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Refractive Errors among Administrative Staff of Senior High Schools in the Kumasi Metropolis

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Abstract

Introduction: Studies in other parts of the world show refractive error as a notable cause of visual impairment. Ghana is not an exception to these findings.

Objective: This study focused on determining the types and prevalence of refractive errors among administrative staff of selected senior high schools in the Kumasi Metropolis of Ghana.

Methods: A descriptive cross-sectional study in which 120 administrative staff from 10 randomly selected public senior high schools was conducted. Information collected from participants included demographics and ocular and medical history. Eye health assessment included visual acuity, examination of external eye structures, direct ophthalmoscopy, and refraction. Refractive error diagnosis was made in the event of pinhole acuity being better than participant's habitual vision in either eye or both. Descriptive statistics was employed and a p-value<0.05 was considered significant for the study.

Results: Oculo-visual symptoms reported included teary eyes, headache, blur vision and double vision. The overall prevalence of refractive error was 30.8%; hyperopia, myopia, and astigmatism with prevalence figures of 17.5%, 10.8% and 2.5% respectively.

Conclusion: The prevalence of refractive error was considerably high among this group of workers. These workers would benefit from vision screening programmes and refractive error correction if made available to them.

Keywords: Refractive error; Prevalence; Hyperopia; Myopia; Astigmatism

Introduction

Refractive error is a condition in which the eye in its relaxed state is unable to sharply see images due to failure of the optical system to bring parallel rays of light reflected off object(s) of regard to a sharp focus on the retina [1,2]. As a result, there is relatively poor vision as images of objects are seen to be blurred. There are different types of refractive errors and they include hyperopia, myopia, and astigmatism, with overlapping forms. Myopia and hyperopia are said to occur when the optical system of the eye brings parallel rays of light into focus in front and at the back of the fovea, respectively. Astigmatism on the other hand occurs when rays of light from different planes do not come to the same point on the fovea.

Between the years 2002-2004, it was estimated that 45 million people were blind globally from several causes, out of which 8 million representing 18% were due to uncorrected refractive error [3-5]. Again, low vision in some 145 million people worldwide has been attributed to uncorrected refractive errors [3]. Hence, people with visual impairment due to uncorrected refractive errors are estimated to be 153 million globally [6]. The global burden of uncorrected refractive errors has for long made it one of the priorities of the W.H.O. [6]. Data suggest that a large number of people are visually impaired in different parts of the world due to high refractive error. This is because these people are not using appropriate refractive correction or refractive correction is simply not available to them.

In 2001, a study conducted in the Volta region of Ghana showed a 6.9% prevalence of refractive error. In another study done in the Wenchi district of Ghana, uncorrected refractive error was reported to be the cause of a high rate of unilateral and bilateral low vision [7]. A global report shows that uncorrected refractive errors are the main cause of visual impairment in children aged 5-15 years. The prevalence of myopia in South-East Asian children for example has been found to be increasing [6].

High refractive error in childhood may lead to amblyopia, resulting in permanent vision loss if not corrected during early childhood. Refractive errors are usually correctable by use of spectacles, contact lenses, or refractive surgery. Spectacles are the most commonly used form of refractive correction since they are the most inexpensive and the simplest of the three options [6]; as such, they are the most appropriate intervention for correction of refractive error in developing countries [8].

A lot of factors can cause refractive errors. These include hereditary factors, refractive error secondary to pathology in the eye, and factors such as one's working environment [9-12]. Increasing educational levels and professional or office-related occupations have been associated with higher rates of myopia. Administrative work often

involves near work and this increases the chance of onset of refractive error [13].

Visual impairment due to uncorrected refractive error can adversely affect education, personality development, career prospects and overall quality of life. All of these could place a socioeconomic burden on the individual or society at large [14,15]. A study done in rural Tanzania has demonstrated that uncorrected refractive error has a significant impact on vision-related quality of life [16]. Thus, the extent of burden on any individual with refractive error cannot be overemphasized. Therefore strategies need to be implemented to detect individuals suffering from refractive error and appropriately manage such people [14].

Methods

Sampling

A descriptive cross-sectional survey was carried out to determine the prevalence of refractive errors. Ten senior high schools out of 16 in the region were selected in a simple random fashion.

Data collection

All administrative workers in the chosen schools were considered for eye screening. Participants' eye and medical history as well as that of their families' were recorded with the aid of a study questionnaire designed by the investigators. Both eyes of all study participants were examined. Distance visual acuity using the Snellen's chart was carried out. Those with worse than 6/6 vision were further assessed for pinhole acuity. If pinhole acuity was better than entrance vision, subjective refraction was done. Other methods of refractive error assessment might have revealed some variations in the magnitude of refractive errors that were measured in this study [2,17-20].

