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3 **Presbyopia and Vision-Related Quality of Life in**
4 **Calabar South, Nigeria**

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9 **ABSTRACT**

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Aim: To determine the magnitude of presbyopia and the effect of uncorrected presbyopia on vision-related quality of life in Calabar South, Nigeria.

Study Design: A community-based, descriptive cross-sectional study.

Place and Duration of Study: Calabar South Local Government Area, Nigeria, between November 2016 and February 2017.

Methods: We included 422 adults (198 men, 224 women) aged 35 years and above, selected by cluster random sampling. Subjective distance refraction was done on all participants with distant visual acuity less than 6/6. Near visual acuity was assessed at 40 centimetres with a Times Roman near vision (British N system) chart, with distant correction in place if required. Presbyopia was defined as inability to read N8 at 40 centimetres unaided or with habitually worn distance refractive correction, with improvement of near vision by at least one line on a Times Roman near vision chart with use of a plus lens. An adapted and validated quality of life questionnaires were administered to the participants.

Results: A total of 422 participants were examined and interviewed. The prevalence of presbyopia was 55.5% (95% confidence interval 51.3 – 60.1) ($p < .001$). There was no significant association between gender and prevalence of presbyopia. The presbyopia correction coverage in the study population was 38.0% with a strong positive correlation between age and the required near vision spectacle lens power ($r = 0.88, p < .001$). Another key finding was a significant association between uncorrected presbyopia and reduced quality of life.

Conclusion: This study has demonstrated that the burden of presbyopia in the study population is enormous in spite of the fact that it has a cost effective intervention. The key findings in this study underscore the need to scale up presbyopic correction services in the study area.

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Keywords: Presbyopia, quality of life, Calabar South, Nigeria

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1. INTRODUCTION

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Presbyopia refers to an age-related loss of accommodation of the crystalline lens that results in an inability to focus at near distances. It is the most common physiological change occurring in the adult eye and is believed to cause universal near vision impairment with advancing age.[1] The amplitude of accommodation decreases with age and symptoms may manifest about the age of 40 years. Symptoms may, however, start earlier or later than this age depending on the refractive state of the patient's eyes, their visual needs and depth of focus among other variables such as residence in the tropics.[2] Variables associated with either earlier onset or increased severity of presbyopia include: female sex, increasing age, higher educational background and urban residence.[3]

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About 1.1 billion people have been estimated to have near vision impairment simply because they do not have a pair of spectacles.[4] This global prevalence of presbyopia is predicted to increase to 1.4 billion by 2020 and to 1.8 billion by 2050.[5] The prevalence of presbyopia in low- and middle-income countries is not well known, as most studies of refractive error in these countries have been limited to distance vision.[1] There are few studies on presbyopia that have used a population-based approach, making it difficult to draw conclusions about the prevalence of presbyopia in the general population.[1] However, a prevalence as high as 85.4% have been reported.[6] Another major challenge with research in this area is the absence of a universally accepted definition for presbyopia and no standardized technique of

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37 measurement. The prevalence of presbyopia will therefore depend on how it is defined, for
38 instance, the end point chosen and the distance at which near vision is tested.[1]

39

40 Presbyopia affects quality of life both in high-income countries, where reading and writing
41 are the main near vision tasks undertaken,[7] and in populations where reading and writing
42 are less a part of daily life for example in the rural populations of low- and middle-income
43 countries.[8] Uncorrected presbyopia can have a potential negative impact on career choice,
44 ocular health and self-esteem and can therefore hamper development.[7]

45 As low- and middle-income countries undergo the demographic transition towards an ageing
46 population, the number of people with presbyopia will increase. The demand for near vision
47 and near vision correction is also increasing with the widespread use of devices such as
48 mobile phones and computers, even in rural areas of the developing world.[5] Presbyopia is
49 associated with worse vision targeted health-related quality of life compared with young
50 patients with ametropia (refractive error).[7]

