CLINICAL AND EXPERIMENTAL
OPTOMETRY

RESEARCH PAPER

Toward eliminating blindness due to uncorrected refractive errors: assessment of refractive services in the northern and central regions of Ghana

Clin Exp Optom 2014; 97: 511–515 DOI:10.1111/cxo.12195

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Submitted: 16 December 2013
Revised: 22 May 2014
Accepted for publication: 25 May 2014

Purpose: This study sought to document current refractive services in the northern and central regions of Ghana as a first step toward evidence-based planning of refractive services.
Methods: A descriptive cross-sectional survey was carried out in health facilities in the northern and central regions of Ghana, which provided eye-care services. A semi-structured questionnaire was administered to gather information on each facility type, human resources providing refractive services, assessment of refraction and spectacle dispensing output and provider barriers to the services.
Results: Current outputs of refraction in the northern and central regions were 0.5 and 1.2 per cent of the estimated refractive needs, respectively. Spectacle dispensing services were below the outputs of refraction. Lack of equipment (36.8 per cent) and cost of providing spectacles frames (31.6 per cent), were identified as the main barriers to providing refractive services.
Conclusion: The provision of refractive services in the study regions was inadequate. Lack of infrastructure and inadequate human resource were the major reasons for the limited service provision. This should be considered for planning refractive services in the study regions and Ghana as a whole.

Key words: Ghana, refractive errors, spectacles

Globally, uncorrected refractive error is a major cause of blindness and visual impairment in most populations. It has been estimated that eight million people are blind and 145 million people have low vision as a results of uncorrected refractive errors.[1] It is one of the World Health Organization (WHO) priority eye conditions within its global initiative, VISION 2020: Right to Sight. Although not preventable, refractive errors are easily treatable with corrective spectacles, contact lenses or refractive surgery.[2] Approximately 90 per cent of people with uncorrected refractive errors are estimated to be living in rural areas and low-income countries.[3] Cost and inaccessibility to refraction and spectacle dispensing services have been identified as major challenges to reducing the current magnitude.[4] Well-developed refractive services could help reduce the current magnitude of the problem, especially in low-income settings.[5]

At the beginning of the five-year national eye health program (2004 to 2008) in Ghana,[6] limited evidence had been gathered on the magnitude of refractive errors in the population and the distribution and nature of refractive services across the country. Notwithstanding, uncorrected refractive errors were captured as part of the priority conditions targeted for control in the five-year program. This period coincided with the expansion of schools of optometry and establishment of a school for dispensing opticians in the country. Five years after the completion of the program, there is no evidence on formal evaluation of refractive services in Ghana. With increasing numbers of both public and private eye-care facilities, there is a need for assessment of refractive services being provided. Additionally, there is little literature on the coverage of refractive services in many developing settings. Given that there are six years left until the completion of the VISION 2020: Right to Sight global initiative, a formal assessment of refractive services is important toward evidence-based planning of services. This would ensure that the limited resources are efficiently allocated to reduce the current magnitude. This study sought to document current refractive services in the northern and central regions of Ghana, as a first step toward planning evidence-based refractive services.

MATERIALS AND METHODS

Study area

A purposive sampling method was used in the selection of health facilities providing eye care in the central and northern regions of Ghana. The two regions were selected to give a geographically representative assessment of refractive services in Ghana. The central region is located in the southern sector of Ghana, while the northern region is in the northern sector of Ghana. The two parts of Ghana differ significantly in various socioeconomic dimensions, such as education, health-care and infrastructure. The northern part of Ghana, where the northern region is located, has historically been deprived of basic social amenities such as

