

**Impact of Increased Screen Time on Myopia in Children and Young Adults during COVID-19****Vaishali Prajapati<sup>1</sup>, Gautam Prajapati<sup>2</sup>, Deepika Singhal<sup>3</sup>, Hansa Thakkar<sup>4</sup>, Dhruvi Shah<sup>5</sup>, Dharti Thakkar<sup>6</sup>, Kushang Shah<sup>7</sup>**<sup>1</sup>PhD Scholar, Gujarat University, Associate Professor, GMERS Medical College, Sola, Ahmedabad<sup>2</sup>Consultant, Shaleen Hospital, Ahmedabad<sup>3</sup>Professor and Head, Department of Ophthalmology, GMERS Medical College, Sola<sup>4</sup>Professor and Head of Squint and Pediatrics ophthalmology department, M & J Western Regional Institute of Ophthalmology, Civil Hospital, Ahmedabad<sup>5</sup>3<sup>rd</sup> Year Resident, Department of Ophthalmology, GMERS Medical College, Sola, Ahmedabad<sup>6</sup>2<sup>nd</sup> Year Resident, Department of Ophthalmology, GMERS Medical College, Sola, Ahmedabad<sup>7</sup>2<sup>nd</sup> Year Resident, Department of Ophthalmology, GMERS Medical College, Sola, Ahmedabad

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**Abstract:****Purpose:** To evaluate the prevalence of myopia in children and young adults and to correlate its association with duration spent in front of computer screens.**Method:** The study was conducted on 200 individuals between the age group of 07-25 years at a tertiary care hospital in Ahmedabad after taking consent. Detailed history taking and ocular examination were carried out. All the study participants were provided a self-structured questionnaire to determine the associated socioeconomic and ecological risk factors.**Result:** Out of the 200 participants examined during the 1.5 month study period, 57 children (28.5%) were found to have myopia. Of these majority (56.14%) were females with maximum number of children (36.84%) in the age group of 11-15 years. Presence of excess screen time (>4 hours/day) was noted in 54.49% children with a simultaneous reduced outdoor activity time. Maximum screen exposure was noted for smartphones and tablets (81.45%) followed by computers (12.28%) and least for television (5.26%). Also, among other risk factors, positive family history (47.37%) was found to have a significant association with prevalence of myopia in our study.**Conclusion:** A significant association is noted between increased screen time and the occurrence of myopia in young individuals.**Keywords:** Myopia, Screen time, Children & Young Adult.This is an Open Access article that uses a funding model which does not charge readers or their institutions for access and distributed under the terms of the Creative Commons Attribution License (<http://creativecommons.org/licenses/by/4.0>) and the Budapest Open Access Initiative (<http://www.budapestopenaccessinitiative.org/read>), which permit unrestricted use, distribution, and reproduction in any medium, provided original work is properly credited.**Introduction**

As we all know that myopia or short-sightedness is one of the 3 commonly detected refractive errors; the other two being Hypermetropia and astigmatism. In myopia, the light rays entering the eye fall in front of the retina and as a result distant objects appear blurred. This commonly occurs when the eyeball is abnormally long or the corneal curvature is altered, making it difficult for the reflected rays of light to focus on the retina. Myopia is the most prevalent refractive error throughout the world [1] and is one of the leading cause of visual disability worldwide.

According to the recent Global Burden of Disease Study 2015 [2], visual and hearing impairment are graded 2<sup>nd</sup> after low backache and neck pain among the all-age causes for years of life lived with

disability worldwide. In 2016, Holden et al. [4] assessed the worldwide status of myopia and found 1.406 billion individuals (22.9% of the world's population) to be suffering from myopia. It was further estimated that by the year 2050, there will be chances of 4.758 billion people with myopia (49.8% of the world's total population). Amongst other risk factors such as extensive near work, reduced outdoor activities, family history and others, the duration of spending time in front of screens of digital devices has been quoted as the most likely modifiable ecological risk factor that can upsurge the risk of myopia. Hence, identifying and controlling these modifiable risk factors early may prevent from future burden of visual

dysfunction and in this way may pave way for bright future of young adults.

**Aims and Objectives**

To determine the association and impact of increased screen time on the development of myopia in children and young adults.

**Materials and Methods**

**Study Type:** Cross sectional study.

**Study Setting:** Department of Ophthalmology in a tertiary care teaching hospital in Gujarat.

**Study Population:** 200 individuals between the age group of 07-25 years attending the outpatient departments of a tertiary care hospital in Gujarat.

**Inclusion Criteria:**

1. Individuals who willingly give consent to be a part of the study.
2. Individuals between the age group of 07-25 years.

**Exclusion Criteria:**

1. Individuals who do not give consent to be a part of the study.
2. Individuals suffering from refractive errors other than simple myopia

After taking ethical approval from ethics committee, the study was conducted on first volunteer 200 individuals who have been diagnosed first time myopia or already having myopic glasses but now increased with the age group of 07-25 years attending the outpatient department of a tertiary care hospital in Gujarat during July 2021- August 2021.

