Is the Child-to-Child approach useful in improving uptake of eye care services in difficult-to-reach rural communities? Experience from Southwest Nigeria

Olutoke O Ayorinde, Gudlavalleti VS Murthy, Oluwaseun O Akinyemi

Background: Blindness and severe visual impairment render affected individuals, families and communities economically, socially and physically disadvantaged. The number of adults ≥ 40 years with severe visual impairment and blindness in Nigeria is projected to increase from 1.02 million (2008) to 1.4 million (2020). Utilization of available eye care services improves quality of life, but uptake is generally unsatisfactory. Empowering individuals, including children, to identify, motivate and appropriately refer them improves utilization. Children, because of their peculiar roles in families and communities, could be important change agents. This study was designed to determine if primary school pupils aged 9-14 years can be satisfactorily trained, using the child-to-parent approach, to assess vision, refer and motivate people to attend screening eye camps. Methods: Ninety pupils aged 9-14 years attending two purposively-selected primary schools were selected by simple random sampling. Using the child-to-parent approach and Snellens 6/60 illiterate E-chart, participants had a 2-day knowledge and skill-based training followed by 2 days of community-based vision assessment and referral of those assessed. The adequacy and success of the training were assessed by comparing pre- and post-test scores. Results: Three hundred and thirty-six persons were referred and examined; of these, 142 (42.3%) persons were reviewed. Overall there was significant improvement in knowledge. The accuracy of assessments was 82.1% for Right Eyes (RE), 83.3% for Left Eyes (LE) and 72.1% for presbyopia. The sensitivities for the RE, LE and presbyopia were 84.8%, 86.1% and 76.3% respectively. Similarly, the specificities were 44.4% for RE, 50.0% for LE and 68.6% for presbyopia. The performances were not significantly influenced by age, sex and locality. Conclusion: Children aged 9-14 years in primary schools can be empowered, using the child-to-child approach, to assess vision and motivate members of their communities to utilize available eye care services.
Is the Child-to-Child approach useful in improving uptake of eye care services in difficult-to-reach rural communities? Experience from Southwest Nigeria

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Introduction

The global estimates for visual impairment [moderate (MVI) and severe (SVI)] and blindness, all ages, are currently 285 million and 39 million respectively; (Pascolini & Mariotti 2011) although, 75-80% of blindness is avoidable (Pascolini & Mariotti 2011). About 80% of all visually impaired persons and 70% of all blind individuals are fifty years and above. Moreover, with the global economic growth, increased health awareness and life expectancy, populations are ageing and non-communicable diseases are attaining greater significance in eye care. Intensified efforts will therefore be needed to eliminate avoidable blindness and visual impairment (Sherwin et al. 2008).

Furthermore, about four-fifths of the world’s blind reside in low income economies; 15-20% of them live in Sub-Saharan Africa which houses about 10% of the world population. Sub-Saharan Africa however lacks appropriate infrastructure, personnel (number and distribution) and political commitment to provide the needed eye care (Rabiu et al. 2012). Blindness and SVI impact negatively on economic, social and health circumstances of those affected, their families and communities. These effects which are more devastating in poor economies, poor families, children, females and the elderly could be alleviated by accessing available eye care services (Kuper et al. 2010).

Despite the challenges of poor vision and the proven benefits of service utilization, a substantial number of affected individuals do not access available services even when provided as outreaches with partial or full sponsorship (Bekibele 2012). Poor uptake of eye care service could be ‘provider’ or the ‘consumer’ related. A lot of social marketing is currently being done by providers to ensure provision of good quality service to consumers (Bekibele 2012; Zhang et al. 2010).

Satisfactory service utilization requires strong community involvement as demonstrated by Bangladesh, Uganda, Tanzania and Northern Nigeria experiences (Cains & Sophal 2006; Etya'ale 2006; Hannan 2002; Moulton 1998; Nkumbe 2008; Ogoshi 2006). When the community plays an active role in creating awareness for visually impairing and blinding eye conditions and services available to manage them confidence in the service is strengthened and uptake improves. The community could be involved in identifying, counselling and appropriate referral of affected individuals, obtaining consent of family members and follow up of identified/treated individuals (Bekibele 2012; Tan 2006). Community members/volunteers commonly involved in such activities include Community Directed Drug Distributors (CDDDs), Community Based
Rehabilitation workers (CBRw), Community Volunteers (CVs), Key Informants (KIs), Traditional Birth Attendants (TBAs) and teachers.

