Near vision spectacle coverage and barriers to near vision correction among adults in the Cape Coast Metropolis of Ghana.

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Abstract:

Purpose: To determine the near vision spectacle coverage and barriers to obtaining near vision correction among adults aged 35 years and older in the Cape Coast Metropolis of Ghana.

Methods: A population-based cross-sectional study design was adopted and 500 out of 576 participants aged 35 years and older were examined from 12 randomly selected clusters in Cape Coast, Ghana. All participants underwent a comprehensive eye examination which included: distance and near visual acuities measurements and external and internal ocular health assessments. Distance and near refractions were performed using subjective refraction technique. Information on participants' demographics, near vision correction status, near visual needs and barriers to acquiring near vision correction were obtained through a questionnaire administered as part of the study.

Results: The mean age of participants was 52.3±10.3 years of whom 280 (56%) were females and 220 (44%) were males. The near vision spectacle coverage was 25%, 33% "met need" for near vision correction in the presbyopic population, and 64% unmet need in the entire study population. After controlling for other variables, age (5th and 6th decades) and educational level were associated with "met need" for near vision correction (OR=2.7 (1.55-4.68), p =0.00, and OR=2.36 (1.18-4.72), p=0.02 respectively). Among those who needed but did not have near vision correction, 64 (26%) did not feel the need for correction, 55 (22%) stated that they were unaware of available interventions, and 53 (21%) found the cost of near vision correction prohibitive.

Conclusion: There was a low near vision spectacle coverage in this population which suggests the need for strategies on health education and promotion to address the lack of awareness of spectacle need and cost of services.

Keywords: Presbyopia, near vision, spectacle coverage, unmet needs, Ghana.

Introduction

Presbyopia is an age-related physiological change in the eye which results in loss of ability to accommodate for near viewing,[1] and generally occurs between ages 40 and 45 years or earlier with a female preponderance.[1,2] The age-related change in presbyopia occurs primarily in the lens: lenticular growth, and changes in its elastic properties. This is observed clinically as a receded amplitude of accommodation.[3] The impact of presbyopia on the quality of life, and the potential loss of productivity are remarkably high for both literate and illiterate populations.[4-6] Yet, a simple and cost – effective intervention through provision of a pair of near- vision spectacles can easily help to address this visual disability.[7] An average cost of near vision spectacle in Ghana is approximately $ 5.8 Near-vision spectacle could be dispensed as single vision, bifocal or progressive eye glasses to meet near vision needs.[2]

Recent evidence suggests that the ageing population in Ghana is increasing and this could have implications for the visual needs of individuals in this age category.[9,10] Ageing is associated with an increased rate of eye diseases some of which are potentially blinding.[11] The adult

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population in Ghana has varied occupational and recreational tasks some of which require extensive periods of near work. Occupations such as fishing, farming, dress making which are common in many Ghanaian communities, could potentially benefit from near vision spectacles corrections.[12] Furthermore, proliferation of portable devices such as smart phones and their wider acceptance by both literates and illiterates in many developing countries including Ghana mean that near vision-related activities are not only limited to traditional reading.[10] Efficient near vision tasks could be easily accomplished if there are near vision spectacle corrections available. Only two studies have reported on the prevalence of presbyopia in Ghana with little or no information on near vision spectacle coverage in those study populations.[2,13] This study therefore sought to determine the near vision spectacle coverage and identify barriers to near vision correction among adults aged 35 years and older in the Cape Coast Metropolis, Ghana. This information is necessary to provide the basis for planning efficient near vision spectacle services.

Materials and methods:
Study design, area and sample selection
A population-based cross-sectional study in adults aged 35 years and older, who were randomly selected from 12 clusters in the Cape Coast Metropolis of Ghana was conducted. A minimum sample size of 576 was determined using the following the mathematical formula:

$$n= Z^2pq/ d^2.^{14}$$

Where n= required sample size, p= expected prevalence, q= (1-p), d= degree of accuracy. (Z=1.96, p=55, d=5%). The value obtained was multiplied by 1.5 to account for design effect.

