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Rise in Pseudomyopia in Time of Covid-19 Pandemic-A Possible Correlation with Screen Time

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ABSTRACT

Objective: To evaluate the presence of pseudo myopia in different age groups and its association with screen time in patients who present with reduced vision during the covid-19 pandemic in Pakistan.
Study Design: Cross-sectional study.
Place and Duration of Study: Combined Military Hospital, Abbottabad Pakistan, from Nov 2020 to Apr 2021.
Methodology: A total of 222 eyes of 111 patients with reduced vision and myopia were evaluated. All patients underwent cycloplegic refraction, and re-evaluation of myopia. An increment in myopia of 0.50 D or more after cycloplegia with cyclopentolate was labeled "Pseudomyopia". The incidence was evaluated in different age groups and its association with screen time and study time was evaluated.
Results: Mean age of study population was 21.16±8.45 years. Mean pre-cycloplegic myopia was -2.32±1.99D and mean post-cycloplegic myopia was -1.39±1.64D. Mean change in myopia after cycloplegia was -0.98±2.07D. Pseudo myopia was found in 120(54.1%) eyes. Difference in frequency of pseudomyopia between different age groups and difference in frequency of pseudomyopia between different groups with respect to screen time was statistically significant (p=<0.001) with more frequency in patients with more than 2 hours per day of screen time.
Conclusion: Pseudo myopia was more prevalent in younger patients and was correlated with increasing screen time in all age groups. Full cycloplegic refraction in all patients of myopia is warranted for accurate assessment of refractive error.

Keywords: Computer Vision Syndrome, Myopia, Pseudomyopia.

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INTRODUCTION

The current Covid-19 pandemic has brought significant changes in our day-to-day life with one significant change relating to more time spent on electronic devices for work, academics, or pleasure with a concurrent decrease in outdoor activities.[1] A plethora of electronic devices are now available for our interaction and have become a ubiquitous part of our personal and professional lives.[2]

With the prevalent use of such devices, comes a group vision and muscular symptoms which are collectively referred to as "Digital Eye Strain (DES).[3,4] These symptoms were previously referred to as Computer Vision Syndrome (CVS)[5]

but with consistent and much commoner use of tablets and smart phones, DES is deemed more appropriate.[3,4] These symptoms include headache, neck/shoulder pain, blurring of vision and dry eyes.[3,6] DES has been recognized as a public health problem for more than 20 years.[7]

With constant close focusing on these devices, continuous effort of accommodation is required. This results in accommodative spasm which has the potential to produce pseudo myopia.[8] Although the term pseudo myopia means a temporary shift in the refractive error towards myopia; in individuals with DES, due to accommodative spasm, these intermittent periods might be so prolonged that the optometrist may be tricked into prescribing a much stronger refractive prescription than is required. This has the potential to cause a vicious cycle of further accommodation to improve the blurred image and a further stronger prescription of glasses.

Although accommodative spasm has been described in literature for the children and young anxious adults, the use of cycloplegic refraction is not routinely performed in adults and older children and very few studies can be found which raise the question whether cycloplegic refraction should be routinely performed in adults.[9]

The current study aims to determine cycloplegic refraction in patients of myopia for accurate

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assessment of refractive error in all age groups and association of screen time with pseudo myopia.

METHODOLOGY

This cross-sectional study was carried out at CMH Abbottabad from November 2020 to April 2021, after approval from the institutional ethical review committee (01112020/1/ophth dated 1st Nov 2020), and taking written informed consent from patients and parents. A total of 222 eyes of 111 patients were evaluated. Non purposive consecutive sampling technique was used. Sample size was calculated using World Health Organization sample size calculator for epidemiological studies. A sample size of 126 was calculated keeping 5% level of significance and 90% power test.[10]

Inclusion Criteria: Patients from either gender, aged 4-40 years, with normal anterior and posterior segment examination, and myopia on auto-refractometer readings were included in study.

Exclusion Criteria: Patients with history of trauma, pathological myopia, amblyopia, congenital glaucoma, congenital cataract, latent or manifest squint, corneal or retinal pathologies, high astigmatism, keratoconus, vernal Keratoconjunctivitis and previous amblyopia treatment were excluded.

All patients underwent detailed ophthalmic assessment, squint assessment with measurement of Best corrected visual acuity. All patients underwent fundus examination and cycloplegic refraction after instillation of cyclopentolate eye drops. Post-cycloplegic refraction was performed. Spherical equivalent was calculated before and after cycloplegia. Patients were divided in four groups with respect to age. Groups 1-4 being <10 years of age, 11-20 years, 21-30 years and 31-40 years. A pre-designed proforma was filled inquiring screen time on computers, laptops, mobile phone and tabloids for analysis. Confidentiality of the patient's record was maintained.

Statistical Package for Social Sciences (SPSS 20.0) for windows was used for statistical analysis. Descriptive statistics i.e., mean±standard deviation for quantitative values (age, Myopia) and frequencies along with percentages for qualitative variables (Gender, Laterality, Pseudomyopia) were used to describe the data. We used Shapiro Wilk's test to check normality of data. Qualitative variables were compared between age groups using Chi Square test. A *p*-value of ≤0.05 was considered statistically significant.

