

RESEARCH PAPER

Awareness, knowledge and self-care practices toward glaucoma among final year health science university students in Ghana

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Background: In the absence of adequate services, patients have to rely on the few health professionals that they do come into contact with to advise them on their treatment options. The aim of this study was to determine the level of awareness and knowledge of glaucoma, and the association between these factors and self-care practices among final year health science university students in Ghana.

Method: A cross-sectional survey involving the use of a structured questionnaire was conducted among 273 final year students (67 per cent) studying at any one of eight health science programs in three selected public universities in Ghana.

Results: All 273 respondents were aware of glaucoma but only 37.7 per cent had knowledge of it. The majority (65.9 per cent) defined glaucoma as raised intraocular pressure, and confused glaucoma with ocular hypertension. Over half (56.8 per cent) had acquired their knowledge of glaucoma during the course of their training. The media also played a major role in glaucoma awareness; however, it played a limited role in impacting on the knowledge of glaucoma. Only 28.6 per cent of respondents had previously undergone glaucoma screening.

Conclusion: Although all respondents were aware of glaucoma, their level of knowledge of glaucoma was low. Self-care practices were also generally poor among the respondents. This information may be useful for glaucoma health education in Ghana.

Key words: attitude, awareness, Ghana, glaucoma, knowledge, self-care practices

Globally, glaucoma is the leading cause of irreversible blindness and the second leading cause of blindness after cataract.¹ It is estimated that over 67 million people worldwide have glaucoma, of whom over 4.5 million are blind.¹ Reports indicate that by the year 2020, the number of people with glaucoma will increase to 79.6 million,¹ with an estimated 5.9 million being bilaterally blind.² Ghana has been reported to have the second highest prevalence of glaucoma worldwide,³ with an estimated 700,000 people affected by the disease, of whom over 60,000 are reportedly blind.⁴ Primary open angle glaucoma (POAG) is the predominant type of glaucoma in Ghana, affecting 6.8 per cent of the population, with an average age of onset of 30 years.^{2,4}

The American Optometric Association recommends that every individual should have a first eye examination at six months

and then at three years and every two years thereafter between the age of six and 18 years.⁵ Many people in developing countries, including Ghana, do not adhere to these recommendations for a variety of reasons, such as poor knowledge about the importance of eye examinations, non-availability, non-accessibility and non-affordability of eye care services, among others.⁶ Early detection enables treatment options to be explored. These may consist of medical treatment during the early stages that can be prescribed by an optometrist or a medical practitioner, to surgery by an ophthalmologist once the condition has become untreatable with medication. In the absence of extensive eye-care professionals, early treatment by nurses and medical practitioners is essential to prevent the onset of blindness.⁷ Nurses and medical practitioners are traditionally the first point of contact for patients access-

ing health care through the public sector, with referral to higher levels of care for specialised services.

Various population-based studies have shown that awareness and knowledge of glaucoma among both rural and urban populations is low in developed countries^{8–13} and worse in developing countries.^{8,14–18} Unfortunately, in Ghana and many other parts of Africa, eye-care services are provided and managed mainly by a few trained eye-care professionals.^{19–21} This is evident from the fact that there are an estimated 812 eye-care professionals^{19–21} providing the eye-care needs of over 24.6 million Ghanaians.²² These consist of 74 ophthalmologists, 300 optometrists, 288 ophthalmic nurses and 130 opticians.^{19–23} In Ghana, ophthalmologists manage ocular diseases and perform surgery, whereas optometrists focus on performing comprehensive eye examinations,

providing refractive services, orthoptics, low vision, ocular diagnostic services and aspects of therapeutics. Ophthalmic nurses assist ophthalmologists and conduct basic eye screening at a district level and opticians manage and dispense ophthalmic lenses, ophthalmic frames and other ophthalmic devices that correct defects of the visual system.

Eye-health education influences people to participate in regular ophthalmic care and therefore, is an important step toward early detection of signs of glaucoma, and consequently its treatment and management to avoid blindness. General practitioners are important agents of health behavioural change, as they have the opportunity to have an effect at a population level;²⁴ however, the role of other health workers cannot be underestimated but they can only make an impact based on their own level of awareness and knowledge. Given the high prevalence of glaucoma and the few eye-care professionals in Ghana, it is important that the non-ophthalmic health-care practitioners get actively involved in creating awareness and educating the general population about glaucoma.

A major challenge identified by various hospital-based studies is that the knowledge of glaucoma among hospital health-care workers is low.^{25,26} Establishing the level of knowledge and awareness of glaucoma of senior health science students is a pertinent step toward ascertaining whether they are adequately equipped with relevant information about glaucoma necessary for patient education, as they are the first-contact health-care workers. Therefore, this study sought to assess the awareness, knowledge on glaucoma and self-care practices (eye) among final-year health science university students studying in selected universities of Ghana.

