Original Article

Change in refractive error after prolonged use of smart phone in ambient light.

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BACKGROUND: Smart phones and mobile figuring maneuvers are being used by increasingly larger number of people today. This has led to an increase in the number of patients complaining about ocular and non-ocular symptoms associated to compute and mobile use. This study compares change in refractive status of eye before and after use of smart phone in ambient light.

OBJECTIVE: To compare the refractive status before and after prolonged use of smart phone and to document any change in refractive status and correlate it with duration of use of smart phone.

PATIENTS AND METHODS: It was comparative cross-sectional study, conducted on hundred ametropes aged between 20 to 30 years. Change in refractive status by using autorefractometer before and after one hour use of smart phone in ambient light was assessed by filling a self-structured proforma.

RESULTS: By comparing the refractive status of emmetropic persons before and after use of smart phone for one hour in ambient light conditions indicated that there was significant change in refractive status of about 0.25-0.50Ds. There was increase in minus and decrease in plus number which was the indication of myopic shift for distance while using smart phone for prolonged time. That myopic shift was transient which disappeared after few minutes

CONCLUSION: It is included that there was change in refractive status before and after use of smart phone. There was significant change in refractive status of about 0.25-0.50Diopters. There was increase in minus and decrease in plus number or induction of transient myopic shift. That myopic shift was transient which disappeared after few minutes.

INTRODUCTION:

A condition of the eye in which images fail to come to a proper focus on the retina, due to difference between the size and refractive powers of the eye is called ametropia.[1]

Near work induced refractive change refers to a near work-related change in convexity of lens or accommodative after effect. That is, after a period of prolonged near work the distance refractive status shows a temporary change because of an incapability of the crystalline lens to reduce its power suitably and rapidly under normal viewing conditions, thus reproducing an accommodative hysteresis phenomenon having neuropharmacologic foundation.[2]

Accommodation is a phenomenon in which convexity of crystalline lens increases when eyes change focus from distance to near target. The term accommodative hysteresis is used to indicate an incomplete and transitory relaxation of the accommodation of the eye after a period of fixation. The amount of relaxation varies according to point of fixation relative to the position of the tonic accommodation, and to the refractive status of the eye. In general, a prolonged near visual task leads to an increase in accommodation, while a prolonged distant visual task leads to a decrease in accommodation.[3]

Ambient light is the combination of light reflections from various surfaces to produce a uniform illumination. There is strong evidence that the development of myopia in humans is influenced by both genetic makeup and environmental factors.[4]

Accommodation is link between near work and myopia. Decrease accommodative tonus, accommodative amplitude and increase accommodative lag present in near work induced myopia. Hyperopic retinal defocus resulting from a large accommodative lag during period of prolonged near work might result in compensatory elongation of axial length of eye.

Animal studies have shown that imposing hyperopic defocus with negative lens induces compensatory change in axial length of eye. Reduce in axial length of eye leads increase accommodative lag because a large amount of hyperopic blur would require high accommodative response that causes fluctuation in accommodation during near viewing than normal range. Elongation of axial length of eye causes change in shape of anterior segment which causes variability in accommodation responses.[5]

The association between myopia and near work has been practically well recognized in humans and in animal models. This includes the environmental factor of near work-induced transient myopia which indicates a small, transient, pseudo myopic shift in the far point of the eye after a period of constant near work. It reveals an incapability of the crystalline lens to reduce its power properly and rapidly, thus reflecting an accommodative aftereffect phenomenon of assumed pharmacologic cause. In the normal population, the mean scale of NITM is typically suitably small (approximately 0.3D) and remains within the depth of focus of the eye, thus creating no perception of blur.[6,7]

The Video Display Terminals (VDTs) are becoming familiar items today. Many individuals, who work with a computer, face eye-related distresses or visual problems.3 VDT work did not have a considerably greater effect on visual function. Vision problem in VDT users were usually transitory. It only causes transient changes that disappear with passage of time.[8]

Vision problems faced by computer operators are usually only temporary and will drop after stopping computer work at the end of the day. However, some workers may practice constant decreased visual abilities, such as blurred distance vision, even after work. If nothing is done to discourse the cause of the problems, they will remain to persist and perhaps deteriorate with future computer use.[9]

