

# Childhood eye care services in South Darfur State of Sudan: Learner and parent perspectives



## Authors:

Saif H. Alrasheed<sup>1,2</sup>  
Kovin S. Naidoo<sup>1,3</sup>  
Peter C. Clarke-Farr<sup>1,4</sup>

## Affiliations:

<sup>1</sup>African Vision Research Institute, University of Kwa-Zulu Natal, South Africa

<sup>2</sup>Department of Optometry and Visual Science, Al-Neelain University, Sudan

<sup>3</sup>Brien Holden Vision Institute, Sydney, Australia

<sup>4</sup>Department of Ophthalmic Sciences, Cape Peninsula University of Technology, South Africa

## Corresponding author:

Saif Alrasheed,  
saif.alrasheed@yahoo.com

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**Purpose:** Most causes of childhood visual impairment are either treatable or preventable. Eye health education plays an important role in reducing avoidable causes of visual impairment as well as to help ensure a healthy and educated community. The main objective of this study was to assess the Knowledge, Attitudes and Practices of the students and their parents on childhood eye services and barriers for accessing child eye care.

**Methods:** The study was conducted in South Darfur State of Sudan between January and February 2015. Both quantitative and qualitative methods were used to collect data from eight secondary schools. Four schools for boys and four schools for girls were randomly selected from a list of 21 districts of South Darfur State and the Knowledge, Attitudes and Practices surveys were conducted with the students to collect quantitative data. In addition, seven focus group discussions were conducted with the children's parents to collect qualitative data.

**Results:** The majority (57.5%) of the students reported that they knew about refractive error; however, 33.07% reported never hearing about refractive error. About 70.3% of the respondents believed that uncorrected refractive error leads to visual impairment, 21% believed refractive error did not cause visual impairment and 30.5% reported that wearing spectacles was not effective in the treatment of refractive error. With regard to the information about eye healthcare, 88.1% of the participants reported they did not have enough information about eye care. The reported need for more information about prevention, treatment and symptoms was 34.0%, 31.4% and 17.5%, respectively. With regard to barriers, 80.6% of the students reported never having had their eyes tested. The most cited barriers were cost, fear of wearing spectacles and fear of an eye examination. In addition, 72.6% of students reported that their health insurance did not cover eye care services. Most (53.6%) of the parents believed that the cause of refractive error in children was poor nutrition. Common themes arising from the focus group discussions included parents reporting that they looked for traditional treatment for their children and preferring to receive child eye information from an eye specialist and through the television and radio. The most frequently cited barriers by the parents were high cost of the treatment, lack of eye care specialists, lack of awareness about child eye diseases and mistrust in eye care providers.

**Conclusion:** The level of knowledge and practices about eye care and refractive error is low and perceptions about spectacles as a method for treatment for refractive error were fraught with misconceptions amongst students. There is a need for structured educational programmes to raise awareness regarding the effect and treatment modalities for childhood eye disease and visual impairment in order to address the barriers for accessing childhood eye care.

## Introduction

Global estimates indicate that there are around 19 million visually impaired children worldwide. Of these, 1.4 million are blind and 17.5 million have low vision, with many of them living in Africa.<sup>1</sup> According to the World Health Organization, 75% of childhood blindness is treatable by early intervention at community, primary, secondary and tertiary levels.<sup>2</sup> Visual impairment drives children and adults further into poverty by limiting their opportunities for education and employment and can seriously affect their quality of life and productivity. It has been estimated that 60% of children die within 1 year of becoming blind.<sup>3</sup>

Current worldwide estimates indicate that more than 90% of people with uncorrected refractive errors live in developing countries.<sup>4</sup> The Centre for Eye Research in Australia reported<sup>5</sup> that the prevalence of eye diseases around the world remains a concern, and the majority of these cases are avoidable or treatable. An understanding of the community's knowledge, attitudes

**Note:** This study was conducted as part of the research undertaken by the first author for the degree PhD in Optometry at the University of Kwa-Zulu Natal.

and practice (KAP) relating to avoidable eye diseases and conditions is therefore very important in the prevention of avoidable blindness.

