ASSESSMENT OF PRESBYOPIA AMONG MOBILE PHONE AND COMPUTER USERS AT PUNJAB, PAKISTAN

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ABSTRACT

Objective: To find any association between presbyopia and usage of smart phones in Pakistani Population.
Study Design: Prospective cross-sectional study.
Place and Duration of Study: University of Health Sciences, Lahore, from Oct 2018 to Jul 2019.
Methodology: Approval for this prospective cross-sectional study was obtained before hand from the Institutional Review Committee, University of Health Sciences Lahore. Questionnaire was made through Google docs. Data were assessed by using SPSS version-26. Frequency distributions of different demographic characteristics and those of patients' history with the use of devices were calculated.
Results: Median ± Interquartile of age was 36.50 ± 14 as it was not normally distributed variable. Mostly were males (78.9%). Majority belonged to age group of 41-50 years (44.7%). This study participants were mostly of the education group of masters or higher (>50%). About 35% of the study participants were suffering from presbyopia. Out of 182 participants who were suffering from presbyopia majority were using the glasses for near vision for 1-3 years. When the cross tabulation of using the glasses for near vision was done with the duration of usage of mobile phones and computers then it was seen that the result was found to be statistically significant (p=0.04).
Conclusion: The usage of smart phones has significantly raised the prevalence of presbyopia and despite knowing all the ocular side effects of using electronic devices the public is still addicted to it.

Keywords: Electronic devices, Smart phones, Presbyopia.

INTRODUCTION

Presbyopia, the impairment of near vision in older adults due to the gradual loss of accommodation, currently affects over 1 billion people worldwide[1,2]. It is estimated that half of affected persons cannot afford corrective spectacles, particularly in under-served regions of low and middle-income countries (LMICs).[3] A recent multi-country, population based study showed that over 90% of near vision impairment was uncorrected in rural areas of LMICs, compared to 40% in urban areas[4]. This study also demonstrated a sharp rise in the prevalence of presbyopia during the working years, with the majority over 50 years suffering from correctable near vision impairment (CNVI), and prevalence as high as 50% among those aged 35-39 in some regions[5].

Uncorrected presbyopia leads to an estimated global productivity loss of $25.4 billion. Despite this, most research on uncorrected refractive error has focused on impairment of distance vision. While presbyopia may once have been considered less problematic in rural LMIC settings due to lower literacy levels and life expectancy, recent studies have demonstrated a significant impact on quality of life and activities of daily living[6]. A population-based, cross-sectional study in rural Pakistan showed that the prevalence of presbyopia increased from 27.6% at 40-49 years of age to 81.8% at 60-69 years, with only 51.5% of affected persons reporting spectacle ownership. Major barriers included poor quality of available glasses and lack of awareness of the condition and its treatment[6]. In addition to low levels of visual functioning, restricted social interaction and leisure activities and a diminished sense of accomplishment among those with presbyopia, this group was significantly more likely to experience difficulties with activities of daily living than unaffected persons (94.6% vs 69.3%, p<0.001)[7]. Uncorrected presbyopia has also been shown to affect quality of life in rural Tanzania, where the large majority of presbyopes (94%) did not have corrective near vision glasses[8]. Those with presbyopia were more likely to report difficulty with near-vision tasks such as cooking, threading a needle and sorting grain or rice. Similarly, a study in Nigeria found impairment of near vision to be associated with reduced quality of physical, psychological and social aspects of life[9]. The most severely affected functions in those self-reporting near vision impairment were reading, writing, use of mobile phones and threading a

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Received: 07 Aug 2019; revised received: 23 Oct 2019; accepted: 29 Nov 2019

needle[10]. Further studies in India[11], Zanzibar[12], Kenya[13] and Timor-Leste[14] add to the evidence that near visual impairment is associated with lower quality of life even where the illiteracy rate is high, due to difficulty in managing near tasks of daily living. The impact of presbyopia has become more pronounced in LMICs due to population aging and technological advancements[15]. Chief among these is the growing reliance on smartphones. In 2015, the World Bank estimated the number of mobile cellular subscriptions per 100 people to be 98.6 worldwide and 93.2 in Pakistan[16]. Based on the latest Mobility Report from Ericsson, there are currently 3.9 billion smartphone subscriptions worldwide, with that number expected to reach 8.9 billion by 2022. Subscriptions for smartphones have surpassed those for basic mobile phones, with smart phones now accounting for close to 80% of all mobile phones sold[17]. Few studies have assessed the influence of presbyopia on the use of basic mobile phones in LMICs [10,18] and existing reports have neither assessed the degree of presbyopia in population-based samples, nor have they examined determinants of self-reported difficulty with smartphone use.