External eye examination was carried out with a pen torch and ophthalmic loupes and the Welch Allyn ophthalmoscope was used for assessment of the interior of the eye.

Ethical consideration

Informed consent was sought from all study participants. The entire study and its procedures were thoroughly explained to the participants, and the study adhered to the tenets of the Declaration of Helsinki.

Data analysis

The data collected was analysed with the Statistical Package for Social Sciences (SPSS) version 16.0. Descriptive statistics was employed and a p-value <0.05 was considered significant.

Results

Participants' demographics

A total of 120 administrative staff members out of 151 from 10 senior high schools were examined. This translated to a response rate of 79.5%. Out of this, 58 (48.3%) respondents were males and 62 (51.7%) were females. Participants' age distribution ranged between 26 and 60 years, with a mean age of 44.6 ± 8.7 years. Modal age group was 46-50 years (25%) Details of the age and gender distribution of respondents are shown in table 1.

Age of respondents (yrs)	Gender			Refractive Error			
	Male	Female	Total	Myopia	Hyperopia	Astigmatism	Total
26-30	9 (7.5%)	9 (7.5%)	18 (15.0%)	4 (3.3%)	0 (0.0%)	0 (0.0%)	4 (3.3%)
31-35	4 (3.3%)	4 (3.3%)	8 (6.7%)	0 (0.0%)	0 (0.0%)	0 (0.0%)	0 (0.0%)
36-40	7 (5.8%)	3 (2.5%)	10 (8.3%)	2 (1.7%)	0 (0.0%)	0 (0.0%)	2 (1.7%)
41-45	6 (5.0%)	10 (8.3%)	16 (13.3%)	5 (4.2%)	0 (0.0%)	0 (0.0%)	5 (4.2%)
46-50	9 (7.5%)	21 (17.5%)	30 (25.0%)	2 (1.7%)	6 (5.0%)	2 (1.7%)	10 (8.3%)
51-55	19 (15.8%)	10 (8.3%)	29 (24.2%)	0 (0.0%)	10 (8.3%)	1 (0.8%)	11 (9.2%)
56-60	4 (3.3%)	5 (4.2%)	9 (7.5%)	0 (0.0%)	5 (4.2%)	0 (0.0%)	5 (4.2%)
Total	58 (48.3%)	62 (51.7%)	120 (100%)	13 (10.8%)	21 (17.5%)	3 (2.5%)	37 (30.8%)

Table 1: Gender and refractive error distribution by age category.

Out of the 120 respondents, 50 (41.7%) reported having ever encountered an eye problem which they reported to an eye doctor. Eighty six (71.7%) had had a form of eye examination before, either at the hospital or at an eye outreach programme.

Oculo-visual characteristics of study participants

Thirty respondents (25%) reported having an idea of a family history of eye problem. Thirty- nine (32.5%) reported tearing whiles 48 (40%) reported redness of the eye. Seventy-six (63.3%), 49 (40.8%) and 18 (15%) reported headache, blur vision and double vision respectively.

In this study, VA ≤ 6/9 was considered subnormal. Some 30.8% of the population aged > 40 years presented with this subnormal acuity. Myopia was defined as best sphere correction of -0.50DS or more, and hyperopia was defined as best sphere correction of +1.00DS or more. Eighty-three (69.2%) respondents had visual acuity of 6/6 whereas 37 (30.8%) had a visual acuity of 6/9 or worse. Respondents within the age group of 51-55 years had the highest percentage (32.4%) of subnormal

visual acuity whiles those within 31 -35 years had none recorded at all. Participants' unaided visual acuities of their better eye were as shown in table 2.

Visual acuity	Gender		Total
	Male	Female	
6/6	42 (35.0%)	41 (34.2%)	83 (69.2%)
6/9	12 (10.0%)	14 (11.7%)	26 (21.7%)
6/12	4 (3.3%)	3 (2.5%)	7 (5.8%)
6/18	0 (0.0%)	2 (1.7%)	2 (1.7%)
6/24	1 (0.8%)	1 (0.8%)	2 (1.6%)
Total	59 (49.1%)	61 (50.9%)	120 (100%)

Table 2: Distribution of unaided VA of the better eye of respondents.

Prevalence of refractive errors in the study population

A total of 83 (69.2%) subjects were classified as emmetropic for either eye. An overall prevalence of refractive error was determined to be 30.8% (Table 3).

Refractive status	Gender		Total
	Male	Female	
Myopia	7 (5.8%)	6 (5.0%)	13 (10.8)
Hyperopia	9 (7.5%)	12 (10.0%)	21 (17.5)
Astigmatism	1 (0.8%)	2 (1.7%)	3 (2.5%)
Emmetropia	42 (35.0%)	41 (34.2%)	83 (69.2%)
Total	59 (49.1%)	61 (50.9%)	120 (100%)

Table 3: Distribution of refractive status by gender.