Sudan is a large country located in north-eastern Africa, with a land area of 1.8 million square kilometres, with seven countries sharing the border (South Sudan, Central Africa Republic, Chad, Libya, Egypt, Eritrea and Ethiopia) and has 18 states and 184 localities. As estimated in 2013, Sudan has a the population of 35 million; 67% live in rural areas and 32.7% live in urban areas, whilst 8% are nomads and about 6.9% of population are internally displaced because of civil conflict.<sup>6</sup> South Darfur is located in the western part of Sudan and is one of the five states that compose the region of Darfur; this region covers an area of 500 000 square kilometres, approximately three quarters the size of Texas and about the size of Spain.<sup>7</sup> South Darfur is the most populous state; it has a population of approximately 4.45 million people.<sup>8</sup> The majority (62.7%) of people live below the poverty line according to the Household Survey 2009.<sup>9</sup> South Darfur is 1096 km from the capital city, Khartoum, where the majority of eye care services are located, resulting in the limited availability of care for this largely poor population.

In Darfur, 77% of health facilities have been affected by war, about 67% of facilities need some rehabilitation and around 10% need complete reconstruction.<sup>10</sup> In South Darfur State, the primary healthcare is poor with an estimated one facility per 13 000 population. Accessibility to healthcare was estimated to be about 66%; most of these services are outpatient (90%). Secondary and tertiary care services are provided at the lowest level with hospital beds per population estimated to be 23:100 000.<sup>10</sup> There is a lack of, and unequal distribution of, health manpower in South Darfur State. For example, only five eye care providers in the public sector consisting of three ophthalmologists and two optometrists who serve the population of about 4.45 million people.

The aim of this study was to assess the level of KAPs of the students and their parents regarding childhood eye services and barriers for accessing child eye care. The study further aimed to provide baseline information about the visual impairment and refractive errors. This would help policymakers to develop information, resources and policies to increase awareness about visual impairment and prevention. It will further enable the communities to recognise the signs and symptoms of refractive errors and know when to seek attention to reduce the prevalence of vision impairment because of refractive errors. The elimination of barriers for accessing eye care encountered by visually impaired children will assist in providing more equitable education opportunities and help them to escape from poverty. In order to meet the aim of this study, the following objectives were developed:

- To assess the KAPs of children regarding eye care and barriers for accessing eye care.
- To assess the parents' KAPs relating to childhood eye care and barriers for accessing child eye care.

## Methods

### Study design

This study used a cross-sectional school-based survey consisting of a semi-structured questionnaire (Appendix 1) for assessing the KAPs of the children. The study involved the collection of both quantitative and qualitative data. The study also used a qualitative study design using the focus group discussion (FGD) methodology to assess parents' KAPs relating to childhood eye care and barriers for accessing child eye care in South Darfur State of Sudan.

### Study site and population

The target population in this study were secondary schoolchildren, from South Darfur State of Sudan, aged 12–17 years and their parents.

### Inclusion criteria

- Children aged between 12 and 17 years.
- Parents who signed the consent form.

## Sample size

### Schoolchildren

#### Sample size and sampling technique

The sample size for the study was calculated by using the formula for estimating a single population proportion:

$$N = \frac{Z^2 \times (P) \times (1 - P)}{C^2} \quad [\text{Eqn 1}]$$

So, in this case:

$$\frac{(1.92)^2 \times (0.5) \times (1 - 0.5)}{(0.047)^2} = 435 \quad [\text{Eqn 2}]$$