Children have been successfully involved as communication agents in achieving social change in areas of skin infection control, nutrition, and breastfeeding, personal and environmental hygiene in Kenya, India, Madagascar and Jamaica (Francis & Wiafe 1996; Knight et al. 1991; Mahr et al. 2005; Onyango-Ouma et al. 2005; Ward et al. 2006). There is scarcity of literature regarding their involvement in eye care, who to involve and what the result would be.

Similarly, mal-distribution of personnel to patients (in proportion, location and productivity) remains a problem south of the Sahara. The majority of eye care personnel live in urban areas while the visually impaired and blind reside mainly in rural settings (Rabiu et al. 2012). Also, the health care infrastructure available in most developing economies is poor, and eye care is grossly underfunded (Rabiu et al. 2012); the situation is better in parts of Asia (Muhit et al. 2007; Tan 2006), and in most developed countries.

The novel strategy of empowering children to share in the responsibility for improving their health and that of their communities using the child-to–child or child-to-parent approach has been successfully implemented in other health areas and may have a place in eye care (Hawes & Scotchmer 1993).

The child-to-child approach launched in 1979 is an innovative approach to basic learning and health for identifying the SVI and blind individuals. It is based on the PHC concept that people should be empowered to share in the responsibility of improving their health and also serve as agents to improve the health of their families. Children are included in the term “people” and this approach utilizes their habits of sharing ideas and helping one another, their families and their communities. Successful implementation requires adaptation to the local context in which it is being applied, and respecting a child’s right to make decisions (Hawes 1988; Pridmore et al. 2000).

Over 95 countries including India, Zambia, Botswana, Uganda, Jamaica and Madagascar have conducted child-to-child projects which targeted various health and development issues peculiar to their communities and these were successful; success was measured by various levels of desired change. However of the many projects, the few that have been evaluated did not discuss their outcomes in relation to age, sex, or community settings of children involved (Onyango-Ouma et al. 2005; Ward et al. 2006). Available evidence are in support of using this approach to promote eye health and prevent blindness in developing economies (Hubley & Gilbert 2006; Sifri et al. 2003).
In Nigeria children are an integral part of households and communities. From an early age, they assume responsibilities of caring for younger siblings and physically/mentally challenged relatives, watching over wares, and occasionally street hawking. Strong social ties and respect are known to exist between families living in communities. Children 5-14 years are 24.4% of Nigerian population; there are 14,917,987 and 666,719 primary school pupils nationwide and in Oyo-State respectively (National Population Commission 2012). If they are involved in improving eye health, by the time they mature into adults, their health (including eye) awareness and practice will be better than their parents (Serpell et al. 2011); they will have a better orientation to education and self-esteem (Pridmore et al. 2000).

Although information on use of child-to-child approach in Nigeria is scarce, it has been recommended for eye health and child care by some local publications (Akinware 1999; Okafor & Agwubike 2012). Thus, this study was conducted to determine if primary school pupils aged 9 – 14 years could be satisfactorily involved in identifying and motivating presbyopic, severe visually impaired and blind individuals in rural Oyo State, Southwest Nigeria.

**Methodology**

**Study area**

Oyo state is located in the Southwest geopolitical zone of Nigeria, and is the largest of the six states in the zone. The capital city is Ibadan, the largest in black Africa (National Population Commission 2012), with a population of about 5.58 million people who are mainly Yorubas, and farmers.

The prevalence of blindness among individuals 40 years or older in the Southwest geopolitical zone is 2.8% (Presenting Visual Acuity); this translates into 150,930 individuals, being the lowest among the six geopolitical zones in the country (Kyari et al. 2009). However, the zone has the highest number of health (and eye) care workers in the country (Rabiu et al. 2012). Oyo state has 17 practicing ophthalmologists and all are located in Ibadan. Several optometry clinics providing primary eye care and optical services are located all over the state. In addition to these, several regular eye outreach services are provided by both public and mission hospitals to underserved areas of the state.