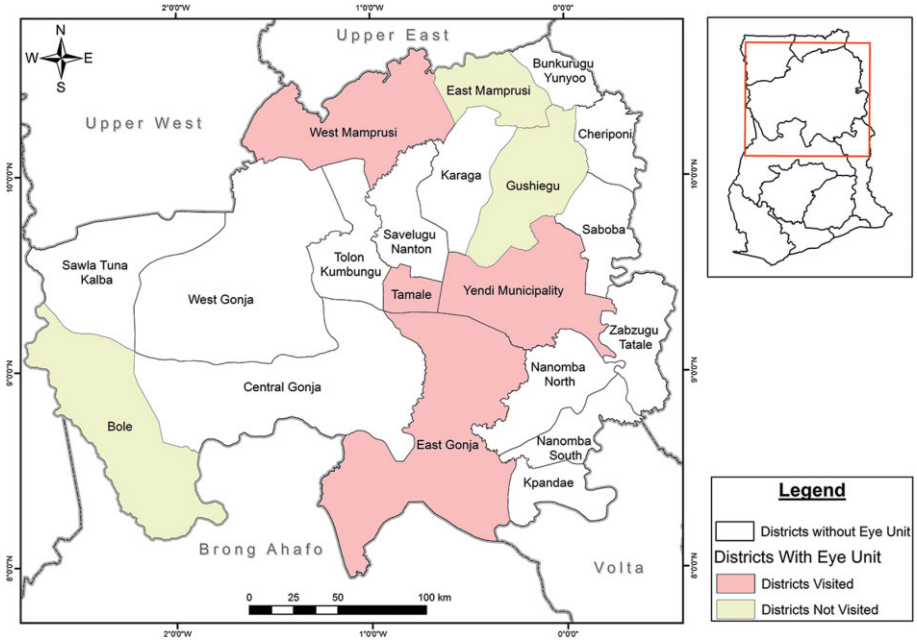

Figure 1. Regions of northern Ghana showing districts visited and those without eye units. Five hospitals and three optical centres were visited in the northern regions.

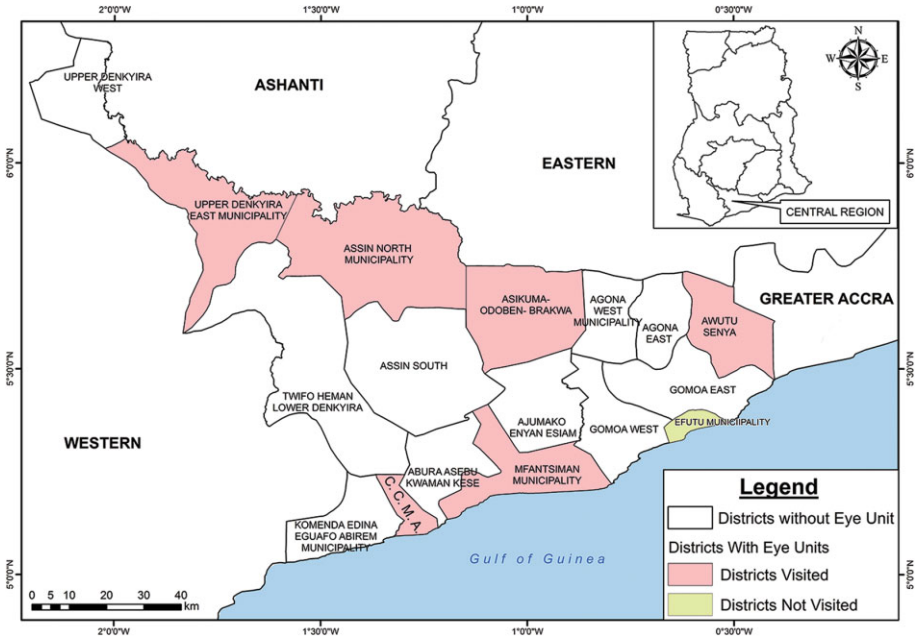

Figure 2. Regions of central Ghana showing districts visited and those without eye units. Six hospitals, two eye clinics and three optical centres were visited in the central region.

