

## CONTRIBUTION OF REFRACTIVE ERRORS TO VISUAL IMPAIRMENT IN PATIENTS AT KORLE-BU TEACHING HOSPITAL

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### SUMMARY

**Objective:** To determine the contribution of refractive error to visual impairment in visually impaired patients attending Korle-Bu Teaching Hospital, Ghana.

**Method:** This study was conducted over a period of 1 year beginning October 2002 at Korle-Bu Teaching Hospital. Every 4th consecutive new case attending the eye clinic, aged 6 years and above was selected and interviewed using a structured questionnaire. A Snellen's chart was used to determine the unaided visual acuity, visual acuity with spectacles where the patient was wearing one, and visual acuity with pin hole with or without spectacles. Improvement in visual acuity by 2 or more lines on the Snellen's chart when looking through the pin hole was regarded as an indication of refractive error.

**Results:** A total of 1,069 respondents, 594 female and 475 male were recruited into the study. One hundred and fifteen (115) patients (10.76%) were found to have impaired vision (Visual acuity worse than 6/18 to PL in the better eye). The vision of 51 of those with impaired vision improved when looking through the pin hole. Refractive error with Visual Acuity worse than 6/18 was present in 4.8% of all patients who attended the eye clinic. Refractive error was present in 44.3% of patients with visual impairment.

**Conclusion:** Visual impairment was a common presentation and uncorrected refractive error was a major cause of visual impairment.

**Keywords:** Refractive error, visual impairment, vision 2020, low vision

### INTRODUCTION

Although one of the symptoms that alert people to seek eye care is deterioration in vision, the level of vision different people tolerate before seeking attention for their sight is variable. It is speculated among ophthalmologists in the West African sub-region that it is not uncommon for a patient to wait until there is marked deterioration in vision before eye care is sought<sup>1</sup>. Some people tolerate impaired

vision once they are able to move round confidently.

A common cause of impaired vision and the second leading cause of treatable blindness in some parts of the world is refractive error<sup>2,3</sup>. Uncorrected refractive error can cause needlessly "impaired vision" or even "blindness". Because of the increasing realization of the enormous need for correction of refractive errors worldwide, this condition has been considered one of the priorities of the global initiative for the elimination of avoidable blindness<sup>4,5</sup>. For the most part, refractive error can be easily corrected with spectacles, which makes it unacceptable for any one to live with this easily treatable cause of impaired vision. The initiative to eliminate visual impairment by the year 2020 was launched in Ghana in October 2000<sup>6</sup>. All the major eye diseases: cataract, trachoma, onchocerciasis, childhood blindness, low vision and refractive errors targeted by the Global Vision 2020 initiative project are also major eye problems in Ghana<sup>7</sup>.

The aim of this study was to find out the contribution of refractive error to visual impairment in new patients attending the Eye Clinic of the Korle-Bu Teaching Hospital in Ghana. Korle-Bu Teaching Hospital receives patients living mainly in the Southern parts of the country. The Accra metropolis has a mixture of people from all parts of Ghana who attend the Korle-Bu Hospital with or without referrals. Statistics from this study will contribute to a clearer understanding of the burden of refractive errors in Ghana for the purposes of eye care planning and intervention.

### MATERIALS AND METHODS

This is a cross sectional study. The subjects were recruited as they went through the routine screening process at the outpatients' clinic. The sample was made up of 1 in 4 of all consecutive new cases attending the eye clinic at the Korle-Bu Teaching Hospital aged 6 years and above. The study was explained to patients or guardians (in the case of children) in a language they understood (English

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or local language). Subjects were recruited after informed consent. None of the patients declined inclusion. An interviewer collected demographic data and also interviewed patients to find out if the patient had defective vision for distant, near, or both. An ophthalmic nurse used a Snellen's chart (non illuminated) to determine the unaided visual acuity, visual acuity with spectacles where the patient was wearing one, and visual acuity with pin hole (with or without spectacles). Improvement in visual acuity by 2 or more lines on the Snellen's chart when looking through the pin hole was regarded as an indication of refractive error or under-corrected refractive error when the patient was already wearing spectacles. The criterion of two or more lines was chosen as this represented a clinically relevant level<sup>8</sup>. Reading 50% or more of the letters on a line correctly was regarded as the patient getting the level correct. In this study impaired vision has not been defined in terms of best-corrected distance visual acuity (i.e. the most appropriate refractive correction) instead presenting distance visual acuity (unaided or the individual's current refractive correction if already wearing spectacles) in the better eye so as to permit assessment of visual impairment due to refractive error, whereas the former definition does not<sup>3</sup>

## RESULTS

A total of 1,069 respondents, 594 female and 475 male were recruited. One hundred and seventy four (174) were less than 16 years old (Children, by WHO definition). The children's ages ranged from 6 to 15 with a mean of 11, median 12 and standard deviation 2.9. The rest of the patients were 16 to 87 years old with a mean age of 37, median 32, and standard deviation 17.4. About 1% of the study group (children excluded) were professionals or in the managerial positions.

**Table 1** Summary: visual impairment (VI) and refractive error (RE)

Age	Total No.	Vision < 6/18	% with VI	VI with RE	%RE
6-15	174	9	5.2	3	1.7
16-87	895	106	11.8	48	5.4
6-87	1069	115	10.8	51	4.8

One hundred and fifteen (115) people out of which 9 were children had Visual Acuity worse than 6/18. The visual acuity of 51 of those with visual impairment (including 3 children) improved when

looking through the pin hole. Uncorrected refractive error was also detected in 5 patients wearing spectacles indicating that they were not wearing the appropriate spectacle correction. The details are shown in Tables 1 and 2.