The demographic profile of patients was recorded in terms of name, age, sex, address, socioeconomic status. Detailed history of patients was taken and the chief complaints were noted in the following categories: 1) Ocular complaints-heaviness/pain in eyes/recurrent redness /deviation of eyes. 2) Visual complaints- difficulty in reading /defective vision for distance or near. 3) Referred complaints-heaviness of head or headache, history of nausea or vomiting.

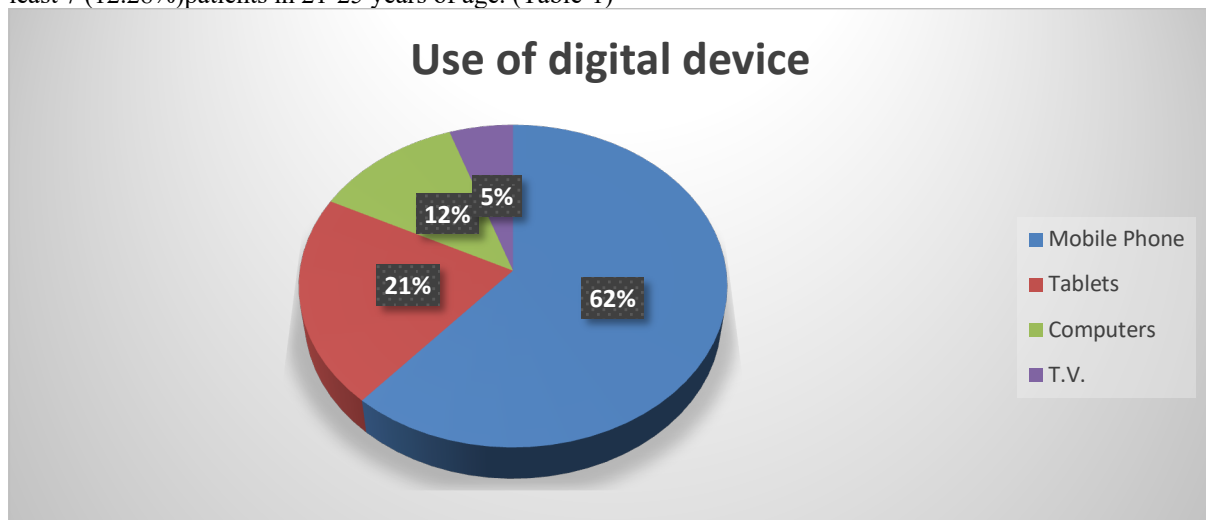
Visual acuity was assessed using the Snellen’s visual acuity chart and automated refractometry performed in each individual. Detailed ocular examination using slit lamp microscope and indirect ophthalmoscopy was performed in all individuals to look out for any other ocular pathology. All study participants were provided a self-structured questionnaire to look out for the presence of significant socio-economic and ecological risk factors.

**Results**

**Table 1: Age & Gender Distributions**

	Male	Female	Total	
07-10 Yrs	6	5	11	19.30%
11-15 Yrs	8	13	21	36.84%
16-20 Yrs	7	11	18	31.58%
21-25 Yrs	4	3	7	12.28%
	25	32	57	100%

We have found 57 patients of myopia out of 200 patients of 7-25 years age group in 1.5 months with prevalence of 28.5%. In age group distribution, most common was 11-15 years of 21 patients with female dominant while least 7 (12.28%)patients in 21-25 years of age. (Table-1)



**Figure 1: Digital device use**

The most common type of digital device was Mobile phone was found in 35 (61.40%) patients, while tablet use was found in 12 (21.05%) patients. The use of computer screen was present in 7 (12.28%) and T.V. in 3 (5.26%) patients. (Chart-1)

**Tabel-2 Screen time & Myopia**

Screen time	Male	Female	Total	Percentage
< 2 hours	3	5	8	14.04%
2-4 hours	7	11	18	31.58%
>4 hours	15	16	31	54.49%
	25	32	57	100%
Break Time	Male	Female	Total	Percentage
At 20 minute	13	10	23	40.35%
At 30 minutes	10	17	27	47.37%
At 45 minutes	2	5	7	12.28%
	25	32	57	100%
Break Time	Male	Female	Total	Percentage
of 10 minute	15	16	31	54.39%
of 20 minutes	4	7	11	19.30%
of 30 minutes	4	6	10	17.54%
of 45 minutes	2	3	5	8.77%
	25	32	57	100%

The screen time of >4 hours was found in 31 patients, while 2-4 hours in 18 (31.58%) patients. The 8 (14.04%) patients had < 2 hours use of screen. A time at break during use of digital device was also varying of 20 minutes, 30 minutes and 45 minutes. A break at 20minutes was present in 23 (40.35%) cases, at 30 minutes was present in 27