where  $N$  = minimum required sample size,  $Z$  = value of  $z$  statistic at 95% confidence level = 1.96,  $P$  = estimated proportion of the outcome of the response assumed to be 50% of the schoolchildren KAP about eye care for maximum sample size,  $C$  = maximum acceptable sampling error = 4.70%. In addition, considering a 10% non-participant rate (44), the final sample size of this study was determined to be 479 students. These schoolchildren were invited to participate in the study from different schools of South Darfur State. At the end of the study, 387 children completed the questionnaire, giving a response rate of 81%. Schools were chosen using a stratified simple random sampling technique. The researcher compiled a list of schools for the entire South Darfur State from the Ministry of Education. The selection process firstly identified all public and private schools within 21 districts of South Darfur State. Eight schools, four for boys and four for girls, were randomly selected from the list of 21 districts of South Darfur State. The sampling frame consisted of a listing of the grade level within each school with the number of children in seventh- and eighth-grade classrooms. Thereafter, 60 students were randomly selected from each school.

## Parents

### Selection of participants

A list of schools was obtained from the Ministry of Education. Seven schools were randomly selected to carry out FGD (Appendix 2) with parents of school-aged children. After the schools were selected for the FGD, the schoolchildren were given an information letter and consent form for their parents to participate in the FGD. The letter included all information about the study, including right of refusal to participate as well as the time of the discussion. A total of 47 parents participated in the focus group (29 women and 18 men). All the participants in the focus group discussion as well as their children underwent a complete eye examination. No payments were made for participation in the study.

### Data collection tools and techniques

For the quantitative design, a standardised questionnaire was developed in English based on the literature review and relating to eye care knowledge and prevention. Then the questionnaire was translated to the Arabic language. The questionnaire was evaluated by optometrists, ophthalmologists and eye care managers as well as pretested with a pilot study, which was carried out with 50 schoolchildren outside of the main research field. Data were gathered by self-administrated questionnaires in the classroom setting, supervised by the principal investigator and a research assistant. For the qualitative design, a semi-structured guideline was developed to guide the discussion. The main idea of the FGDs was to assess key concepts relating to knowledge attitudes and practices. Data were collected by three trained data collectors using the focus group guide. The discussion was conducted in the local language (Arabic) and transcribed in English. The FGD were audio recorded.

### Data analysis

Questionnaire data were analysed using the Statistical Package for Social Sciences (version 22). The data were cleaned for data entry errors, and any missing values were entered before conducting the data analysis. Descriptive statistics were used to describe the data. The data generated from the focus groups discussion were analysed by the transcript-based analyses. The focus group audiotapes were transcribed verbatim by the principal investigator. The information was cleaned by stripping off non-essential words. The transcripts were coded according to the discussion questions, and then the participants comments were categorised into themes. The summary and descriptive statistics were performed using Microsoft Excel software. For all statistical determinations, significance level was established at  $P < 0.05$ .

## Ethical and legal consideration

Ethical permission for conducting the study was obtained from the University of KwaZulu-Natal's Biomedical Research Ethics Committee and the National Research Ethics Review Committee in Sudan. Permission was also obtained from the South Darfur authorities in Sudan to undertake the research at their facilities. Informed consent was obtained from all

participants included in the sample study to facilitate a better understanding of conditions of involvement in the study.

## Results

### Quantitative results

#### Socio-demographic characteristics of participants

The response rate of all participants was 81%. This comprised 198 female participants (51.2%) and 189 male participants (48.2%). The mean age of the female participants was  $14.15 \pm 1.27$  (s.d.) and the mean age of the male participants was  $14.25 \pm 1.25$ , whilst the mean age of both was  $14.20 \pm 1.26$ . The majority of respondents fell either in the 14-year age group (36.4%) or 13-year age group (22.5%), whilst the least were aged 16 years (6.2%). The majority of the respondents (60.5%) were in the eighth grade. In terms of the parents' education levels, 62.3% reported their parents have primary education, 28.2% reported their parents have secondary education level and only 9.6% of the schoolchildren reported their parents as having higher education.

