·Investigation·

Public´s knowledge of the differences between ophthalmologists and optometrists: a critical issue in eye care service utilisation

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Abstract

• AIM: To assess the public´s knowledge of the differences between ophthalmologists and optometrists and identify the factors associated with knowledge.

• METHODS: The study was a population-based random survey of adults aged 18 years or older conducted in Enugu, south eastern Nigeria, between March and June, 2011. Data on respondents´ socio-demographics, clinical profile, and knowledge of the differences between ophthalmologists and optometrists were collected using a 28-item questionnaire. Data were analysed using descriptive and analytical statistics. Values of $P<0.05$ were considered statistically significant.

• RESULTS: The respondents ($n=394$) comprised 198 males and 196 females (sex ratio=1.01:1), aged 18-70 (30.9±10.8) years. The majority of respondents were single (57.4%), possessed secondary education (96.9%), employed (65.2%) and had no health insurance (77.4%). Their clinical profile showed previous eye exam 54.1%, spectacle wear 41.6% and contact lens wear 5.6%. In the multivariate analysis, participants´ good knowledge of the differences between ophthalmologists and optometrists was significantly associated with educational status (OR: 0.32, 95% CI: 0.23-0.44, $P<0.0001$, $\beta=-0.988$), employment status (OR: 1.8, 95% CI: 1.45-2.25, $P<0.0001$, $\beta=0.124$) and previous eye examination (OR: 1.63, 95% CI: 1.29-2.07, $P<0.0001$, $\beta=0.549$).

• CONCLUSION: Participants' socio-demographic and clinical characteristics are important predictors of good knowledge. The findings may have implications for all stakeholders in eye care delivery. There is need for knowledge enhancement, by the government and eye care providers, through population-based eye health literacy campaigns.

• **KEYWORDS:** public's knowledge; ophthalmologists; optometrists

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INTRODUCTION

The development and even distribution of appropriate eye care manpower, universal access to eye care, and awareness creation among consumers of eye care services are cardinal operational indices of any eye care programme premised within the operational framework of VISION 2020-The Right to Sight [1]. Although the provision of promotive, preventive, curative and rehabilitative orthodox eye care services is shared by an array of dedicated and integrated eye care workers, clinical ophthalmic care is provided mainly by ophthalmologists and optometrists[1-3]. As obtains in other medical specialties, and medical care generally, access to eye care-a crucial bridge between service availability and uptake-is often impeded by demographic, socio-economic and geographic barriers [4-12]. Specifically, awareness and knowledge of eye care service consumers of the training hierarchy, licensure requirements, professional roles, capabilities and responsibilities of the two main clinical eye care service providers-ophthalmologists and optometrists-have been variously identified as important parameters influencing their utilisation of available eye care services[8,11,13-14]. Additionally, eye care consumers' knowledge of their eye care providers' standing with respect to these practice parameters has critical implications for appropriateness of presentation for care, trust during physician-patient interaction, compliance with prescribed care, outcome of care, ethics, and medico-legal litigations[14-16]. Despite these far reaching implications, various hospital- and population-based surveys have reported gross deficiencies in knowledge of these crucial practice parameters of their eye care givers [8,13-14,16-18]. The majority of previous knowledge-specific

surveys were conducted outside Africa and were more often hospital-based studies than population-based surveys[4-7,13-17]. In these reports, gender, educational status, possession of health insurance, and previous interaction with the eye care system were inconsistently associated with knowledge of the professional identity and roles of eye care providers[8-10,13-14,16,18]. The only population-based African report by Ayanniyi *et al*[18] in Ilorin, Nigeria, was specific for government employees thus compromising the extrapolation of their survey results to the general population. To generate population-wide data on this important research theme, the investigators conducted a population-based random survey of adults aged 18 years or older, in Enugu, south-eastern Nigeria, to assess the public's knowledge of the training requirements, professional roles and responsibilities of ophthalmologists and optometrists; and identify the factors associated with this knowledge. In view of the existence of significant inter-professional care overlap between ophthalmologists and optometrists, the findings will assist all stakeholders in eye care delivery in Nigeria, and probably under similar settings elsewhere, in overcoming knowledge-related barriers to eye care access, ensure appropriate and timely presentation for care, and optimise eye care outcomes[15].

