Healthy Aging & Clinical Care in the Elderly

ORIGINAL RESEARCH

Ocular Health of the Emerging Elderly Population in Ghana: Evidence From a Peri-urban Community

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Abstract

Purpose: As people age, the risk of visual impairment increases because the major eye diseases that cause visual disorders are age-related. By the age of 65, 1 in 3 people suffer from some degree of eye disease that contributes to impaired vision. This study assessed ocular disorders, visual impairment, and blindness among an elderly population at Yamoransa, Ghana.

Method: A community based cross-sectional survey was conducted among 170 elderly (aged 60 years and over) persons. The research participants underwent a complete ophthalmic examination that involved visual acuity, external, and dilated internal examinations.

Results: The mean age of the respondents was 70 years with 58.2% being females. Visual impairment and blindness were found among 58.7% and 5.9%, respectively, according to their presented visual acuity; these decreased to 45.3% and 5.2%, respectively, after optical correction. About 68.3% of the respondents had poor near vision with only 40% having near reading corrections. The major causes of visual impairment were cataract (42.5%), uncorrected refractive errors (21.8%), retinal disorders (11.4%), and glaucoma (9.8%). Among the elderly with bilateral blindness, cataract was the main cause. Multinomial logistic regression showed that sex had a higher likelihood of being associated with visual disorders compared with age and education ($P = 0.001$); similarly females, older patients, and the those with no education had higher odds ratios.

Conclusion: The need for increased health education, regular eye examination, and the need to subsidize surgical and refractive eye care services for the elderly in Ghana cannot be over emphasized.

Keywords: elderly, eye disease, Ghana, population, visual impairment

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Introduction

Aging is not just numerical, but a physiological process that steadily reduces the body's ability to fight diseases, resulting in diminished ability to compensate for a toll of illness at old age.[1] Chronic illnesses accumulate with age and increase in severity. At old age, the triple burden of social problems, psychological decline, and disease can lead to difficulty in performing simple physical and mental tasks, making adaptations necessary for daily life.[2] Global population and health figures suggest that the number of elderly persons needing care will continue to increase. This is evident in the decline in mortality rates and increases in life expectancy at birth, especially in developing countries.[3] According to the World Health Organization (WHO) in 2010, there were 680 million people aged 60 years and above worldwide, and going by the trend of the population ageing in the world especially in developing countries, this number is expected to increase to 1.2 billion by 2025 and 2 billion by 2050.[4] The challenge in administering the best of care for the elderly lies with the ability to investigate and develop appropriate comprehensive assessment, practical interventions, and rehabilitation strategies tailored to the specific needs and resources of older patients. A study by WHO[5] indicates that the situation is particularly challenging in developing countries where available data indicate that about 90% of the world's 285 million visually impaired and 39 million blind persons live.

Ghana has not officially defined a specific age bracket to determine who is an elderly or aged person.[6] Various programs and documents, which could be assumed to wholly or partially target older people, do not have a clear-cut definition of elderly. The 2000 Ghana population census defined the aged as people 60 years and above, the same age for compulsory retirement from the civil or public service.[7] The proportions of the population aged 60 years and older and those aged 65 years and older rose from 4.9% and 3.2%, respectively, in 1960 to 7.2% and 5.2%, respectively, in 2000 (Table 1). Overall, the proportion aged 50 years and above was 13.6% in 2000. The increase in the proportion of persons 60 years of age and above in Ghana reflects the increasing life expectancy at birth, which rose from 50 years among males and 54 years among females in 1984 to 55 and 60 years, respectively, in 2000[6] and is estimated to be 61 years among males and 63 years among females in 2012.[8] Very little is known about the ocular health profile of Ghana's elderly population. Projections indicate that by 2050, the aged population will account for 14.1% of the total population of Ghana and constitute the highest age group needing health care.[6]

Global population figures suggest that about 4% of persons 60 years and above are blind and about 65% are visually impaired,[4] yet these groups constitute only about 11% of the world's population, making them a high risk group.[9] This is partly due to reduced cell growth, atrophy of cellular structures, and lowered metabolism in the tissues in and around the eyes leading to functional changes in the eye.[10] To the aged patient, often the myriad of changes come as a shock, and adapting to the resultant visual disability is

Table 1. Percentage distribution of Ghana's elderly population by sex: 1960–2000.