METHODS

Study design

A descriptive cross-sectional study using a structured questionnaire was conducted among final-year health science university students studying one or more of the eight health science programs in three major public universities in Ghana. The design of the questionnaire was based on a review of other related studies.^{18,26} The questionnaire covered four main areas; demographic details, awareness, knowledge and self-care

practices toward glaucoma. Awareness as used in this study was defined as 'having heard of glaucoma' and consisted of several questions on basic national and international epidemiological facts aimed at establishing their awareness of glaucoma. The questions about knowledge of glaucoma centred on the definition of glaucoma, risk factors, differential diagnosis, signs and symptoms of the condition, as well as treatment and management protocols. A respondent was said to have knowledge of glaucoma if he/she scored 50 per cent or more on the 10 questions about basic knowledge of glaucoma. Finally, a respondent was said to have good self-care practice, if he/she had previously undergone an eye screening or eye examination. All the questions were closed-ended with options to specify if needed.

Sampling technique

A survey was conducted among students from the following health science programs; medicine, nursing, radiography, pharmacy, optometry, physiotherapy, dentistry and medical laboratory technology at the Kwame Nkrumah University of Science and Technology (KNUST), University of Ghana (UG) and the University of Cape Coast (UCC). These universities were selected because they run the majority of health science programs in Ghana and are affiliated to major teaching hospitals and major referral centres in Ghana.

These are public universities that adequately represent students from all political regions in Ghana. All final-year students in the listed eight programs of study were eligible to participate. The total number of registered and eligible students in 2012 for the research within the health science programs was 409. Questionnaires were distributed to all 409 final-year health science students who were given two months to complete them. The respondents were representative of the various programs as some had lower intakes. For example, optometry and dentistry, radiography and physiotherapy each had a total of less than 50 final year students from all the universities, while radiography and physiotherapy are only offered by the University of Ghana. The numbers of students who were enrolled in each of the programs from which participants were recruited were as follows: medicine: 112, pharmacy; 71, nursing; 61, medical laboratory; 45, optometry; 35, dentistry; 37, physiotherapy; and 28, radiography.

Data analysis

Data was analysed using the Statistical Package for the Social Sciences (SPSS version 21, SPSS Inc., Chicago, Illinois, USA). The chi-square test was used to test associations between variables. A two-tailed p-value of less than 0.05 was considered statistically significant. In addition, the descriptive data were analysed in terms of frequencies.

Ethical consideration

Ethical approval was obtained from the University of Cape Coast Ethical Review Board. Written informed consent was obtained from the study participants after the nature and purpose of the study were explained to them. The study was conducted according to the Helsinki Declaration on research regarding human subjects.

RESULTS

Demographic characteristics

Of the 409 questionnaires that were distributed, 273 were completed, giving a response rate of 67 per cent. This was considered adequate for tolerable confidence intervals around the desired parameters. The respondents included 157 males (57.5 per cent) (Table 1). Their ages ranged from 20 to 43 years with a mean age of 25 ± 3.7 years.

Awareness of glaucoma

All the respondents were aware of glaucoma and while 150 (54.9 per cent) knew that glaucoma is also referred to as 'the silent thief of sight', only 19.4 per cent could correctly specify the reason for the use of this term (Table 2). Few respondents (28.2 per cent) were aware that over 67 million people worldwide have glaucoma, while 30 per cent were aware that approximately 4.5 million people worldwide are blind from glaucoma.

Approximately one-quarter (24.9 per cent) were aware that over 700,000 Ghanaians have glaucoma, while 24.2 per cent were aware that about 60,000 Ghanaians are blind from glaucoma. Most of the respondents (79.1 per cent) did not know that Ghana has the second highest prevalence of glaucoma worldwide (Table 2). There was no significant ($p < 0.05$) association between age and awareness of glaucoma.

Knowledge of glaucoma

One hundred and three of the respondents (37.7 per cent) scored 50 per cent and

Program of study	Mean age	Gender		Total
		Male (n)	Female (n)	
Medicine	25.67 ± 2.20	31	20	51
Nursing	27.12 ± 4.53	10	23	33
Radiotherapy	23.94 ± 3.72	10	7	17
Pharmacy	23.94 ± 4.24	28	23	51
Optometry	25.31 ± 2.16	19	14	33
Physiotherapy	23.09 ± 2.56	10	14	24
Dentistry	25.19 ± 1.44	19	6	25
Medical laboratory	25.15 ± 4.81	30	9	39
Total	25.02 ± 3.67	157	116	273