SUBJECTS AND METHODS

Background Enugu state, with its administrative capital in Enugu town, is one of the five component states of Nigeria's south-east geo-political zone. The state comprises 17 administrative sub-units or Local Government Areas (LGAs) which are distributed between the state's urban, semi-urban and rural populations. Although predominantly populated by ethnic Ibos, numerous inhabitants from other tribes in Nigerian reside in the state. The state has numerous public and privately-owned tertiary academic institutions. The state's population is made up of traders, civil servants, farmers and artisans. The population has an average general literacy level; however, there is no anecdotal data on the population's health literacy level. In the state, orthodox eye care services are provided by ophthalmologist, optometrists, opticians, ophthalmic nurses and community eye health workers who work in the public and private health sectors. There is pro-urban mal-distribution of available human and material resources for eye care delivery with a resultant restriction of eye care access in the rural areas. In addition, cost is another important barrier to uptake of eye care services in the state. Consequently, especially among the state's rural dwellers, an appreciable proportion of the state's population patronise patent medicine dealers, alternative medicine practitioners and spiritual healers, as affordable alternatives to orthodox eye care providers.

Ethics Prior to commencement of study, ethical clearance compliant with the Declaration of Helsinki on research involving human subjects was obtained from the University of Nigeria Teaching Hospital (UNTH)'s Medical and Health Research Ethics Committee (Institutional Review Board). Furthermore, informed verbal consent to participation was obtained from each study participant after the investigators' guarantee of anonymity of participation, confidentiality of responses, and the use of obtained data strictly for research purposes.

Eligibility Adult males and females aged 18 years or older.

Survey instrument The survey instrument, adapted from a previous survey with additional modifications to suite the local need, was a pre-tested 28-item, self-administered, questionnaire containing both open- and close-ended questions [13]. The questionnaire has three fields which explored the participants' socio-demographics, previous clinical interaction with the eye care system, and knowledge of training hierarchies, professional responsibilities, and competencies of ophthalmologists and optometrists.

To ascertain its construct validity and psychometric reliability, the questionnaire was pretested on 40 randomly selected eligible participants from Ebonyi state, a neighbouring state which share similar population characteristics with Enugu state, the study state. Feedbacks elicited from the pre-test informed modifications of the questionnaire to ensure its local suitability; and enhance the face, flow and interpretation.

Sample size and sampling The calculated minimum sample size of 317 was based on a 29.2% prevalence of good knowledge reported in a previous survey, 95% confidence interval and a 5% margin of error[13]. The calculated minimum sample size was inflated to a modified sample size of 394 to achieve a wider coverage of the population and ensure the representativeness of the sample. The study was a population-based random survey conducted in Enugu state between March and June, 2011. The sampling technique utilised in the survey was multistage cluster random sampling. Enugu State was already divided into 17 LGAs (clusters); these in turn were further sub-divided into political wards. Three LGAs (Enugu North, Enugu East and Enugu South) were randomly selected for participation. Using a simple random sampling technique, one ward was selected from each of the 3 LGAs. The households in each selected ward were enumerated to provide the sampling frame. Being approximately equal in population, the modified sample size of 494 was equally distributed amongst the three study wards. After a random start, every sixth household was selected until the required sample size was obtained. In each of the selected household, one eligible adult was recruited by balloting. Each participant had an in-person questionnaire-guided interview by one of the researchers. The investigators obtained participants relevant socio-demographic data on age, sex, marital status, educational status, occupation, and possession of health insurance. Also collected were respondents' clinical data on previous eye examination since age 18 years, perceived professional identity of the eye examiner, past and

present corrective spectacle or contact lens wear. Respondents who had multiple previous eye examinations as an adult were asked to provide information on their most recent eye examination. The participants' knowledge of the training requirements, responsibilities, and capabilities of ophthalmologists and optometrists was assessed by asking them to select one correction answer from "Ophthalmologist/ Optometrist/Both/Neither/Not sure" in response to questions on mandatory undergraduate medical training, testing of vision, prescription of glasses, fitting of contact lens, grinding of lenses, performance of cataract operations, and performance of ophthalmic laser therapy. Additionally, respondents were asked to select one correct answer from "Yes/No/Not sure" in response to statements on permission of ophthalmologists and optometrists to test eyes for glaucoma, treat glaucoma with medications, and prescribe codeine and other narcotic medications.

