Research Article

Prevalence, Correction Coverage, Unmet Need and Impact on the Quality of Life of Presbyopia among Market Traders in Ibadan, Nigeria

Adeyemi O. and Bekibele C.O.

Department of Ophthalmology, College of Medicine, University of Ibadan. Ibadan, Nigeria.

ABSTRACT

Presbyopia is an age-related condition that results from the gradual decline in accommodation leading to inability to focus at near distances. This study sought to determine the prevalence, correction coverage, unmet need and impact on the quality of life of presbyopia among Bodija market traders in Ibadan, Nigeria. A cross sectional study was conducted on 314 participants aged 35 years and older selected by a non-probability sampling method. Their near vision was tested and corrected to the nearest diopter. Presbyopia was defined as being able to read the N8 optotype at a distance of 40 cm after correction with plus lens of at least one diopter. The prevalence of presbyopia was 46.8% (95% CI: 41.20, 52.5). The prevalence was significantly higher in those aged 50 years or more (95% CI: 2.98, 7.77), in females (95% CI: 1.45, 3.64) and in individuals with no formal education (95%CI: 3.32, 10.91). The presbyopia correction coverage was 29.9% and unmet need was = 70.1%. The major barriers reported as reasons for not obtaining near vision spectacles were lack of money and spectacles not being a priority. Presbyopes reported more difficulty with near work (p<0.001). The prevalence of presbyopia in Bodija market is relatively low compared to other reports with major risk factors being increasing age, female gender and no formal education. Presbyopia correction coverage is low with high unmet need it is important to create awareness and provide affordable and accessible near vision spectacles for those in need.

Keywords: *Presbyopia, prevalence, correction coverage, unmet need, impact*

INTRODUCTION

Presbyopia is an age-related visual impairment that results from a gradual decrease in accommodation expected with age and may affect the quality of vision and of life (Goetz et al. 2014). Holden et al using multiple population-based surveys estimated that 1.04 billion people globally have presbyopia (Holden et al. 2008). Everyone eventually develops presbyopia but symptoms may vary. Presbyopia's exact mechanisms are not fully understood; research evidence most strongly supports a loss of elasticity of the crystalline lens. Current treatments are corrective in nature either by optical (bifocal, trifocals or contact lenses) or surgical (accommodative intraocular lenses or laser or conventional corrective surgical techniques) refractive modification (Goetz et al. 2014). Previous studies from low- and middle-income studies suggest that more than half of adults aged 30 years and greater have presbyopia with women being more affected both in prevalence and in severity (Patel & West 2007).

Population based studies from rural Tanzania, South India, Brazil, and Iran recorded presbyopia prevalences of 62%, 55.3%, 54.7% and 58.2% respectively (Burke et al.2006; Nirmalan et al. 2006; Duarte et al.2003; Hashemi et al. 2012). The ages of the study subjects in these studies vary remarkably and this makes it difficult to compare their results. A study conducted in Nike, Enugu, Nigeria had a prevalence of 63.4% (Uche et al. 2014) and another in Owerri 70.9% (Emerole, Nneli & Osim 2014). Visual impairment from uncorrected presbyopia predominantly exists (94%) in the developing world (Holden et al. 2008). Distance refractive error and presbyopia are corrected with readily available spectacles but the underserviced areas of the world where there are high levels of refractive error have limited access to spectacles (Holden et al. 2008). Access to spectacles in developing countries is limited by insufficient numbers of healthcare professionals able to perform relevant eye examinations, lack of available and affordable spectacles, and lack of adequate

public health support structures to help people obtain spectacles (Burke et al.2006; Nirmalan et al. 2006).