51 Few population-based surveys have been conducted to assess the burden of presbyopia in
52 developing countries and even fewer studies on impact of presbyopia on quality of life in
53 developing countries.[9] This is attributed to the perception that presbyopia is not important
54 in areas with low literacy rates such as low- and middle-income countries.[9] This perception
55 lacks evidence as only few population-based studies have assessed presbyopia in the
56 developing world and anecdotal evidence reveals the need for good near vision even among
57 rural dwellers who require it for near vision-related tasks such as threading needles, sorting
58 rice and cutting nails.[8] Service provision for presbyopia begins with estimating the need.
59 This study will among other things estimate this (presbyopic service) need in the target
60 population.

61 With the emphasis on adult education and literacy as well as good quality of life, it becomes
62 necessary to estimate the level of presbyopia in the population with a view to developing
63 refraction and optical services that have a high success rate vis-a-vis visual acuity (distance

64 and near) and improved quality of life. The aim of this study, therefore, was to determine the
65 magnitude of presbyopia and the effect of uncorrected presbyopia on vision-related quality of
66 life in Calabar South Local Government Area of Cross River State, Nigeria with a view to
67 generating data that could be useful in the planning and implementation of successful
68 comprehensive presbyopic correction service in Calabar South, Nigeria.

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71 **2. MATERIAL AND METHODS**

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73 **2.1 Study design and setting**

74 This descriptive cross-sectional research was conducted among adult residents of Calabar
75 South Local Government Area of Cross River State, Nigeria from 1st November 2016 to 28th
76 February 2017. Calabar South Local Government Area is found in the southern senatorial
77 district of Cross River State. Its headquarters is in the town of Anantigha. It has an area of
78 264 km², a density of 725.4 inhabitants/km² and a population of 191,515 at the 2006
79 Nigerian National census.[10] It is divided into 12 political wards and has a general hospital,
80 28 primary health centres/health posts spread across the 12 political (electoral) wards,
81 numerous private health facilities and optical shops (eye care facilities that are run by
82 optometrists or refractionist). The general hospital in Calabar South is a government owned
83 secondary health facility with an eye unit that is run by the Cross River State Eye Care
84 Programme. The eye unit provides comprehensive eye care services, including refractive
85 error and presbyopic correction services. About 5 kilometres away from the local
86 government headquarters is the University of Calabar Teaching Hospital in Calabar
87 Municipality with an ophthalmology department that provides comprehensive tertiary eye
88 care services, refractive error and presbyopic correction services inclusive.

89

90 **2.2 Sample size determination**

91 Allowing for 10% attrition, a minimum sample size of 420 participants was calculated using
92 the formula for single proportion:[11,12]

93
$$n = z^2 pq/d^2$$

94 Where;

95 n = minimum sample size (when population is >10,000)

96 z = Standard error of the mean which corresponds to 95% confidence level (1.96)

97 p = Proportion of the target population estimated to have the particular characteristic, in this
98 case presbyopia. The prevalence of 53.4% was used in the study.[13]

99 $q = 1-p$

100 d = Precision with which p is determined which is 5% (0.05)

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102 **2.3 Study population**

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104 The study population was a randomly selected sample of political (electoral) wards in
105 Calabar South Local Government Area that was obtained from the 2006 census data.

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107 **2.4 Selection criteria**

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109 The eligibility criteria were based on criteria used in previous studies on presbyopia.[17,18]

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111 **2.4.1 Inclusion criteria**

112 Individuals aged 35 years and above who had resided in the selected area for a minimum of
113 6 months were recruited for the study. Another inclusion criterion was presenting visual
114 acuity of 6/60 or better in at least one eye. Participants also had pinhole visual acuity
115 improvement of 6/18 or better in at least one eye.

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119 **2.4.2 Exclusion criteria**

120 Individuals with mental or other incapacitating illnesses whose vision could not be tested
121 were excluded from the study. Refusal to give inform consent was another exclusion
122 criterion that was utilised.