Table 1. Age, gender and program of study of participants

above, while the other 170 (62.3 per cent) scored less than 50 per cent (Table 3), when the factual knowledge of glaucoma was assessed. Excluding students of optometry, who are specially trained in eye care, the level of knowledge of glaucoma among the remaining respondents from non-ophthalmic programs dropped to 29.2 per cent. An association was found between the program of study and the knowledge of glaucoma ($\chi^2 = 184.5$, $df = 7$; $p < 0.001$) (Table 3). All optometric students and 84.3 per cent of medical students had knowledge of glaucoma, while 12 nursing students (36.4 per cent) and six pharmacy students (11.8 per cent) had knowledge of glaucoma. Only one student each from physiotherapy (4.2 per cent), radiography (5.9 per cent) and medical laboratory technology (2.6 per cent) had knowledge of glaucoma (Table 3). No statistical significance was found between knowledge of glaucoma and gender ($\chi^2 = 1.14$, $df = 1$, $p = 0.29$). Age was also not a predictive factor of knowledge of glaucoma ($\chi^2 = 5.034$, $df = 1$, $p = 0.28$) (Table 1).

One hundred and eighty respondents (65.9 per cent) defined glaucoma as raised intraocular pressure in the eye, while 63 (23.1 per cent) defined glaucoma as damage to the optic nerve head. Very few respondents (2.9 per cent) fully defined glaucoma as a 'disease of the eye with a characteristic optic neuropathy and visual field loss with raised intraocular pressure as the main risk factor'.²⁷ Other responses are as presented in Table 3.

A total of 237 of the respondents (86.8 per cent) knew that glaucoma is associated

with raised intraocular pressure; 27 (9.9 per cent) did not know, while nine (3.3 per cent) did not believe this statement. In contrast, 118 respondents (43.4 per cent) did not believe that glaucoma can also be associated with low or normal intraocular pressure and only 90 (33.1 per cent) believed this assertion, while 64 (23.5 per cent) did not know (Table 3). One hundred and seven (40.4 per cent) did not believe that glaucoma is characterised by damage to the crystalline lens, while a third (80 or 31.3 per cent) believed this. Seventy-five respondents (28.3 per cent) did not know whether this assertion was true or false (Table 3).

One hundred and seventy-nine respondents (66 per cent) did not know the normal intraocular pressure, while 64 respondents (23 per cent) knew that it ranges from 10 to 21 mmHg. Sixteen respondents (six per cent) believed that normal intraocular pressure is 1 to 10 mmHg and four from each discipline (1.5% per cent) said normal intraocular pressure is less than 10 mmHg and between 21 mmHg to 50 mmHg, respectively, while seven respondents (2.6 per cent) did not answer this question. One hundred and nineteen respondents (43.6 per cent) believed that glaucoma is curable, 99 respondents (36.2 per cent) did not believe this, while 55 (20.2 per cent) did not know whether or not glaucoma can be cured (Table 3). One hundred and eighty-two respondents (67.2 per cent) believed that damage from glaucoma is permanent, while 32 (11.8 per cent) said that it is reversible (Table 3).

Of the respondents, 130 (47.6 per cent) did not know the duration of treatment for glaucoma, 102 (37.4 per cent) believed that it is life-long, while 23 (8.4 per cent) and eight (2.9 per cent) respondents believed that treatment is for years and one month, respectively. Two hundred and forty-one (88.3 per cent) respondents believed that untreated glaucoma leads to a loss of vision, while 22 (8.1 per cent) believed that it leads to swelling of the eyes. Three respondents (1.1 per cent) believed that it leads to severe pain in the eyes (Table 3).

Responding to 'who was best qualified to treat glaucoma?', 203 (74.4 per cent) said it was ophthalmologists, while 54 (19.8 per cent) believed that it was optometrists. When students of optometry were excluded, 78.8 per cent of the remaining 240 respondents said ophthalmologists were the best professionals to diagnose and manage glaucoma, while 15 per cent said it was optometrists (Table 3).

In relation to the management of glaucoma, 208 respondents (77 per cent) knew that management of glaucoma is aimed at lowering intraocular pressure. Twenty-one respondents (7.8 per cent) indicated that management is aimed at restoring lost vision, seven (2.6 per cent) reported that the rationale is to cure the disease and 14 (5.1 per cent) did not know the rationale behind glaucoma management (Table 3). In addition, 94 (34.4 per cent) could mention at least one drug used in managing glaucoma, while the remaining 179 (65.6 per cent) had no knowledge of these drugs. All optometric students had knowledge of drugs used in managing glaucoma, while 3.7 per cent of pharmacy students, 8.8 per cent of medical students and 3.3 per cent of nursing students were aware of the drugs (Table 3). There was a statistically significant association between the program of study and knowledge of drugs ($\chi^2 = 93.045$, $df = 7$, $p < 0.001$) (Table 3). Students from medical and optometric programs had better knowledge of anti-glaucoma drugs than students from other programs.

