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Original Research Article

Increased Screen Time as a Cause for Further Myopia Boom- Follow up Study of School Health Survey

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Abstract

Background: Myopia is a major health issue around the world. The World Health Organization estimates that half of the population of the world may be myopic by 2050. In the present years, insufficient time spent in outdoor activities has been recognized as a major risk factor for myopia development. The duration and intensity of near work are also associated with myopia progression.

Aim: To study the increase in myopic shift in school going children during covid 19 pandemic due to increased screen time.

Materials and Methods: A prospective cross sectional study was done as a follow up after 2 years (in March 2021) from a school health survey done in May 2019. 150 students, of ages 7-15 were included and spherical equivalent refraction was recorded for each child and progression of myopia was documented in dioptres. Children wearing contact lenses, with h/o any ocular surgery and children with pathological myopia were excluded from study.

Results: Out of 145 children called for follow up, only 123 children reported in the OPD for follow up. The mean refractive error(spherical equivalent) had increased by +2D in children of ages 7-10 and by +1D in children from ages 11-13 and somewhat remained constant in older ages. The parents reported an increase in time spent on digital devices and prolonged near work and all this had a positive correlation with an increase in myopic shift.

Conclusion: Shorter viewing distance, increased screen time and lesser outdoor activities is also associated with myopia progression, especially in younger children. Younger children's refractive status may be more sensitive to environmental changes than older children, as they are in a more important period for myopic development and progression.

Keywords: Myopia, Screen Time, Covid, School- Going.

Introduction

Myopia is a major health issue around the world. The World Health Organization estimates that half of the population of the world may be myopic by 2050. [1,2] In the present years, insufficient time spent in outdoor activities has been recognized as a major risk factor for myopia development. [3,4] The duration and intensity of near work are also associated with myopia progression. [5]

Home quarantine is one of the main measures at the early stage, which effectively controlled the spread of COVID-19 to a limit. [6,7] The pandemic may have affected people's physical and mental health, especially that of the children and adolescents. Since Asia has a high incidence of myopia, more attention should be paid to the refractive status of children and adolescents. [8,9,10]

Due to Covid-19, many changes came to our world and it took some time for everyone to adopt the new normal. The Covid-19 impact was everywhere, which resulted in the closure of schools and other educational institutions. Though schools are closed, students are attending their classes through various education initiatives like digital teaching. As a result children are spending increasing more time online on digital screens indoor than outside playing.

Although these efforts have been shown to control the pandemic in India, concerns have been raised about whether the period of lockdown may have worsened the burden of myopia due to significantly decreased time spent outdoors and increased screen time at home. [11,12] In this study, we aimed to investigate the association of home confinement during the COVID-19 outbreak with myopia development in school-aged children in India.

Aim

To study the increase in myopic shift in school going children during covid 19 pandemic due to increased screen time.

Objective

To study the increase in myopic shift in school going children during COVID 19 pandemic due to increased screen time.

Materials and Methods:

A prospective cross sectional study was done. A follow up after 2 years (in March 2021) from a school health survey done in May 2019 in a Government school in the Medical College Campus. 150 students, of ages 7-15 years were included and spherical equivalent refraction (SER) was recorded for each child and progression of myopia was documented in dioptres. Owing to the COVID-19 pandemic, all examiners were trained to perform trials at a safe distance of 1.5 m from the children, with their arms extended. All the examiners and children wore masks during the screening. Children wearing contact lenses, with h/o any ocular surgery ,children using topical eye drops and children with pathological myopia were excluded from study. This study followed the Strengthening the Reporting of Observational Studies in Epidemiology (STROBE) reporting guideline for cross-sectional studies.

Exclusion Criteria

1. Children wearing contact lens
2. Children who had undergone any ocular surgery in the past.
3. Children using any topical eye drops

4. Children with pathological myopia
5. Presence of heterotropia, amblyopia or nystagmus
6. Presence of ocular or systemic conditions that can affect the refractive error of the eye or its axial development
7. Presence or family history of keratoconus
8. Presence of ptosis

Statistical Analysis

Statistical analysis was conducted using SPSS software. Chi-square test was used and p value <0.05 was considered as statistically significant.

