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An observational study on refractive status of school going children in COVID-19 period due to online classes with electronic devices in a tertiary care health centre.

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AIM : To observe the refractive status of school going children(5yr-15yr) in COVID pandemic period between Oct 2020 to Sept 2021(one year).
METHOD: All school going children presenting to OPD with complain of decreased vision without any pathological ocular morbidity undergo testing of slitlamp biomicroscopy, visual acuity with use of Snell's chart, retinoscopy ,autorefractometer test, trial of glasses.
RESULT: Total school going children observed are 320.Among them refractive error myopia, compound myopia and progress of myopia that already exist are more than hypermetropia and astigmatism.
CONCLUSION : Due to increased use of mobile and laptop in online classes as near work there is increased incidence of refractive error among school going children.

I. INTRODUCTION

- Corona virus disease (COVID-19) is an emerging pandemic disease that forces Govt. to introduce shut down and lockdown in the localities in which the schools and education system suffered a lot.
- Thereby introduction of online classes(approx.1 to 4 hrs/day) through computers and android phones, self study 1-4 hrs/day, playing games with mobile and computer 1-4 hrs/day, indoor activity ,that all leads to increase near work activities and decrease outdoor activities of school going children (5-15 yrs).Total exposure time to electronic devices is approx. 4-12hrs/day.

II. AIMS OF THIS STUDY

1. To find the prevalence of refractive error in 5 to 15 years age school going children.
2. To observe the impact of Electronic Screen Devices on school going children(5yr-15yr) in COVID-19 pandemic period between Oct 2020 to Sept 2021(one year).

III. MATERIALS AND METHOD

- Total children presented to the eye OPD during study was – 1945
- The sample size was calculated as 315 with -
- Formula used : $n = N/(1+Ne^2)$, as N = Population, e = allowable error=5%
- No. of children with refractive error were – 370
- According to calculated sample size I had taken 320 children between 5yrs to 15 yrs age group randomly from 370 children.
- It is an observational and cross sectional study on 320 school going children attended to eye OPD with complaining of decreased vision, excluding pathological ocular morbidity.
- Detail clinical histories were taken along with family history.
- Slitlamp biomicroscopy was done.
- Refractive error was estimated by autorefractometer, retinoscopy, trial of glasses.
- Best corrected visual acuity tests were done with Snell's chart.

Inclusion criteria: .
School going children within 5 to 15 yrs. of age having refractive errors.

Exclusion criteria :

- Children < 5 yrs and above 15 yrs of age having refractive errors.
- Children (5 to 15 yrs) having any pathological ocular morbidities.
- Children whose parents not given consent for complete evaluation.

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IV. RESULT

Table #1

Age(yrs)	Total number	Male	Female
5 - 7	108	68 (63%)	40(37%)
8 - 11	93	47(50.5%)	46(49.5%)
12 – 15	119	70(58.8%)	49(41.2%)
Total	320	185(57.8%)	135(42.2%)

Table -1 Show male children with refractive error are more than female children.

Table #2

Age(yrs)	New Refractive error patients	Old Refractive error patients
5-7	83	25
8-11	53	40
12-15	50	69
Total	186	134

- The mean age of the total study participants, exposed to electronic screen devices was found to be **9.8 yrs** with a s.d. of **3.16**.
- The mean age of the male study participants was found as **9.2 yrs** with a s.d. of **2.8**.
- The mean age of the female study participants was found as **9.4 yrs** with a s.d. of **2.64**.
- The mean age of old Refractive error patients was found as **11.26 yrs** with a s.d. of **2.01.**

Table #3 Showing Refractive Errors :

Types of Refractive Errors	Only Right Eye	Only Left Eye	Both Eyes	TOTAL
Myopia	5	3	123	131
Compound Myopia	6	8	91	105
Simple Myopic Astigmatism	2	0	70	72
Hypermetropia	0	0	7	7
Compound hypermetropia	0	0	0	0
Simple hypermetropic Astigmatism	0	0	0	0

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Mixed Astigmatism	**0**	**0**	**5**	**5**
TOTAL	**13 (4.06%)**	**11 (3.44%)**	**296 (92.5%)**	**320**