	Age group	60–64	64–69	70–74	75–79	80+	Total	Number
1960	Both sexes	1.75	0.91	0.84	0.46	0.96	4.42	325,178
	Male	1.87	0.95	0.88	0.48	1.02	5.20	176,814
	Female	1.46	0.86	0.80	0.44	0.90	4.46	148,364
1970	Both sexes	1.71	1.10	0.96	0.49	1.08	5.34	452,236
	Male	1.77	1.12	0.99	0.51	1.09	5.48	232,780
	Female	1.53	1.06	0.94	0.48	1.08	5.09	219,456
1984	Both sexes	1.84	1.18	1.05	0.58	1.20	5.85	706,385
	Male	1.78	1.16	1.05	0.60	1.17	5.76	349,278
	Female	1.89	1.20	1.04	0.37	1.23	5.73	357,107
2000	Both sexes	1.94	1.37	1.19	0.77	1.96	7.23	1,366,408
	Male	1.90	1.38	1.14	0.79	2.01	7.22	675,603
	Female	1.98	1.36	1.24	0.74	1.91	7.23	690,805

Source: Mba, 2010.
Note: *The percentages refer to the proportion of the aged population to the total country population.*

beleaguered with psychological and social problems in the face of their frailty.[11]

Diseases such as cataract (47.8%), glaucoma (12.3%), age-related macular degeneration (ARMD) (8.7%), diabetic retinopathy (4.8%), and corneal opacity (5.1%), which are age related, are listed as the leading causes of blindness in the world by the WHO.[12] Resultant visual impairments increase frailty in the elderly patient. These developments are seen as major global public health problem because of the challenge they pose to the elderly in performing their daily activities effectively.[13] Strategies such as vision screening and comprehensive assessment by eye health practitioners or rehabilitation personnel are required for identification of those elderly people with treatable impairment of vision and for promoting the necessary referral of those who may benefit from rehabilitation.[14]

With Ghana's population expected to grow for a considerable period of time into the latter part of the 21st century, the elderly population of the country is expected to increase. As a result of this emerging aging phenomenon, there is the need to highlight research gaps about the health profile and what could be done concerning population aging in the Ghanaian context. This study attempts to draw attention to the ocular health status of the elderly in peri-urban community in Ghana.

Methods

Participants

This community-based cross-sectional study was conducted at Yamoransa in the Mfantsiman West District of the Central Region of Ghana in 2012. The total population of the town was 5413 comprising 45.8% males and 54.2% females, and 5.7% of persons were aged 60 years and above in 2010.[8] The study population consisted of all persons aged 60 years and above, or 308 persons (5.7% of 5413). All elderly persons that met the age criteria for the study had an equal chance of participating in the research. National Health Insurance (NHIS) and voter identification cards were used to verify participants' ages. Community volunteers were used to validate that participants were residents of the community.

Procedure

The study involved a survey using a semi-structured interview guide, ophthalmic (eye) examination, and observation. The team that undertook the fieldwork was made up of 5 experienced doctors of optometry (OD), an ophthalmic nurse, 5 senior optometry clinical students, and 3 social workers. All the team members also had previously been involved in community eye screening and so were conversant with their roles. The examination protocol included detailed ocular history and visual acuity (VA), which was recorded as presented visual acuity (PA) measurement with or without glasses according to what the patient was wearing at the time of the examination. For distance VA, a tumbling E optotype chart was used at 6 meters, and for near VA, Jaeger's tumbling E optotype chart was used at 40 cm, both with adequate light conditions. Refractive errors were evaluated by both objective method using streak retinoscopy and subjective method using the following: trial lenses to refine errors detected after which VA was recorded as best corrected visual acuity (BCVA); external eye examination using a penlight; dilated internal eye examination using direct ophthalmoscopy to evaluate retinal status including vessels, macula, and optic disc features; and hand held applanation tonometry to measure intraocular pressure (IOP) when indicated. A verifying process was performed on a subsample of cases diagnosed at the regional hospital by the resident ophthalmologist.