Source of awareness and knowledge of glaucoma

Respondents had varying sources of information about glaucoma. Program training was the source of awareness and knowledge of glaucoma among 56.8 per cent of the respondents, followed by the media (34.8 per cent) and eye-care specialist (four per cent) (Table 2). Program training was the

What is your source of information	Program of study										Total
	Medicine	Nursing	Radiotherapy	Pharmacy	Optometry	Physiotherapy	Dentistry	Medical lab			
Media	1 (0.4)	10 (3.7)	15 (5.5)	26 (9.5)	0 (0.0)	19 (7.0)	3 (1.1)	21 (7.7)	95 (34.8)		
Interview	0 (0.0)	0 (0.0)	2 (0.7)	1 (0.4)	1 (0.4)	1 (0.4)	0 (0.0)	1 (0.4)	6 (2.2)		
Relative/friend	0 (0.0)	0 (0.0)	0 (0.0)	2 (0.7)	0 (0.0)	2 (0.7)	0 (0.0)	2 (0.7)	6 (2.2)		
Eye specialist	3 (1.1)	2 (0.7)	0 (0.0)	1 (0.4)	1 (0.4)	0 (0.0)	0 (0.0)	4 (1.5)	11 (4.0)		
Program training	47 (17.2)	21 (7.7)	0 (0.0)	21 (7.7)	31 (11.4)	2 (0.7)	22 (8.1)	11 (4.0)	155 (56.8)		
Glaucoma termed as silent thief of sight	36 (13.2)	16 (5.9)	4 (1.5)	20 (7.4)	33 (12.1)	5 (1.8)	15 (5.5)	21 (7.7)	150 (55.1)		
No	15 (5.5)	16 (5.9)	13 (4.8)	31 (11.4)	0 (0.0)	19 (7.0)	10 (3.7)	18 (6.6)	122 (44.9)		
If yes, why the use of this term?	30 (20.1)	7 (4.7)	1 (0.7)	12 (8.1)	32 (21.5)	2 (1.3)	11 (7.4)	10 (6.7)	105 (70.5)		
No	5 (3.4)	9 (6.0)	3 (2.0)	8 (5.4)	1 (0.7)	3 (2.0)	3 (2.0)	12 (8.1)	44 (29.5)		
Over 67 m people worldwide have glaucoma?	20 (7.4)	10 (3.7)	1 (0.4)	6 (2.2)	26 (9.6)	2 (0.7)	5 (1.8)	7 (2.6)	77 (28.3)		
No	31 (11.4)	22 (8.1)	16 (5.9)	45 (16.5)	7 (2.6)	22 (8.1)	20 (7.4)	32 (11.8)	195 (71.7)		
Yes	20 (7.4)	12 (4.4)	3 (1.1)	8 (2.9)	26 (9.6)	2 (0.7)	4 (1.5)	7 (2.6)	82 (30.1)		
Over 4.5 m people worldwide are blind from glaucoma?	31 (11.4)	21 (7.7)	14 (5.1)	43 (15.8)	6 (2.2)	22 (8.1)	21 (7.7)	32 (11.8)	190 (69.9)		
No	15 (5.5)	11 (4.1)	2 (0.7)	3 (1.1)	24 (8.9)	2 (0.7)	5 (1.8)	6 (2.2)	68 (25.1)		
Over 700,000 Ghanaians have glaucoma?	36 (13.3)	21 (7.7)	15 (5.5)	48 (17.7)	8 (3.0)	22 (8.1)	20 (7.4)	33 (12.2)	203 (74.9)		
Yes	12 (4.4)	11 (4.0)	2 (0.7)	5 (1.8)	23 (8.5)	0 (0.0)	5 (1.8)	8 (2.9)	66 (24.3)		
Over 60,000 Ghanaians are blind from glaucoma	39 (14.3)	21 (7.7)	15 (5.5)	46 (16.9)	10 (3.7)	24 (8.8)	20 (7.4)	31 (11.4)	206 (75.7)		
No	15 (5.5)	2 (0.7)	0 (0.0)	5 (1.8)	30 (11.0)	0 (0.0)	0 (0.0)	5 (1.8)	57 (20.9)		
Ghana is second in world prevalence for glaucoma?	36 (13.2)	31 (11.4)	17 (6.2)	46 (16.8)	3 (1.1)	24 (8.8)	25 (9.2)	34 (12.5)	216 (79.1)		

Table 2. Awareness of glaucoma

main source of information for the majority of students pursuing nursing, optometry, dentistry and medicine, while the majority of students from radiography, physiotherapy, pharmacy and medical laboratories had the media as their source (Table 2).