health-care and education.[7,8] This is contrary to the picture in the south, where the central region is located. Additionally, the study wanted to determine the influence of an optometric training school in the central region on refractive services in such areas as human resource distribution and output of services compared to a region without such an institution. Health facilities were selected from two sources; government facilities and Christian Health Association of Ghana (CHAG) facilities were obtained from the eye-care unit of the Ghana Health Service and private optical shops were obtained from the Ghana Optometric Association (GOA) secretariat. At the time of the study, a total of 28 health facilities were identified to be providing eye-care services in the two study regions. There were 17 government hospitals, two mission (faith-based) facilities and seven optical centres in the two study regions; however, the study could only take place in 19 facilities from an initial 22 sampled. Six hospitals, two eye clinics and three optical centres were visited in the central region, while five hospitals and three optical centres were visited in the northern region (Figures 1 and 2). These were the facilities actively providing refractive services in the last three months, as in some facilities no refractive services were provided even though they provided some form of eye care. In the other three facilities, where the study could not take place, reasons for non-participation included consent refusal and lack of provision of refractive services because personnel manning the centres had vacated the posts.

Study design

A descriptive cross-sectional survey was conducted over a period of two months (June and July, 2013) in selected health facilities providing eye care in the two selected study regions. At each facility visited, a semi-structured questionnaire was administered to the health professional who actively provided refractive services (refraction or spectacle dispensing). The questionnaire covered the demographic details of the professional actively providing refractive services, general facility information, such as the level of eye-care services provided and sources of funding (support), output of refraction, the average number of refractions delivered in each facility in a month, spectacle dispensing in a month in each facility, sources for spectacle dispensing, types of spectacles dispensed, methods used to deliver refractive services and barriers to providing these services.

Data analysis

Stata version 12 (StataCorp, College Station, Texas, USA) was used for statistical analysis. Descriptive statistics including frequencies, percentages, means and standard deviations were computed. The current output of

	Government				Private			Total
	RH	MEH	MUH	EC	MIH	EH	OC	
Central	1	1	1	1	3	1	3	11
Northern	1	1	3	0	0	0	3	8
Total	2	2	4	1	3	1	6	19

RH: regional hospital, MEH: metropolitan hospital, MUH: municipal/District hospital, EC: eye clinic, MIH: mission hospital, EH: eye hospital, OC: optical centre

Table 1. Distribution of health facilities providing refractive services by region

Service	Central N			Total	Northern N			Total
	Optom	ON	DO		Optom	ON	DO	
Refraction	85 ± 49	40 ± 23	50 ± 28	175 ± 100	35 ± 48	8.5 ± 11	30 ± 41	74 ± 100
Spectacle dispensing	62 ± 67	0 ± 0	30 ± 33	92 ± 100	30 ± 55	5 ± 9	20 ± 36	55 ± 100

Optom: optometrist ON: ophthalmic nurse DO: dispensing optician

Table 2. Average output of refraction and spectacle dispensing in a month

Region	Population†	Annual refraction	Total number of refractionists	Annual refraction/ refractionist
Central	1,072,918	1,020	16	64
Northern	1,191,399	468	9	52

† 2010 Population and housing census

Table 3. Current number of refractions per refractionist

refractions for facilities visited in each region was compared to an estimated output required for the presbyopic population served by these facilities (based on the 2010 Ghana population and housing census).

This estimated output was calculated based on the finding in the literature that 90 per cent of refractions in most developing countries are in the presbyopic populations.[9–12]

Ethics statement

Ethical approval for the study was obtained from the Ethics Committee at the London School of Hygiene and Tropical Medicine and the Research and Ethics Committee of Ghana Health Service. Informed written consent was obtained from each participant.

RESULTS

A total of 19 facilities were visited from the 22 initially sampled. Table 1 provides a description of the facility type, the ownership and the location of the facility.

Characteristics of human resources providing refractive services

There were 20 participants in total who responded to the questionnaire in these 19 eye-care facilities. These participants consisted of the following professionals: 12 optometrists (63 per cent), six ophthalmic nurses (26 per cent) and two dispensing opticians (11 per cent). These were the eye-care staff that actively provided refractive services and were present at the time of the visit. In one facility in the northern region, the optometrist and ophthalmic nurse both provided refractive services. This explains why there were 20 participants in 19 facilities. The mean age of the participants was 35.79 ± 2.65 years (95 per cent CI 30.21 to 41.36). Most participants of the study (79 per cent) were males. The mean number of years of providing refractive services was 5.47 ± 3.88 years (95 per cent CI 3.60 to 7.34).

