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Original Article

Impact of Online Classes and Home Confinement on Prevalence of Myopia in Children during COVID-19 Pandemic

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ABSTRACT

Purpose: The aim of this study was to assess the prevalence of myopia in children before and after the Covid -19 pandemic.
Methods: This is a comprehensive retrospective study conducted in a secondary eye care centre at Panipat. All the children of the age group between 5-18 years were who attended our OPD were included. Period of study was April and May months of Year 2018, 2019, 2021, 2022. Visual acuity (unaided & aided) was recorded in all the children. The data was extracted, compared and analysed for difference in prevalence of myopia
Results: During the post Covid period (April-May 22), 710 children attended the OPD. Among these, 324 (47%) were having the refractive error of more than 0.5 D. In comparison, in the same months of previous year 2021, only 349 children visited the OPD, out of these, 124 (38%) were having ref error. Secondly, in the months of April May 2022, 128 children of the age group of 5-11 years got the refractive errors, out of 321 (39.9%) of the total children of the same age group who came to OPD during that period. In comparison, in the year 2021, only 25 (17%) got the refractive errors out of 147. This figure was much lower in the years 2018(6.3%) & 2019(6.8%).
Conclusion: After the COVID-19 pandemic, myopia showed an alarming increase in pediatric age group. The change of myopia in younger children was comparatively greater than that in adolescents. Therefore, measures should be taken to prevent and control the progression of myopia after the COVID-19 pandemic.

Key Words: *Myopia, Covid-19, Prevalence, Eyeglasses, Children, Ref Errors.*

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INTRODUCTION

Myopia is an important health problem. According to WHO, by 2050 half the world population will be myopic [1]. Community and school based epidemiological studies suggest that near work is related to higher prevalence and degree of myopia [2]. The duration of close distance activities is also related to myopia [3]. The novel coronavirus 2019 has had a global impact [4]. During the COVID-19 pandemic, Governments around the world have provided distance education at a scale to ensure continuity of learning. According to United Nations Educational, Scientific and Cultural Organization (UNESCO), in early-September, 820 million children and youth were affected by school closures. Forty-six countries were in a state of nationwide school suspension [5].

During the COVID-19 pandemic, e-learning was the only studying option for school aged children and required children to adjust to online classes. To prevent the spread of infection, restrictions on social gatherings were imposed, resulting in less outdoor activities. Major changes in daily life during the COVID-19 era increased children's screen time and home confinement [6]. As a result of the prolonged use of digital devices, there was and may soon be an increase in ocular health related issues such as, accommodation vergence dysfunction, digital eye strain dry eye related complications, and myopia progression in children [7].

The aim of this study was to assess the change in refractive status in children before and after the Covid -19 pandemic.

MATERIALS AND METHODS

This was a retrospective comparative study of the prevalence of Myopia in the age group of 5-18 years presenting in our Out Patient Department (OPD) at secondary eye care centre in Panipat, Haryana. Data of all children who attended

our OPD in the age group 5 to 18 yrs in April and May months from year 2018 – 2022 was extracted, analysed and compared.

Inclusion criteria consisted of refractive error ≥0.5 D under cycloplegic conditions. Patients who were using atropine (0.01%) eye drops during the study period were excluded from this study. The presence of myopia related to retinal dystrophies, collagen disorders or any previous ocular surgeries were excluded from this study.

The following data was recorded: gender, age, date of examination and refraction of both eyes in the April and May months of years 2018, 2019, 2021 and 2022. As there was a complete lockdown in April and May 2020 except any medical emergencies, and regular OPD`s were also off so the data of these months were not included. Ophthalmic examination included distance visual acuity measurement and cycloplegic refraction. Refractive error was measured with Autoref keratometer Tonoref III (Nidek, Japan) and it was confirmed with retinoscopy with retinoscope (Heine beta 200, Heine Optotechnik, Germany). Glasses were prescribed according to the standard protocols.

RESULTS

During the post Covid period (April-May 22), a total of 710 children attended the OPD. Among these, 324 (45.6%) were having the refractive error of more than 0.5 D. (Table 1).

On comparison, in the same months of last year (2021), only 349 children visited the OPD, out of these, 124 (35.5%) were prescribed glasses In 2019, 601 children visited the OPD, out of which, only 62 (10.3%) had the refractive errors. In 2018, 599 children visited the OPD, out of which only 57 (9.5%) had the refractive errors

Table 1: Total Pediatric OPD cases

Month	Total Paed OPD	Paed Patients with ref errors	% with ref error
April 18	278	33	11.8
May 18	321	24	7.4
Total	**599**	**57**	**9.5**
April 19	278	26	9.3
May 19	323	36	11.1
Total	**601**	**62**	**10.3**
April 21	188	87	46.27
May 21	161	37	22.9
Total	**349**	**124**	**35.5**
April 22	313	165	52.7
May 22	397	159	40.0
Total	**710**	**324**	**45.6**

In the post covid era as seen in Table 2, there is a gross increase in refractive errors in the children of age group 12-18 years. Earlier, in the year 2018 (April & May), only 39 out of 313 (12.5%) had the refractive errors and in 2019, this figure was 44 out of 336 (13.10%). This figure has increased to 99 out of 202 (49%) in the year 2021 and 196 out of 389 (50.4%) in the year 2022 in the same months.