**Study sites**

The study was conducted at St. Paul’s School Latunde (School A) and CRIN Staff School 1 Idi Ayunre (School B) in Oluyole Local Government Area (LGA) of Oyo State between June and July 2012.
Latunde is rural and located 60km from the University College Hospital (UCH), Ibadan. It has 7000 people, a Primary Health Centre (PHC) and a private clinic which offers primary health care but no eye care, and School A with total enrolment of 130 pupils (2012) is the only primary school.

Idi Ayunre (the LGA headquarters) is semi urban and located 20km from UCH. It has 12,000 people, two PHCs and one General Hospital (the only one in the LGA), no eye care service, and three big primary schools one of which is School B with total enrolment of 506 pupils.

**Study design**

This pilot study followed an evaluation of interventions design. One hundred and ninety-five pupils met the selection criteria from the two schools (aged 9-14 and in class 4, 5 or 6). Taking maximum possible difference between estimated proportions as 30%, acceptable variation around estimated sample size proportions as 6% and 95% confidence interval for the results, a sample size of 224 pupils was obtained. However, since the study is a pilot, 90 pupils were selected by balloting from two purposively identified schools (Kotrlik & Higgins 2001).

**Sampling method**

The schools were purposively selected based on the setting (rural and semi urban - to allow for comparison), and accessibility. In each school, a list of all children aged 9-14 years and in classes 4-6 was compiled from the attendance register. Pupils who met the selection criteria but who had visual, hearing or mental disability were excluded (as the field team were not equipped to adequately train these categories of pupils). Similarly, pupils who could not read and write English or Yoruba were excluded even if they met the inclusion criteria.

At School A, the required sample of 30 pupils was satisfied by picking all the pupils in these three classes (16 males and 14 females). At School B using the compiled list, the pupils were stratified by sex and class. Using a systematic random sampling, 60 pupils (31 males and 29 females) were selected in the same sex and class ratios as the sample obtained at School A. Parents of four pupils (two boys and two girls) did not consent to them participating, so they were replaced using the same sampling technique.

Furthermore, all the 3 teachers at School A were selected while at School B, 7 teachers (out of 17) were selected by simple random sampling. They gave their verbal consent to complete questionnaires
commenting on the study approach at the end of the study. Members of the field work team consisted of two each of ophthalmologists, public health nurses, research assistants and clinic assistants.

**Using the child-to-parent approach**

The study was conducted at School A (week 1), School B (week 2) and both schools (week 3). The stages were the same in both schools. In each school participants were trained over a three-day period. Box 1 highlights the activities throughout the three-day training period.

**Data analysis**

All quantitative data were entered into MS Excel spread sheet, coded if not numerical, and then cleaned. The data were transferred and analysed using STATA 12. New variables were generated to pull together all assessments (pupils and ophthalmologists separately) of VA (RE), VA (LE) and Presbyopia, and identify the eyes/persons correctly assessed (taking the ophthalmologist as the standard). Descriptive statistics such as means were used to summarize quantitative variables while categorical variables were summarized using percentages. Chi square test was used as test of significance of associations between categorical variables, one way test to compare means within and between categorical variables and t-test (paired and unpaired) to compare means. Statistical significance was considered at 95% confidence level.

Qualitative data were extracted from the questionnaires and grouped into coded themes and entered into the Excel spread sheet. Coded themes for qualitative data were tabulated and results extracted in percentages. The raw data for this study may be accessed through: [https://drive.google.com/file/d/0BxDl-mGBDiH1RkttVFJkbjh1M2M/view?usp=sharing](https://drive.google.com/file/d/0BxDl-mGBDiH1RkttVFJkbjh1M2M/view?usp=sharing).

The London School of Hygiene & Tropical Medicine Research Ethics Committee (No: 011/415) and the University of Ibadan/University College Hospital Ethics Committee (NHREC05/01/2008a) provided ethical clearance for this study. Written informed consent was obtained from parents and teachers as well as written assent from pupils before the onset of the study.