Methods used to deliver refractive services

In all 19 facilities, refractions were done within the facility. Fifteen (78.95 per cent) facilities rendered refractive services during community outreaches. Of those facilities which rendered community outreaches, these were carried out at least once every month. Refraction and spectacles (mostly reading glasses) were dispensed during these outreaches.

Output of refractive services

The average output of refractions and spectacles dispensed in both regions shows that facilities involving optometrists for refractive services had higher refraction and spectacle dispensing outputs than those involving other cadres (Table 2). On average, the number of refractions performed per professional in a year for the population within the catchment areas of these facilities was low (Table 3).

Based on the finding in the literature that approximately 90 per cent of visits for refraction in developing countries are by presbyopes,[9–12] this study sought to estimate the demand for refraction among patients aged 45 years and above. Current outputs of refraction were compared with this estimated demand and were found to be lower. In the central region, the current number of refractions in a year is 1.2 per cent of the estimated requirements in a year. In the northern region, only 0.5 per cent of the required refractions per year is being covered (Table 4).

The average numbers of spectacles dispensed annually in both the northern (240) and central (684) regions were low when compared to the average number of refractions performed in one year.

Region	Population covered	Presbyopic population (aged ≥ 45)	Estimated number of annual refractions†	Required refraction per refractionist	Current output as % of estimated output††
Central	1,072,918	171,667	85,834	5,365	1.2
Northern	1,191,399	190,624	95,312	10,590	0.5

† These were estimated based on the rule of thumb that a presbyopic population (over 45 years) would have refraction at least once every two years (A/2 years)
†† Current number of refractions in a year (Table 3) per estimated number of refractions in a year (4th column of Table 4)× 100

Table 4. Estimated need for refraction (presbyopia only) by region

Sources of spectacle dispensing services

In 13 facilities (68.4 per cent), spectacle dispensing units (optical laboratories) were available in the facilities, so that the clients' spectacle prescriptions could be filled there. These were mostly in mission and private facilities; however, in three government facilities (15.8 per cent), dispensing facilities were not available, therefore, clients' prescriptions were ordered from private optical shops. The other 15.8 per cent of facilities usually give spectacle prescriptions to clients, so that they can obtain spectacles from other sources, such as from the high-street spectacle retailers. In all facilities visited, none provided any form of contact lens services.

Barriers to providing refractive services

Provider barriers to refractive services were reported to be lack of equipment (seven or 6.8 per cent), cost of spectacles (procuring frames) (six or 31.6 per cent) and lack of motivation (two or 10.6 per cent). Four (21 per cent) said that there were no barriers to providing services.

DISCUSSION

This was a descriptive cross-sectional study involving an assessment of the current state of refractive services in the northern and central regions of Ghana. To the best of the authors' knowledge, this is the first assessment of refractive services in Ghana. It is a critical first step toward planning and meeting the refractive needs of the population.

Results of this study show that the number of government (public) facilities providing refractive services is inadequate and unevenly distributed. There are more government (public) facilities than private in Ghana;[13] however, the number providing eye care with refractive services is inadequate. Most of the government facilities visited which provided refractive services were located in the regional capitals and a few district capitals. This means that most clients in districts and rural communities without these government hospitals would have to travel very long distances to access refractive services. These long distances travelled are further compounded by an inaccessible road network making travel difficult. Low coverage for refractive correction has been reported in people domiciled in rural communities.[14] Often, distance has been cited as a major barrier for these individuals to access eye care.[15,16] Integration of refractive services with health care at the community level, for example, integration into the Community-based Health Planning and Services (CHPS) compound (a health post which serves very remote communities and generally provides an outpatient department and antenatal services only) could help reduce the current magnitude of uncorrected refractive errors in the communities of these regions.