In accordance with a previous related study conducted in South Africa,[15] the lower age boundary of 35 years for presbyopia was used in the current study. Cape Coast is the capital of the Central region of Ghana. It has one of the highest growth rates in adults aged 60 years and older.[10] The educational and socio-economic backgrounds of adults varies and includes: teachers, traders, fishermen and women, and artisans.[16] The area also has eight eye care facilities with different cadres of eye care professionals including: ophthalmologists (2), optometrists (16), and dispensing opticians (6) which should theoretically translate to improved refractive services and an adequate near vision spectacle coverage. These reasons informed

the choice of this area for the study. The population in the Cape Coast metropolis is approximately 170,000, with 60% of the population in urban settlements.[16,17] There are 18 settlements (clusters), and 12 (8 from urban and 4 from rural locations) were randomly selected. Using probability proportionate to size, participants were calculated for each cluster and those who met the inclusion criteria within each cluster were enumerated two days before the data collection day. Households were identified by "random-walk", and "the spinning bottle" technique was used to choose directions when the team came to an area with a junction within a cluster.[18] Adults aged ≥ 35 years within each household were enumerated until the required sample for the cluster was obtained. Participants selected were individuals resident in any of the selected settlements for more than three months, were without any ocular pathologies and presented with a distance, pinhole visual acuity better than or equal to 6/18 in the worse seeing eye.[14,18] An opinion leader (Assembly man), who was a resident of respective clusters assisted in identifying the boundaries of clusters as well as inhabitants in each cluster. The study was conducted at a common assembly point in each cluster such as community or health center.

Study definition and examination procedures
A presbyope in this study was defined as a participant needing an optical correction of ≥ +1.00D added to the best distance optical correction to improve near vision to a near visual acuity criterion of at least N8 line or better.[7,19] The study team consisted of four experienced optometrists, a local health worker and a final year optometry student. Examination procedures consisted of distance visual acuity, measured under ambient outdoor illumination, and acuity charts were positioned to prevent reflections which could induce glare. Distance Snellen charts were used to measure visual acuity; a tumbling "E" chart was used for illiterate participants and a letter chart for literate individuals. An external eye examination with a hand-held slit lamp biomicroscope and an internal examination with direct ophthalmoscope were done to exclude participants with ocular pathology. This was followed by distance refraction using subjective technique to obtain the best correction. Subjective refraction technique, which relies on a participant's feedback, involves placing a series of trial lenses before the eye until a clear retinal image is perceived by the participant.[20] Near vision was then assessed monocularly over distance refractive correction using a near Snellen chart, held at 40cm from the participants'

eyes. A near version of the tumbling 'E' chart was used to assess the near visual acuity of illiterate participants. Any participant who needed an additional plus lens ≥ +1.00D to obtain a near visual acuity of N8 was considered presbyopic. The participant then responded to a pre-tested questionnaire which covered areas such as the near vision correction status, near visual needs and barriers to acquiring near vision correction.

Statistical analysis

Statistical analyses were carried out using Statistical Package for Social Sciences (IBM SPSS Statistics for windows, version 21, Armonk, NY, USA). Descriptive statistics including percentages, means and standard deviations were computed. Determinants of near vision correction were computed using Chi square statistical test and logistic regression analysis. Near vision spectacle coverage was computed by finding the proportion of the study participants who had near spectacle correction (100 × those with correction/ (those with correction + those without correction), while the "met near spectacle correction need" was computed as those with near spectacle correction in the presbyopic group. The "unmet need" was calculated as those without near vision correction or those with under corrected near correction. These definitions have been previously used in other population-based presbyopic studies.[14,18]

Ethical consideration

The study was conducted in accordance with the tenets of the Declaration of Helsinki. Ethical approval was obtained from the ethics review board of the Department of Optometry, University of Cape Coast (Reference number: FYP/15/0004). Participant's consent was sought before the study commenced. For those who could not read and write, the study aim and procedures were explained to them in local dialect (Fante). Participants without near vision spectacles were given spectacles after the examination procedures while participants who presented with other vision-related problems were referred to the nearest eye centre.

Results

Five hundred participants out of the 576 took part in the study giving a response rate of 87%. Their mean age was 52.3 ±10.3 years and 280 (56%) were females while 220 (44%) were males. The majority of participants (76%) were educated having had at least a basic school certificate while 24% were uneducated. Details of participants' demographics are shown in table 1.