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124 All subjects that were excluded on account of visual impairment were examined by the first
125 author and referred to the eye clinic of the University of Calabar Teaching Hospital, where
126 necessary. Minor ocular conditions like allergic conjunctivitis and suspected mild dry eye
127 disease were treated in the field.

128

129 **2.5 Sampling technique**

130 Cluster sampling with equal allocation was used to select a representative sample of the
131 population. The survey was carried out in 7 out of the 12 political wards (which served as
132 clusters) in Calabar South using a simple random sampling technique. All eligible clients that
133 met the criteria for inclusion and consented to participate were enrolled into the study. The
134 procedure is described as follows:

135 **2.5.1 Stage 1: Selection of clusters (political wards) by simple random** 136 **sampling**

137 To reduce enumeration costs and simplify the field work during data collection without
138 significantly compromising precision, seven wards were randomly selected as clusters from
139 the twelve political wards using the lottery method. This involved the allocation of a unique
140 number to each of the twelve political (electoral) wards. Each electoral ward's unique
141 number was written on a small piece of paper which was thereafter folded and placed in a
142 box. The box containing the numbers was then shaken by the first author and seven of the
143 folded pieces of papers blindly pulled from it and opened by a research assistant. The 7
144 political wards assigned the randomly picked numbers were included in the study.

145 **2.5.2 Stage 2: Total sampling of households in selected clusters**

146 There were 7 clusters with 60 participants in each cluster. A bottle was spun at the centre of
147 a cluster and this was followed by a random walk (from the direction the bottle pointed) to
148 identify households for inclusion in the survey. All adults aged 35 years and above within
149 each household were enumerated by trained research assistants until the required 60
150 participants for that cluster were enrolled. In situations where the required number of
151 participants was not obtained in a cluster, a neighbouring cluster was sampled for
152 completion.

153

154 **2.6 Survey tool**

155 The survey questionnaire was adapted from an interviewer administered semi-structured
156 questionnaire that was validated in the International Centre for Eye Health of the London
157 School of Hygiene and Tropical Medicine and had been used in Nigeria in an earlier
158 study.[13] It comprised four sections: information was collected on basic socio-demographic
159 characteristics; distance/near visual acuity assessment with subjective refraction and service
160 provision; visual function and quality of life.

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162 **2.7 Data collection procedure**

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164 **2.7.1 Examination of participants**

165 Participants were examined and interviewed in their homes. Presenting distance visual
166 acuity was tested in all subjects by an ophthalmic nurse in the team with a tumbling E
167 Snellen chart at 6 meters in ambient outdoor illumination under a shade. Correct
168 identification of more than half of the optotypes in a line constituted success at reading that
169 line. Distance subjective refraction was then performed by the first author (an
170 ophthalmologist) in subjects with visual acuity $\geq 6/60$ but less than 6/6 if improvement of
171 visual acuity to at least 6/18 (in one or both eyes) is demonstrated with a pinhole test. The
172 refraction was conducted with a trial lens set with addition of plus or minus lenses in 0.5

173 dioptre increments until the subject reads 6/6 or has no further improvement in visual acuity.
174 Astigmatism was not corrected to reduce testing time due to time constraints in data
175 collection.

176 Near vision was then tested by the ophthalmologist (first author) with a Times Roman near
177 vision (British N system) chart at a distance of 40cm under ambient illumination. The
178 distance of 40cm from the eyes was maintained with an inextensible string which was
179 attached to the top of the chart at one end, while the other end was placed against the
180 subject's forehead and held taut. A subject was defined as presbyopic (functional
181 presbyopia) if s/he cannot read the N8 optotype (Times Roman Printer's Point) at 40cm
182 unaided or with habitually worn distance refractive correction, with improvement of near
183 vision by at least one line on a Times Roman near vision (British N system) chart with use of
184 a plus lens. The N8 optotype was selected as it matches the type size for newsprint in
185 Nigeria. This definition of presbyopia is the near equivalent of distance visual impairment
186 (i.e. $6/18$) which translates to N-sized (typeface size) print at 40cm with a Times Roman
187 near vision chart, requiring at least +1.00 dioptre (D) near add to see clearly.[14]