Human resources providing refractive services are lower in much the same way as the human resources for other eye-care services in both regions and it reflects the general situation in Ghana and most developing countries at large.[17–19] In the northern region, there were only five optometrists in both public and private facilities serving a population of approximately 1.2 million. This means that the optometrist to population ratio was 1:238,280, far below the WHO target of 1:100,000 by 2010 and 1:50,000 by year 2020.[19] To compound the burden further, this region has a sparse population density, which means that accessing the optometrists, who are all based in the regional capitals becomes very difficult. This finding is similar in the central region. Ophthalmic nurses who provide refractive services are unable to do much given the additional ophthalmic procedures they have to provide in addition to refraction. They provide mainstream ophthalmologic services given the dearth of ophthalmologists in the two regions. Ophthalmic nurses elsewhere are often deployed to eye-care services other than refraction.[20]

Provision of refractive services to communities through outreach is a crucial step toward addressing the magnitude of uncorrected refractive errors, as it brings the service closer to the communities.[4] This is especially important given that the majority of inhabitants in the two regions are in farming (northern region) and fishing (central region), so that the cost of visiting an eye clinic may become a barrier. As such, refractive services during such outreaches would bring eye care to such communities, which otherwise would have to travel long distances. Apart from that, such outreaches would enhance the reputation of the provider, reduce costs to patients by meeting their needs there and then. It has even been argued that a refractive error outreach service during which spectacles are dispensed is more likely to attract patients than a surgical program, as fear of surgery may prevent some patients from attending.[4,21]

Presbyopic populations constitute the largest demand for refractions in eye-care facilities in most low-income countries.[9–12] In Ghana, a population-based survey of teachers found 68.5 per cent were presbyopic,[22] while Morny,[23] using hospital chart reviews, found a prevalence of 65 per cent. Based on the findings of greater presbyopic visits in low-income settings, the proportion of individuals aged 45 years and above in the districts covered by the facilities visited in the two regions was estimated and the demand for refraction in this population was calculated and compared with the current output of refractions in the facilities. Overall, the average number of refraction per refractionist was low in the two regions compared to the estimated need. Possible reasons for this low output could be due to a lack of awareness on the part of patients about the availability of refractive services, the small number of optometrists in the northern region and the low productivity of

optometrists in the central region. A public health approach to increase output of refractions in the two regions may include increased public awareness of the availability of refractive services and the benefits of correction and measures to increase the productivity of the optometrists, including providing the essential equipment and motivation. Additionally, more optometrists would be required in the public sector as a long-term measure, where they could be deployed to health facilities at the district and community levels.

The average number of spectacles dispensed in each of the two regions is below the needs of the populations covered. Not only does this represent a magnitude of impairment or disability but also a loss of potential source of revenue to the facilities. Additionally, most public facilities lose a potential source of revenue by not dispensing spectacles from their own facilities.

Most optometrists did not report any barrier to providing refractive services in the two regions; however, a few reported a lack of basic equipment, such as trial lens sets or retinoscopes as barriers. A situation where there is only one trial lens set (which may have missing lenses) in a facility affects the number of refractions that could be delivered in a day. This was observed mostly in government (public) facilities. If such basic equipment is made available, productivity could be increased by those optometrists citing lack of equipment as a barrier. In facilities where ophthalmic nurses and dispensing opticians were the providers of refractive services, lack of equipment and insufficient training were reported as the major barriers to providing refractive services. These findings of lack of equipment and insufficient training are consistent with other situational analyses that assessed barriers to providing refractive error services in other parts of Africa and reflect a general problem in the developing world.[24,25]

CONCLUSION

Provision of refraction service in the two study regions was inadequate. Most of the facilities provided refractive services both in hospital settings and in community outreaches. Most of the refraction facilities had spectacle dispensing units. The number of facilities providing refractive services should be increased. These services were mostly provided by optometrists and ophthalmic nurses. Training requirements of human resources providing refractive services should be reviewed. In conclusion, strategies to scale up refractive services through infrastructure and human resource development and proper management are required to strive toward eliminating blindness and visual impairment due to uncorrected refractive error.

ACKNOWLEDGEMENTS

The authors acknowledge the immense help of the staff of the International Centre for Eye Health (ICEH), London School of Hygiene and Tropical Medicine, United Kingdom. The authors are equally grateful to the medical directors of the facilities which were visited during the study.

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