Visual display operators are usually only transitory and will drop after discontinuing computer work at the end of the day. Some workers may face constant impaired or reduced visual abilities, such as blurred distance vision, even after work. If nothing is done to reduce the etiology of the problems, they will last to recur and perhaps deteriorate with future visual display users.[10]

Another longitudinal study stated that subjects below 40 years of age who used VDTs lost more accommodative amplitude than who did not. It has been recommended that a work accommodative response (AR) during working at the VDTs or a failure to lessen the AR at achievement of the near task is at the mood of the asthenopia faced by the users. Blurred vision at near and trouble to move to distant gaze is a common complaint in CVS and accommodative infacility was the most common oculomotor disorder informed. These changes are temporary and workers return to starting point values by the end of workday or week. Significant losses have not been told in longitudinal studies when corrected for age changes.[11,12]

Eye-strain, tired eyes, irritation, burning feelings, redness of eyes, dry eyes, blurred and double vision were described by the visual display unit users and called “Computer Vision Syndrome”. These symptoms seemed to rise as duration of VDT exposure increased.[13,14]

After work with the smartphone, the most important changes like diminished power of accommodation, removal of the near point of convergence and deviation of phoria for near vision. The results advocate that weakness of these important visual functions could be the cause of eye-strain in visual display users.[15]

VDT use has been associated with a small and temporary myopic shift of refraction. These shifts are so small that distant visual acuity is not affected. VDT users experienced a myopic shift of about - 0.12 D after the work period compared with no change of refractive error of typists in a cross-sectional study.[16]

Taking a smaller break for 5-10 min more habitually is better than taking a longer break every 2 or 3 hours36. A 10-15 min break from the computer is suggested for every continuous 1-2 hours of computer use but is held by limited verifications.[17]

The working distances described by workers presented that the mean distance for the small screen devices (75% people preferring distances between 26 and 40 cm) was lesser than for hard copy use. This set of users would need a near prescription for the reduced distances when presenting with asthenopia.[18]

PATIENTS AND METHODS:

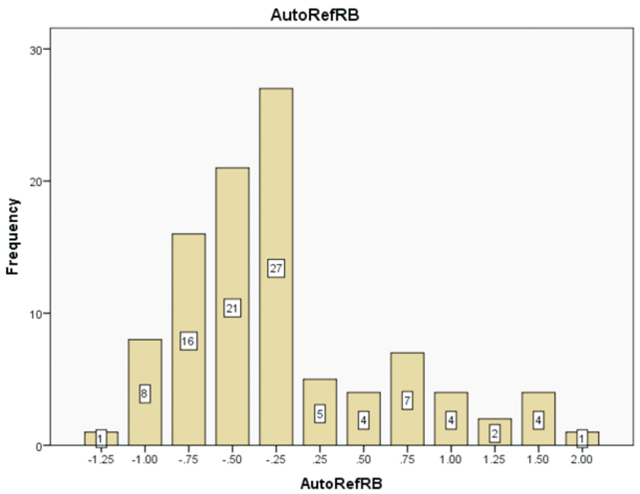
This community based cross sectional study was conducted at College of Ophthalmology and Allied Vision Sciences (COAVS) Lahore from March to November 2015, conducted on one hundred ametropes aged between 20 to 30 years. Change in refractive status by using autorefractometer before and after one hour use of smart phone in ambient light was assessed by filling a self-structured proforma. Verbal and cooperative clients, between 20 to 30 years and mild ammetropic clients were included. Mentally retarded, uncooperative and clients having visual field defect were excluded. Before the start of research, the objectives and the process of research were explained to them in detail. Individuals having refractive errors were prescribed glasses. The data was recorded on the Performa, fed on the computer using the SPSS 13.0 software. The results were analyzed and tabulated using the same software.

RESULTS:

The data was arranged in tabulated form as well as graphical and diagrammatic form for the analysis of variables. The data was divided into four parts containing Demographic profile, Presentation profile, Association profile and Final outcome. We selected the individuals of age above 20 years of either sex.