(47.37%) cases, while break at 45 minutes was present in 7 (12.25%)cases. The duration of break time during online studies and media use was also different of 10, 20, 30, 45 minutes. It was 31 (54.39%), 11 (19.30%), 10 (17.54%), 5 98.77%) cases of myopia in 10, 20, 30, 45 minutes respectively. (Table-2)

**Table 3: Risk Factors and Myopia**

Outdoor Activity	Male	Female	Total	Percentages
Not all	8	9	17	29.82%
< 30 minutes	11	17	28	49.12%
30-60 Minutes	4	5	9	15.79%
> 60 Minutes	2	1	3	5.26%
	25	32	57	100%
Family History	Male	Female	Total	Percentages
No one	14	16	30	52.63%
Mother	4	5	9	15.79%
Father	4	7	11	19.30%
Both	3	4	7	12.28%
Total	25	32	57	100%

For other risk factors, we have check the outdoor activity duration in myopic cases. It was not at all in 17 (29.82%) cases, of <30 minutes in 28 (49.12%) cases, of 30-60 minutes in 9(15.79%) cases. Only 3 (5.26%) cases had >60 minutes' duration of outdoor activity. Association of family history, Father had glasses in 11 (19.30%) cases, mother had glasses in 9 (15.79%) cases and history of both parents had glasses in 7 (12.28%) cases. (Table-3) The association of myopia in siblings was present in 33 (57%), while absent in 24 (43%). An apartment living was present in 42 (74%)

myopic patients, while 15 (26%) had individual houses or row-house.

**Discussion**

The COVID-19 pandemic in 2020 has led to the complete closure of schools and playgrounds, and restrictions on social gatherings and outdoor activities, a state termed as “lockdown.” In India, complete lockdown was announced in the last week of March 2020 and continued for almost a year because of lockdown, school-aged children were confined to their homes from April to October

2020, and e-learning in the form of online classes began. Therefore, there was an increase in children's screen time and indoor activities, as well as a decrease in their outdoor activities. [4] During the COVID-19 pandemic, there was a marked increase in screen time among children, with one study reporting that it increased by about 30 h/week. [5,6] Because of restricted outdoor activity during the pandemic, children used their smartphones for extended hours to play video games and browse the Internet during leisure time.

In our study, 83% children used to attend online classes by means of smartphones and tablets whereas 12% children used computers in the form of desktops and laptops for the same. This was found as a risk factor for the progression of myopia. As a result of the prolonged use of digital devices, there may soon be an increase in ocular health-related issues such as digital eye strain, accommodation-vergence dysfunction, dry eye-related complications, and myopia progression in children.[6] Evidence suggests that sustained near work on digital devices and less outdoor activities are important factors in the progression of myopia.[7,8]

It has been estimated that the prevalence of myopia will increase to affect approximately 50% of the world's population by 2050.[9] A similar finding was reported by Sun et al.[7] in China during the COVID-19 pandemic. Studies have also reported that fourth-to sixth-grade children use smartphones frequently for online learning and social media.[7,8] The digital eye strain among kids (DESK) study 1 reported that the duration of digital device use during the COVID-19 era increased to  $3.9 \pm 1.9$  h during the pandemic as compared with  $1.9 \pm 1.1$  h prior to the COVID-19 era.[9] Montag et al.[6] reported that children's screen time increased by 4.85 h per day during the pandemic.

Similarly in our study, more than half of the children i.e 31 out of 57 children (54.49%) had a screen time of more than 4 hours per day, whereas only 8 children out of 57 children (14.04%) had a screen time of less than 2 hours per day. Furthermore a lesser no-screen time was noted among most individuals in our study, which is also believed to be an important factor in increasing eye strain and associated symptoms in children. Decreased outdoor activity is a significant risk factor for a higher incidence of myopia in children[10].

In our study, home confinement in the form of less sun exposure was found to be the most important risk factor for the rapid progression of myopia during the COVID-19 pandemic. An outdoor activity of less than 30 minutes was found in 28 out of 57 children with myopia (49.12%). As compared to males, females spent a lesser time

outdoors and coincidentally the overall prevalence of myopia was also found to be more in females (56.14%) as compared to males (43.86%) in our study. Data have shown that time spent outdoors had a protective effect on myopia progression in children.[19,20] Wu et al.[11] found a 54% lower risk of myopia progression in children who spent  $\geq 11$  h per week outdoors.

### Conclusion

The findings of our current study suggest that amount of screen time has a positive impact on the development of myopia, the prevalence of which was found to be significantly higher in individuals with excessive screen time exposure at a relatively younger age. However, considering the limited sample size and the poor assessment of myopia in our study, it would be premature to conclude that early and prolonged screen time exposure leads to development of myopia. More longitudinal research performed with cycloplegia would be essential to strongly establish the causal link between screen time exposure and the incidence and prevalence of myopia.

### Limitation

Short duration, single center, small sample size

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