Table 1. Demographic characteristics of study participants

Variable	Presbyopic n(%)	Non-presbyopic n(%)
Age		
<40	7(18)	32 (82)
40-49	132(73)	49 (27)
50-59	136(84)	26(16)
60-69	68(88)	9(12)
≥70	33(80)	8(20)
Gender		
Male	154(70)	66(30)
Female	222(79)	58(21)
Education		
No formal education	91(76)	29(24)
Basic	177(73)	64(27)
Vocational	53(83)	11(17)
Secondary	25(78)	7(22)
Tertiary	30(70)	13(30)
Occupation		
Unemployed	64(84)	12(16)
Unskilled	132(72)	52(28)
Skilled	180(75)	60(25)
Total	**376(75)**	**124(25)**

Of the 500 participants examined, 376 (75%) were presbyopic by the study's definition. One hundred and twenty-five of the participants owned and presented with a near vision spectacle correction at the time of the study.

This represents a near vision spectacle coverage of 25 % (125/500 × 100) and a 33% (125/376 ×100) 'met need' among the presbyopic population. However, only 11 %(56/500×100) were comfortable with their current

spectacles, with 14% (69/500×100) reporting difficulty with near vision due to under correction when using their current prescription. The source and conditions of current spectacle for those who owned one are presented in table 2. The unmet presbyopic need in the study population was 64% (those with under corrected near correction (69) + those with uncorrected presbyopia (251)) = 100 × (69+251)/ 500).

<p style="text-align:center">Table 2. Source and state of spectacle for participants with "met need"</p>

Source of spectacle prescription	n(%)
Eye care Centre	77(62)
Wayside vendor	48(39)
Condition of glasses	
Good	56(45)
Not very good	45(36)
Bad	24(19)
How long Glasses has been used	
≤ 6 months	19(15)
1 year	32(26)
2 years	28(22)
3 years	24(19)
4 years	23(18)
Total	**125(100)**

The mean near addition lens (near ADD) required was 1.50D ±1. 00D. Univariate analysis of "met need" and socio demographic factors revealed that "met need" was associated with age and educational level (Table 3).

<p style="text-align:center">Table 3. Results of Univariate analysis of socio-demographic variables on 'met near vision spectacles need'.</p>

Demographics	X^2	*p*-value
Gender	0.72	0.397
Age	17.00	0.002
Educational level	30.71	0.000
Occupation	2.72	0.606

Further analysis using logistic regression revealed statistically significant relationships between met presbyopic need and age (statistical significance was observed in those in the 5th and 6th decades), and educational level (Table 4).

Table 4. Results of logistic regression analysis of socio-demographic variables on 'met near vision spectacles need'

Variable	No. examined n(%)	No. of 'met need' n(%)	Adjusted OR (95% CI)		*p*-value
Gender					
Male	220(44.0)	53(42.0)	**Reference**		–
Female	280(56.0)	73(58.0)	1.03 (0.64,1.65)		0.90
Occupation					
Unemployed	76(15.2)	23(18.3)	**Reference**		–
Skilled	184(36.8)	41(32.5)	0.52 (0.25,1.28)		0.17
Unskilled	240(48.0)	62(49.2)	0.66	(0.34, 1.60)	0.44
Age					
<40	39(8)	0(0.0)			–
†40-49	181(36)	32(25.4)	**Reference**		–
50-59	162(32)	59(46.8)	2.70(1.55,4.68)		0.00
60-69	77(15)	27(21.4)	2.36(1.18,4.72)		0.02
≥70	41(8)	8(6.3)	2.01(0.66,6.09)		0.22
Education					
No formal education	120(24.0)	11(8.7)	**Reference**		–
Basic	241(48.2)	65(51.6)	6.58(3.04,14.24)		p<0.001
Vocational	32(6.4)	24(19.0)	10.41(4.12,26.31)		p<0.001
Secondary	64(12.8)	10(7.9)	8.05 (2.67, 24.22)		p<0.001
Tertiary	43(8.6)	16(12.8)	14.62(5.03,42.44)		p<0.001

†40-49 was held as a reference group because there were no participants in the <40 group.
OR: Odds ratio, CI: Confidence interval

Results of barriers to obtaining near vision spectacle in those with 'unmet need' included: lack of felt need for near vision correction 64 (26%), unaware of available intervention/correction 55 (22%%), financial constraint 53 (21%), lack of access to eye care facilities 32 (13%), other barriers such as concerns about perception of spectacle wear 29 (12%), and more than one barrier 12 (5%). Many participants 188 (50%) were willing to obtain a pair of near vision spectacles if the cost was between 5-30 Ghana Cedis (GHS) (approximately 2-8 US $), while 154 (41 %) were willing to pay if the cost of was GHS 5 (2 US $) only. Thirty-four (9%) were willing to pay as much GHS 30 (8 US $) or more for near vision spectacle. Two hundred and thirty-nine (63.8%) of the participants wanted the National Health Insurance Scheme to cover the cost of near vision spectacles, 18 (5%) did not support the idea and 119 (32%) were indifferent.