**Results**

Figure 1 illustrates the process of recruitment of pupils and persons with visual impairment as well as the accuracies of the pupils’ assessment of visual impairment.
Socio-demographic characteristics of Participating Pupils

Ninety pupils aged 9-14 years participated in this study. None of the pupils was on spectacle correction. The mean ages in schools A and B were 11.7±1.3 years and 11.1±1.4 years respectively. Table 1 summarises the socio-demographic characteristics of participants.

Performance in pre-test and post-test

Overall, mean post-test score was significantly higher, p<0.0001. Significant improvement was also seen when considered by locality (school) and sex. See Table 2 for details.

Although School A had a higher post-test score compared to School B, the difference (0.5±0.5) is however not statistically significant. School A is however the more improved school (p<0.0001). Similarly, males scored higher in the post-test, but compared to females, a difference of 0.1±0.6 is also not statistically significant. Compared to females, males were more improved (p<0.0001).

Number of persons referred and reviewed, by pupils’ age, sex and locality

Per age group, the number of persons referred exceeded that reviewed (Figure 2). The differences between the ages, in numbers referred and reviewed, were not statistically significant at 95% confidence level, p=0.45 and 0.80 respectively.

Figure 3 shows that females referred more persons but males had more persons reviewed. The differences between both sexes in numbers referred and reviewed were -0.25(-1.0 to 0.5), p=0.54 and 0.39 (-0.27 to 1.04), p=0.24 respectively, which were not statistically significant.

A higher number of persons were referred to and reviewed at School A (rural setting). The differences in these numbers between School A and School B, 0.6(-0.2 to 1.4), p=0.16 and 0.48(-0.2 to 1.1), p=0.15, for referred and reviewed persons respectively were not statistically significant. See figure 4.

Socio-demographic characteristics of the reviewed persons
From Table 3, the 40-60 year group had the highest attendance (46.8%) followed by the >60 year group (30.3%); 50 were males (35.2%) and 92 females (64.8%). About two-thirds (66.2%) of the reviewed persons had either primary or no education. Similarly, traders and farmers were 62.7% of those reviewed while civil servants were 23.2%, artisans (bricklayers, carpenters, plumbers and welders) were 7.8% and students (primary, secondary and tertiary) were 6.3%. Proportion of reviewed persons with SVI/blindness was 6.3% and this prevalence increased with age (Table 4). More than 40% of the persons reviewed were pupils’ neighbours. The pupils also succeeded in bringing some of their parents (25.3%) and grandparents (19.7%) as well as other relations.

**Review of vision assessments made by pupils**

**Assessment of VA and presbyopia (the ophthalmologist as standard)**

Assessments for 133(RE) and 132(LE) were documented by the pupils. The sensitivity, specificity and accuracy of the pupils’ assessments are as detailed in table 6. A total of 110 (RE and LE) and 93 presbyopic assessments were made correctly. Assessment of vision in people with VA $\geq$ 6/60 was very accurate but less accurate in those with VA<6/60. The reverse applied in presbyopia where the assessment was more accurate in those with presbyopia and less accurate in those without. Overall, the accuracy of their assessments was high.

For VA assessment, younger persons were more likely to be correctly assessed, mean age being 51.0±3.0 years compared to 56.0±5.0 years for incorrect assessments; this relationship was not statistically significant [p=0.12(RE), 0.22(LE)].

For presbyopia assessment, older persons were more likely to be correctly assessed, mean age being 54.4 (51.1-57.3) years, compared to 48.5 (42.8-54.1) years for incorrect assessment; this relationship was not statistically significant at 95% confidence level, p=0.06.

Association between occupations, relationship to the pupil, educational attainment and being correctly assessed were not statistically significant at 95% confidence level. As shown in Figure 5, the least percentage correctly assessed was seen among the pupils that examined one person, being 60% (Presbyopia), 65% (LE) and 68% (RE). Presbyopia assessment improved with number examined while VA assessment did not follow a consistent pattern.