#### Knowledge about refractive error

This part of the questionnaire dealt with the schoolchildren's knowledge of aspects related to refractive error and barriers for accessing eye care. The majority (57.5%) of children stated that they knew about refractive error, of these 62.4% were boys and 52.0% were girls. A third (33.07%) of the respondents reported that they never heard about refractive error, and 9.8% of respondents did not understand the question. Most (70.3%) of the schoolchildren believed that uncorrected refractive error leads to loss of vision. However, 21.0% believed that uncorrected refractive error did not lead to visual impairment. Only 8.7% reported they did not know if uncorrected refractive error causes loss of vision or not. Regarding the question on the effectiveness of using spectacles in treatment of refractive error, 62.8% of the students felt that wearing spectacles was an effective method for the treatment of poor eyesight. Of these, 71.4% were boys and 54.5% were girls, whilst 30.5% of the respondents felt that wearing spectacles was not effective in the treatment of refractive error and only 6.7% said they did not know whether it was effective. For the question that tested the knowledge of the children regarding the common signs and symptoms of refractive error, the students selected multiple answers from a range of answers. In this part of the survey, it was clear that the respondents had low knowledge about the signs and symptoms of poor eyesight. Only 22.30% believed that the most common signs and symptoms of refractive error are difficulty with seeing a distance object, followed by 11.80% who reported difficulty with seeing at night. In addition, 8.0% and 6.6% stated that the common signs and symptoms of refractive error was blurred vision for near objects and diplopia or seeing two images instead of one, respectively (Figure 1).

#### Sources of information about eye health

Amongst the students, 59.4% reported having received some information about eye health, whilst 39.8% reported not receiving any information. Only 0.8% reported they did not

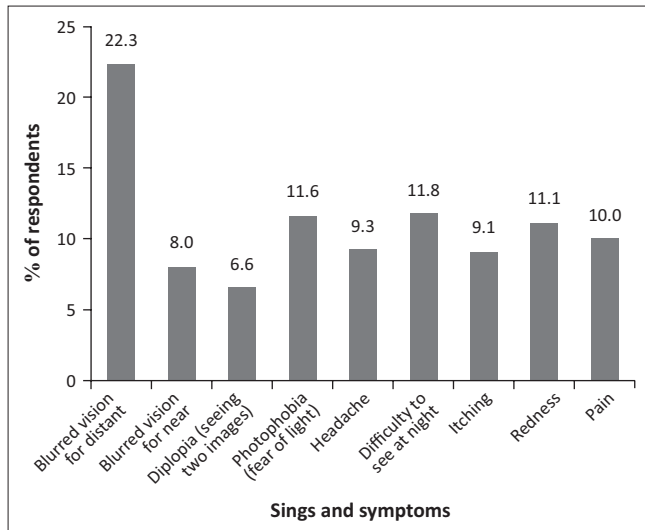


FIGURE 1: Knowledge of the most common signs and symptoms of poor eyesight.

know (Figure 2). Sources of information about eye health varied amongst the students. Television was found to be the main source (21.1%), followed by school (17.0%), parents (16.7%) and radio (13.0%). In addition, the respondents indicated other avenues for receiving information such as the newspaper (8.5%), health centre in village or town (8.3%) and the pharmacy (5.0%) (Figure 3). With regard to the question, 'Do you have enough information about eye health care?', most of the students (88.1%) felt they did not have enough information related to eye health. Only 9.1% felt they had enough information about eye care. The participants who reported not having enough information about eye care felt they would like more information on prevention (34.1%), treatment (31.4%), signs or symptoms (17.5%) and selected information about complications (17.0%) (Figure 4).

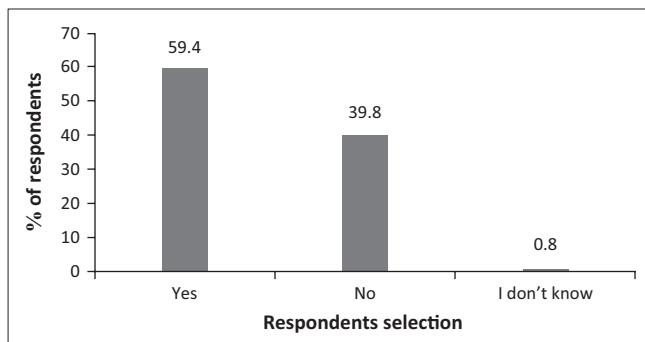


FIGURE 2: Have you got any information related to eye health?

