming more common everywhere, and this is significant. According to a 2016 study by Holden et al, 28% of the world's population, or 1.9 billion individuals, had myopia in 2010.[8] It is anticipated that myopia will affect about 5 billion individuals by 2050, or 50% of the world's population. Additionally, they stated that 3% of the population in 2010 had high myopia and that by the year 2050, 10% of the population, or 1 billion people will have high myopia and be at risk of vision loss and blindness.[9] The purpose of the present study was to observed myopia onset and its magnitudes among different age groups during global covid-19 pandemic and lockdown.

METHODS

This Comparative Cross Sectional Study was conducted at department of ophthalmology Avicenna Medical Complex Islamabad. The total duration of the study was 15 months from 1April 2020 to 31st July 2021. A total of 420 subjects were selected with age ranging from 4-24 year having no significant refractive error with spherical equivalent refraction (SER) -0.25D to +0.50D. The subjects were enrolled using consecutive sampling techniques. Sample size was calculated on time based concept, those who fulfilling the inclusion criteria were included in the said period time. Myopia Onset was defined as Subject with Spherical Equivalent Refraction (SER) of at least -0.50DS or more on second follow-up. Subjects ranging from age 4-24 years having no refractive error, normal ocular dimension and ocular motility were included while subjects having Squint, ocular trauma, High myopic Astigmatism, history of Ocular surgery, Poor cooperation and coordination were excluded. After the first visit two more follow-ups of all subjects were carried out of at least 6 to 8 months. As all the subject attending the hospital were entitled so no loss on follow-up fully informed consent was taken from the patients/Guardian according to the declaration of Helsinki. Ethical approval was taken from the hospital ethical review board under letter no. KRL-HI-ERC-DC/Nov21/23. Several ophthalmic examinations like visual acuity were done with Log-MAR (Bailey Lovie Chart panel 53x60cm) and refractive status was evaluated using Retinoscopy (Hiene BETA 200 Streak Retinoscope). On second follow up if a child got myopia he/she underwent for a full cycloplegic refraction to rule out any pseudomyopia. Descriptive statistics for pre-pandemic and post-pandemic refractive prescription and visual acuity were applied, Also Pair t-test was applied for mean difference in pre-pandemic and post-pandemic refractive prescription.

RESULTS

A total of 420 subjects, including 52.62% female. The pre-pandemic refractive status of all participants was 0, but after 15 months, the mean refractive error was determined to be -1.23D with a standard deviation of ± 0.68. At the conclusion of the 15 months, the mean corrected VA was 0, while the mean uncorrected VA was 0.02 with a SD of ±0.04. The post-pandemic refractive status in the age range of 4 to 8 years was -1.2925 with a SD of ±.64, CI level of 95% and a p value of .000, which was highly significant between the pre and post-pandemic refractive status of this group. The pre and post pandemic change in refractive status for the 9-13 age group were -1.20 with SD of ±.755 and an accuracy level of 95%, and a p value of ±.001 highly significant. in the 1418 age group, the mean post-pandemic refractive error was -1.21, with a SD of ±0.662, a 95% confidence interval, and a p value of 0.001. The age group of 1924 years had a mean refractive error of -1.140, a SD of ±0.644, a 95% confidence interval, and a p value of 0.001.

Table 1: Visual acuity in Log MAR and Refractive status in Diopter at pre-pandemic and Post-pandemic

Descriptive Statistics	Minimum	Maximum	Mean	Standar d. Deviation (±)
Uncorrected VA in LogMAR	0.00	0.40	0.02	0.04
Corrected VA in LogMAR	0.00	0.0	0.00	0.00
Pre Pandemic Refractive Status	0	0	0	0
Post Pandemic Refractive Status	-0.25	-3.50	-1.23	0.68

VA= Visual Acuity, Log MAR= Logarithm of the Minimum Angle of Resolution

Table 2: Test Statistics among Pre and Post Pandemic Refractive Errors in Different Age Groups

Age in years of groups	n	Mean Difference among Pre and Post Pandemic Refractive Error (DS)	Standard Deviation ±	95% Confidence Interval		P-value
				Lower	Upper	
4 to 8	53	-1.29	0.64	1.11	1.47	0.00
9-13	134	-1.20	0.75	1.07	1.33	0.00
14-18	158	-1.28	0.66	1.17	1.38	0.00
19-24	75	-1.14	0.64	.99	1.28	0.00