**Impressions of the reviewed persons, teachers and pupils about the child-to-child approach**
Majority of the reviewed persons (79.3%) agreed that the child-to-parent approach was good as it encourages uptake of eye care services by the blind and the visually impaired. All the reviewed persons also agreed that the approach will foster the development of the pupils and that of the community. Table 6 further highlights the frequency of agreements to some questions by the teachers and the pupils about the child-to-child approach.

Participants’ suggestions on improving on the child-to-parent approach

Half (50%) of the teachers were of the opinion that having a longer and regular training for the children will have lasting impact on the community. Similarly, about a quarter (24.3%) of the pupils suggested involving more children for them to really impact the community.

Discussion

Child-to-parent approach trains children to identify important health issues in their communities, gather sufficient information about these, propose and take actions to effect change (Mahr et al. 2005; Pridmore et al. 2000). This study already identified poor identification and uptake of eye care services by severe visually impaired and blind individuals as the problem so children were trained as agents to improve identification and uptake.

Children 9-14 years old in primary classes 4 - 6 were selected because they would be mature enough to understand the training and conveniently perform the expected tasks without exposure to most of the risks to adolescents in communities. Most studies concerning children have involved these ages (Ahmad et al. 2006; Mahr et al. 2005).

The draw and write technique was intended for both pre- and post- tests. It is a popular method for collecting information from primary school children and is assumed to be participatory, friendly, and encourage self-expression (Gabhainn & Kelleher 2002).

However, this study found only 15 (16.7%) pupils expressing themselves in minimal drawing; others wrote their responses. Drawing in response to questions was found not to be a familiar approach to teaching the pupils and probably made it difficult for them to perceive responses that would be acceptable. Although there is limited evidence to prove draw and write technique is popular in Nigeria, it is a familiar technique in Ghana and Kenya (Francis & Wiafe 1996; Onyango-Ouma et al. 2004).
The child-to-child approach is effective in improving children’s knowledge of poor vision using interactive health education technique which is characteristic of the method. Significantly higher mean post test scores were obtained across board and in each stratum except among the 9-year olds where the improvement was less appreciable. This was probably because they were the youngest group, the teaching technique was unfamiliar to them and they require time to adapt. However, studies done in the United Kingdom and Pakistan involved even younger children with success (Ahmad et al. 2006; Woods et al. 2005). Mahr in Madagascar and Onyango in Kenya also found health education improved knowledge of health topics among children (Mahr et al. 2005; Wilkinson 2000). Evidence from child-to-child project in India where children were trained as “little doctors” for control of scabies and common skin infections also confirm tasks were clearly understood because skin infections reduced (Pridmore et al. 2000).

A Snellens illiterate ‘E’ 6/60 optotype chart was used to assess VA because it is easy to use; the ultimate goal is to train the children to reliably identify severe visually impaired and blind individuals. In some settings children are taught to count fingers at 6m instead (Francis & Wiafe 1996; Moulton 1998); however, using Snellens’ optotype is more objective as it allows for comparison and ensures quality provided each rotation of the optotype is done out of view before being presented to the subject. VA was assessed for each eye and not the individual to ensure the pupils were comfortable with assessing and documenting distance vision. The interpretation and documentation of findings was also simplified to terms they were familiar with: “yes” or “no”.

Presbyopia was assessed using N8 optotype at 40cm because this is equivalent to newspaper print at 40cm (Burke et al. 2005; Nirmalan et al. 2006); at this distance most near work is done. Only persons 30 years and above were assessed; 30-40 year range was considered because presbyopia sets in earlier in blacks, and being rural/ semi-rural communities where documentation of birth is poor the people may be older than ages estimated for them. The beaded twine used made the procedure attractive, interesting and helped ensure the 40cm working distance was kept.

The performance at vision assessment was high with accuracy. Normal vision and presbyopic patients were better assessed. Probably because of the short training, and presbyopia assessment being easier to make in this study, presbyopia assessment improved with increase in number of persons assessed but VA assessment did not. With continued practice and evaluation of results, the children should improve in assessing the visually impaired/blind too.
Although all the ages performed satisfactorily, the performance of 12 and 13 year olds respectively in the post test and the number of persons referred and reviewed were the highest, and that of 9 year olds the lowest. Their good background knowledge of poor vision, academic maturity and experiences living in the communities could have enhanced their performance. Being older, they might be more outgoing and matured in applying the knowledge and skills acquired thereby earning community confidence and having better results.