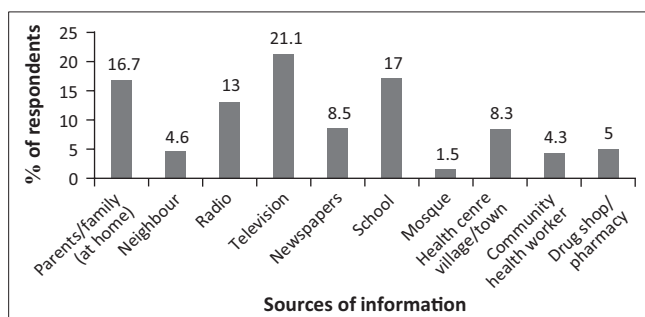


FIGURE 3: Sources of information about eye health.

### Barriers for accessing eye care and practices towards eye disease

The participants were asked when their eyes were last tested. Most of the respondents (80.6%) reported never having their eyes tested, 9.5% reported having their eyes checked more than 3 years ago, 6.2% one year ago and 3.6% two years ago (Figure 5). The students were asked to give the reason for not visiting an eye care provider in the past 12 months, and 28.3% reported they could see well, 20.6% stated their eyes did not hurt, 15.1% reported the examination was too costly, and 10.9% reported they did not want to wear spectacles. Almost 11% reported they were worried their eyes may have something wrong, 8.0% stated the examination might be painful and 6.3% reported the place of eye examination is too far and no transportation was available (Figure 6).

With regard to barriers to accessing eye care, 30.0% of students reported the main barrier for accessing eye care

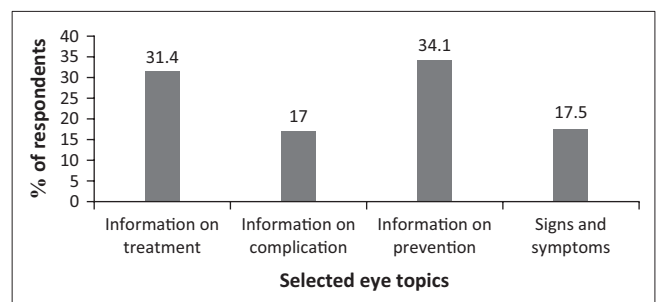


FIGURE 4: Eye health topics selected by participants to receive more information regarding.

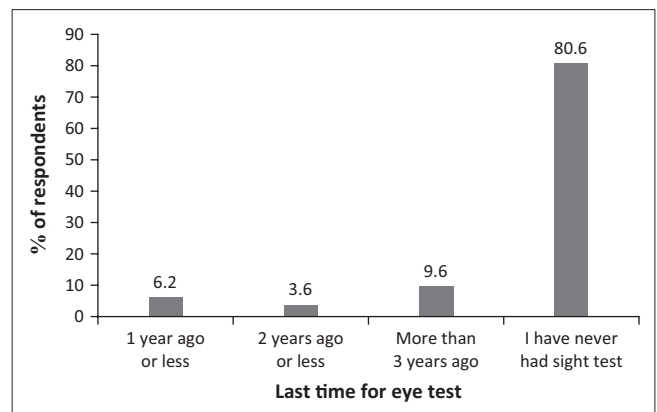


FIGURE 5: When was your last eye test?