Meeting the needs of individuals suffering from presbyopia is an essential step towards addressing the burden of visual impairment in Nigeria. Recently, a study showed that met presbyopia needs was 17.6%, unmet presbyopia need was 48.8% and presbyopia coverage of 27.8% among a cross section of adults in Enugu, Nigeria (Uche et al. 2014). Presbyopia coverage was higher for males than females, for those with tertiary or secondary education than primary or no formal education and for skilled workers more than manual workers. Presbyopia affects quality of life as demonstrated in studies conducted in high income countries like the United States. McDonnell et al. showed that presbyopia had significant negative effects on health-related quality of life (McDonnell et al. 2003).

In developing countries like Nigeria where literacy rates are low, it is a misconception to think that presbyopia has no impact on the quality of life (Patel & West 2007). Near vision is needed for tasks such as sorting rice, winnowing grain, weeding, cooking food, dressing children and operating mobile phones. In a study done in Tanzania, almost 80% of people with presbyopia reported having problems with near vision and 71% were dissatisfied with their ability to do near work (Patel & West 2007). A population-based study conducted in rural Gwagwalada, Nigeria revealed that subjects with presbyopia had reduced quality of life because activities of daily living could not be accomplished easily without glasses (Chioma & Jamda 2017).

To the author's best knowledge, the prevalence, correction coverage, unmet need and impact on the quality of life of presbyopia in Oyo State has not been assessed limiting appropriate planning and implementation of necessary interventions. More epidemiological research in presbyopia is needed to generate data that can inform policy change and/or design population-specific intervention. As more data become available, an increasingly accurate picture of the burden of presbyopia will emerge. Although many studies have shown that visual impairment reduces the quality of life but only few have investigated the impact of presbyopia. The study is aimed at determining the prevalence of presbyopia, its correction coverage, unmet need and impact on the quality of life among Bodija market traders in Ibadan, Nigeria.

MATERIALS AND METHODS

Study design: This study was an analytical cross-sectional study conducted in Bodija market between February 2016 and January 2017. The study involved one-time interaction with the participants.

Study population: Market traders aged 35 years and older, males and females in the study area were the target population for the study. This age group was chosen because previous studies have shown that the disease occurs more commonly in this age group. The population of Bodija market is a mixture of different socioeconomic strata who go to the market for the purpose of trading.

Study area and setting: Bodija market is located in Bodija, a district in Ibadan North Local government area of Oyo state,

south western Nigeria. It is about one kilometer from the University of Ibadan along the road to the State Government's secretariat which is also about one kilometer away. The market is populated by Hausa, Igbo and Yoruba traders. It is the largest food market in Ibadan. The market is designed in such way that each produce such as pepper, rice, beans and yams has its own row of stalls. The market also has a timber section, abattoir and trailer park. The market is a mixture of open space trading and concrete and wooden stalls.

Sample size determination: A minimum sample size was calculated prior to data collection. This estimate was obtained using the formula for estimating the sample size for single proportion at an assumed prevalence o**f** presbyopia of 70.9% (Emerole, Nneli & Osim 2014) ,95% level of confidence and allowable margin of error of 5% and adjusting for non-response rate of 10%. The sample size was 314.

Sampling method: A non -probability sampling method was used to select participants. On the day of visit, eligible traders were asked if they would participate in the study and only consenting volunteers were interviewed.

The inclusion criteria included traders domiciled in the market, aged 35 years or older, both males and females. Those who were excluded are traders younger than 35 years, buyers and visitors.

Data collection, instrument and quality controls: A questionnaire adapted from a previous study was used for data collection. The questionnaire included: socio demographic characteristics, record of near vision examination carried by the investigator, service provision, service utilization and visual function. The questionnaire was translated to Yoruba language. The questionnaire was pretested in the eye clinic section of the general outpatient department of the University College Hospital. Near vision was assessed binocularly using a near vision chart held at 40cm from the participant's eyes. The smallest line read was recorded as the presenting near visual acuity. For those who already had spectacles for presbyopia, their presenting near visual acuity with and without spectacles were recorded. If the person was able to see N8 or better without any spectacles, they did not need spectacles for presbyopia. For those who had spectacles that could read N8 also did not new spectacles. For those who could not read N8, plus lenses were introduced binocularly in half diopter steps until the subject was able to correctly identify the N8 line or no further improvement occurred. Presbyopia was defined as being able to read the N8 optotype at a distance of 40 cm after correction with plus lens of at least one diopter. Functional presbyopia is defined as requiring at least +1.00 diopter in order to read the N8 optotype at a distance of 40 cm in the participant's usual visual state. Distance vision was not assessed. Arrangements are being made to provide spectacles to those who met the presbyopia criteria.

