



## Presbyopic Spectacles Correction Coverage and Barriers to Spectacles Uptake in Chikun LGA of Kaduna State

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### Authors' contributions

This work was carried out in collaboration among all authors. All authors read and approved the final manuscript.

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## ABSTRACT

**Background:** Presbyopic Spectacles Correction Coverage (PSCC) is a measure of presbyopic spectacle utilization in a defined area. Previous studies in Africa and Asia have shown low Met Presbyopic Need and high Unmet Presbyopia Needs with different barriers responsible for these.

**Purpose:** To determine the rate of presbyopic spectacles utilization and identify barriers to utilization in Chikun LGA, Kaduna State, Nigeria.

**Materials and Methods:** One thousand and forty seven (1047) eligible and consenting participants persons aged 35 years and above were examined in 63 clusters using multistage random sampling with probability proportional to size. Visual acuity (distance and near), anterior and posterior segment examinations and near refraction was done for all participants with distance correction in place where applicable. Inability to read N8 (1M) was considered presbyopia. Data

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was extracted from the presbyopic participants using a pretested questionnaire and the rates were calculated.

**Results:** A total of 1047 people participated in the study with a mean age of participants 48.2 years  $\pm$  8.194 SD and age range of 35 – 87 years. The met need was 24.8%, unmet 60.7% and Presbyopic Spectacles Correction Coverage (PSCC) of 27.8%. The main barriers to presbyopic spectacle utilization and/or ownership were "Unsatisfactory near vision" with available near spectacles (20.3%), "lack of money" (20.2%), "lost or broken spectacles" (18.6%) and "no felt need" (17.8%).

**Conclusion:** There was a low PSCC in this population unmet spectacle need and poor purchasing power as the main barriers to utilization, there is need for concerted efforts among stakeholders to bridge the gap and meet the refractive needs of the population.

*Keywords: Presbyopic; spectacles; correction coverage; barriers; uptake.*

## 1. INTRODUCTION

Presbyopic spectacles correction coverage (PSCC) also known as presbyopic spectacles utilization rate, is a measure of uptake of presbyopic spectacles in a defined area. Successive reports from developing countries have consistently shown low utilization rate but for a few with estimates from Africa to parts of Asia are between 0.0% - 61.5% [1-4]. Consequently, the Met Presbyopic Need (UPN) and Unmet Presbyopia Needs (UPN) respectively in these populations were low (0.2%- 50.0%) and high (31.3% - 45.8%) [2-5]. this has enormous negative effect on the productivity of the affected populations.

The most common barriers to presbyopic spectacle utilization reported include: 'not aware of service', 'not a priority', 'not aware of problem', 'services too far', and 'lack of money'. Others include, hospital protocol, belief that spectacles will damage one's eyes, cosmesis, broken/lost spectacles, far hospital, not a priority and belief that presbyopia is a normal aging process which does not need a remedy [2,3,5-8]. There is a need to identify local barriers in Chikun LGA to support eye care service delivery in Kaduna State.

In order to eliminate avoidable visual impairment the 2014 – 2019 Global Action Plan of the World Health Organization (WHO) included presbyopia in its refractive error program with the aim of reducing the magnitude of uncorrected presbyopia [9]. An effective way of achieving this objective is provision of affordable good quality presbyopic spectacles.

The purpose of this study was to estimate the rate of presbyopic spectacles utilization and identify barriers to utilization in the study area.

## 2. MATERIALS AND METHODS

This was a population based study conducted among individuals 35 years of age and above in Chikun Local Government Area of Kaduna, State. A sample of individuals aged 35 years and above resident in the LGA between Nov, 2017 and March, 2018 was obtained from the total population. The minimum sample size was calculated to be 1084 (using the Leslie-Kish formula), [10] A multistage cluster random sampling with probability proportional to size was used for cluster selection. The sampling frame consists of clusters (towns and villages) of enumeration areas in Chikun LGA based as on National Population Commission (NPC) estimated population for 2016 [11]. The estimated local government population was 484,376, There were 165 clusters which represent the total communities in the LGA out of which 63 were selected for the study. The sampling interval (SI) was obtained by dividing the local government population by the number of cluster ( $SI = 484,376/165 = 2935$ ) A point 377 was selected based from the list of the cluster and the community which had that number based on the list (Kubana) was the first cluster. The second cluster was selected by adding the SI (2935) to 377 which gave 3312. The community where this fell (Kubani) was selected. This was continued until the desired sample size was obtained. In each cluster, a bottle was spun in the center of the cluster to determine the direction to start. All adults, 35years and above, were enumerated consecutively in each household until the required sample was obtained in a cluster. The following were excluded from the study:

1. Non-resident (i.e. anybody who has not been residing in the area cumulatively for the past 6 months).

2. Available best corrected distance visual acuity (BCVA) <6/18.
3. Individuals whose vision could not be tested, such as those with severe illness, mental illness, deafness.