To prepare the patients for the eye examinations, they were given a short health education and prepared by the ophthalmic nurse. Preliminary tests such as VA and pinhole examination were performed by the senior clinical students under supervision by optometrist. Penlight examination, ophthalmoscopy, and refraction were done by the doctors of optometry. Diagnoses were cross-checked by different examiners to determine the major cause of visual impairment in either eye. When multiple disorders were present, the examiners attempted to identify the disorder causing the greatest limitation of vision. If there were any other contributory causes, the examiners specified these as secondary causes. When 2 causes appeared to have an equal contribution to visual impairment, the primary cause was assigned to the one that was amenable to treatment to restore vision. Each eye examination process took about 30 minutes to complete. In all, a total of 170 elderly persons out of the potential 308 had their eyes screened. This constituted 55.2% of the expected number. A preexamination interview was administered

by the social workers of the team and an optometrist to determine the sociodemographic background of respondents. Each questionnaire took about 15 minutes to administer. The 170 individuals who were available for the eye screening were interviewed.

Data analysis

Visual impairment (moderate visual impairment) was determined using PA and BCVA less than 6/18 to 6/60 in the better eye and blindness using visual acuity of less than 3/60 in the better eye.[15] Pathologic conditions were entered as abnormal findings. Data obtained were analyzed using the Statistical Package for Service Solutions (SPSS version 16) to carry out descriptive statistics, chi-square tests, and multinomial regressions. The multinomial logistic regression analyses were carried out to test the hypotheses that eye disorders and visual impairment has an independent effect on selected sociodemographic variables. Independent variables included age, sex, and education level, while dependent variables were the major causes of visual impairments (ocular disorders) and visual impairment. The model allowed the prediction of multiple discrete outcomes of the categorically distributed dependent variables.

Ethical considerations

The proposal for the study was first approved by the Institutional Review Board of University of Cape Coast (UCCIRB). Further, permission was sought from the chief and elders of the Yamoransa after assuring them of the harmless nature of the study. Participants were made to sign informed consent forms attached to the questionnaires after the procedures of the study had been explained to them. Those diagnosed with eye problems were given eye medications and optical aids provided by the research team and Lions Club of Cape Coast. Those who needed specialist attention were referred to the regional hospital.

Results

Sociodemographic background

Sociodemographic characteristics such as age, gender, education, and occupation of any study population are crucial for the interpretation of their health status. Background information of the 170 elderly persons who reported for the screening and interview showed that 86.4% were from the Central Region, 12.4% from other regions and 2 were non-Ghanaians. Of those from the Central Region, 64.1% were born at Yamoransa while a further 4.7% were born in other towns in the Mfantsiman West district.

Out of 170 respondents, 71 (41.8%) were males, and 99 (58.2%) were females (Table 2). The distribution shows that half of the respondents were aged 60 to 69 years (young old), and those aged 80 and over (oldest old) accounted for 17.1%. The mean age of the respondents was 70 years (SD 8.7, range 60–101 years). Crucial is also formal education, which helps individuals make informed decisions that can have implications for their health and well-being.[8] Data collected (Table 2) showed that 58.8% of respondents of both sexes (78.8% for females and 31% for males) had had primary education, and 39.4% had had middle or secondary education. Only 8.2% had had postsecondary education.

Eye examination

Distance visual acuity was measured and recorded as PA. Respondents were then refracted and their vision

Table 2. Respondents by highest level of education and sex in percentages.