The confidence intervals for the post test scores show that knowledge of health education of both sexes is equally good. Regarding Number of referred and reviewed persons, the performance of both sexes was also similar. Evaluation of a child-to-child project in India found girls to be more likely than boys to be communicators but in this study found sex not to influence satisfactory performance of any of the key tasks (Pridmore et al. 2000).

The remarkable improvement in mean post-test scores and the apparently higher numbers of patients referred and reviewed at School A (local setting) compared to School B (semi-urban setting) can be attributed to the voluntary participation of the teachers in the project. Evidence from India alluded to better results when teachers are involved (Pridmore et al. 2000). Being a rural school, the teachers and the community showed interest since the nearest facility offering eye care service is 1.5 – 2 hours journey away.

The performance in both settings (rural and semi-urban) was similar. The locality of the children may not have direct impact on their performance but it provided an enabling environment in which their inputs thrived. For child-to-child approach to improve uptake of eye care service the school and community environments should be supportive. In the implementation of the approach, the adequacy and appropriateness of the training is the concern and not the age, sex or locality of pupils.

The perception of all interviewed participants was good. They foresee the approach developing their community and empowering their children, if it is improved to ensure the children are properly trained. This was probably why they turned out in large numbers and will allow their children to participate in similar programmes in future. A good community perception indicates acceptance and support; this should be encouraged.

However, some limitations of this study should be highlighted. The sample size was smaller than needed because this is a pilot and minimal variations between groups may be evident with larger sample size.
Also, the presbyopic assessments done did not initially correct for distance error which could have indicated the need to modify corrections given for near. Furthermore, those referred but not reviewed may be different from those who did; having their socio-demographic data and contact would have been helpful in finding out their reasons for not keeping the appointments which will be useful for future planning. Nevertheless, this study provides important preliminary data on the effectiveness of the child-to-child approach in a developing country like Nigeria.

**Conclusion**

Poor Identification and utilization of available eye care services by visually impaired and blind persons is a problem in Ibadan, Nigeria as it is in most low income settings. This study found child-to-child approach simple, friendly and effective in improving children’s knowledge and attitude toward visual impairment and blindness. This empowers children to go into their households and communities to reliably assess people’s vision and motivating a sizeable number to attend reviews on appointment. Eye care programmes should adopt child-to-child approach, in addition to other strategies already in operation, to improve the identification and uptake of services by severe visually impaired and the blind in the rural, unreached communities.
References


Bekibele CO, Murthy G.V.S. 2012. *Cataract services uptake by outreach camp patients at Ibadan Nigeria*. Deutsche Nationalbibliothek, Germany: LAP LAMBERT Academic Publishing GmbH & Co. KG


Table 1: Socio-demographic characteristics of participating pupils

<table>
<thead>
<tr>
<th>Age group (years)</th>
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<th>School B</th>
<th>Total (N)</th>
<th>%</th>
</tr>
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<tr>
<td>9-11</td>
<td>11 24.4</td>
<td>34 75.6</td>
<td>45 50.0</td>
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<tr>
<td>12-14</td>
<td>19 42.4</td>
<td>26 57.8</td>
<td>45 50.0</td>
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<tr>
<td><strong>Total</strong></td>
<td><strong>30 33.3</strong></td>
<td><strong>60 66.7</strong></td>
<td><strong>90 100</strong></td>
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<th>Sex</th>
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<th>School B</th>
<th>Total (N)</th>
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<tr>
<td>Male</td>
<td>16 53.3</td>
<td>31 51.7</td>
<td>47 52.2</td>
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<tr>
<td>Female</td>
<td>14 46.7</td>
<td>29 48.3</td>
<td>43 47.8</td>
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<tr>
<td><strong>Total</strong></td>
<td><strong>30 33.3</strong></td>
<td><strong>60 66.7</strong></td>
<td><strong>90 100</strong></td>
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<td><strong>60 66.7</strong></td>
<td><strong>90 100</strong></td>
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Table 2: Comparing pre- and post- test scores* between groups