From Table – 3

- It was noticed that 92.5% of the study participants had Refractive error in both eyes where 4.06% of the study participants had Refractive error only for Right eyes and 3.44% had only for Left eyes.
- Refractive errors like Myopia, Compound Myopia, Simple myopic astigmatism were more prevalent in 315(98.44%) children under study.
- 236(73.75%) children under study had Refractive error like Myopia and Compound myopia.
- All 134 old refractive error patients(from Table -3) came with old glasses, out of them 76 patients have old records and rest patients refractive status were calculated by neutralisation method and got the result :

Table # 4:

Types of Refractive Errors	No. of study subjects
Myopia	**77**
Compound myopia	**35**
Simple myopic astigmatism	**18**
Hypermetropia	**3**
Compound hypermetropia	**0**
Simple hypermetropic astigmatism	**0**
Mixed astigmatism	**1**
Total	**134**

Distribution of Myopic power range of 77 myopic patients out of 134 old refractive error patients with new and old powers :

Table# 5

Range of myopic power in Dioptre	No. of Cases with old refractive power	No. of Cases with new refractive power
-0.25 to -1 D	**30**	**13**
- 1.25 to -2 D	**17**	**15**
- 2.25 to -3 D	**13**	**18**
- 3.25 to -4 D	**12**	**20**
> - 4 D	**5**	**11**

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The no. of higher myopic power ranges are increased in new myopic values than old records.

Distribution of the visual acuity of the study participants :

Visual acuity in Dioptre	Before exposure		After exposure		Degree of freedom	t– value	P - value
	Mean	S.D.	Mean	S.D.			
- 0.25 to - 1.00	- 0.62	- 0.26	- 0.26	- 0.13	41	4.72	< 0.0001
- 1.25 to - 2.00	- 2.08	- 0.26	- 1.62	- 0.28	30	4.82	< 0.0001
- 2.25 to - 3.00	- 2.54	- 0.25	- 2.57	- 0.26	29	0.3221	> 0.05
- 3.25 to - 4.00	- 3.56	- 0.28	- 3.65	- 0.27	30	0.9005	> 0.05
- 4.25 to - 5.25	- 4.45	- 0.33	- 4.25	- 1.44	14	0.3015	> 0.05

V. INTERPRETATION

- The prevalence of Refractive error in School going children in 5 to 15 yrs age group in this study was found to be 19.02 %.
- Unpaired t – tests were applied to the visual acuity in pre and post-exposures to the electronic screen devices and there were significant differences found in the Visual acuity range of – 0.25D to – 1.00D and – 1.25D to – 2.00D.
- From the study it is proved that exposures to the electronic screen devices by the school going children of 5 to 15 yrs age group have severe impact on visual acuity.
- From various literature it was studied :

1. Genetic predisposition, increased axial length of eyeball, increased near work and lack of time spent outdoors are all thought to be risk factors associated with myopia. When they act together, the risk increases.

2. The Myopia Screening Survey of Children and Teenagers in Schools is a cohort study conducted in 46 primary and junior high schools in Hangzhou, China. Accelerated myopic progression was noticed during the COVID-19 pandemic lockdown in children and teenagers. However, this myopic progression was reversed partially after lockdown, suggesting that both accommodative spasm and structural changes contributed to this accelerated rate.

3. A significant myopic progression was observed in the post-COVID-19 period compared to the pre-COVID-19 period in the 0.05% and 0.025% atropine groups ($P < 0.001$ and $P = 0.020$, respectively). For children aged 5 to 7 and 8 to 10 years, the axial elongations were significantly faster in the post-COVID-19 period than in the pre-COVID-19 period ($P = 0.022$ and $P = 0.005$, respectively). However, the rates of axial elongation and myopic progression were not significantly different between pre- and post-COVID-19 in children aged 11 to 15 years ($P = 0.065$ and $P = 0.792$, respectively). The average time spent using computers and smartphones and reading time were significantly increased, and the times of physical and outdoor activity were significantly decreased in the post-COVID-19 period compared to the pre-COVID-19 period.

VI. CONCLUSION

The pandemic COVID-19 disease causes the myopic shift of the school going children due to home confinement and increased use of screen electronic devices. Parents should be counseled to encourage their children to do more outdoor activities and remain away from electronic devices.

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