An association was found between the sources of information and the knowledge of glaucoma ($\chi^2 = 70.26$, $df = 4$, $p < 0.001$) (Table 2). Thus, the majority of respondents (89, 57.4 per cent) who obtained their information about glaucoma during the course of medical training, demonstrated knowledge of glaucoma as compared to the other sources (Table 2). There was also a significant difference in knowledge obtained via medical training and the media ($\chi^2 = 68.26$, $df = 2$, $p < 0.01$) but not the other sources. The probability that a student who obtained information about glaucoma from the media was knowledgeable was significantly lower compared to a student who acquired the knowledge of glaucoma during the course of program training (Table 2).

Self-care practices

Glaucoma screening in Ghana comprises the assessment of the optic nerve head through ophthalmoscopy and measurement of intraocular pressure.³ Seventy-eight respondents (28.6 per cent) had previously undergone vision screening for glaucoma (Table 4), with 38 (13.9 per cent) being screened by optometrists, 27 (9.8 per cent) by ophthalmologists and four (1.5 per cent) by ophthalmic nurses. One respondent was screened by a medical practitioner, while another respondent could not tell who screened him and one was screened by an optician. Fifty-seven (20.8 per cent) out of the number who sought eye care were told they had no sign of glaucoma, with 11 (four per cent) being glaucoma suspects, whereas eight respondents (2.9 per cent) were told they do not have any sign of glaucoma but had some other ocular condition. Of the 11 glaucoma suspects, two (0.7 per cent) were given treatment immediately, while seven (2.6 per cent) were asked to report to the eye clinic for other diagnostic tests (Table 4).

There was no statistically significant association between gender and self-care practices ($\chi^2 = 2.520$, $df = 1$, $p = 0.11$) (Table 4). In total, 33.6 per cent of the female respondents had undergone glaucoma screening, while only 24.8 per cent of males had undergone vision screening for glaucoma. Age was also not a predictive factor for self-care practice in this study ($\chi^2 = 4.520$, $df = 1$, $p = 0.21$)