Discussion

Our study sought to profile near vision spectacle coverage and barriers to near vision spectacle coverage in the Cape Coast Metropolis of Ghana. This is usually the first step towards planning near vision correction (presbyopic) services in the community.[21] The response rate for our study was high, which is comparable to other related presbyopia studies.[7,14,18] This high response rate could be partly explained by a desire on the part of participants to be provided with corrections for their near vision problems. Also, the enumeration and recruitment strategies could have had an impact on the high turnout. The mean age of study participants compares to a similar study in Nigeria,[14] and could be the reason for a low near ADD observed in the study participants given that younger presbyopes normally require lower ADD. Majority of participants in our study were literate and people with high literacy have been reported to engage in near visually demanding tasks such as reading.[14] Consequently, absence of near correction in such persons could affect their quality of life and well-being.

The spectacle coverage rate observed in our study was lower compared to a recent study in Nigeria.[22] While their study participants were staff of a health facility who were

more likely to be educated and own spectacles for near tasks such as reading, our study participants were adults in the community with different educational and occupational backgrounds. The low spectacle coverage in this area suggests that it is a high priority area for targeted intervention using WHO recommendation.[23] Public health strategies to increase presbyopic correction coverage could be undertaken by optometrists and other eye care professionals in a region which has a reported low refractive services.[24] Results of met presbyopic need in our study are similar to those of Timor- Leste study[18] in terms of the proportion of the study population with "met need" and factors which are associated with met need. Age and educational level were associated with met presbyopic need. With increasing age, the progressive loss of ability to accommodate will increase the severity of presbyopia which could be a compelling reason to seek correction. This may help explain why adults in their fifth and sixth decades in particular, were likely to have their near vision correction need met. The use of near vision correction for work-related activities maybe pronounced in this age group and could explain this finding even though no statistically significant association between "met need" and occupation was observed. Similarly, literate adults would be more willing to get near corrections as reading and execution of other near vision related tasks become difficult. While some previous studies have found gender as a determinant of met presbyopic needs,[18,25,26] our study did not find that. This could be due to our study location being predominantly urban, compared to the other studies which were conducted in rural settlements, where cultural factors such as unequal access to eye care by males and females, markedly influence the gender difference in met presbyopic need.[26] The majority of those who had a near vision spectacle correction had obtained them from an eye care centre. This is a positive finding as they may have been seen by a qualified eye care professional, and may have had a comprehensive eye examination, compared to those who may have obtained their correction from a wayside vendor for example.

Barriers to obtaining near correction were mainly due to lack of felt need, financial constraint and lack of awareness of available intervention. These findings are consistent with those of previous studies conducted in developing countries.[14,18] The benefits of having near vision correction for economic, educational, and recreational activities are enormous. Consequently, increased public health ed-

ucation in the communities could help increase interest in near vision correction, and raise awareness about available interventions. Provision of affordable spectacles in both routine clinical eye care, and during community outreach programmes could help to overcome the cost barrier. This is important as the study found that many participants were willing to acquire a pair of near correction if the cost was US $ 2 or less, which is far below a previously reported cost of $5.8 Also, inclusion of near vision spectacles to the list of prosthesis covered by the national health insurance scheme, which is the main method of health financing in Ghana, could help to improve near vision spectacle coverage.

Conclusion
In summary, our study found a low near vision spectacle coverage for a study population with a high prevalence of presbyopia. This and several barriers to obtaining a near vision correction reported in this study warrant mitigation through public awareness and health promotion messages. Education on the benefits of near vision correction, and provision of affordable spectacle services (including national health insurance financing of near vision spectacles) should be developed to address this challenge.

Conflict of interest:
The authors have no conflict of interest to declare.

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