Met and unmet needs

In this study, met need refers to those presbyopes who have spectacles and were satisfied with their correction. On the other hand, unmet need refers to those presbyopes who do not

have spectacles and those who were unsatisfied with their present correction.

Total need is the sum of met and unmet need.

Presbyopia correction coverage was calculated from the following equation (Laviers et al. 2010):

$$\text{Met need/total need} \times 100$$

Data analysis: Data was entered and analyzed using the Statistical Package for the Social Sciences version 23.0. Main outcome variables were the prevalence of presbyopia, met need, unmet need, correction coverage and impact on quality of life. Independent variables included demographic variables. Chi-square test was used for test of associations. The level of significance was set at 5 %.

Ethical considerations: The study protocol was reviewed and approved by the University of Ibadan/University College Ethical Review Committee (Approval Number: UI/EC/15/0325). Ethical principles were adhered to.
.

Prevalence of presbyopia: Of the 314 participants,147 had presbyopia giving a prevalence of 46.8%. Participants that were aged 50 years or more were 4.8 times more likely to be presbyopic compared to those less than 50 years and this is statistically significant (95% CI= 2.98, 7.77; p = <0.001). Females were 2 times more likely to have presbyopia than men and this was statistically significant (OR=2.30; 95% CI= 1.45, 3.64). Those with no formal education had almost 4 times higher odds than those with tertiary level of education of having presbyopia (OR=3.79; 5%CI=3.32, 10.91) as shown in Table 2.

RESULTS

Demographics: The baseline characteristics of the study sample are shown in Table 1. Three hundred and fourteen people participated in the study; the ages of the respondents range from 35 to 80 years with a mean age of 48.5 ± 9.4. There were 136 and 178 male and female participants respectively.

Table 1:
Baseline Characteristics of the study sample

	Characteristic	Frequency	Percentage
Age group	<40	52	16.6
	40-49	123	39.2
	50-59	94	29.9
	60 and above	45	14.3
Gender	Male	136	43.3
	Female	178	56.7
Marital status	Single	8	2.5
	Married	299	95.2
	Widowed	7	2.2
Level of education	No formal education	21	6.7
	Primary	78	24.8
	Secondary	142	45.2
	Tertiary	73	23.2
Religion	Christianity	123	39.2
	Islam	189	60.2
	African traditional religion	2	0.6

Table 2:
Prevalence of presbyopia by age, gender and level of education

Variable		Presbyope		Non- Presbyope		OR (95% CI)	p value
		n	%	N	%		
Age Group	50 or more	94	67.6	45	32.4	4.81(2.98, 7.77)	<0.001
	Less than 50	53	30.3	122	69.7		
Gender	Female	99	55.6	79	44.4	2.30 (1.45, 3.64)	<0.001
	Male	48	35.3	88	64.7		
Level of education	No formal education	15	71.4	6	28.6	3.79(3.32, 10.91)	0.020
	Primary	35	44.9	43	55.1	1.23(0.63, 2.36)	0.635
	Secondary	68	47.9	74	52.1	1.39(0.79, 2.47)	0.320
	*Tertiary	29	39.7	44	60.3	1	