	Program of study										Total	
	Medicine	Nursing	Radiotherapy	Pharmacy	Optometry	Physiotherapy	Dentistry	Medical lab				
What is your understanding of glaucoma?												
High IOP	31 (11.4)	20 (7.3)	12 (4.4)	48 (17.6)	1 (0.4)	20 (7.3)	22 (8.1)	26 (9.5)	180 (65.9)			
Optic nerve head damage	15 (5.5)	6 (2.2)	4 (1.5)	2 (0.7)	30 (11.0)	1 (4)	2 (0.7)	3 (1.1)	63 (23.1)			
Retinal damage	0 (0.0)	0 (0.0)	0 (0.0)	1 (0.4)	0 (0.0)	3 (1.1)	1 (0.4)	10 (3.7)	21 (7.7)			
Redness of the eyes	0 (0.0)	0 (0.0)	1 (0.4)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	1 (0.4)			
Others but correct	5 (1.8)	1 (0.4)	0 (0.0)	0 (0.0)	2 (0.7)	0 (0.0)	0 (0.0)	0 (0.0)	8 (2.9)			
Others but wrong	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)			
Restoring lost vision	0 (0.0)	7 (2.6)	1 (0.4)	2 (0.7)	0 (0.0)	4 (1.5)	3 (1.1)	4 (1.5)	21 (7.8)			
Lowering IOP	50 (18.5)	22 (8.1)	13 (4.8)	38 (14.1)	33 (12.2)	10 (3.7)	21 (7.8)	21 (7.8)	208 (77.0)			
Increasing IOP	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)			
Curing the disease	0 (0.0)	0 (0.0)	0 (0.0)	4 (1.5)	0 (0.0)	2 (0.7)	1 (0.4)	0 (0.0)	7 (2.6)			
I do not know	0 (0.0)	3 (1.1)	2 (0.7)	7 (2.6)	0 (0.0)	8 (3.0)	0 (0.0)	14 (5.2)	34 (12.6)			
True	16 (5.9)	17 (6.3)	12 (4.4)	32 (11.8)	0 (0.0)	10 (3.7)	13 (4.8)	17 (6.3)	117 (43.2)			
False	30 (11.1)	9 (3.3)	2 (0.7)	9 (3.3)	32 (11.8)	1 (0.4)	6 (2.2)	2 (0.7)	91 (33.6)			
I do not know	5 (1.8)	6 (2.2)	2 (0.7)	10 (3.7)	1 (0.4)	13 (4.8)	6 (2.2)	20 (7.4)	63 (23.2)			
Yes	24 (8.8)	9 (3.3)	0 (0.0)	10 (3.7)	33 (12.1)	2 (0.7)	9 (3.3)	7 (2.6)	94 (34.4)			
No	27 (9.9)	24 (8.8)	17 (6.2)	41 (15.0)	0 (0.0)	22 (8.1)	16 (5.9)	32 (11.7)	179 (65.6)			
I do not know	4 (1.5)	12 (4.5)	7 (2.6)	29 (10.9)	0 (0.0)	6 (2.3)	5 (1.9)	20 (7.5)	83 (31.3)			
Yes	40 (15.1)	8 (3.0)	3 (1.1)	8 (3.0)	32 (12.1)	5 (1.9)	9 (3.4)	2 (0.8)	107 (40.4)			
I do not know	3 (1.1)	11 (4.2)	7 (2.6)	14 (5.3)	1 (0.4)	13 (4.9)	10 (3.8)	16 (6.0)	75 (28.3)			
True	49 (17.9)	27 (9.9)	13 (4.8)	48 (17.6)	29 (10.6)	18 (6.6)	23 (8.4)	30 (11.0)	237 (86.8)			
False	2 (0.7)	1 (0.4)	1 (0.4)	0 (0.0)	4 (1.5)	0 (0.0)	0 (0.0)	1 (0.4)	9 (3.3)			
I do not know	0 (0.0)	5 (1.8)	3 (1.1)	3 (1.1)	0 (0.0)	6 (2.2)	2 (0.7)	8 (2.9)	27 (9.9)			
True	38 (14.0)	31 (11.1)	3 (1.1)	1 (0.4)	31 (11.4)	4 (1.5)	4 (1.5)	6 (2.2)	90 (33.1)			
False	7 (2.6)	21 (7.7)	8 (2.9)	39 (14.3)	2 (0.7)	9 (3.3)	15 (5.5)	17 (6.2)	118 (43.4)			
I do not know	5 (1.8)	9 (3.3)	6 (2.2)	11 (4.0)	0 (0.0)	11 (4.0)	6 (2.2)	16 (5.9)	64 (23.5)			
Permanent	47 (17.3)	25 (9.2)	7 (2.6)	28 (10.3)	32 (11.8)	11 (4.1)	15 (5.5)	17 (6.3)	182 (67.2)			
Reversible	2 (0.7)	4 (1.5)	3 (1.1)	8 (3.0)	1 (0.4)	3 (1.1)	4 (1.5)	7 (2.6)	32 (11.8)			
I do not know	0 (0.0)	4 (1.5)	7 (2.6)	15 (5.5)	0 (0.0)	10 (3.7)	6 (2.2)	15 (5.5)	57 (21.0)			
Opticians	0 (0.0)	1 (0.4)	1 (0.4)	1 (0.4)	0 (0.0)	0 (0.0)	0 (0.0)	2 (0.7)	5 (1.8)			
Optometrist	0 (0.0)	6 (2.2)	2 (0.7)	9 (3.3)	18 (6.6)	7 (2.6)	3 (1.1)	9 (3.3)	54 (19.9)			
Ophthalmologists	51 (18.8)	25 (9.2)	12 (4.4)	38 (14.0)	14 (5.1)	15 (5.5)	22 (8.1)	26 (9.6)	203 (74.6)			
Ophthalmic nurses	0 (0.0)	0 (0.0)	0 (0.0)	1 (0.4)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	1 (0.4)			
Medical doctors	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)			
Herbalist	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)			
I do not know	0 (0.0)	1 (0.4)	2 (0.7)	2 (0.7)	0 (0.0)	2 (0.7)	0 (0.0)	2 (0.7)	9 (3.3)			
For a week	1 (0.4)	0 (0.0)	0 (0.0)	2 (0.7)	0 (0.0)	0 (0.0)	0 (0.0)	1 (0.4)	4 (1.5)			
For a month	1 (0.4)	4 (1.5)	1 (0.4)	2 (0.7)	1 (0.4)	2 (0.7)	0 (0.0)	4 (1.5)	8 (3.0)			
For years	6 (2.2)	3 (1.1)	2 (0.7)	2 (0.7)	1 (0.4)	2 (0.7)	3 (1.1)	4 (1.5)	23 (8.6)			
For life	33 (12.4)	9 (3.4)	0 (0.0)	11 (4.1)	32 (12.0)	3 (1.1)	9 (3.4)	5 (1.9)	102 (38.2)			
I do not know	9 (3.4)	15 (5.6)	13 (4.9)	34 (12.7)	0 (0.0)	18 (6.7)	12 (4.5)	29 (10.9)	130 (48.7)			
Not knowledgeable	8 (2.9)	21 (7.7)	16 (5.9)	45 (16.5)	0 (0.0)	23 (8.4)	19 (7.0)	38 (13.9)	170 (62.3)			
Knowledgeable	43 (15.8)	12 (4.4)	1 (0.4)	6 (2.2)	33 (12.1)	1 (0.4)	6 (2.2)	1 (0.4)	103 (37.7)			
IOP: interocular pressure												

Table 3. Knowledge of glaucoma. Figures in parentheses are percentages.