All individuals excluded due to visual impairment were National referred to Eye Centre, Kaduna for review and definitive care.

Demographic data obtained include; age, gender, education status, and occupation were obtained using a pre-tested questionnaire administered by a trained interviewer (which included the principal investigator).

All participants had binocular distance (using tumbling E-Chart at 6 meters) and near visual acuity (LogMAR Chart) tested. Anterior segment and post segment examination was done with Pen torch and magnifier and direct ophthalmoscope, respectively. Eligible persons were done refracted for distance and near to determine best corrected vision. Any participant who could not read 1M optotype at 40cm (N8) optotype with distance correction in place (if required) was adjudged presbyopic. Monocular and binocular near vision were tested using the LogMAR near E chart at 40 cm under ambient indoor illumination with best distance correction in place (where necessary).

A 40 cm string was attached to the near vision chart to ensure a measurement distance of 40cm from the forehead of each participant. Identification of 3 out of 5 characters constituted a successful reading of the line and the participant was permitted to move to the next line. Any one unable to read N8 had a plus spherical lens in 0.25 diopter increment added until the participant read N8 or until additional lenses yielded no further improvement. The principal investigator (ophthalmologist) did all the refractions and interviews on spectacle utilization and barriers to usage. Participants who needed reading spectacles were given free spectacles at the end of examination in the entire cluster to minimize bias.

Data entry was done using SPSS (Chicago Illinois) version 20 and statistical analysis done with a confidence interval and level of significance at the  $P < 0.05$ .

#### Study definitions:

1. Met presbyopic need (MPN): This is the number of presbyopic subjects who are able

to read N8 with presenting near vision spectacles out of the total population examined [6].

2. Unmet presbyopic need (UPN): This is the number of presbyopic persons without near vision spectacles or unable to read N8 with spectacles (where available) out of the total persons examined [6].
3. Presbyopic Spectacle correction coverage [6] (PSCC) =  $\text{Met need} / (\text{Met need} + \text{Unmet need}) \times 100$

**NB:** This is part of a larger study on time magnitude presbyopia and its impact vision related quality of life. The Prevalence of presbyopia in the population was of 85.6% (95% confidence interval: 85.58% - 85.62%) [12].

### 3. RESULTS

A total of 1047 people participated in the study with a mean age of participants 48.2 years  $\pm$  8.194 SD and age range of 35 – 87 years, 568 (54.3%) were females while 479 (45.7%) were males. Majority attained tertiary education 584 (56.2%) while 499 (47.7%) were civil/public servants.

A total of 505 presbyopic participants had presbyopic spectacles at presentation out of which 260 had near vision corrected to at least N8. The met need was 24.8% (260/1047 x 100). In all, 636 participants (245 had near spectacles but near vision not corrected to N8, 391 had no spectacles) could not see N8 due to uncorrected presbyopia. The unmet need was 60.7% (245+391/1047 x 100) and a PSCC for the population was 27.8% (met need/met need +unmet need x 100). There was a statistical significant difference in distribution of participants with presbyopic spectacles and age ( $P = 0.001$ ). Also, a significant higher amount of civil servants had presbyopic spectacles at presentation compared to other occupations ( $P = 0.007$ ) Table 1.

Majority (164/545-30%) of participants purchased spectacles at a cost higher than four thousand naira (\$11.1) and a good proportion (134/545 – 24.6%) obtained for free Fig. 2.

#### 3.1 Barriers

The bar chart show “no satisfaction with available spectacles”, “lack of money”, “lost or broken spectacles”, “lost or broken spectacles” and “no felt need” as the major barrier to ownership or use of presbyopic spectacles with frequencies

of 20.3% (131), 20.2(130)%, 18.6%(120) and 17.8(114)% respectively. While “no accompanying person” 1.1% (7) was the least frequent barrier.