*Reference category

Table 3:
Presbyopia Correction Coverage

Variable		Unmet need		Met need		OR (95% CI)	P value
		N	%	N	%		
Age group	50 or more	62	66	32	34	0.57 (0.26, 1.23)	0.147
	Less than 50	41	77.4	12	53		
Gender	Female	68	68.7	31	31.3	0.82 (0.38, 1.75)	0.599
	Male	35	72.9	13	27.1		
Level of education	No formal education	15	100	0	0	-	<0.001
	Primary	24	68.6	11	31.4	3.09(1.11, 8.63)	0.054
	Secondary	52	76.5	16	23.5	4.60(1.82, 11.64)	0.002
	*Tertiary	12	41.4	17	58.6	1	

*Reference category;
% met need = Presbyopia correction coverage

Presbyopia correction coverage: Table 3 shows presbyopia correction coverage. Participants aged 50 years or more had less odds of having unmet need than those less than 50 years, however it is not statistically significant (95% CI=0.26, 1.23; p= 0.147). The odds of unmet need in females was less than in men (OR =0.82; 95% CI =0.38, 1.75; p=0.599). The odds of having unmet need was higher in those with secondary level of education than those with tertiary level of education and this is statistically significant (OR =0.4.60 ;95% CI =1.82, 11.64).

Source of Spectacles: Of the 66 participants who had purchased spectacles,34.9% obtained them from private hospitals,27.3% obtained them from private optometrist. Other sources were as shown in table 4.

Barriers to purchasing spectacles: Majority of those who needed spectacles but did not purchase stated lack of money as the reason (38.3%). Other reasons disclosed are shown in table 5.

Table 4:
Source of spectacles

Source	Frequency	Percentage
Private optometrist	18	27.3
Over the counter	6	9.1
NGO-donated	1	1.5
Roadside seller	6	9.1
Private hospital	23	34.9
Government owned hospital	5	7.6
Church outreach	5	7.6
Overseas	2	3.0
Total	**66**	**100**

Table 5:
Barriers to purchasing spectacles

Barrier	Frequency	Percent
Not aware of the problem	11	13.6
Not aware of service	2	2.5
Services are too far	1	1.2
Lack of money	31	38.3
Not a priority	25	30.9
Others	11	13.6
Total	**81**	**100**

Effects of uncorrected presbyopia on the quality of health of Bodija traders: On amount of near work, majority of the participants reported doing little or no near work (n=247,78.7%. Others are as shown in table 6. There was a statistically significant association between having presbyopia and difficulty with near work as shown in Table 7.

Table 6:
How much near work

Near work	Frequency	Percentage
None/little	247	78.7
Moderate	59	18.8
Great	8	2.5
Total	314	100

DISCUSSION

This study set out with the aim of determining the prevalence, correction coverage, unmet need and impact on the quality of life of presbyopia among Bodija market traders.

In this study, unexpectedly the prevalence of presbyopia among those aged 35 years or older is low,46.8% (95%CI: 41.20, 52.5). This could be because of the inclusion of those less than 40 years as the average age of those first reporting symptoms of presbyopia is between 42 and 44 years of age with a complete loss of accommodation typically occurring between the ages of 50-55 years (Kleinstein 1987: Croft, Glasser and Kaufman 2001). This finding however, is in agreement with another cross sectional community based survey done in Kahama District, Tanzania (Mashayo et al. 2015) which had a prevalence of 46.5% among those aged 35 years or older but lower compared to other studies such as the one in Nike, Enugu state which had a prevalence of 63.4% (Uche et al. 2014), Muhammad and co-workers found a prevalence of 53.4% in Gwagwalada, Abuja (Muhammad, Jamda & Langnap 2017), Sherwin & Mathenge found 85.4% in Nakuru district, Kenya (2007); and is higher than the prevalence in a community based study conducted in a rural area in Anambra State, Nigeria which found a prevalence of 33% (Nwosu 1998). These varying differences in prevalence may arise from differences in definitions of presbyopia, age ranges of subjects, examination conditions in terms of outdoors or indoor and some authors examined for functional presbyopia while others for objective presbyopia. This study examined for functional presbyopia.