	Male				Female				Grand total
Education	**60–69***	**70–79**	**80+**	**Total**	**60–69**	**70–79**	**80+**	**Total**	
No education	5.0	–	–	2.8	2.1	–	–	1.0	1.8
Primary	12.5	35.3	78.6	31.0	63.0	89.2	100	78.8	58.8
Middle Sch./JSS	17.5	11.8	–	12.7	8.7	2.7	–	5.1	8.2
Secondary/Tech/Vocational	45.0	47.1	14.3	39.4	21.7	2.7	–	11.1	23.0
Post secondary	20.0	5.9	7.3	14.1	4.3	5.4	–	4.0	8.2
Total	100	100	100	100	100	100	100	100	100
Total number	40	17	14	71	46	37	16	99	170

**Age group.*

recorded as BCVA (the most appropriate refractive correction). The differences between the 2 visual acuities were noted. Visual impairment and blindness was defined either in terms of PA or BCVA in the better eye. Using the International Classification of Diseases, 10th revision (IDC-10)[15] grades for visual impairment, visual impairment was defined as VA <= 6/18 (moderate impairment) in the better eye to estimate impairment before (PA) and after correction (BCVA). Studies among the elderly either use PA or BCVA to measure visual impairment, but in this study both standards were used to allow for comparative analysis in the same study.

Visual impairment and blindness

As indicated in Table 3, 58.7% of respondents had visual impairment, and 5.9% were found to be blind according to PA. After corrections, the number decreased to 45.2% and 5.3% for visual impairment and blindness, respectively, using BCVA. This translates into about 14% who were either visually impaired or blind at the point of examination but had improvement in vision after intervention and, therefore, fell outside that categorization. Visual impairment among each age group decreased after correction showing that if refractive corrections are administered, respondents' vision could be improved.

Near visual acuity was also measured in each eye separately and in both eyes. The scales used were N 5 to N 10 (normal near vision), N 12 to N 36 (moderate near vision impairment) and vision equal or greater than N 37 (severe near vision impairment). Those who could not identify any line on the near vision chart were considered to be blind at near. About forty (23.5%) of them fell between N 12 and N 36 on the near visual acuity chart, and a further 34.0% were severely impaired at near and were expected to have problems with near vision or at least not able to read clearly if they were literates. Only 40.0% of those with near visual impairment had near correction (reading spectacles) to correct their impairment. Fifteen (8.8%) individuals could not see at near at all.

Main causes of visual impairment and blindness

The most common causes for visual impairment were cataract 42.5%, followed by uncorrected refractive errors (21.8%), retinal disorders (11.4%), and glaucoma (9.8%), and post operative cataract complications accounted for 7.3% of cases (Table 4). Age-related macular degeneration (ARMD), hypertensive retinopathy, and diabetic retinopathy were the most common conditions in the retinal disorders category. Cataract accounted for 117 (29.2%) of 400 conditions and was the most diagnosed in the 340 eyes of the 170 participants examined. Plotting the number of diagnosed cataracts on a map of Yamoransa by area, respondents from Ahenbrom had the most cataracts (13–16) followed by those at Etsifi (9–13). Other close areas of Kokwaado and By-pass station

Table 3. Distribution of presented visual acuity (PA) and best corrected visual acuity (BCVA) in the better eye in percentages.

Visual acuity	PA	BCVA
>=6/6*	10.2	15.9
6/9	17.6	17.7
6/12	7.6	15.9
6/18	14.1	10.0
6/24	7.6	12.9
6/36	23.5	13.5
6/60	13.5	8.8
<=3/60	5.9	5.3
Total	100	100
Total number	170	170

**Snellen acuities.*
VA >=6/6 = Normal vision, VA < 6/6–6/9 = Mild visual impairment, VA < 6/12–6/18 = Moderate visual impairment, VA < 6/18–6/60 = Severe visual impairment, VA <=3/60 = Blindness.