In the younger age group that is from the year 5-11, there is a steep rise in the refractive errors. In the year 2018 (April & May), only 18 children out of 286 (6.3%) had the refractive errors and next year in 2019 in the same months, 18 out of 265 (6.8%) suffered from refractive errors. This figure increased approx three times in the year 2021 i.e. 25 out of 147 children (17%) had the refractive errors. This figure again doubled in the year 2022 i.e. 128 out of 321 (39.9 %) suffered from refractive errors.

Table 2: Age wise Pediatric OPD record

Age	April May 2018	April May 2019	Apr May 2021	Apr May 2022
5	1	1	1	9
6	1	2	2	21
7	2	2	4	13
8	3	4	4	18
9	4	3	3	18
10	3	4	6	18

11	4	2	5	31
Sub Total 5-11 years (with ref. error)	**18**	**18**	**25**	**128**
Total OPD 5-11 Years	**286**	**265**	**147**	**321**
% with refractive error	**6.3 %**	**6.8 %**	**17 %**	**39.90 %**
12	3	9	20	36
13	3	7	11	33
14	6	8	17	34
15	7	3	11	26
16	6	4	13	31
17	9	6	10	18
18	5	7	17	18
Sub Total 12-18 years (with ref. error)	**39**	**44**	**99**	**196**
Total OPD 12-18 Years	**313**	**336**	**202**	**389**
% with refractive erros	**12.5 %**	**13.10%**	**49 %**	**50.4%**
Total	**57**	**62**	**124**	**324**

DISCUSSION

This was a comprehensive retrospective comparative study of the prevalence of myopia in the age group of 5-18 years before and after the Covid-19 pandemic. The COVID-19 pandemic in 2020 led to complete closure of schools and restrictions were imposed on social gatherings as well as outdoor activities. School aged children were confined to their homes from April to October 2020, and e-learning in the form of online classes was started later on. This led to an increase in children's screen time and indoor activities and also a decrease in their outdoor activities [8]. Parents of the children have become more aware of the fact that due to covid, children are using online devices to a greater extent and they should get eyes checked which led to early detection of refractive errors, hence explaining an increase in pediatric patients in OPD and hence more refractive errors in younger age group.

Several studies have been conducted regarding prevalence of myopia after COVID-19 pandemic. A cross sectional study on school aged children in Shandong, China [9] showed that prevalence of myopia increased by 1.2 - 3 times after the COVID-19 pandemic as compared to 4 years before. And it increased more among 6 to 8 years olds. Outdoor activities have previously shown to decrease the occurrence as well as progression of myopia [10]. He et al reported that for every additional 40min of outside activities there is a decreased myopia incidence by 23%. Wu et al. have suggested that myopia progression in children who spent >11hr a week outdoors decreases by 53% [11]. In general, 2h of outdoor activities per day is assumed to decrease myopia progression in school age children [12]. A study in Chongqing, China [13], revealed that the prevalence of myopia increased from 45.3% in 2019 to 55.4% in 2020, which was in accordance with ours. In our study we have seen a sudden spurt of pediatric patients after covid-19 pandemic with vision problems as compared to previous years which has led us to do this comparative study in our setup. There was an approximate 400% increase in refractive errors in the children of same years as compared to previous years.

We have chosen the months of April and May for our study as during these months there were reopening of schools generally after exams in February and March. Moreover after Covid -19 pandemic, when children started going to schools in March and April months and started having trouble seeing boards and made mistakes, which made teachers and parents suspect about their child`s eye problem and visited our centre for check up. In our study we have seen that in the year 2022 that is post covid time there is a sudden increase in refractive errors as compared to 2019 and 2021 data. This sudden increase is attributed to online classes and indoor activities of children during lockdown. Though there has been slight increase in paediatric OPD in 2021-2022 as compared to 2018-2019 but there is gross change seen in the refractive error prescription pattern as compared to older years.

The relationship between long-term exposure to digital devices with myopia is still a controversy and some studies support this relationship and others claim the opposite [14, 15]. The duration of reading, watching television or using computer has been suggested to influence progression of myopia, rather than its occurrence, in the Collaborative Longitudinal Evaluation of Ethnicity and Refractive Error Study [16]. However, this may not be due to effect of digital screens on the progression alone and could also be influenced by the 'substitution effect', as there is an indirect decrease of the outdoor activity as a result of the increased time spent in front of the screen [17]. The effect of the activities performed in front of the digital screen on myopia, may not be equivalent to the effect of reading and writing in

traditional education [18, 19]. Dopamine release in retina is stimulated by daylight and it suppresses the axial expansion of the eye [20, 21]. The effect of display devices on the retinal dopamine levels is still not known, however, Spiperone, which is a dopamine antagonist, has been shown to inhibit the protective effect of light against the increase of the ocular axial length in experimental models [22]. It has not been possible to demonstrate the relationship between myopia progression and the duration of use of a digital display device such as a tablet, smartphone, or computer with our study but it is seen clearly from the data that the prevalence of myopia post Covid has increased alarmingly.

Our take home message that outdoor activities should be increased and media devices like tablets, smart phones and laptops etc should be avoided to reduce the progression of myopia.

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