Operational definitions The outcome variable of interest in this study was participants' knowledge of the difference between ophthalmologists and optometrists. The participants' knowledge status was categorised into "Knowledgeable" and "Not knowledgeable" based on the following scoring criteria: 1) knowledge scoring: correct answer=1; wrong answer=0; 2) average knowledge score (standardised knowledge domain score): this was computed using the method described in the AGREE II INSTRUMENT as [X/Y] ×100% where X=Obtained score-Minimum possible score, Y=Maximum possible score-Minimum possible score; 3) grading of knowledge status: poor knowledge (average score of less than 50%); fair knowledge (average score of 50%-<75%); good knowledge: (average score of ⩾75%)[19]. For the purpose of statistical analysis of data, all scores ⩾50% (*i.e.* fair and good knowledge scores) were taken as satisfactory knowledge.

Statistical Analysis Data were entered into and analysed using the Statistical Package for Social Sciences (SPSS), version 18, (SPSS Inc., Chicago, Illinois, USA). Preliminary descriptive statistics was performed to yield frequencies, percentages and proportions. In the univariate analysis, statistical tests for significance of observed between-group differences in knowledge status was performed using the Chi-squared (χ^2) test for categorical variables and Student's *t*- test for continuous variables. For all comparisons, a P <0.05, at one degree of freedom, was considered statistically significant. The participants' characteristics that showed significant associations with knowledge status in univariate analysis were selected and entered into a multivariate logistic regression model to ascertain their independent effect on the outcome of interest, satisfactory knowledge status. Only those variables retained after multivariate analysis were considered significantly predictive of participants' good knowledge status.

RESULTS

The survey response rate was 100%. All the respondents, selected from the designated households by simple balloting were successfully recruited. In cases of initial non-availability, the investigators repeatedly visited the same house hold until the selected participant was recruited.

Table 1 Age and sex distribution of 394 respondents *n* (%)

Age (a)	Sex		Total
	M	F	
18-27	95	102	197 (50.0)
28-37	67	55	122 (30.9)
38-47	16	22	38 (9.6)
48-57	12	10	22 (5.6)
58-67	6	5	11 (2.8)
68-77	2	2	4 (1.1)
Total	198 (50.3)	196 (49.7)	394 (100.0)

Table 2 Socio-economic characteristics of 394 respondents

Characteristic	*n* (%)
Educational status	
None	8 (2.0)
Primary	4 (1.0)
Secondary	58 (14.7)
Tertiary	324 (82.2)
Occupation	
Civil servant	116 (29.4)
Trading	119 (30.2)
Farming	3 (0.8)
Self-employed	19 (4.8)
Retired	10 (2.5)
Student/unemployed	127 (32.2)
Marital status	
Single	226 (57.4)
Married	164 (41.6)
Divorced/separated	2 (0.5)
Widowed	2 (0.5)
Possession of health insurance	
Yes	89 (22.6)
No	305 (77.4)

Socio –demographic Characteristics There were 394 survey respondents comprising 198 (50.3%) males and 196 (49.7%) females (M: F=1.01:1) who were aged 18-70y with a mean age of 30.9 ±10.8y. Their modal age group, both overall and by gender, was 18-27y. There was no statistically significant difference between the mean ages of male and female respondents (males *vs* females, 31.25 ±10.96 *vs* 30.48 ±10.73, t=0.7046, 95% CI: -1.38-2.92, P=0.48). The majority of the participants were single (226, 57.4%), possessed a minimum of formal secondary education (382, 96.9%), and were frequently traders (119, 30.2%) or civil servants (116, 29.4%) who did not (305, 77.4%) possess any health insurance. The respondents' demographic profile is presented in Table 1 while their socio-economic characteristics are presented in Table 2.