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<thead>
<tr>
<th></th>
<th>Mean Pre-test Score (±SD)</th>
<th>Mean Post-test Score (±SD)</th>
<th>Difference between post- and pre-test scores (±SD)</th>
<th>p-value</th>
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<tr>
<td><strong>Overall</strong></td>
<td>3.2±0.3</td>
<td>4.5±0.3</td>
<td>1.3±0.4</td>
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<td><strong>Locality</strong> (School)</td>
<td>3.0±0.6</td>
<td>4.9±0.3</td>
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<td>3.3±0.4</td>
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<tr>
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<tr>
<td>Male</td>
<td>3.1±0.5</td>
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<tr>
<td>Female</td>
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<td><strong>Age group</strong></td>
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*Maximum score for both the pre- and post-tests is 7
Table 3: Socio-demographic characteristics of persons reviewed (N=142)

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<th>Age group (years)</th>
<th>No. (n)</th>
<th>% of Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>0-20</td>
<td>7</td>
<td>4.9</td>
</tr>
<tr>
<td>21-40</td>
<td>26</td>
<td>18.3</td>
</tr>
<tr>
<td>40-60</td>
<td>66</td>
<td>46.8</td>
</tr>
<tr>
<td>&gt;60</td>
<td>43</td>
<td>30.3</td>
</tr>
<tr>
<td><strong>Sex</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td>50</td>
<td>35.2</td>
</tr>
<tr>
<td>Female</td>
<td>92</td>
<td>64.8</td>
</tr>
<tr>
<td><strong>Level of Education</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>None</td>
<td>43</td>
<td>30.3</td>
</tr>
<tr>
<td>Primary</td>
<td>51</td>
<td>35.9</td>
</tr>
<tr>
<td>Secondary</td>
<td>31</td>
<td>21.8</td>
</tr>
<tr>
<td>Post- Secondary</td>
<td>17</td>
<td>12</td>
</tr>
<tr>
<td><strong>Occupation</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Traders &amp; farmers</td>
<td>89</td>
<td>62.7</td>
</tr>
<tr>
<td>Civil servants</td>
<td>33</td>
<td>23.2</td>
</tr>
<tr>
<td>Artisans</td>
<td>11</td>
<td>7.8</td>
</tr>
<tr>
<td>Students</td>
<td>9</td>
<td>6.3</td>
</tr>
</tbody>
</table>

Table 4: Visual acuity (<6/60) distribution of reviewed persons by age

<table>
<thead>
<tr>
<th>Age group (years)</th>
<th>No. with VA&lt;6/60 Both eyes (BE)</th>
<th>% (SVI*/Blind)</th>
</tr>
</thead>
<tbody>
<tr>
<td>0-20</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>21-40</td>
<td>1</td>
<td>3.8</td>
</tr>
<tr>
<td>40-60</td>
<td>4</td>
<td>6.1</td>
</tr>
<tr>
<td>&gt;60</td>
<td>5</td>
<td>11.6</td>
</tr>
</tbody>
</table>

*Severe Visual Impairment
### Table 5: Analysis of VA* and presbyopia assessment done by Pupils

<table>
<thead>
<tr>
<th></th>
<th>VA RE** (%)</th>
<th>VA LE+ (%)</th>
<th>PRESBYOPIA (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>N=133</td>
<td>N=132</td>
<td>N=129</td>
</tr>
<tr>
<td>Sensitivity</td>
<td>84.8</td>
<td>86.1</td>
<td>76.3</td>
</tr>
<tr>
<td>Specificity</td>
<td>44.4</td>
<td>50.0</td>
<td>68.6</td>
</tr>
<tr>
<td>Accuracy</td>
<td>82.1</td>
<td>83.3</td>
<td>72.1</td>
</tr>
</tbody>
</table>