#### 4. DISCUSSION

This study reported a low met presbyopic need (MPN) of 24.8% and PSCC of 27.8% as just 260 of the 505 participants who had their near spectacles at presentation could see N8 and better with the correction. These figures are markedly lower than 61.5% and 50.0%, respectively reported in Ifo Township [9]. The whole population in Ifo were teachers whose occupation required constant near work compared to the mix in this study. This socio-demographic difference between the two populations can be adduced as reason for the variation. Also, in this study, there was a significant difference between occupation and ownership of near spectacles too. This is also in keeping with a report from Ifo, Ogun State where occupational demands may have influenced participants to seek presbyopic correction [9]. Conversely, compared to earlier presbyopia studies in Nigeria, there appeared to be a higher PSCC, met and unmet need in this study. PSCC

in the index study was fairly higher than that from a study in Gwagwalada (F.C.T) and Dutse Jigawa State, [3,13] which both reported a PSCC of 21.0%, met need of 11.2% and 12.4% respectively as against a met need of 24.8% in this study. In Bungudu, Zamfara State, a very low PSCC of 0.7% was reported [2]. The low literacy level in the population may have contributed to this low value. Although this study did not show a significant difference between gender and literacy level as male gender and higher education have been reported to be associated with higher PSCC [3].

The barriers to presbyopic spectacle use were; ‘No satisfaction with available spectacle’, ‘lack of money’, ‘Lost or broken spectacles’ and ‘no felt need’. No satisfaction with available spectacle’ being the most common barrier as over 50% of participants had near correction at presentation but were not satisfied with their spectacles. The fact that road side (market) purchases and those whose glasses were gifts make up 35.2% of spectacles sources may be plausible reasons for this. Also, even from the hospitals there may be wrong prescription or wrong dispensing of which are important causes of spectacle intolerance and consequent poor spectacles acceptance.

**Table 1. Ownership of near vision spectacle by age, literacy level and occupation in participants with presbyopia**

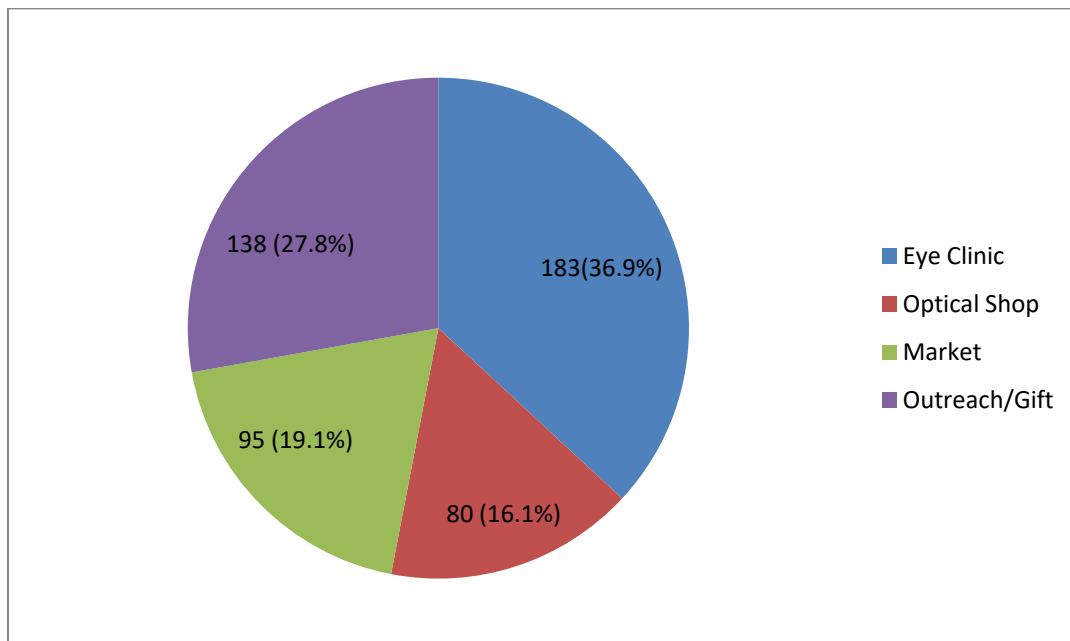
Age group (years)	Yes N (%)	NoN (%)		
35 -44	57 (6.4)	176 (19.6)		
45 – 54	299 (33.4)	172 (19.2)		
55 – 64	113 (12.6)	35 (3.9)		
65 -74	25(2.8)	15 (1.7)		
>/ 75	2	2	4	
<b>Total</b>	<b>496</b>	<b>400</b>	<b>896</b>	<b>P= 0.001*</b>
Literacy Level	Yes N (%)	NoN (%)	Total N (%)	
None	22 (2.5)	18 (2.0)	40 (4.5)	
Quranic	0 (0)	3 (0.3)	3 (0.3)	
Primary	76 (8.5)	68 (7.6)	144 (16.1)	
Secondary	128 (14.3)	91 (10.2)	219 (24.5)	
Tertiary	268 (29.9)	216 (24.1)	484 (54.0)	
Informal	2 (0.2)	4 (0.4)	6 (0.6)	
<b>Total</b>	<b>496 (55.4)</b>	<b>400 (44.6)</b>	<b>896 (100)</b>	<b>P= 0.293</b>
Occupation				
Unemployed	0 (0)	7 (0.8)	7 (0.8)	
Housewife	4(0.4)	8 (0.9)	12 (1.3)	
Farming	68 (7.6)	23 (2.6)	91 (10.2)	
Manual work	7 (0.8)	5 (0.6)	12 (1.3)	
Skilled(Self-employed)	55 (6.1)	44 (4.9)	99 (11.0)	
Civil (Public servant)	227 (25.3)	183 (20.4)	410 (45.8)	
Retired	58 (6.5)	25 (2.8)	83 (9.3)	
Trader	90 (10.0)	92 (10.3)	182 (20.3)	
<b>Total</b>	<b>496 (55.4)</b>	<b>400 (44.6)</b>	<b>896 (100)</b>	<b>P=0.007*</b>