Fig.no:1

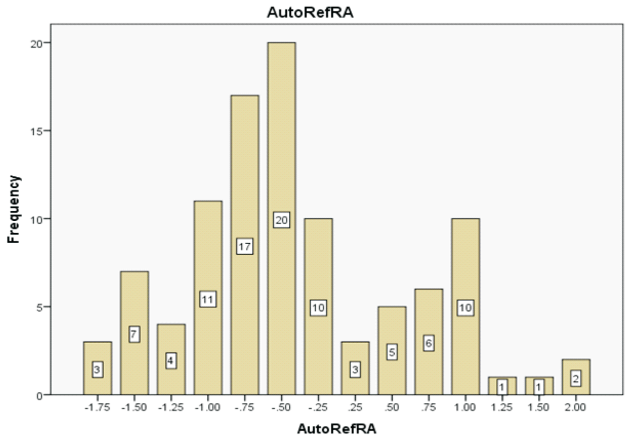
Refractive status of right eye before use of smart phone.



Refractive status of right eye before smart phone use which is measured by autorefractometer.

Fig no: 2

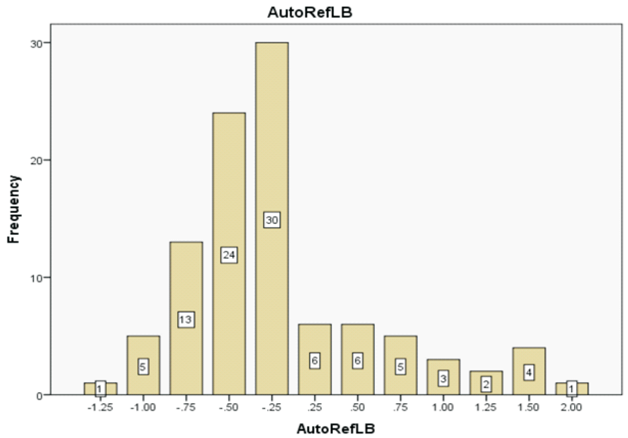
Refractive status of right eye after use of smart phone.



Refractive status of right eye after smart phone use which is measured by autorefractometer. The comparison of refractive status before and after use of smart phone indicates increase in minus number and decreases in plus number.

Fig no: 3

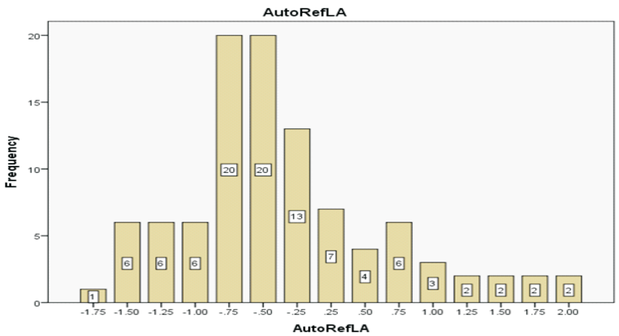
Refractive status of left eye before use of smart phone.



Refractive status of left eye before smart phone use which is measured by autorefractometer.

Fig no: 4

Refractive status of left eye after use of smart phone.



Refractive status of left eye after smart phone use which is measured by autorefractometer. The comparison of refractive status before and after use of smart phone indicates increase in minus number and decreases in plus number.

TABLE: 1

Paired Samples Test									
		Paired Differences					t	df	Sig. (2-tailed)
		Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference				
					Lower	Upper			
Pair 1	AutoRefRB - AutoRefRA	0.17	0.46	0.0462	0.0784	0.262	3.68	99	0
Pair 2	AutoRefLB - AutoRefLA	0.15	0.59	0.0591	0.0278	0.262	2.46	99	0.016

There is marked difference of refractive status before and after use of smart phone. This table shows that the difference of refractive is statistically significant having P value 0.00.

CONCLUSION:

It is concluded that there was change in refractive status before and after use of smart phone. There was significant change in refractive status of about 0.25-0.50Ds. There was increase in minus and decrease in plus number or induction of transient myopic shift. That myopic shift was transient which disappeared after few minutes.

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