Table 3 Participants' responses to knowledge questions and statements *n*(%)

Knowledge question or statement	Response (*n*=394)				
	Ophthalmologist	Optometrist	Both	Neither	Not sure
SECTION A: questions					
Which of them went to medical school to become a doctor as part of their training?	219 (55.6)	27 (6.9)	89 (22.6)	59 (15.0)	0 (0.0)
Which of them tests your vision?	152 (38.6)	66 (16.8)	112 (28.4)	5 (1.3)	59 (15.0)
Which of them prescribes glasses?	87 (22.1)	172 (43.7)	73 (18.5)	6 (1.5)	56 (14.2)
Which of them fits contact lenses?	53 (13.5)	177 (44.9)	51 (12.9)	11 (2.8)	102 (25.9)
Which of them grinds lenses?	26 (6.6)	178 (45.2)	38 (9.6)	25 (6.3)	127 (32.2)
Which of them performs cataract operations?	284 (72.1)	16 (4.1)	20 (5.1)	9 (2.3)	65 (16.5)
Which of them uses lasers to treat eye diseases?	190 (48.2)	34 (8.6)	25 (6.3)	23 (5.8)	122 (31.0)
SECTION B: statements	Yes	No		Not sure	
An ophthalmologist is allowed to test the eyes for glaucoma.	295 (74.9)	9 (2.3)		90 (22.8)	
An optometrist is allowed to test the eyes for glaucoma.	97 (24.6)	169 (42.9)		134 (34.0)	
An ophthalmologist is allowed to treat glaucoma with medications.	289 (73.4)	27 (6.9)		78 (19.8)	
An optometrist is allowed to treat glaucoma with medications.	114 (28.9)	98 (24.9)		182 (46.2)	
An ophthalmologist is allowed to prescribe codeine and other narcotic medications.	215 (54.6)	47 (11.9)		132 (33.5)	
An optometrist is allowed to prescribe codeine and other narcotic medications.	45 (11.4)	180 (45.7)		169 (42.9)	

Clinical Profile Two hundred and thirteen (54.1%) respondents have had an eye examination by an eye care provider since age of 18 years while 181 (45.9%) had not. Of the 213 (54.1%) who had previous eye examination as an adult, the eye examiner was identified as an ophthalmologist (101, 47.4%), optometrist (41, 19.2%), and optician (15, 7.0%), medical practitioner (general or specialist) (18, 8.5%) and other health care providers (16, 7.5%). Twenty-one (9.9%) respondents did not know the professional identity of their eye examiner. One hundred and sixty-four (41.6%) respondents reported previous or current wear of corrective spectacles while 22 (5.6%) reported current or previous wear of corrective contact lens.

Respondents´ Knowledge Profile The majority (219, 55.6%) of the respondents reported awareness of the difference between the professional training requirements of ophthalmologists and optometrists. However, the respondents' knowledge of their professional roles and responsibilities varied widely between the different roles whose knowledge was assessed. The profile of respondents' knowledge is presented in Table 3. Specifically, the majority of respondents were aware of the exclusive responsibility of ophthalmologists to perform cataract operations (284, 72.1%), treat glaucoma with medications (289, 73.4%) and prescribe narcotic drugs for treatment of eye diseases (215, 54.6%).