*Higher % of civil servants own spectacles at presentation which is statistically (P =0.007)\*= Statistically significant*

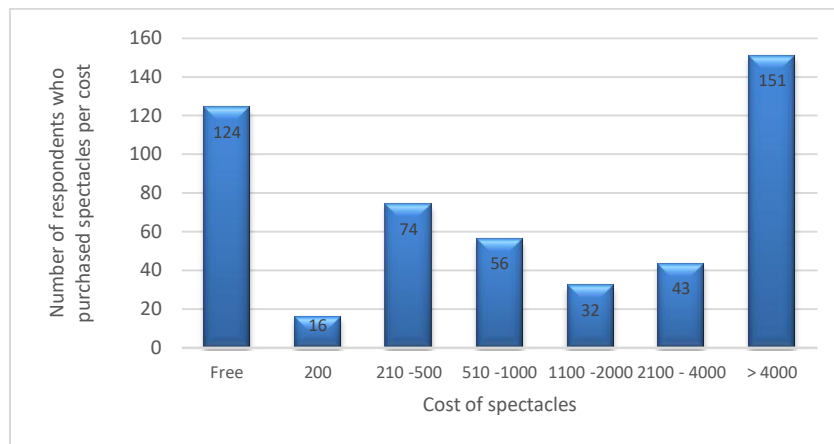
**Table 2. Presbyopic spectacle correction coverage, met and unmet needs**

Variable	Sample SN= 1047 (%)	NWP(896)	MPN n (%)	UPN n (%)	PSCC (%)	P
<b>Age group</b>						
35 – 44	332 (31.7)	223 (67.2)	42 (18.8)	181 (81.2)	23.2	0.000*
45- 54	508 (48.6)	478 (93.9)	133 (27.8)	345 (72.2)	38.5	
55 - 64	161 (15.4)	150 (93.2)	70 (46.7)	80 (53.3)	87.6	
65 – 74	41 (3.9)	41 (100)	13 (31.7)	28 (68.3)	46.4	
>/= 75	4 (0.4)	4 (100)	2 (50)	2 (50)	100	
<b>Gender</b>						
Male	478 (45.6)	391 (44.2)	99 (25.3)	292 (74.7)	34.0	0.000*
Female	569 (54.4)	505 (55.8)	161 (31.9)	344(68.1)	46.7	
<b>Literacy Level</b>						
None	42 (4.0)	40 (3.72)	13 (32.5)	27 (67.5)	48.1	0.047*
Qur'anic	3 (0.3)	2 (0.3)	1 (50)	1 (50)	100.0	
Primary	154 (14.7)	145 (13.9)	48 (32.6)	97 (67.4)	48.4	
Secondary	254 (24.3)	219 (20.4)	52 (23.7)	167 (76.3)	31.1	
Tertiary	584 (56.2)	484 (46.6)	146 (30.2)	338 (69.8)	43.3	
Informal	6 (0.6)	6 (0.6)	2 (33.3)	4 (66.7)	49.9	
<b>Occupation</b>						
Unemployed	8(0.7)	7 (0.8)	2 (28.6)	5 (71.4)	40.1	0.000*
House wife	15 (1.5)	12 (1.3)	0 (0.0)	12 (100.0)	0	
Farming	97 (9.3)	91 (10.2)	40 (44.0)	51(56.0)	78.6	
Other manual work	19 (1.8)	12 (1.3)	2 (12.0)	10 (83.3)	20.0	
Skilled (Self employed)	118 (11.3)	99 (11)	28 (28.3)	71 (71.7)	39.4	
Civil/Public Servant	499 (47.7)	410 (45.8)	118 (28.8)	292 (71.0)	40.6	
Retired	87 (8.3)	83 (9.3)	24 (29.0)	59 (71.1)	40.8	
Trader	204 (19.5)	182 (20.3)	56 (30.8)	126 (69.2)	44.5	