Table 4. Major causes of visual impairment (VI) and blindness in percentages.

Causes	VI PA (VA < 6/18)
Cataract	42.5
Glaucoma	9.8
Post. cat. operative complication	7.3
Uncorrected RE**	21.8
Comea Opacity	4.4
Retinal Disorders*	11.4
Pterygium	1.8
Trauma	1.0
Total	100
Total number	110

**Retinal disorders = PA: Age-related macular degeneration (ARMD) (7.3%); Hypertensive Retinopathy (3.7%) and Diabetic Retinopathy (0.9%) BCVA: ARMD (7.3%); Hypertensive Retinopathy (3.7%) and Diabetic Retinopathy (0.9%).*
***RE: Uncorrected refractive error.*

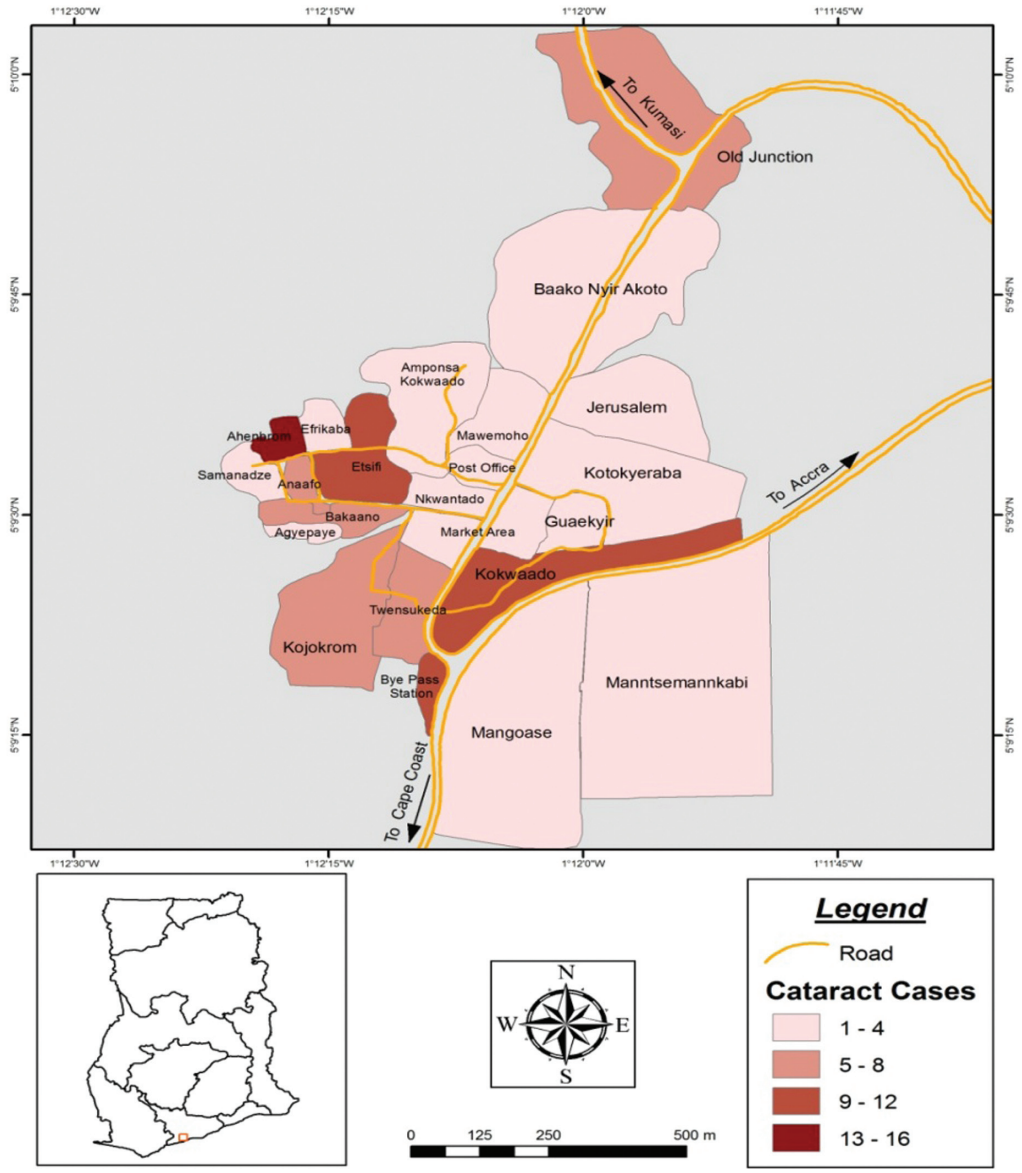

Figure 1. Map showing the distribution of diagnosed cataract at Yamoransa.

also recorded the same margins. Adjoining areas of Kojokrom, Twensukeda, and Old Junction recorded a range of 5 to 8 cataracts (Fig. 1).

The study analyzed whether the principal (major) cause of impairment was influenced by respondents' sociodemographic characteristics. The relationship was evaluated using the multinomial logistic regression model with ocular disorders and visual impairment as the outcome and sex, age, and education as the covariates. The results indicated that sex had the highest likelihood ratio of 201.084 and was also the only variable with a P value less than 0.05 ($P = 0.001$). This suggested that only sex showed any difference in the major causes of visual impairment as compared with age and educational level (Table 5).

In terms of visual impairment, the outcome ocular disorders, it was found that variations in sex, age, and educational level had no significant effect on visual impairment. However, from the likelihood ratios, it is shown that educational level (140.008) had a higher likelihood to cause variations in visual impairments than sex (135.981) and age (138.728) (Table 5). Associations (odds ratios) of major causes of visual impairment and the resultant visual impairment with age, sex, and education are shown in Tables 6 and 7. Females, the oldest old, and persons with no

Table 5. Association between major causes of visual impairment and visual impairment.

Effect	Model fitting criteria	Likelihood ratio tests		
	–2 Log likelihood of reduced model	Chi-Square	Df	Sig.