Another important finding is that there is a statistically significant association between presbyopia and age and this is consistent with other studies (Mashayo et al. 2015; Muhammad, Jamda & Langnap 2017). The prevalence of presbyopia also increases with female gender and this is consistent with other studies (Mashayo et al. 2015; Muhammad, Jamda & Langnap 2017).

The presbyopia correction coverage is (29.9%,95% CI: 22.78, 338.09) with an unmet need of 70.1%. The unmet need is higher in those with less than tertiary education and thus, low literacy level in this study may have contributed to the low presbyopia correction coverage.

Table 7:
Presbyopia and difficulty with near work

Presbyopic status	None (%)	Little (%)	Moderate/great (%)	Total (%)	Chi-square	P value
Presbyope	31.1(21.1)	93(63.3)	23(15.6)	147(100)	100.1	<0.001
Non -presbyope	128(76.6)	37(22.2)	2(1.2)	167(100)		
Total	159(50.6)	130(41.4)	25(8.0)	314(100)		

The presbyopia correction coverage in this study although low is in agreement with studies done in Nike, Enugu state (Uche et al. 2014) and Timor-Leste (Ramke et al. 2007) which revealed a correction coverage of 27.8% and 26.2% with unmet need of 45.8% and 11.7% respectively. Our presbyopia correction coverage is higher than that in Nakuru, rural Kenya, where the presbyopia correction coverage was at 6.3% with an unmet need of 80% (Sherwin & Mathenge 2007) and in Zanzibar the presbyopia correction was 17.6% (Laviers et al. 2010). The reason for this disparity between our study and other studies could be from differences in definitions of presbyopia correction coverage and unmet need and the demographics of the populations studied.

The most commonly stated reason for not purchasing spectacles was 'lack of money' followed by 'not a priority'. This is consistent with other studies from Nakuru, Zanzibar and Eritrea (Sherwin & Mathenge 2007; Laviers et al. 2010; Chan et al. 2013) which revealed similar reasons. This is probably due to the economic recession in the country and ignorance that correcting near vision impairment can increase their productivity at doing near work.

Our study was able to demonstrate that presbyopes had more difficulty with near work compared to non-presbyope. Similarly, Sherwin et al. were able to show that presbyopia is associated with near vision-associated functional impairment and likewise Patel and co-worker (Sherwin & Mathenge 2007; Patel & West,2007).

This study provided baseline information for monitoring and evaluating future eye care interventions in Bodija market. However, a limitation to this study is that distance vision was not tested and corrected for. Also, study design/sampling technique was non probability and may have introduced a bias in the selection of participants.

Our study demonstrated that presbyopia correction coverage is low with high unmet need. There is need to increase the awareness of the condition to enhance people's uptake of correction and increase the availability of good quality, affordable and readily accessible spectacles

In conclusion, Presbyopia is a widespread and the most common physiological age-related change that occurs in the adult eye. The prevalence of presbyopia in this study is relatively low with low correction coverage and high unmet need. It is recommended that awareness on the need for spectacle correction be created and provision of affordable and accessible near vision spectacles for those in need be made.

REFERENCES

Burke, A, Patel, I, Munoz, B, Kayongoya, A, McHwiwa,W, Schwarzwarzwalder, A & West ,S (2006): 'Population based study of presbyopia in rural Tanzania', *Ophthalmology*, vol. 113, no.5 ,pp.723-727.

Chan, V, Mebrahtu, G, Ramson, P, Wepo, M & Naidoo, K (2013): 'Prevalence of refractive error and spectacle coverage in Zoba Ma'ekel,Eritrea : a rapid assessment of refractive error', *Ophthalmic Epidemiology*,vol.20,no.3,pp.131-137.

Chioma, M & Jamda, A (2017): 'Impact of uncorrected presbyopia on the quality of life in rural Gwagwalada,Nigeria', *Journal of Community Medicine and Primary Health Care,* vol.29,no.1,pp.68-73.

Croft M, Glasser, A & Kaufman, P (2001): Accommodation and presbyopia', *International Journal of Clinical Ophthalmology*, vol.41, no., pp.33-46.