DS=Diopter Sphere, n=Number

DISCUSSION

The global health crisis created by the COVID-19 pandemic makes it imperative that everyone be informed about the virus.[10] Wuhan, China, was the site of the initial 2019 discovery of the Coronavirus 2019 (COVID-19) Disease.[4] There would be attempts to contain the disease by sealing off the city. A study reported that pandemic affects nursing students' mental health.[11] Health care personnel as front line fighters, need to have better mental health in the fight against COVID-19 pandemic and to take better care of their patients . For some patients; a co infection with COVID-19 can be fatal.[12] The widespread spread of COVID-19 has prompted numerous nations to develop a wide variety of anti-coronavirus vaccinations.[13] Our study confirms previous research showing that myopia rates were higher in all age groups prior to the COVID-19 pandemic. Possible causes include spending more time indoors[14], particularly in front of screens, and less time engaging in outdoor active and healthy activities.[15] It is important to remember that this hospital is a tertiary referral center, which means that all patients who present themselves here will have some sort of eye problem. In addition, participants were enrolled in the study on the off chance that they did not have a refractive error when they first presented for examination and were then followed for a total of 15 months. This study also demonstrates that the incidence of myopia has increased across all age groups and is now greater than 1D. To be more precise, age group A, which has a total of 54 participants, has an incidence of myopia of -1.29DS that is greater than the incidence in the other age groups, which have incidences of -1.20, -1.28, and -1.14D, respectively, and a sample size of 134, 158, and 75. Why children younger than 8 years in study sample showed a greater progression with the COVID-19 lockdown is unknown. This group may have been more prone to increasing myopia, especially with restricted exposure to outdoor light during the lockdown period. One might assume that younger children are more sensitive to environmental change than older children based on the same observation established in studies of study populations of other ethnicities and countries. According to a newly released study, the increase in myopia was about 1D.[17] This study also shows that myopia appears more frequently than 1D in all age groups and progresses quickly. Alarmingly, the incidence of myopia changes between age groups by 1.15 and 1.3 times during the course of 15 months. These results almost exactly mirror those of the study of Wang J. et al.and Toro et al., which found that myopia increased from 1.4 to 3 times.[14,16] It is probable that the non-cycloplegic refraction methods utilized in that study to measure refractive status contributed to the threefold increase in myopia. In the trial described here, cycloplegic refraction was administered to each patient. Similar myopic shifts have been observed in other investigations.[17] The findings of this study are concerning, and they could be interpreted as indicating that the subjects were pathologically myopic since they showed an increase of at least -0.75 DS.[17-21] Myopic change of 1.5 diopters was also documented in a study with an equivalent methodology, with a follow-up period of six months.[22] These results are comparable with those of the study by Wang W. et al[16], which showed a significant myopic shift.

Age was used to categorize participants in this study. Group A included kids still in the "plastic" stage of visual development; group B included kids too young for secondary school; group C included kids in high school; and group D included college students. The split did produce a larger C group and a smaller A group, but both groups were sizable enough for statistical testing. These results are consistent with the literature because it has been noted that students in several Asian nations frequently feel more academic pressure than their counterparts in Western nations, which results in a higher frequency of myopia.[23,24,25,] Myopia prevention is aided by outdoor activity, and there appears to be a dose-response relationship between time spent outside and the incidence of incident myopia. Myopia seems to progress regardless of how much time a person spends outside once it has begun. Some studies suggested that progression of myopia was less progressive in summer compare with winter.[25] Additionally, frequently less time spending and limited engaging in physical activity and outdoor pursuits may be one of the serious effects of lockdown.[25] One should not overlook the benefits of axial, minor to moderate, myopia, such as a decreased risk for age-related macular degeneration and diabetic retinopathy, in the discussion of the drawbacks of a myopic shift in children and adolescents, such as an increased risk for rhegmatogenous retinal detachment and the need for myopia correction by glasses or other optical measures. Activities that effectively promote outdoors can delay the incidence of myopia. Children and adolescents spent less time outdoors during the early stages of the COVID-19 outbreak due to home quarantines, which may have contributed to the rise in myopia rates. While there is only a small body of evidence suggesting that spending time outdoors can protect against myopia progression, there is a substantial body of evidence suggesting that spending time outdoors can delay or prevent the onset of myopia, which may influence the amount of myopia displayed in adulthood. However, further research is needed to determine the optimal exposure type, dosage, and time period. Therefore, the author's advice engaging in outdoor activities to prevent myopia during home quarantine periods, even though self-protection and isolation are crucial during a pandemic. Myopia is a rising concern for public health, as it is associated with serious visual morbidity on both an individual and societal scale. The expected worldwide increase in myopia prevalence and its secondary problems, as well as the already concerning rise in myopia progression and prevalence in East Asia, are causes for concern. This study highlighted that Myopia is on the rise across the world and in Pakistan as well so developing effective strategies to stop it must be a top priority. Eye care specialists, government organizations, school authorities, industry, family physicians, pediatricians, and others need to work together to find innovative solutions to this global health crisis. Here are some measures to take for a complete summary of the findings. Spread awareness of its effects among the general public and those that work in the field of eye care, such as Ophthalmologists, Optometrists, Pediatricians, Family Doctors, and Government Officials. For myopia to be recognized as a public health crisis and addressed by the government, non-profits, schools, and community organizations need to work together to raise awareness of the problem. It's important to conduct studies in many parts of the country and to make sure everyone has access to the results. Myopia is a worldwide public health concern, so first we work to prevent it from ever happening, and then we work to slow or stop its advancement once it has.

Conclusion

Myopia onset were acerbated by global pandemic Covid-19 and lockdown. Also the high magnitude of up to -3.50DS were observed on just 6 to 8 month follow-up which is alarming. Progression of myopia is > than -0.75DS in a year that is included in the fast progression category. All age groups were affected equally however more progression were seen in age group 4-8 and 14-18 years.

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