188 Near visual acuity (VA) was tested binocularly and recorded as the smallest line with over
189 half of the optotypes read, spelled or reported as seen correctly. The distance correction was
190 put in place for those that require it before near vision testing was done. Subjects with
191 uncorrected near VA <math>< N8</math> on N notation chart underwent vision testing with progressively
192 higher plus sphere power (in increments of +0.5 dioptre and +0.25 dioptre occasionally) in
193 both eyes simultaneously until a binocular vision of at least N8 was obtained or no further
194 improvement occurs. Subjects that present with a VA of 6/6 were assumed to be emmetropic
195 and were tested for near vision as described without undergoing distance refraction. The
196 spherical dioptre corrections along with the corresponding best-corrected near visual acuity
197 were recorded. Subjects that needed presbyopic glasses were provided with a pair of near
198 vision spectacle free of charge while patients with reduced visual acuity that did not

199 improved with refraction and those that needed distance correction were referred to the eye
200 clinic of the University of Calabar Teaching Hospital, Calabar.

201 The anterior segment of the eye was examined by the first author using loupe magnification
202 and a torch. The posterior segment was examined in a dimly lit room, with a direct
203 ophthalmoscope (HEINE BETA200 LED ophthalmoscope, HEINE Optotechnik, Germany)
204 through an undilated pupil.

205 **2.7.2 Interview of participants**

206 The interview questions included: socio-demographic characteristics, visual function and
207 questions on quality of life. Visual functions that were covered in the interview included
208 reading, writing, use of mobile phones, cooking food, sorting out rice/grain, threading a
209 needle, cutting finger nails etc. Participants were asked if they regularly conducted the
210 particular activity. If the answer was 'yes', they were then asked to rate the difficulty they
211 have performing such activity due to poor near vision base on a rating scale of 1-5 where: 1
212 = no difficulty, 2 = little difficulty, 3 = moderate difficulty, 4 = great difficulty, 5 = do not
213 undertake the task (not applicable). Participants were instructed that this is a linear increase
214 in severity and other factors that did not relate to their near vision (e.g. mobility and distance)
215 were not relevant to this question.

216 Regarding near vision-related quality of life, the participants were asked how much
217 satisfaction they have with their distance vision, near vision and general health. They then
218 rated their level of satisfaction as: 1= very satisfied, 2 = satisfied, 3 = do not know, 4 =
219 dissatisfied, 5 = very dissatisfied. These ratings correspond to 100%, 75%, 50%, 25% and
220 0% respectively.

221 Further questions on quality of life assessment included how much difficulty the participant
222 has in carrying out his or her daily tasks and how much near vision contributed to the

223 difficulty among others. All collected data were entered into a study questionnaire for each
224 participant.

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226 **2.8 Data management and analysis**

227 Each completed questionnaire was checked at the end of each day to ensure that there was
228 no missing information. Data was double entered and validated in Microsoft Office Excel
229 2007 for Windows XP Professional and was later uploaded and analysed using the
230 Statistical Package for the Social Sciences version 21 (SPSS, Chicago IL). Point prevalence
231 estimates were calculated. Descriptive statistics (frequencies and proportions) were used to
232 summarize qualitative variables. Chi-square test was used to test for association between
233 categorical variables.

234 Presbyopic correction coverage (PCC) was calculated with the formula:

$$235 \text{ PCC (\%)} = 100 \times \frac{\text{Met need}}{\text{Met need} + \text{Unmet need}}$$

236 Level of statistical significance was set at *P* value of less than 5% (.05).

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238 **2.9 Ethical considerations**

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240 Ethical clearance was obtained from the Cross River State Health Research Ethics
241 Committee. Permission to conduct the study in the LGA was obtained from the LGA primary
242 health care coordinator, the village chiefs and the Director of Cross River State Eye Care
243 programme.