In a univariate analysis, male gender (OR: 0.98, 95% CI: 0.77-1.24, P<0.0001), educational status (OR: 0.32, 95% CI: 0.23-0.44, P<0.0001), occupational status (OR: 1.8, 95% CI: 1.45-2.25, P<0.0001) and possession of health insurance (OR: 1.33, 95% CI: 1.00-1.77, P=0.042) showed significant association with being knowledgeable. Also, previous eye examination (OR: 1.63, 95% CI: 1.29-2.07, P<0.0001), past or present spectacle wear (OR: 1.34, 95% CI: 1.02-1.76, P=0.029) and contact lens wear (OR: 1.65, 95% CI: 0.97-2.82, P=0.0498) were identified as statistically significant predictors of good knowledge (Table 4). In the multivariate logistic regression analysis, educational status (regression coefficient β, P-value; β=-0.988, P=0.000), occupational status (β=0.124, P=0.031) and previous eye examination (β=0.549, P=0.007) were retained as significant independent predictors of good knowledge. Possession of health insurance (β=0.439, P=0.077), spectacle wear (β=0.170, P=0.469) and contact lens wear (β=0.042, P=0.923) dropped as significant predictors of good knowledge in the multivariate logistic regression model. The negative regression coefficient for educational status indicates that respondents who possessed secondary education or less were more likely to be knowledgeable compared with those who possessed tertiary education.

DISCUSSION

The demographic distribution of the survey respondents showed almost equal number of males and females with an age range of 18-70 years and mean age of 30.9±10.8 SD years. The respondents' gender characteristic is similar to the report by Mahmoud *et al* [15] in Nigeria; however, the participants in the two surveys differed markedly by age. Further between-survey comparisons were precluded by partial or total lack of participants' demographic data in previous similar reports in Los Angeles [13] and Michigan [14], USA. The observed partial agreement with the Nigerian report is attributable to between-survey difference in participants' socio-economic characteristics [13-14,18]. While the

Table 4 Factors associated with participants' correct response to knowledge questions

Characteristic	Correct answers to knowledge questions *n* (%)	Incorrect answers to knowledge questions *n* (%)	Odds ratio (95% CI)	Chi-squared (χ^2)	*P*
Age (a)			1.01 (0.78-1.31)	0.002	0.9628
≤37	482 (33.5)	957 (66.5)			
>37	114 (25.2)	229 (74.8)			
Gender			0.98 (0.77-1.24)	57.34	<0.0001
M	298 (50.2)	296 (49.8)			
F	298 (50.7)	290 (49.3)			
Educational status			0.32 (0.23-0.44)	52.06	<0.0001
Secondary or less	63 (28.4)	159 (71.6)			
Tertiary	533 (55.5)	427 (44.5)			
Employment status			1.8 (1.45-2.25)	29.27	<0.0001
Never employed	256 (35.8)	459 (64.2)			
Employed/retired	340 (50.1)	338 (49.9)			
Possession of health insurance			1.33 (1.00-1.77)	4.14	0.042
Yes	145 (54.9)	119 (45.1)			
No	439 (47.8)	479 (52.2)			
Previous eye examination			1.63 (1.29-2.07)	17.59	<0.0001
Yes	343 (55.8)	272 (44.2)			
No	247 (43.6)	320 (56.4)			
Past or present spectacle wear			1.34 (1.02-1.76)	4.75	0.029
Yes	164 (55.2)	133 (44.8)			
No	424 (47.9)	461 (52.1)			
Past or present contact lens wear			1.65 (0.97-2.82)	3.85	0.0498
Yes	39 (59.1)	27 (40.9)			
No	521 (46.7)	595 (53.3)			

present report is on a general adult population, Mahmoud *et al*'s [15] was specific for civil servants who were in the employment age group, and therefore comparatively older. Demographic factors have been established as important determinants of knowledge of the professional identity, roles and responsibilities of eye care providers, frequency of eye care-related visits, and utilisation of eye care services [9-11]. Therefore, future similar surveys should capture and uniformly report participants' demographic data to permit valid cross-survey comparisons.

The respondents' were mainly traders and civil servants who possessed a minimum secondary education and had no health insurance. Again, these findings could not be compared with previous related reports which, although evaluated the predictive values of selected socio-economic variables on knowledge status, did not provide participants' baseline socio-demographic data [7,9-11,13]. This further underscores the need for comprehensive reporting of their respondents' socio-demographic data in future surveys.