Discussion

Reports of refractive error among young adults and the middle-aged have been given in several studies [15,21,22]. Some studies on global estimates show that uncorrected refractive errors are one of the major causes of visual impairment [23]. The target population for this study is one whose eye care needs is crucial.

The study found an approximately equal distribution between the gender counts. Female to male ratio was 1.1:1 this could be due to the gradual embrace of female capacity by the Ghanaian society in the field of academia [24, 25]. Participants' ages spanned 26 to 60 years, age 60 being the retirement age of civil servants in Ghana. This was an anticipated finding as most civil servants in developing countries expect to remain on government payroll till they officially retire [26]. It also found an indication of the awareness of good eye health practices. Eighty six (71.7%) out of the 120 participants had had an eye examination before. Some had had it at a hospital or during eye screening at an outreach post. Moreover, respondents who had visited an eye specialist might have done so because they probably understood it was best to consult qualified personnel for their eye care needs [27,28]. Their level of literacy may also have contributed to this finding.

From the results, 30.8% of respondents had received spectacles as treatment when they visited the eye clinic and 30.0% (36 respondents) admitted full compliance to the wear of their spectacle prescription. This might be attributed to their level of education and being aware of the fact that refractive correction was needed when their vision became defective. Comparing our study to one survey [8], distance spectacle coverage was higher among the urban and literate and those in paid employment, compared with rural, illiterate and adults involved in subsistence farming. This further supports the idea that access of eye care services is mostly by the elite in the society.

Participants reported various oculo-visual symptoms: teary eyes, redness of the eye, headache, blur vision, and double vision. This may be due to ocular fatigue as a result of the visual demands related to their job. General fatigue may also be a contributor [29]. As the results indicate, a high percentage of respondents fell into the category of emmetropia as defined by the study. It did not show statistical significance whether participants' gender predisposed them to having refractive error or not ($p > 0.05$). Hyperopia was recorded as the highest prevalent refractive error followed by myopia and astigmatism. A similar outcome was reported in some studies [17,30]. Other studies, however, have shown myopia to have the highest prevalence [19]. Hyperopia was also observed to increase with age. A similar outcome was seen in a prevalence study of refractive errors in a rural south Indian population [31]. A prevalence of 18.7% was recorded in that study and hyperopia increased till age 60 years before a gradual decline ensued. Among office workers in Buenos Aires, Argentina, hyperopia was found to be associated with older age [32]. This observation is perhaps due to the decrease in accommodative amplitude with increasing age together with the increasing demand for reading and other near work especially for this category of persons [33]. While the definition of refractive error, for the purposes of this study, did not allow for presbyopia to be discussed, it does not doubt the possibility of presbyopia in the study population. The mean age (44.6 ± 8.6years) further makes it plausible to note that presbyopia may confound the findings since presbyopia is found among this age group of individuals. Both myopia and astigmatism also increased with age though not as significant as hyperopia. Moreover, both refractive errors were not as prevalent as hyperopia. In the adult years, myopia tends to progress slowly [33]. This could be explained as being as a result of continued axial elongation or to the presence of early-stage nuclear lens changes [34]. A direct cause-effect relation between myopia and increased access to education has been suggested in another study as a possible reason to this finding [5]. The demand for reading and other near work amongst this category of civil servants could also be an explanation for this finding [19]. This adds to the tenet of the 'use-abuse' theory, which shows an increase in myopia with an increase in hours of near work [17,35-37].

Hyperopia was highest in the 51-55 years age group. Studies in India and in the black population in Barbados reported an increasing trend of myopia with age. However, some studies in other tropical areas of the world showed a decreasing prevalence of myopia with age [31]. In one study a higher prevalence of myopia in females than in males was found [19] whereas the current survey revealed more males being myopic as compared to females ($p > 0.05$). Hyperopia was more prevalent among women than men. This compares favorably with a similar report of the Bangladesh and the Nigeria National Blindness and Visual Impairment Study [28].

Conclusion

A representation of the distribution of the various types of refractive errors among senior high school administrative staff in Kumasi has been recorded by the study.

The overall prevalence of refractive errors among the study population was considerably high (30.8%) for the sample studied (N = 120)

There are several senior high schools within the metropolis. The findings of the study give an insight into the refractive error situation that exists among this population.

Recommendations

We recommend that the Ghana Education Service and other stakeholders develop and implement eye care programmes that will help detect and correct refractive errors among staff in senior high schools within the metropolis.

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