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247 **3. RESULTS**

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249 A total of 422 participants were recruited to participate in the study. There were more
250 females than males in the study sample (224/422, 53.1%). The mean age of participants

251 was 51 years (± 11.2) ranging from 35 to 82 years. Almost three out of every five (59.2%)
 252 members of the study population were in the 35 to 50 years age group, while participants
 253 aged 67 years and above constituted the least age group (11.4%) [Table 1]. About two-fifth
 254 of the study population (40.5%) had tertiary education while at least 9 out of every 10
 255 persons examined belong to the most popular religion in southern Nigeria: Christianity.
 256 About two out every five person surveyed (41.0%) was self-employed (Table 1).

257

258 **Table 1 Socio-demographic characteristics of study participants (N = 422)**

Variable	Frequency (N=422)	Percentage (100.0%)
Age group (years)		
35-50	250	59.2
51-66	124	29.4
67-82	48	11.4
Sex		
Male	198	46.9
Female	224	53.1
Religion		
Christianity	396	93.8
Islam	20	4.7
Others*	6	1.4
Educational status		
Non-formal	54	12.8

Primary	41	9.7
Secondary	156	37.0
Tertiary	171	40.5

Occupation

Unemployed	35	8.3
Self-employed	173	41.0
Civil servant	154	36.5
Retired	48	11.4
Others**	12	2.8

Tribe

Efik	124	29.4
Ibibio	54	12.8
Ekoi	72	17.1
Others***	172	40.8

259 Others* include Grail Message, Eckankar, Rosicrucian and None.

260 Others** include politician and student

261 Others*** Igbo, Anang, Efut, Idoma, Oron, Degema, Quas, Ejagham, Bette, Bekwarra, Boki,

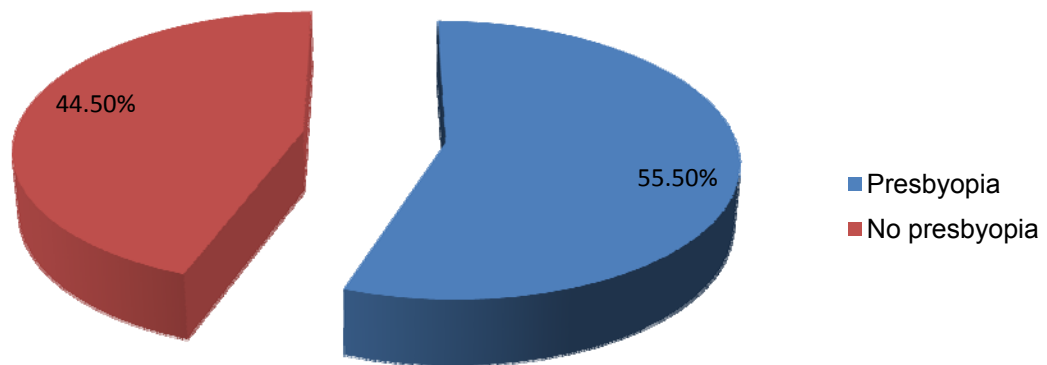
262 Ukelle, Tiv, Andoni, Yoruba, Urobo, Igbira, Nkim, Bansara, Ijaw, Abuo, Igalla, Mbembe,

263 Olulumo, Yakurr, Hausa, Isoko and Nupe

264

265 **Prevalence of presbyopia in Calabar South**

266 Two hundred and thirty-four out of 422 of the study participants were presbyopic. This gives
267 a prevalence of $234/422 = 0.555$ or 55.5% (95% confidence interval 51.3 – 60.1) ($p < .001$)
268 in the study population (Figure 1).
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271 **Figure 1 Prevalence of presbyopia in the study participants (N = 422)**

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281 **Prevalence of presbyopia among respondents by sex**

282 Chi-square test for assessing relationships between categorical variables indicated no
 283 significant association between gender and prevalence of presbyopia among the study
 284 participants. However, more female participants 132 (58.9%) compared to males 102
 285 (51.5%) had presbyopia (Table 2).