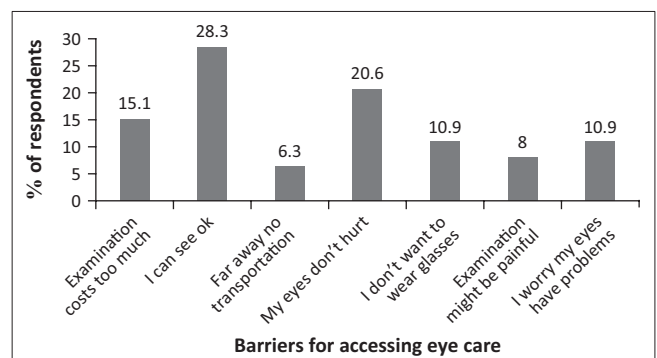


FIGURE 6: Reasons for not visiting an eye care professional in the past 12 months.

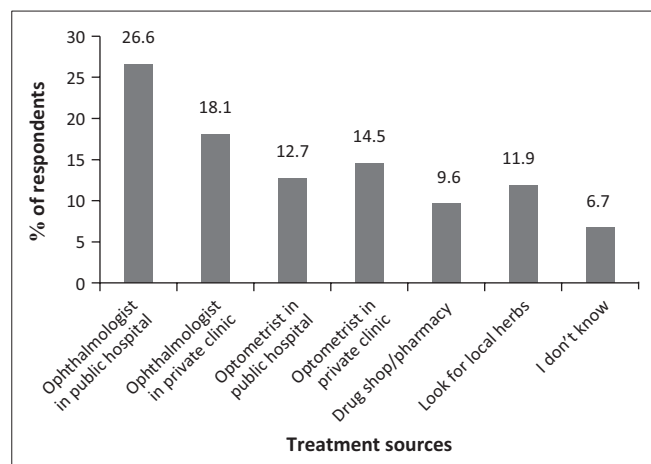


FIGURE 7: Sources of treatment by participants.

was cost and 7.5% reported they did not know. On the question that dealt with health insurance, 59.7% reported having health insurance and 39% reported not having health insurance. From those who reported having health insurance, only 23% stated that the health insurance would cover the cost of spectacles and eye drops and 72.6% reported that the health insurance would not cover the cost of spectacles and eye drops, but only cover the examination fees. When the participants were asked if they had signs and symptoms of refractive error, where they would seek treatment, 26.6% reported ophthalmologist in public hospital, 18.1% reported ophthalmologist in private clinic, 14.5% stated optometrist in private clinic, 12.7% optometrist in public hospital, 11.9% reported looking for traditional treatment and 9.6% reported from a drug shop or pharmacy (Figure 7).

## Qualitative results

### Socio-demographic characteristics of the participants

The sample comprised 29 women (61.7%) and 18 men (38.3%). Their ages ranged from 32 to 52 years with the largest age group of participants (23.4%) in the 41–43-year age group. In terms of education level, the majority of the respondents (61.7%) reported that they had basic school education, 25.5% had high school education and only 12.8% were college graduates. Focus groups ranged in size from 5 to 8 people. The average group size was 7 people. With an average age of 42 years, all the participants lived in South Darfur State.

### Knowledge about refractive error

Just over half of the parents (53.6%) believed that the child's poor eyesight was because of poor nutrition. The parents also voiced several other factors such as inflammation and allergies that affect the child's eye, reading in poor illumination, watching television for long time, congenital and hereditary factors, ageing and the harmful habits and beliefs that are used in the treatment of child's eye diseases. The following examples demonstrate their knowledge:

'Factors that cause impaired vision for the children were the lack of feeding the children with milk, reading in the sun light, reading on the white paper reflects the sun light into the eye

and cause impaired vision for the children.' (Focus group 5, participant 6, 50-year-old, mother of schoolchild)

'Poor eyesight is caused by multiple factors, for example, it may be due to congenital, hereditary, malnutrition, neglecting eye conditions and ageing.' (Focus group 6, participant 2, 52-year-old, mother of schoolchild)

When the parents were asked how they know when their children had refractive errors, most of the parents (89.3%) reported doing this through observation of the children during reading, writing and walking. Others expressed that they knew this from the child's eye movements and if the child complains. The majority of the parents indicated that if they knew their children had a refractive error, they would seek treatment from an eye specialist. However, others reported they treated their children with good food, as they believed that refractive error was because of poor nutrition.