MCVI*				
Intercept	195.549	22.085	9	0.009
Sex	201.084	27.620	9	0.001
Age	185.911	12.447	9	0.189
Educational level	182.526	9.062	9	0.432
VI**				
Intercept	137.996	4.736	4	0.315
Sex	135.981	2.721	4	0.606
Age	138.726	5.466	4	0.243
Educational level	140.008	6.748	4	0.150

*MCVI Major cause of visual impairment.
**VI Visual impairment.

formal educations had higher odds of having visual impairment.

Discussion and Conclusion

A number of scientific studies have focused on the impact of aging on the various spheres of social life.[13,14,16] Most, however, have concentrated on the financial-economic consequences. Relatively little attention has been paid to the consequences of visual impairment/poor eye health on an aging population. This is particularly the case in developing countries where aging is emerging as a developmental issue. The study was community-based to investigate eye problems among the elderly population at a peri-urban community in Ghana. This is the first report of results of the survey on visual impairment and ocular disorders among an elderly population in Ghana.

The study encountered some challenges in the field that must be acknowledged. Firstly, despite the acceptable response rate of 55.2%, the prevalence of ocular disorders and visual impairment may be overestimated or underestimated assuming that those that did not participate in the study were less or more likely to be suffering from ocular disorders and/or impaired vision. Again, prevalence estimates among the study population were based only on visual acuity measurements, and therefore, some visual impairment associated with visual field defects could have been missed, resulting in a potential underestimation among them. Secondly, because the clinical examination was conducted on site, some heavy equipment needed for certain clinical or investigative procedures could not be conveyed to the site. As result, some diagnoses could not be confirmed on-site, which affected the accuracy of some of the findings. In spite of these limitations, data from this study will provide valuable insight into the magnitude of eye health problems among the aging population in Ghana.