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287

288 **Table 2 Prevalence of presbyopia among respondents by sex**

Variable	Sex		χ^2	P- value
	Male (n=198) Freq. (%)	Female (n=224) Freq. (%)		
Presbyopia				
Present	102 (51.5)	132 (58.9)	$\chi^2 = 2.05, df = 1$.15*
Absent	96 (48.5)	92 (41.1)		
Total	198 (100)	224 (100)		

289 *P> .05

290 Freq. = Frequency

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297 **Presbyopia correction coverage**

298 Met presbyopic need (number of presbyopic participants who already had near vision
299 spectacles during the study period) = **89**

300 Unmet presbyopic need (number of presbyopic subjects who did not own near vision
301 spectacles during the study period) = **145**

302 Spectacle coverage (%) = Met need / Met need + unmet need x 100

303 = 89 / 89 + 145 x 100

304 = 38.0%

305 The calculation above reveals that the presbyopia correction coverage in the study
306 population during the study period was 38.0%.

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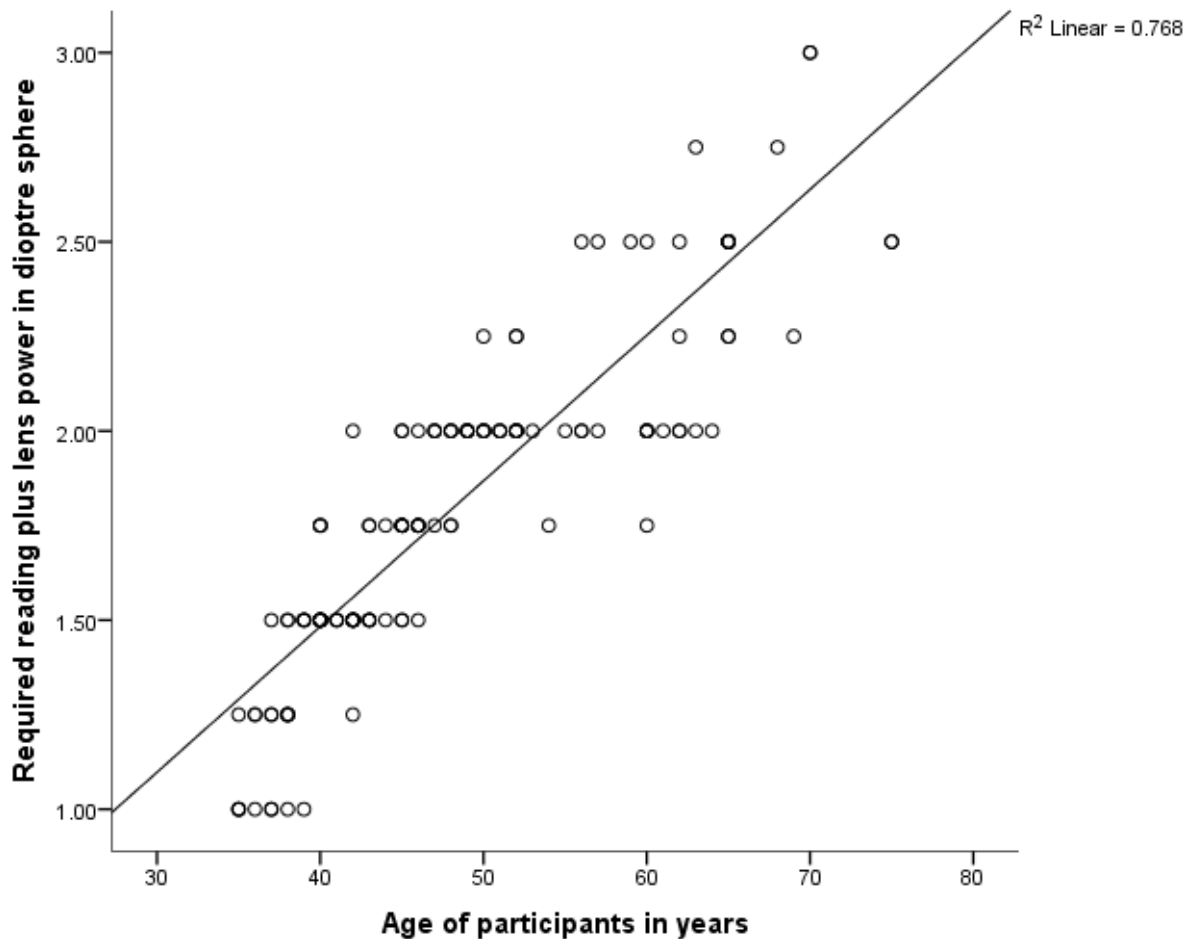
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324 **Age and presbyopia**