RESULTS

A total of 222 eyes of 111 patients were included. Mean age, gender distribution and laterality is given in Table-I. It shows that pre-cycloplegic refractive error in general population was higher than post cycloplegic and this difference was statistically significant ($p<0.001$). This difference in pre and post cycloplegic refraction which was seen in 120 eyes, depicts the rising trend of pseudomyopia. Table-II shows that all of the children under 10 years of age had pseudomyopia. Those aged between 11-20 showed a frequency less than half whereas those individuals older than this, in both age groups ie aged between 21-40 years showed a frequency of psuedomyopia in half the group and thus the difference in frequency of pseudomyopia between different age groups was statistically significant ($p=0.001$) and the frequency of pseudomyopia with screen time and shows that as screen time becomes greater than 2 hours, its frequency rises up to 80% and the difference in frequency of pseudomyopia between different screen time groups becomes statistically significant ($p=<0.001$).

Table-I: Clinical Data of Study Population (n=111)

Variable	Values
Age (Years)	21.16±8.45
Gender	
Male	36(32.4%)
Female	75(67.6%)
Laterality	
Right	111(50%)
Left	111(50%)
Pre-Cycloplegia Refractive error	
(Diopters, D)	-2.32±1.99
Post-Cycloplegia Refractive error	
(Diopters, D)	-1.30±1.64
Difference in Refractive error after Cycloplegia	
(Diopters, D)	-0.98±2.07

Table-II: Association between Pseudomyopia with Respect to Age and Number of Hours (n=111)

Age	Yes (n=120)	N0 (n=102)	*p*-value
<10 Years	24(20.0%)	0(0.0%)	0.001
10–20 Years	42(35.0%)	48(47.1%)	
21–30 Years	36(30.0%)	36(35.3%)	
31–40 Years	18(15.0%)	18(17.6%)	
Number of hours			
<1 Hour	52(43.3%)	34(33.3%)	<0.001
1–2 Hours	20(16.7%)	56(54.9%)	
>2 Hours	48(40.0%)	12(11.8%)	

DISCUSSION

Globally the COVID-19 pandemic has had a marked effect on our lifestyles and has been seen to have an adverse effect on eyesight, with a possible correlation to screen time and role of pseudomyopia. Previous studies have demonstrated that children reporting longer time usage of electronic devices had greater progression of myopia.[11] Cheng *et al.*, also demonstrated that more outdoor activities were associated with lower levels of myopia.[12]

In our study we evaluated presence of pseudo myopia and its relationship with different age groups and its association with screen time in patients who present with reduced vision and a myopic shift after Covid-19 pandemic in Pakistan.

Our study revealed a younger cohort of patients with symptoms in general. The mean age of our study population was 21.16±8.45 years, which corresponds with previous studies which have demonstrated that younger children have been more adversely affected during the pandemic as compared to adults possibly because they are spending more time in indoors taking online classes and spending more time on social media with decreased outdoor activities.[13]

Another important facet of our study shined a light on the importance of full cycloplegic refraction in all patients of myopia for accurate assessment of refractive error, something also advocated by previous studies.[14,15] The mean pre-cycloplegic myopia in our study was -2.32±1.99D and mean post-cycloplegic myopia was -1.39±1.64D. Mean change in myopia after cycloplegia was -0.98±2.07D. Therefore, our study also reinforces that cyclopegic refraction is a required step in all patients of myopia and yields more accurate assessment of refractive error, a notion supported by a study Mimouni *et al.*, which demonstrated that a difference in spherical error in young adults (18-21 years) and found a difference of 0.68±0.83 D (95 % CI, 0.64-0.72) between non-cycloplegic and cycloplegic measurements, with a difference hypermetropes than myopes.[9]

In our study Pseudo myopia was found in 120(54.1%) eyes which is higher than a pre pandemic study by Kang *et al.*, which demonstrated a prevalence of 24.1%.[16] This difference could be relayed to significant lifestyle changes during the pandemic as discussed earlier.

Difference in frequency of pseudo myopia between different age groups was statistically significant (p=<0.001) with more frequency in patients with age less than 10 years. Also, difference in frequency of pseudo myopia between different groups with respect to screen time was statistically significant (p=<0.001) with more frequency in patients with more than 2 hours per day of screen time. The findings of our study are supported by previous studies which showed that younger individuals developed myopia more as compared to elders.[17-19]

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LIMITATION OF STUDY

Some limitations of our study were the sample size and cross-sectional design. Prospective randomized control trials would be ideal for this evaluation but may prove challenging. Future areas of research can be focused on a larger sample size. Additionally, markedly reduced vision and myopia patients can be studied for development of pseudo myopia.

CONCLUSION

Our study aims at shining a light on potentially increasing pseudo myopia in our population due to lifestyle changes during the pandemic. It is our hope that this study will increase awareness about this entity and its current substantial incidence. We also hope that this can provide some impetus to study this important public health impact more. Although pseudomyopia is more prevalent in younger patients but it is also observed in any age group having more screen time. Full cycloplegic refraction in all patients of myopia is warranted for accurate assessment of refractive error.

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Authors' Contribution

Following authors have made substantial contributions to the manuscript as under:

MS & MAM: Data acquisition, data analysis, critical review, approval of the final version to be published.

SF & NF: Study design, data interpretation, drafting the manuscript, critical review, approval of the final version to be published.

SUS & BS: Conception, data acquisition, drafting the manuscript, approval of the final version to be published.

Authors agree to be accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved.

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