Results

Out of 150 children called for follow up, only 123 children reported in the OPD for follow up. This study included 64 boys (52%) and 59 girls (48%).

The children were divided into 3 groups of ages 7-10 years, 11-13years & 14-15 years, these groups had 56,44,23 children in them respectively that previously were diagnosed with myopia in the School health survey conducted in May 2019.

Table 1: Showing Range of dioptric shift and Mean dioptric shift in various age groups

	Range Of Dioptric shift		Mean Dioptric shift
	MIN.	MAX	
7-10 YEARS (GROUP A)	-1.0D	-2.5D	-2D(P<0.05)
11-13 YEARS (GROUP B)	-0.5	-1.75D	-1D(P<0.05)
14-15 YEARS (GROUP C)	-0.25	-0.75D	-0.25(not significant)

The range of dioptric shift of myopia (SER) was tabulated in each of these groups. In Group A (7- 10years) the range of shift of spherical equivalent was in the range of -1.0D to -2.5D, the Group B the range of dioptric shift was in the range of -0.5D to -1.75D, the Group C the range of dioptric shift was in the range of -0.25D to 0.75D (Chart No.1)

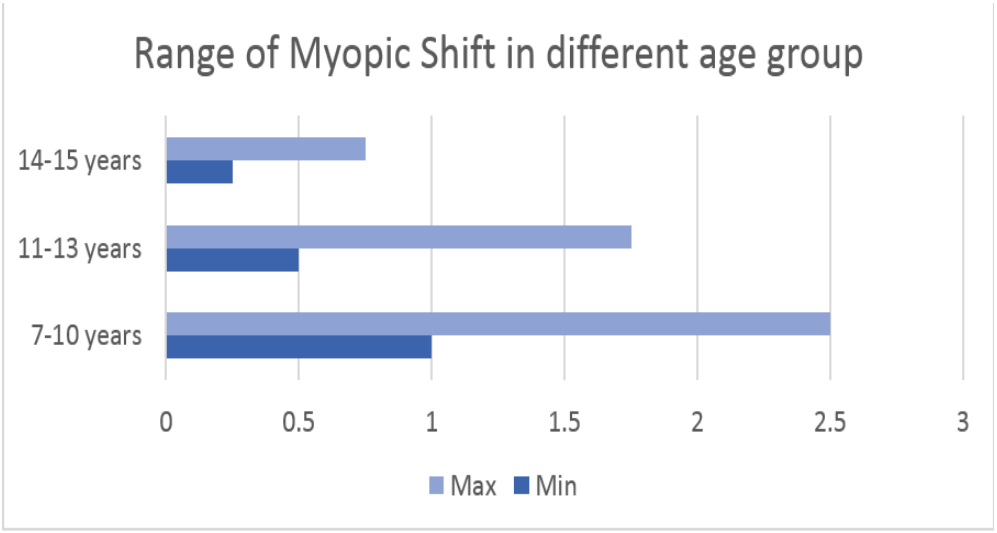

Figure 1: Showing the Range of myopic shift in Groups A, B, C

The mean SER was recorded to be increased by -2.0D in Group A (p value <0.05). The mean SER was recorded to be increased by -1.0D in group B (p value < 0.05). The mean SER was noted to be increased by -0.25D in group C (p>0.05) which was statistically non-significant.