Duarte W, Barros A, Dias-da-costa J & CAtten, J (2003): 'Prevalence of near vision deficiency and related factors:a population based study' ,*Cadernos de Saude Publica* ,vol.19,pp.551-559.

Emerole, C, Nneli, O, & Osim, E, (2014): 'Presbyoia: prevalence, distribution and determinants in Owerri, Nigeria', *Journal of Experimental and Clinical Anatomy*, vol.13, pp.21-25.

Goetz,D, Stewart, C, Burns, R, Stewart,J & Nelson, L (2014): 'Review of the impact of presbyopia on the quality of life in the developing and developed world', *Acta ophthalmologica* vol. 92,pp.497-500.

Hashemi, H, Khabazkhoob, M, Jafarzadehpur, E, Mehravaran, S, Emamian, M, Yekta, A, Shariati, M & Fatouhi, A (2012): 'Population based study of presbyopia in Sharoud, Iran', *Clinical and Experimental Opthalmology*, vol.40, no.9, pp.863-868.

Holden, B, Fricke, T, Ho, S, Wong, R, Schlenther G, Cronge , S, Burnett, A, Papas ,E ,Naidoo ,K & Frick, K (2008): 'Global vision impairment due to uncorrected presbyopia', *Archives of ophthalmology*,vol.126,no. 12pp.1731-1739.

Kleinstein, RN (1987): . Epidemiology of presbyopia. In Stark L, Obrecht G,eds. Presbyopia :recent research and reviews from the third international symposium. New York: Professional Press Books,1987:12-8.

Laviers, H, Omar, F, Jecha, H, Kassim , G & Gilbert, C (2010): Presbyopic spectacle coverage ,willingness to pay for near correction and the impact of correcting uncorrected presbyopia in adults in Zanzibar,East Africa', *Investigative Ophthalmology & Visual Science*, vol. 51,pp.1234-1241.

Mashayo, E, Ving, F, Ramson,P,Chinanay,F &Naidoo, R (2015): Prevalence of refractive error, presbyopia and spectacle coverage in Kahama District,Tanzania: a rapid assessement of refractive error', *Clinical and Experimental Optometry*, vol.98,pp.58-64.

McDonnell, P,Lee, P, Spritzear ,K, Lindblad, A & Hays, R (2003): 'Associations of presbyopia with vision-targeted health-related quality of life', *Archives of Ophthalmology*, vol.121,pp.1577–81.

Muhammad,R, Jamda,M & Langnap, L (2017): 'Prevalence of presbyopia in rural Abuja,Nigeria',*Annals of Nigerian MedicineI*,vol.9,no.2,pp.56-60.

Nirmalan, P, Krishnaiah, S, Sharmanna, B,Rao, G& Thomas, R (2006): A population based assessment of presbyopia in the state of Andra Pradesh, south India: the Andra Pradesh Eye Disease Study' , *Investigative Ophthalmology and Visual Sciences*,vol. 47,no.6,pp.2324-2328.

Nwosu, S (1998): Ocular problems of young adults in rural Nigeria', *International Ophthalmology*, vol.22,pp.259-63.

Patel, I & West, S (2007): 'Presbyopia: prevalence, impact and interventions', *Community Eye Health*, vol.20, no.63, pp.40-41.

Ramke, J, du Toit, R, Palagyi, A, Brian, G & Naduviath, T (2007): 'Correction of refractive error and presbyopia in Timor-Leste', *British Journal of Ophthalmology*, vol.91, pp.860-866.

Sherwin,J & Mathenge, W (2007): 'Presbyopia,related functional impairment and spectacle use in rural Kenya', *US Ophthalmic Review*,vol.3,pp.8-10.

Uche, J, Ezegwui,I, Uche, E, Onwasigwe, E, Umeh ,R & Onwasigwe, C (2014): 'Prevalence of presbyopia in a rural African community, *Rural and Remote Health*, 14 (13): 273