	Program of study										Total
	Medicine	Nursing	Radiotherapy	Pharmacy	Optometry	Physiotherapy	Dentistry	Medical Lab			
Have you been screened for glaucoma before?	Yes	15 (5.5)	14 (5.1)	1 (0.4)	5 (1.8)	29 (10.6)	2 (0.7)	5 (1.8)	7 (2.6)	78 (28.6)	
	No	36 (13.2)	19 (7.0)	16 (5.9)	46 (16.8)	4 (1.5)	22 (8.1)	20 (7.3)	32 (11.7)	195 (71.4)	
Who screened you?	An ophthalmic nurse	2 (2.8)	1 (1.4)	0 (0.0)	0 (0.0)	0 (0.0)	1 (1.4)	0 (0.0)	0 (0.0)	4 (5.6)	
	A medical doctor	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	1 (1.4)	0 (0.0)	1 (1.4)	
	An optician	0 (0.0)	1 (1.4)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	1 (1.4)	
	An optometrist	2 (2.8)	5 (6.9)	1 (1.4)	1 (1.4)	26 (36.1)	0 (0.0)	0 (0.0)	3 (4.2)	38 (53.2)	
What was the outcome?	An ophthalmologist	11 (15.3)	4 (5.6)	0 (0.0)	2 (2.8)	2 (2.8)	1 (1.4)	4 (5.6)	3 (4.2)	27 (37.8)	
	Others	0 (0.0)	1 (1.4)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	1 (1.4)	
	I am a glaucoma suspect	3 (3.9)	3 (3.9)	0 (0.0)	0 (0.0)	2 (2.6)	0 (0.0)	0 (0.0)	3 (3.9)	11 (14.3)	
What were you advised on	I have glaucoma	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	
	No sign of glaucoma	9 (11.7)	9 (11.7)	1 (1.3)	3 (3.9)	27 (35.1)	1 (1.3)	5 (6.5)	3 (3.9)	58 (75.4)	
	Another ocular condition	3 (3.9)	2 (2.6)	0 (0.0)	0 (0.0)	0 (0.0)	1 (1.3)	1 (1.3)	1 (1.3)	8 (10.4)	
	Instant treatment	1 (10.0)	1 (10.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	2 (20.0)	
Report for other confirmatory tests	Report for other confirmatory tests	2 (20.0)	2 (20.0)	0 (0.0)	0 (0.0)	1 (10.0)	0 (0.0)	0 (0.0)	2 (20.0)	7 (70.0)	
	Others but reasonable	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	1 (10.0)	0 (0.0)	0 (0.0)	0 (0.0)	1 (10.0)	

Table 4. Glaucoma screening among participants

(Table 4). There was a significant association between the knowledge of glaucoma and the self-care practice of respondents ($\chi^2 = 49.591$, $df = 1$, $p < 0.001$), with 55 respondents (20.1 per cent) who had knowledge of glaucoma having undergone glaucoma screening, whereas 23 (8.4 per cent) who did not have knowledge of glaucoma had undergone glaucoma screening (Table 4).

There was a significant association between program of study and self-care practices ($\chi^2 = 79.681$, $df = 7$, $p < 0.001$), with the majority of the optometry respondents (29 out of 33; 88 per cent) having undergone screening for glaucoma. Although medical students were second to students of optometry in terms of knowledge rating, only 15 out of 51 medical students (29 per cent) had undergone screening for glaucoma. Second to optometry in terms of good self-care practices on glaucoma was nursing, where 14 out of 33 (42 per cent) had undergone screening for glaucoma (Table 4).

There was also a statistically significant association between the source of information about glaucoma and self-care attitude of respondents ($\chi^2 = 33.693$, $df = 4$, $p < 0.001$), as 34 (21.6 per cent) of those who selected program training as their source of information had undergone eye screening. Those who obtained their source of information from the media demonstrated the poorest self-care practice toward glaucoma.

DISCUSSION

Awareness of glaucoma

In this study, awareness of glaucoma was universal among respondents, this being consistent with that found among the medical staff members of a hospital in India.²⁶ A similar study among health-care workers in a Nigerian hospital recorded an awareness rate of 95.1 per cent.²² Although all respondents had heard of the disease called ‘glaucoma’, it was not clear what exactly they were aware of about glaucoma, as on average, only a quarter were aware of the basic national and international epidemiologic facts about the condition. The complete awareness level is an indication that respondents are likely to perceive the condition as a major health challenge.