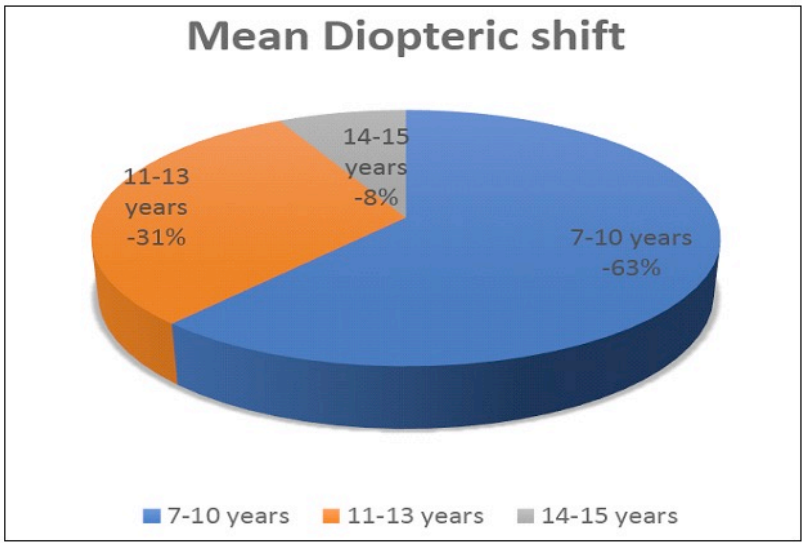

Figure 2: Showing the Mean SER in various age groups

Discussion

Out of 145 children called for follow up, only 123 children reported in the OPD for follow up.

The children were divided into 3 groups of ages 7-10 years, 11-13 years & 14-15 years, these groups had 56,44,23 children in them respectively that previously were diagnosed with myopia in the School health survey conducted in May 2019

In Group A (7-10 years) the range of shift of spherical equivalent was in the range of -1.0D to -2.5D, the Group B the range of dioptric shift was in the range of -0.5D to -1.75D, the Group C the range of dioptric shift was in the range of -0.25D to 0.75D.

The mean SER difference was statistically significant in group A and B and non-significant in Group C.

According to Wang J et. Al., [13], the SER distribution in their study population appeared to be stable from 2015 to 2019, with a slight overall myopic shift .However, in the 2020 screenings, there was a substantial myopic shift (approximately −0.3 D) for children aged 6 to 8 years. Given the large sample sizes, although statistical significance was also shown for myopic shifts in children aged 9 to 13 years, they did not consider those shifts to be of clinical significance. The SER difference between 2020 and the earlier years in children aged 9 to 13 years was approximately −0.1 D, which is smaller than the difference observed in children aged 6 to 8 years. Very large sample sizes tend to decrease *P* values toward 0. Solely relying on *P* values can lead the researcher to claim support for results of limited to no clinical significance.

Chee Wai Wong et. Al., [14] did a large cohort study with 5074 children in Rotterdam (the Generation R study), found an association between increased computer use and myopia at 9 years of age (odds ratio = 1.005 [95% confidence interval, 1.001-1.009]). The combined effect of near work, including computer use, reading time, and reading distance, increased the odds of myopia at 9 years of age (odds ratio = 1.072 [95% confidence interval, 1.047-1.098]). [15,16] A study of 418 students found that device-recorded smartphone data usage, an objective surrogate for time spent using the smartphone, was independently associated with myopia in a study of 418 students (odds ratio = 1.08 [95% confidence interval, 1.03-1.14]). [17,18,19]

Trovato Battagliola et. Al., [20] stated that the mean SE of children between 5 and 12 years of age was found to be −0.08 ± 1.44

in 2021. Tukey's post-hoc analysis has shown that this mean value has decreased by a factor of 0.619 and 0.501 D, as compared to the mean SE in 2016 and 2017 respectively ($p < .05$). This change was also reflected as an increase in the percentage of myopes from 25.63% (in 2016) and 33.10% (in 2017) to 40.56% in 2021 (Chi-square, $p = .016$).