325 There was a strong positive correlation between age and the required near vision spectacle
326 lens power ($r = 0.88$, $p < .001$) with increasing age associated with higher presbyopic
327 correction lens power (Figure 2).

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329

330 **Figure 2 Relationship between age and presbyopic correction lens power**

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332 $r = 0.88$, $n = 145$, $P < .001$

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336 **Association between presbyopia and near vision-related quality of life**

337 A significantly higher proportion of the respondents with uncorrected near vision had low
 338 level of satisfaction with their vision-related quality of life compared to participants with
 339 corrected presbyopia (Table 3). Further test of association revealed that presbyopes are
 340 more likely to require help from other people as a result of poor near vision than do non-
 341 presbyopes (Table 4).

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345 **Table 3 Association between level of satisfaction with near vision and**
 346 **presbyopia among respondents (n = 234)**

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	Near Vision-Related QOL			χ^2	P-value
	Satisfied	Dissatisfied	Don't Know		
Presbyopes (n = 234)	Freq. (%)	Freq. (%)	Freq. (%)		
Corrected (n = 89)	33 (36.6)	53 (59.2)	3 (3.8)	11.77	.008*
Uncorrected(n = 145)	33 (23.1)	108 (74.5)	4 (2.4)		
Total	66 (28.2)	161 (68.8)	7 (3.0)		

348 *P < .05

349 Freq. = Frequency

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355 **Table 4 Comparison of the frequency of requiring support/assistance due to**
 356 **poor near vision in presbyopes and non-presbyopes.**

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Variable	Assistance Needed due to Poor Near Vision		χ^2	P- value
	Yes Freq. (%)	NO Freq. (%)		
Presbyopes (n = 234)	180 (76.9)	54 (23.1%)	28.54	.001*
Non-presbyopes(n=188)	97 (51.6%)	91 (48.4%)	df = 1	
Total (N = 422)	277	145		

359 *P < .001

360 Freq. = Frequency

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365 **4. DISCUSSION**

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367 The effect of presbyopia on quality of life and society in both the developed and developing
 368 worlds is a public health issue.[16] This survey provides a population-based data on the
 369 prevalence of presbyopia and the public health impact of uncorrected presbyopia vis-à-vis its
 370 effect on quality of life in residents of Calabar South, Nigeria.

371 **Prevalence of presbyopia in Calabar South**

372 The prevalence of presbyopia in this study was 55.5%. An earlier study in adults aged 35
 373 years and older in Nike, Enugu State, Nigeria found an objective presbyopia prevalence of
 374 63.4%.[17] A study in Gwagwalada, Nigeria found a functional presbyopic prevalence of
 375 53.4% [18] which is similar to the finding in this study. A similar study which examined 650
 376 individuals aged 40 years and above in Bungudu Local Government Area of Zamfara state in