The age distribution found in the study sample is comparable to the elderly population in the Central Region but lower than the national average of persons 60 years and older in Ghana, that is, 4.9% and 7.8%, respectively.[8] The gender distribution among the respondents is also comparable to that of the studied administrative district (45.2% males and 54.8% females[8]) and the Central Region (47.7% males and 52.3% females[8]). A possible factor for the slightly higher representation of women in the study could be due to a greater participation of women in community activities and their higher life expectancy.

The prevalence of visual impairment and blindness and their causes were comparable to those reported in other countries.[5,12,16] Comparison with other studies, however, should be treated with caution, as the results are very sensitive to VA classification criteria and the population used. In this study, different approaches were used to investigate visual disorders, such as visual acuity assessment and ophthalmic diagnosis. In order to compare the results with other studies, we presented data using the WHO criteria for visual impairment.[15] Since visual impairment due to uncorrected or undercorrected refractive errors is missed with the best corrected visual acuity definition, the results were presented based on both PA

Table 6. Odds ratios for major causes of visual impairment.

Variable	Cataract		Glaucoma		Post. cat. operative complication		Uncorrected RE		Comea opacity		Retinal disorder	
	OR	95% CI	OR	95% CI	OR	95% CI	OR	95% CI	OR	95% CI	OR	95% CI
Sex												
Male	1		1.00		1		1		1		1	
Female	1.739	0.104–29.144	1.00	0.048–20.829	1.79	1.790–9.790	0.600	0.027–13.586	0.500	0.023–11.088	12.00	0.384–34.837
Age												
60–69	1		1		1		1		1		1	
70–79	2.382	2.080–40.717	7.741	15.137–69.621	3.090	6.059–71.851	0.468	0.686–1.786	3.091	0.076–51.173	1.548	2.671–12.876
80+	0.733	0.043–12.642	0.423	0.012–14.486	4.231	0.169–105.946	1.679	0.262–20.689	2.821	0.125–63.847	0.846	0.022–33.106
Education												
No formal Education	1		1		1		1		1		1	
Primary	2.000	2.080–44.350	1.000	0.299–12.022	1.000	0.493–14.895	1.000	0.211–13.087	0.0069	0.012–0.377	0.0047	0.067–0.876
JHS	1.167	0.239–15.789	0.002	0.076–0.887	1.000	0.457–15.760	0.0013	0.021–0.288	0.333	0.122–1.766	0.167	0.977–1.080
Secondary	0.005	0.021–0.733	1.877	0.090–44.350	1.00	0.276–14.87	1.582	0.103–17.007	0.005	0.0828–0.286	0.0029	0.004–0.451

Table 7. Odds ratios for visual impairment.

Variables	Presenting acuity (PA)		Best corrected visual acuity (BCVA)	
	OR	95% CI	OR	95% CI
Sex				
Male	1		1	0.172–0.612
Female	1.939	1.011–3.719	3.083	1.634–5.817
Age				
60–69	1		1	
70–79	1.000	0.302–3.312	0.698	0.232–1.647
80+	4.556	1.595–13.009	4.879	1.942–12.257
Level of education				
No formal Education	1		1	
Primary school	0.650	0.067–6.281	0.522	0.082–3.313
Middle school/JHS	0.290	0.121–0.698	0.137	0.059–0.316
Secondary	0.044	0.011–0.181	0.027	0.003–0.216
Tertiary	0.002	0.002–0.021	0.003	0.003–0.032

**Adjusted Odds Ratio at 95% CI from Multiple Logistic Regression.*

and BCVA to estimate visual impairments amendable to treatment. These definitions gave the "real" magnitude of visual impairment in the respondents as well as the impact of refractive corrections.[15,18,19] Regarding the strong effect of age on the estimate of visual impairment, it should be considered that only elderly persons 60 years and above were employed in the study.