We surveyed patients presenting to different teaching hospitals of Lahore and concluded study of presbyopia on their attitudes towards use of smartphones. The objective of the this study was to define the prevalence and determinants of self-reported difficulty with smartphone use in an older population, while assessing the efficacy of various behavior modifications in reducing difficulty of use, and willingness of users to pay for technological solutions to the proble

METHODOLOGY

Approval for this prospective cross-sectional study was obtained before hand from the Institutional Review Committee, University of Health Sciences Lahore from _____. A validated questionnaire was made by going through the literature review and after detailed discussion with senior faculty members. Sample size was calculated by using following formula:

$$\text{Sample size} = \frac{Z^{2}_{1-\frac{\alpha}{2}} p(1-p)}{d^2}$$

$Z_{1-a/2}$= is standard normal variate (at 5% type 1 error (p<0.05) it is 1.96. As in majority of studies p-values are considered significant <0.05 hence 1.96 is used in formula.

p=Expected proportion in population based on previous studies or pilot studies= 0.706

d=Absolute error or precision= 0.03

Sample size = 505.

Convenient sampling technique was used.

All the patients presenting to out-patient department of Ophthalmology without any previous ocular surgery and currently wearing glasseswere included in the study while all patients with other eye disorders were excluded. An informed consent was taken before filling of questionnaire forms. Questionnaire was made through Google docs.

Data were assessed by using SPSS-26. Frequency distributions of different demographic characteristics and those of patients' history with the use of devices were calculated. We also calculated p-value by finding association of duration of electronic device usage with near vision.

RESULTS

Median ± Interquartile of age was 36.50 ± 14 as it was not normally distributed variable. Mostly were males (78.9%). Majority belonged to age group of 41-50 years (44.7%). This study participants were mostly of the education group of masters or higher (>50%) (table-I).

Table-I: Frequency distribution of demographic characteristics (n=532).

Demographic Characteristics	Groups	n (%)
Gender	Male	420 (78.9)
	Female	112 (21.1)
Age	<30	28 (5.3)
	31-40	224 (42.1)
	41-50	238 (44.7)
	> 50	42 (7.9)
Literacy	Illiterate	64 (12.0)
	Under Matric	38 (7.1)
	Matric	38 (7.1)
	FSc/FA	60 (11.2)
	Graduate	42 (7.9)
	Masters or Higher	290 (54.5)

About 35% of the study participants were suffering from presbyopia. Out of 182 participants who were suffering from presbyopia majority were using the glasses for near vision for 1-3 years. And for most of the participants their power of glasses were between the 1-2. Almost 95% of the total participants were using mobile phones for >3 years and majority of these used the mobile phone for more than five hours per day. Majority of our participants were also aware of the side

effects of the prolonged use of mobile phones and computers on eyes (table II).

When the cross tabulation of using the glasses for near vision was done with the duration of usage of mobile phones and computers then it was seen that the result was found to be statistically significant (p=0.04) (table III).

Table-II: Frequency distributions of different responses by the study participants (n=532).