**Table 2** Frequency distribution of visual acuity (VA)

VA in better eye	No spectacles with RE	Spectacles with RE	No RE	Total
6/24	22	1	6	29
6/36	11	0	4	15
6/60	6	4	10	20
CF	7	0	32	39
HM	0	0	8	8
PL	0	0	4	4
<b>Total</b>	<b>46</b>	<b>5</b>	<b>64</b>	<b>115</b>
<b>%</b>	<b>40</b>	<b>4.35</b>	<b>55.65</b>	<b>100%</b>

CF: Counting Fingers,  
HM: Hand Movements,  
PL: Perception of Light

The responses to determine whether distant or near vision was defective were unreliable and therefore not analysed.

## DISCUSSION

The major findings in this study are the magnitude of visual impairment and the proportion related to refractive errors. Most of the reduced vision was attributed at least in part to refractive error. For the purpose of screening, two types of visual acuity charts have been most commonly used. The first type, the non-logarithm of the minimum angle of resolution (MAR) type of visual acuity chart, uses lines of English alphabets, with no universally accepted number of letters per line or standardized number of lines per chart, and has acuity values recorded as a Snellen notation (a fraction) or as a decimal. The second type is a letter-counting type of visual acuity chart, which has a standardized number of lines and letters per line and also is able to discriminate finer levels of visual acuity and document minimum resolution acuity in a logarithmic scale (logMAR), which facilitates algebraic operations for compiling statistics.

Despite the shortcomings of using the Snellen's visual acuity chart and the advantages of the second type of visual acuity chart, screening traditionally has been performed in many studies using simplified visual acuity charts based on Snellen fractions<sup>9</sup>. The figures should be interpreted with the following limitations in mind: a Snellen's chart was used to determine the distant

visual acuity, pin hole was used to detect refractive error instead of actual refraction suggesting that the reduced vision could be attributed fully or at least partly to refractive error, and finally, this was a hospital study with the usual implication of some bias towards a higher prevalence of visual impairment and refractive error than a population study. Nevertheless these findings give reasonable indication of the problem and suggest that interventions primarily focused on the provision of efficient refractive services and provision of spectacles will result in potential major improvements in visual functions.

The prevalence of impaired vision due to refractive error in a population based cross sectional study in North London was 9%<sup>10</sup>. Surprisingly a population based study of Mexican Americans in Arizona reported that uncorrected refractive error accounted for more than 73% of impaired visual acuity<sup>11</sup>. Generally population based reports on the magnitude of uncorrected refractive errors impairing vision is relatively lower in Caucasians<sup>12,13</sup> probably a reflection of better access to optical eye care. Factors of Socio-economic disadvantage are probably the markers of limited access to eye care services associated with uncorrected refractive error as found in the Blue Mountain study<sup>8</sup>.

Socioeconomic status of patients attending our clinic is skewed as most people in the higher classes prefer to attend private clinics. Indeed only about 1% of the study group (children excluded) were professionals or in the managerial positions. There is relative lack of information in the literature on how much visual impairment is attributable to refractive error in our West African sub-region. This is partly because studies have based their definition on the old WHO definition of visual impairment which uses the corrected visual acuity<sup>14,15</sup> thus excluding refractive error as a major cause of impaired vision.

It was interesting, though not surprising, to note that some patients were wearing inappropriate spectacle correction. This observation confirms clinical experience that some people retain the same spectacles even when the vision deteriorates. Surprisingly under-corrected refractive error was present in only 5/1069 (0.005%) subjects although in the Blue Mountain Eye Study under-corrected refractive error was present in 814/3654 subjects (10.2%)<sup>8</sup>. The study referred to also defined under-corrected refractive error by an improvement of at least two lines after refraction and in contrast subjects with presenting visual acuity 6/9 or worse

were the subjects. Although increasing age and measures of socioeconomic disadvantage and isolation have been found to predict under corrected refractive error<sup>8</sup> the number with under-corrected vision in this study is too small for such analysis. Many patients who should be wearing spectacles are not wearing them anyway and perhaps that is why the proportion wearing under-corrected spectacles is so low.

The high magnitude of uncorrected refractive error is an indication of inadequate accessibility of optical services. Socio-economic and cultural factors influence the decision on which medical facility to utilize and when. The diagnosis of refractive error is simple and provision of spectacles is a very cost-effective intervention. Optometrists are the major service providers in refraction and correction of impaired vision from refractive errors worldwide. At the time of this study, there were 30 optometrists in Ghana with a population of about 20,000,000<sup>16</sup> giving optometrist population ratio of 1 to over 600,000 of the population. Nearly all of them were in the urban areas, usually in private practice, making the ratio worse in rural areas where the majority of the population, about two thirds, lives. Public health optical services outside the cities and big towns are even less developed<sup>17</sup>.



**Figure 1** Spectacle vendor

The current situation has given opportunities for oversimplification of the issue of refraction and vision correction by self styled spectacle vendors who perform subjective trial and error refraction and provide relatively cheaper optical services (Figure 1). Interim measures whereby “eye care refractionists” are trained has been used in East Timor<sup>17</sup>. Auto-refractometers make refraction easy and are less time consuming but financial constraints have limited their acquisition by developing countries. The focometer, operated manually for refraction, is less expensive but time consum-

ing and also difficult to operate by some people especially the elderly in our communities<sup>α</sup>.

Furthermore from the prevailing visual impairment statistics it can be estimated that about 27 of those with visual impairment may benefit from Low Vision care (i.e 25% of 95% of those with visual impairment).

## CONCLUSION

The study has shown that visual impairment is a common presentation and refractive error's contribution is high in this tertiary hospital in Ghana. Improved access to optical services could reduce the burden of visual impairment and help accomplish the goals of Vision 2020 concerning refractive error and low vision.

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<sup>α</sup> personal experience from the author's use of the focometer