Although 55.6% of the respondents were knowledgeable on the difference between the training requirement of ophthalmologists and optometrists, their knowledge assessment by specific professional tasks varied widely with a range of 18.5%-74.9%. The 55.6% observed in the present survey is similar to Guffey *et al*'s [14] 56.0% in Michigan, USA; however, this is higher than 33.0% reported by Wilson *et al* [13] and 49.0% by Bruninga *et al* [17] both in USA. Further literature search did not yield any related data for valid local comparison as the participants in the only Nigerian survey by Ayanniyi *et al* [18] were strictly civil servants. The observed similarities and differences could be attributed to between-survey differences in methods of knowledge assessment and probably time interval between surveys. Although a marginal majority claimed good knowledge, the wide discrepancies between general knowledge and task-specific knowledge probably suggest the possibility of participants laying false claim to knowledge, especially in self-report surveys like the present one [6,13,17]. These findings may have critical implications for the public's time to presentation for uptake of appropriate ophthalmic care and care outcomes. The present data probably suggest the need for government to embark on aggressive population-based eye health education with emphasis on professional competencies of the various eye care workers, and appropriate eye health seeking behaviour. Educational status and employment status were the significant socio-demographic predictors of good knowledge; however, both correlated negatively with knowledge. The observed relationship between education and knowledge is markedly different from the positive correlation found in previous

surveys in United States of America and Canada, and a Nigerian survey of government employees [5-6,13,16,18,20]. Although the difference between the present report and the previous Nigerian report [18] might be partly explained by between-survey differences in participants' socio-demographics, the reason for this negative correlation is not immediately clear. Could this finding be new data that may be attributed to a hitherto unidentified independent predictor variable? This observation may imply that high general literacy level associated with higher educational status does not necessarily translate directly to equivalent eye health literacy. This may suggest targeting the whole population, irrespective of educational status, during public eye health literacy campaigns. Similarly, unemployed participants were significantly more knowledgeable than their employed counterparts. This contrasts the findings of Wilson *et al* [13] in USA and also the report by Zeller *et al* [16] from a hospital-based survey of parents of paediatric ophthalmic out patients. While the differences in study settings and participants' ethnic characteristics might explain the observed discrepancies between the present report and the reports by Wilson *et al* [13] and Zeller *et al* [16], Zeller *et al*'s[16] emphasis on employment in the health care system might further account for the discordant observations. The observed parallel between the predictive roles of employment status and educational status is logical as participants who were highly educated are more likely to be employed. This observation further strengthens the previously established case for population-wide eye health literacy campaigns in the study area.

Previous eye examination as an adult correlated positively with participants' knowledgeable status while spectacle and contact lens wear did not. This corroborates the observation by Wilson *et al* [13] but differs from the report by Zeller *et al* [16], both in USA. The present survey and that of Wilson *et al* [13] are both population-based surveys while the other related study was a hospital-based survey whose data cannot be validly extrapolated to the general population. This might partly explain the differences. In the study area, contact lens wear is uncommon because of the dusty and humid tropical climate and the associated problems of maintaining standard lens care hygiene and risk of contact lens-related microbial keratitis [21-22]. Also, for reasons of cost and convenience, the inhabitants of the study area often acquire ready-made spectacles from spectacle vendors without undergoing standard refractive eye examination. Therefore, eye health literacy campaigns, by the government and eye care providers should highlight the need for periodic screening eye examination and the ocular health hazards associated with patronage of untrained market-based spectacle vendors[23].

The conclusions drawn from this study are limited by the possibilities of participants' inaccurate recall of the details of their previous clinical interaction with the eye care system and inadvertent false claim of knowledge of the professional identities of previous eye care providers[9,11,13,17].

The participants in the present survey have a fair general knowledge of the training requirements for ophthalmologists and optometrists but widely variable knowledge of their specific professional roles and responsibilities. Previous eye examination as an adult was positively predictive of knowledge status while educational status and employment status correlated negatively with knowledge. These findings may have implications for eye care planners, implementers, and providers in the study area. Mass media-based population-wide eye health literacy campaigns and promotive and preventive eye care interventions are needed. Additionally, the present data suggest an aspect-specific shift in public eye health policy aimed at equipping eye care consumers with role-specific knowledge of their eye care providers.

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