Questions	Options	n (%)
Are you wearing eye glasses for far vision	Yes	322 (60.5)
	No	210 (39.5)
What is the number of you far vision	<1	56 (10.5)
	1-2	154 (28.9)
	2-4	42 (7.9)
	>4	70 (13.2)
Are you wearing eye glasses for near work	Yes	182 (34.2)
	No	350 (65.8)
Duration of wearing eye glasses for near work	<1 year	42 (7.9)
	1-3 Years	98 (18.4)
	>3	70 (13.2)
What is the power of your near eye glasses	<1	70 (13.2)
	1-2	84 (15.8)
	>2	56 (11.3)
Are You Wearing Contact lenses	Yes	42 (7.9)
	No	490 (92.1)
How long have you been using laptop/computer	Not Using at all	28 (5.3)
	>3 years	504 (94.7)
How long have you been using smart mobile phones/tablets	<1	14 (2.7)
	1-3 years	14 (2.7)
	>3 Years	504 (94.6)
Average duration of laptop/computer use in a day	<2 hours	196 (36.8)
	2-6 Hours	238 (44.7)
	>6 hours	56 (10.5)
Smart mobile phone/tablet use per day (for video/internet/ social media)	<2 hours	112 (21.1)
	2-6 Hours	266 (50)
	>6 hours	154 (28.9)
Are you aware that prolonged use of computer/laptop/smart phones & tablets have bad effects on the eyes	Yes	504 (94.7)
	No	28 (5.3)

Table-III: Association of duration of using laptops/ computers with near vision (n=532).

Question	Groups	How long have you been using the laptop/ Computers		p-value
		I am not using at all	Using for >3 years	
Are you wearing eye glasses for near Vision	Yes	14	168	0.04
	No	14	336	

DISCUSSION

This study mostly included patients without any ocular surgery and those who presented to outdoor department first time with vision difficulties which makes it a prospective study in oppose to most of the previous studies which were retrospectively were done. We found that nearly ninety five percent (94.7%) of this population sample of urban Pakistani residents owned smartphones, and that over two-thirds (68.1%) of those reported some difficulty in smartphone usage. Those with higher education levels were more likely to report such difficulties, and nearly 70% were interested in mobile phone features to address these problems. Uncorrected presbyopia has a significant influence on ease of smartphone use in this middle-income country setting, affecting a substantial proportion of even educated urban-dwellers. The high willingness to pay suggests that the market for technical solutions may be substantial.

This was the first population study of presbyopia influence on smartphone use of which we were aware. The design offers certain key advantages, as a clinic-based approach would be more likely to enroll participants already having contact with the medical care system, and might thus tend to over-estimate the proportion of persons having access to presbyopic correction. Nonetheless, ownership was relatively high (66.2%) in this setting, compared to a previous study in China (51.5%)[19], likely due to the current study's setting in a relatively wealthy urban area, as compared to the previous, rural-based study. Our finding that CNVI led to significant difficulties with mobile phone use is consistent with a previous, non-population study from Zanzibar[20].

We found that more educated participants were more likely to report difficulties in utilizing smartphones, even adjusting for daily use time and level of NVA. It may be that more educated users are using their smartphones for more visually demanding tasks (eg, web searches vs games). Three-quarters (73.7%) of participants having difficulty with smartphone use in the current study reported using presbyopic glasses as their coping strategy, the most commonly reported strategy. However, the fact that difficulties were reported suggests that glasses were not an entirely satisfactory solution.

Problems with quality and accuracy of routi-nely available presbyopic spectacles have previously been identified in Pakistan[21], and this may explain the failure of spectacles to fully address problems with smartphone use. Alternatively, respondents may simply have found presbyopic glasses inconvenient to use in conjunction with their smartphones. Nonetheless, there does seem to be ample room for technological

solutions beyond those already offered by available devices, such as adjustment in the size of type face. Potential solutions might include the ability to project images from the smartphone screen onto a conveniently located surface at an appropriate reading distance, or directly onto the retina of the user, as with devices such as the Guyton-Minkowski potential acuity meter[21]. Strengths of the current study include the population-based sampling and relatively high response rate (83.5%), and careful assessment of CNVI using a well-described and validated protocol[22]. Unlike most previous studies touching on presbyopia and smartphone use, the current report concentrates entirely on smartphones and mobile phones, and thus contains more information about problems with their use and possible solutions to these problems. Limitations must also be acknowledged.

ACKNOWLEDGEMENT

The authors are deeply indebted to Prof. Dr. Fridon, Head, Department of Physiology, University of Health Sciences Lahore for his motivation to initiate and complete this project successfully.

CONCLUSION

The usage of smart phones has significantly raised the prevalence of presbyopia and despite knowing all the ocular side effects of using electronic devices, the public is still addicted to it.

CONFLICT OF INTEREST

This study has no conflict of interest to be declared by any author.

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