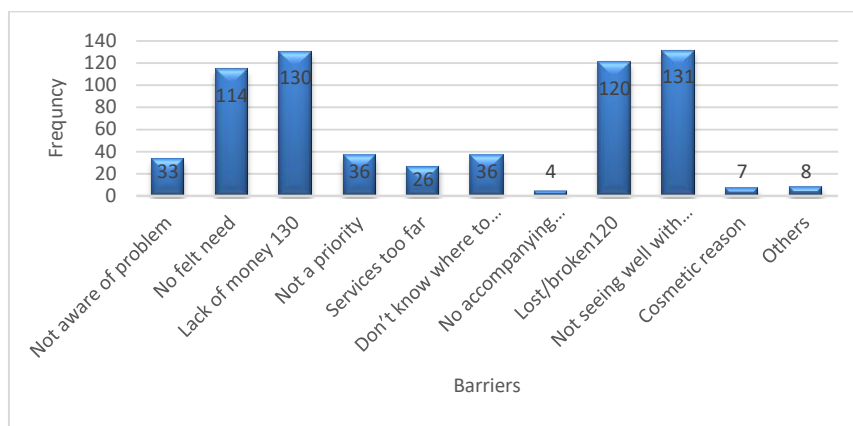
SN = Sample size, NWP = Number with presbyopia, MPN = Met Presbyopic Need, UPN = Unmet Presbyopic Need, PSCC = Presbyopic Spectacles Correction Coverage. The UPN captured in this table represent participants who have Presbyopic Spectacles at presentation



**Fig. 1. Pie chart depicting source of spectacles and it frequency a among 496 participants who own spectacle at presentation**



**Fig. 2. Showing respective cost of spectacles among presbyopic participants who own near spectacles with majority purchasing a at a cost higher than (\$11.1)**



**Fig. 3. Barriers to ownership or use of spectacles correction among 645 of 896 presbyopic participants**

The second most common barrier was cost of spectacle/ lack of money and was similar to report by Ifo Ogun, Nike Enugu and in Zanzibar [4,5,14]. However, other studies in northern Nigeria reported it as the most common barrier [3,13]. The study in Ifo was conducted among teachers in a township community while two of the studies in Northern Nigeria were in Rural populations who are expected to have relatively lower socio-economic status [2,3,5]. Chikun is a predominantly urban population where over half of the study population have attained tertiary level of education with a seemingly steady source of income.

Fig. 1 shows that only 19.1% of the respondents who own spectacles obtained their reading glasses from the road side. This suggests that the majority must have consulted an eye care worker before proceeding to obtain their reading spectacle and this is in accordance with best

practices. The benefit of this practice is that some eye conditions (which initially may be asymptomatic) such as primary open angle glaucoma and diabetic retinopathy, which otherwise may have gone undetected until later stages, are more likely to be discovered and managed appropriately. The reason for this high consultation rate may be attributed to high literacy level of the study population where 78% attained at least secondary level of education (24.5% - Secondary and 54%- tertiary) as seen in Table 1.

We recommend training and retraining of middle-level manpower such as nurse refractionists and CHEW refractionists in parts of Chikun LGA to bridge the existing gap and reduce the UPN. Also community insurance involving the informal sector will mitigate the economic barriers to uptake of near spectacle services especially in the rural area.

## 5. CONCLUSION

This study recorded a low PSCC (27.8%), MPN (24.8%) and a high UPN (60.7%), which is not acceptable considering the fact that presbyopic spectacle correction is very affordable. Also, poor satisfaction with available spectacles, lack of money and no felt need were the most common barriers. Training of middle-level manpower for refraction and incorporation of eye care into the primary health care system will bridge this avoidable gap. Making spectacle more affordable and accessible, enlightenment are expected to mitigate these barriers and will improve uptake of presbiopic spectacles.

## CONSENT AND ETHICAL APPROVAL

Ethical approval was obtained from the Research and Ethics Committee, National Eye Centre, Kaduna. Administrative clearance obtained from the Kaduna State Ministry of Health and Human Services, Chikun Local Government Council and its traditional rulers. Written informed consent was also obtained from each participant.

## COMPETING INTERESTS

Authors have declared that no competing interests exist.

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