Knowledge of glaucoma

In contrast to high levels of awareness, only 37.7 per cent of the respondents had

knowledge of glaucoma. This implies that two out of every three health science students cannot be considered a reliable source of knowledge about glaucoma. This compares favourably to a study in India²⁶ and among hospital health-care workers in Nigeria.²² This finding indicates that the assumption that health-science students and health-care workers have adequate knowledge of glaucoma could be misleading. Therefore, it cannot be assumed that they may be in a position to play an important role in glaucoma health education among patients. Despite the low knowledge level among the study respondents, it is much higher than those reported among the general population.^{10,12,14,16,18}

Most of the respondents (65.9 per cent) defined glaucoma as 'high pressure in the eye', this being higher than the 39 per cent reported by Adegbehingbe and Bisiriyu²⁵ in Nigeria. The low level of defining glaucoma accurately in this study implies that among the health science students, most defined glaucoma inaccurately as ocular hypertension. This is possibly due to glaucoma having been translated in most of the local languages in Ghana by health workers as 'high pressure of the eye'. This translation may give the wrong impression to patients, as it suggests that once the pressure has been reduced, there is no need for further medical care and attention. Unfortunately, this leads to blindness in most cases. A review of the translation of glaucoma in the different local languages may be warranted, if the necessary impact in glaucoma health education has to be made.

The misconception among many (63.7 per cent) of the participants about glaucoma (unaware about curability or otherwise of glaucoma), and only one-quarter being aware of the rationale for treatment, indicates that more education needs to be done among students in health science programs in Ghana. Despite this, most of the students (88.3 per cent) were aware that untreated glaucoma leads to a loss of vision, while more than a third (36.4 per cent) knew that management of glaucoma is life-long. This indicates that they were likely to give correct advice to patients, if they were aware of their own glaucoma status. Although this was better than the study in India, where approximately 40 per cent of the respondents believed that damage due to glaucoma is reversible,²⁶ it suggests the potential for misinformation to be given. While only a few believed that damage due to glaucoma is

reversible, it poses a great challenge in the efforts to educate patients appropriately.

Source of awareness and knowledge about glaucoma

The majority of respondents acquired their knowledge of glaucoma during the course of training, as has been reported in similar studies,^{25,26} with the media playing a less significant role. The statistically significant association between the program of study and the source of information is consistent with other studies among hospital health-care workers.^{25,26} Respondents who had acquired their knowledge of glaucoma during the course of their training had better knowledge than those who acquired their knowledge of glaucoma from the media, an indication that the media (mainly radio and television) might not always provide accurate information about the disease.

Gender was not a predictor of knowledge of glaucoma, as there was no statistically significant association between gender and knowledge of glaucoma. This finding is consistent with studies elsewhere^{18,26} and females had better knowledge of glaucoma than males as reported by other studies.¹⁶

Self-care practices

It is generally advised that people have at least had one eye examination between the ages of six and 18 years and every other year if they were normal or every year, if they have any eye condition that poses a danger to their ocular health.⁵ Self-care practices (having had an eye examination) were generally poor among respondents, with one-quarter (28.6 per cent) having previously undergone an eye examination. Respondents who demonstrated good knowledge of glaucoma had better self-care practices. This is an indication that improved health education on glaucoma can enhance eye-care seeking behaviour, which will reduce blindness due to glaucoma.^{16,28} This is supported by the fact that accurate sources of information influenced a positive self-care attitude. Thus, the poorer the knowledge of glaucoma, the poorer the self-care practices toward eye care, this being consistent with a study in Nigeria.^{25,29}

Caution needs to be exercised when interpreting the results of this study. For example, participants included optometric, medical and nursing students, who by virtue of their programs, have some basic knowl-

edge about glaucoma compared to their counterparts, who do not have any such didactics. This may have influenced the awareness and knowledge rates reported in this study.

CONCLUSION

The level of awareness of glaucoma among health science university students studying in Ghana was high. Given that the health-care professionals in programs other than ophthalmology and optometry are often the first point of contact when patients seek medical advice, efforts must be made to include and/or emphasise glaucoma in their curriculum, specifically nurse and medical practitioners. This will assist in reducing the risk of blindness due to glaucoma, particularly in Ghana, with the second highest prevalence of the disease in the world. Basic lessons on glaucoma must be provided to non-ophthalmic care givers (other than ophthalmologists, optometrists and ophthalmic nurses), who act as a first point of contact for persons seeking health advice to promote increased awareness and provide quality information to reduce avoidable and irreversible blindness. Health-care professionals should increase their visibility through various media and intensify public education and awareness about the conditions and not leave public health education to non-professionals who may not have adequate information. In addition, seminars and workshops could be used as a means of addressing the problem of poor level of knowledge about glaucoma among health-care students and professionals to enable them to participate in effective public health education about the condition.

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