377 north-west Nigeria, found a presbyopic prevalence of 30.4%. Other previous studies found
378 presbyopic prevalence of 85.4% in the Rift valley of Kenya,[6] and 61.7% in rural
379 Tanzania.[9] An earlier study in Chinese adults aged 40 years and above found a prevalence
380 of 69.3%.[19] The varying differences in prevalence of presbyopia may be due to the
381 different definitions of presbyopia, different minimum age of study participants and different
382 examination conditions (outdoors or indoors). Age as confirmed by the current study (Figure
383 2) is an established risk factor for development of presbyopia.[20] Furthermore, some
384 studies examined for objective presbyopia[17] while others examined for functional
385 presbyopia.[18,21] The current study examined for functional presbyopia. When functional
386 presbyopia is used, people with low or moderate myopia are less likely to be identified as
387 requiring presbyopic correction, so the estimated prevalence will be lower.

388

389 Another important finding of the present study was that the observed difference in
390 prevalence of presbyopia between male (51.5%) and female (58.9%) participants was not
391 statistically significant (Table 2). Although, these results differ from some published
392 studies,[9,20,18,21] they are consistent with those of a study in Jos, Plateau state,
393 Nigeria.[22]

394 The spectacle coverage of 38.0% in the current study is higher than presbyopia correction
395 coverage obtained in a previous study conducted in a rural community in Enugu, south-east
396 of Nigeria which found presbyopic spectacle coverage of 27.8%.[17] Another study in a rural
397 community in Abuja found a presbyopia correction coverage of 21%,[23] whereas a similar
398 study in a rural population in Zamfara state, north-western Nigeria revealed a presbyopia
399 correction coverage of only 0.7%.[21] A possible explanation for this discrepancy is that
400 unlike the current study, the previous studies cited were all conducted in rural communities
401 where it may be unlikely to find any form of eye care services. Literacy level and requirement
402 for use of reading spectacles are also more likely to be higher in urban community than rural
403 settlements.

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405 The strong positive correlation between age and required near vision spectacle lens power
406 observed in the current study is consistent with a previous work which linked increased
407 severity of presbyopia to age and higher educational background.[3] A significant proportion
408 of the participants (40.5%) in the present study had tertiary education.

409

410 **Effect of uncorrected presbyopia on vision-related quality of life**

411 The current study found significant association between uncorrected near vision and
412 reduced vision-related quality of life among the study participants (Table 3). A higher
413 proportion of presbyopic participants were found to require help from other people as a result
414 of difficulty with near vision than do non-presbyopes (Table 4). The findings observed in this
415 study mirror those of a previous study that have examined the impact of uncorrected
416 presbyopia on vision-related quality of life in a rural African setting.[8] The findings also
417 corroborate the results of previous studies in Nigeria which found an association between
418 uncorrected presbyopia and vision-related quality of life.[24,25] This combination of findings
419 provides some support for the conceptual premise that uncorrected presbyopia has potential
420 negative impact on quality of life and self-esteem.

421

422 **Limitations of the study**

423 An arguable weakness is the use of the WHO recommendations for the definition of
424 presbyopia: inability to read N8 at 40cm. This definition does not consider the fact that some
425 persons may still require spectacles for reading prints tinier than N8 optotype. Finally, the
426 issuance of free reading spectacles to participants that needed it during the study was likely
427 to influence their responses to some of the interview questions. Information bias that likely
428 resulted from this was however reduced to the barest minimum by concealing the fact that
429 free spectacles will be issued until after the survey was completed in a household.

430

431 **4. CONCLUSION**

432

433 This study has shown that presbyopia with a prevalence as high as 55.5% but with a
434 presbyopia correction coverage of only 38.0% in the study population is a major eye health
435 issue that requires intervention. Another obvious finding to emerge from this study is the
436 significant negative impact of presbyopia on vision-related quality of life. To address these
437 issues, there is need to scale up presbyopic correction services in the study area.

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439 **COMPETING INTERESTS**

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441 All authors have declared that no conflict of interests or financial support exist.

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445 **ETHICAL APPROVAL**

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447 Ethical clearance was obtained from the Cross River State of Nigeria Health Research
448 Ethics Committee.

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