*Visual Acuity; **Right Eye; +Left Eye

### Table 6: Comments of teachers and pupils about the study

<table>
<thead>
<tr>
<th>Comment</th>
<th>Teachers (10)</th>
<th>Pupils (30)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Experience with children participating</td>
<td>Impressive performance (100%).”</td>
<td>Happy and good 26(86.7%); satisfied 4(13.3%)</td>
</tr>
<tr>
<td></td>
<td>It has empowered the children to be achievers” (60%)</td>
<td></td>
</tr>
<tr>
<td>Teaching and Training during the study</td>
<td>Good, simple and friendly (100%)</td>
<td>Good, simple and friendly (100%)</td>
</tr>
<tr>
<td>Effect of study on the community</td>
<td>Positive (100%). It will raise awareness, reduce eye diseases and need to</td>
<td>It will help people with eye problems (70%); “It will let people know about</td>
</tr>
<tr>
<td></td>
<td>go to the hospital in the community (60%)</td>
<td>eye disease and what to do” (30%)</td>
</tr>
<tr>
<td>Participation in future programmes</td>
<td>Will allow their children/wards to participate (100%); “it will help the</td>
<td>They will all participate; “I want to help my community”</td>
</tr>
<tr>
<td></td>
<td>community to develop and “empower the children to be doctors in future”</td>
<td></td>
</tr>
</tbody>
</table>
### Box 1: Highlights of the three-day child-to-parent approach training

#### Day 1

- Filling of assent forms by pupils in selected schools
- Issuing unique identification codes to pupils based on their age, sex, class and school
- Ocular examination (anterior segment and fundoscopy) for all consenting members of staff and participating students
- Teachers’ selection
- Brief singing session to emphasize importance of good vision and eye care
- Pre-test for participating pupils (Ahmad et al. 2006; Onyango-Ouma et al. 2005; Pridmore et al. 2000; Starkey & Orme 2001)
- Interactive session guided by response to the pre-test

#### Day 2

- Post-test (Campbell et al. 2010; Mahr et al. 2005)
- Skills training on how to assess PVA (each eye), and for presbyopia in households and communities, and to refer when appropriate (Burke et al. 2006; Francis & Wiafe 1996; Moulton 1998; Nirmalan et al. 2006; Sherwin et al. 2008). For this activity, the pupils learnt to use the illiterate ‘E’ Snellens chart and the N8 optotype near chart.
- Hands-on session for pupils where the pupils used one another as subjects for VA assessment and field team members/teachers for presbyopia assessment under the supervision of the ophthalmologist/nurse
- Equipping the pupils for community activities with a kit containing a laminated 6/60 optotype illiterate ‘E’ Snellens chart, a flat 6m rope, a 40cm twine with a large colourful bead at either end, a N8 optotype near chart (English/Yoruba), a 6-leafed referral booklet bearing the pupil’s unique identification code on each page and a face cap with “Child-to-Child Approach for eye screening” inscribed on it.

#### Day 3

- Submission of referral booklets to head teacher
- Review and management of referred persons, and completion of questionnaires
- Referred persons were identified by matching their referral slips with the counterfoil; written consent was then taken
- Sociodemographic data (age, occupation, educational attainment and relationship to the referring pupil) were entered into a questionnaire
- VA (each eye) and presbyopia assessments were done using the same tools as the children.
- Arrangement was made for those needing further review at UCH and the cost was borne by the study.
- Completion of administered Questionnaires by referred Adults, Pupils and Teachers
- The pupils were provided feedback on their general performance at the activities
- 90 pupils selected (all participated in the pre- and post- tests and skills training)
- 540 persons (6/pupil) projected as total number expected at follow up review
- 87 pupils examined persons in their households/communities
- 336 persons were examined and referred (62.2% of projected)
- 142 persons (42.3% of referred persons) were reviewed at the schools.
- They were referred by 61 pupils (67.8% of pupils trained)
- The accuracy of their assessments were RE (82.1%), LE (83.3%) and presbyopia (72.1%)

Figure 1: Summary of the recruitment process
Figure 2: Number of persons (mean) referred and reviewed, by pupils’ age group

Figure 3: Number of persons referred and reviewed, by pupils' sex
Figure 4: Number of persons referred and reviewed by location of school

Figure 5: Relating number of persons examined to percentage correctly assessed