Alvarez-Peregrina C. et. Al., in 2021 did a study which showed a decrease in the mean SE in 1600 children aged 5–7 years. The SE changed from +0.66 D in 2019 to +0.48 D in 2020 in the same age group. The Spanish authors used a questionnaire to document an increase in the number of hours spent on near-work activities and digital devices, as well as a decrease in outdoor time. The percentage of children who spent 3 or more hours a day on near distance activities increased from 18% in 2019 to 42% in 2020. [21,22]

Liu J. et. Al., 2021 [21] did a study which was conducted on 3831 adolescents and confirmed an increase in digital screen engagement during the pandemic. Authors found that each dioptre hour increase in daily e-learning screen use was significantly associated with progression of myopia symptoms (OR: 1.074, 95% CI: 1.058–1.089; $p < 0.001$), whereas engaging in outdoor exercise four to six times per week (OR: 0.745, 95% CI: 0.568–0.977; $p = 0.034$) and one to three times per week (OR: 0.829, 95% CI: 0.686–0.991; $p = 0.048$) was associated with a lower likelihood of myopia progression than none at all.

Digital Eye Strain(DES) constitutes a range of visual symptoms; its prevalence may be 50% or more among computer users. [23] In DESK-1 study, the prevalence of DES was also found to be 50.23%. However, a recent meta-analysis reported that the pooled prevalence of DES is 19.7% in children. [24] In a study conducted in the private schools of west India, they reported the prevalence of DES as 17.9%. [16] The increased prevalence of DES in DESK-1 study is probably due to the increased visual demand of digital device use in our cohort because of the online classes in this COVID era. There was a significant increase in the mean duration of digital device use during the COVID era (3.9 ± 1.9 h) compared to the pre-COVID era (1.9 ± 1.1 h, $P = <0.0001$). In the COVID era, 36.9% of children were using digital devices for >5 h compared to 1.8% of children before the COVID era.

In the DESK-1 study, 96.3% of children were attending online classes, out of which 49.8% of them were attending online classes for >2 h per day. In a study conducted in India before the COVID era, only 40% of children were using smartphones for school project purposes, and only 3.3% spent >5 h per day on digital devices. [23] In addition, 68.4% of children were using digital devices at a distance of >18 inches, which is similar to the study carried out by Ichapujani *et al.* [25] in which 56% were maintaining an ideal distance for digital device use. The most common symptoms reported by Shantkumari *et. al.* among school children using digital devices were headache and burning sensation in 53.3% and 54.8% of cases, respectively. [26] Multivariate analysis of that study revealed age >14 years, male sex, smartphone preference over other digital devices, use of digital devices >5 h, and use of mobile games >1 h/day were found to be independent risk factors for DES in children.

The term quarantine myopia [27] is finding its place in debates and discussions in the eye care world. There are increased concerns about restrictions to community eye health programs and restrictions in travel reducing the accessibility to seeking eye care. However, the time is now more than ever to follow-up children who are at risk for myopia and who already have the diagnosis of myopia, especially progressive myopia. [28]

Due to COVID-19, the school-aged children were confined to their homes

from March 2020 to till today, and online courses are being offered.

For the screened population, their daily online course hours range for about 4-6 hours per day.

Children's indoor activities and screen time therefore has increased and their outdoor activities have been decreased,* Lessened outdoor activity is known to be significantly associated with a higher incidence of myopia in school-aged children.

Concerns have been raised about whether home confinement may worsen the burden of myopia.

Conclusion

With the "lockdown" issued by the Government of India, people are forced to stay indoors in the fear of contracting the virus. Furthermore, with parents having to work from home, they are forced to hand these devices to even infants to keep them engaged.

Indian schools have also began to gradually adopt digital teaching methods. But the outbreak of COVID-19 has made it mandatory for all classes to be held online. In addition to classes being held online, class notes are circulated through WhatsApp™ groups or email. Hence, a child on an average spends about 4-6 hours on these devices for academic purpose in addition to playing on the hand-held devices.

Shorter viewing distance, increased screen time and lesser outdoor activities is also associated with myopia progression, especially in younger children.

Public health measures should be adopted to avoid the consolidation of these unhealthy behaviours among children. Without such measures, we might observe a faster-than-expected rise in the prevalence of both non-pathological and pathological myopia among young adults. Pathological myopia is also associated with sight-threatening ocular comorbidities, such as retinal detachment and glaucoma.

Younger children's refractive status may be more sensitive to environmental changes than older children, as they are in a more important period for myopic development and progression, which has been established in our study.

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