Consistent with other studies,[9,12,20] cataract was the leading cause of visual impairment and blindness as more than a third (42.5%) of the cause of visual impairment and blindness was attributed to cataract. Senile changes in the eye accounted for the high number of cataract cases found in the population considering their age distribution; however, occupational exposures to heat, lack of access to surgical care, cost, and deep-seated sociocultural beliefs about uptake of cataract surgery underpinned the geographical differences in cataract distribution in the area. Persons living in urban centres have much better access compared with the other parts of the country to health services like cataract surgery. Refractive errors, another condition that is easily treatable by optical aids, was another important cause of visual impairment among elderly, according to their PA. After correction however, about 14% had their vision improved to normal vision from presented visual impairment. This underscored why refractive errors remain as one of the leading causes of visual impairment in development countries and among elderly individuals despite available treatments. People with distant vision impairment have been found to also have a significant amount of near vision impairment and, therefore, have difficulty performing close daily activities.[12] Considering that only about 34.0% of near normal vision was found in the study population, the majority was expected to have difficulty performing near activities like threading a needle, recognizing faces, moving around, sewing, and reading.

In contrast with other studies, visual impairment was only associated with sex but not age and educational level.[21–24] Socioeconomic indicators show that elderly females in Ghana are more vulnerable and disadvantaged than their male counterparts, finding it difficult to cater to their own health. The occupational background of the women show that most were exposed to visual hazards such as smoke and heat (fire), as greater number of them were fish mongers, predisposing them to some eye disease.[25]

Increases in visual impairment and ocular disorders as one ages is recognized as a public health issue worldwide and, as Ghana's population continues to grow and age,[6,7,25] the issue will likely become of greater importance in the near future. Based on the findings of this study, it would seem important to further investigate the causes and severity of visual impairment at the national level and to investigate the regional differences due to differences in demographic characteristic among the regions. Also, the barriers to obtaining eye care services should be determined for the Ghanaian elderly population. Culturally sensitive eye health promotion programs that address known

risk factors for eye problems and that emphasize regular eye examinations will increase access to eye care for all. Data to inform policy makers and health planners in developing countries on the implication of aging on the eye health of the elderly population is readily not available.[4] Such is the lack of comprehensive assessment of the eye health needs of this vulnerable and high risk group.[2] According to the World Health Organization, people who are visually impaired are mostly aged 60 years and older. The increase in the elderly population in many countries implies more people will be at risk of age-related eye diseases because of the concomitancy of certain eye conditions with aging and chronic vascular diseases. Due to the faster pace of population aging in developing countries than in developed countries, developing countries will have less time to adjust to the consequences of population aging, including the health consequences. Moreover, population aging in developing countries is taking place at lower levels of socioeconomic development than has been the case for developed countries, thus compounding the problem.[4,6] Data obtained from this study provide a baseline for developing such programs and for planning the eye care services required to prevent unnecessary visual impairment and improve eye health among older persons in Ghana.

Author Contributions

Conceived and designed the experiments: SO, KA. Analysed the data: SO, KA, AK. Wrote the first draft of the manuscript: SO. Contributed to the writing of the manuscript: SBB, AK, KA. Agree with manuscript results and conclusions: AK, KA, SBB. Jointly developed the structure and arguments for the paper: SO, AK. Made critical revisions and approved final version: SO, KA, AK, SBB. All authors reviewed and approved of the final manuscript.

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Author(s) disclose no potential conflicts of interest.

Disclosures and Ethics

As a requirement of publication the authors have provided signed confirmation of their compliance with ethical and legal obligations including but not limited to compliance with ICMJE authorship and competing interests guidelines, that the article is neither under consideration for publication nor published elsewhere, of their compliance with legal and ethical guidelines concerning human and animal research participants (if applicable), and that permission has been obtained for reproduction of any copyrighted material. This article was subject to blind, independent, expert peer review. The reviewers reported no competing interests.

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