Parents expressed the following eye diseases in their children to be of concern and would visit an eye care provider in order to seek treatment: inflammatory eye conditions (21.4%), night blindness (14.3%) and cataract (10.7%). About 42.9% of the parents reported they visit the eye specialist for any eye diseases. Only 21.4% of the parents stating they looked for traditional treatment. The following are examples of their comments:

'When young children become infected by inflammation in their eyes, they do not visit the eye doctor as they believed that this inflammation is part of the stages of a child's eye development, and it disappears spontaneously.' (Focus group 2, participant 5, 41-year-old, mother of schoolchild)

'The simple things, for example, a child with eye inflammation are treated at home without consulting a doctor. We go to the pharmacy and take eye drop or eye ointment and we used the traditional treatment. For instance boiling salt water and using this as eye drops and tea water as well as chilli. In the case of the child who has poor eyesight, we use the razor blade and sharply cut the both side of the child's eyes. The blood from the wound is wiped in their eye is said to be improve the child's vision. This process is called specs.' (Focus group 4, participant 3, 40-year-old, father of schoolchild)

Almost 90% of the parents reported if their children developed a squint, they would visit an eye specialist for the treatment and others stated that they looked for traditional methods. However, 45.6% of them believe that a squint is an untreatable eye condition. Just over 14.0% of the parents expressed that traditional treatment of squint is more effective than the treatment in the hospital:

'In the past time I thought that strabismus is a congenital condition which has no cure. One day I followed a program on television and learnt that strabismus is a treatable eye condition. I had a son who has strabismus as result of trauma when he was two years old. After hearing that program, I went to the eye doctor and showed him my son. He said to us that the trauma affected the eye muscles. Then the doctor conducted an operation on my child and now he has become completely healthy. Before that programme, I believe that strabismus was an untreatable eye condition.' (Focus group 1, participant 4, 45-year-old, mother of schoolchild)

'Here in Darfur, there is a traditional method for the treatment of strabismus. Method is the child to be lying on the bed and put the object with red colour above the child in the direction of the normal eye, the red object attracts the squint eye to be in normal position. This method is used in new-born child and many people said it is effective in the treatment of the strabismus.' (Focus group 7, participant 3, 47-year-old, mother of schoolchild)

### Information about child eye care

Parents were asked where they received information about childhood eye care and 28.6% reported that they received the knowledge about child eye care from television, followed by 25% from health education workshops and eye care providers, with 21.4%, 14.3% and 10.7% stating having received information from radio, school textbooks and newspaper, respectively. However, 25% of the parents reported that they have not received any information about child eye care. The majority of the participants (85.7%) reported preferring to receive child eye information from an eye specialist through television. One parent expressed:

'I prefer to receive the health information about the child eye care from the eye specialist through television and radio because the doctor explains the disease aetiology and risk and how to prevent and cure. The most houses in the city have television and the entire village is covered by the radio broadcast, if found car with health education programme to remote villages that is the best.' (Focus group 4, participant 4, 47-year-old, mother of primary school child)

Other participants said:

'I prefer to receive the health information about child eye care from the eye specialist because he/she is fully aware about the eyes disease so as to have the correct information.' (Focus group 1, participant 4, 40-year-old, mother of primary school child)

### Barriers for accessing child eye care

Parents identified several factors when asked about the barriers affecting their children in accessing eye care. The most frequently cited barriers were high cost of the treatment (75%), lack of eye care specialists (64.3%), lack of awareness about child eye diseases (35.7%) and the high rate of poverty amongst the population in the State (32.1%). The following are examples of comments on the most frequently cited barriers affecting access to eye care:

'I have two sons they have problems in their eyes. When we went to see a doctor after the examination the eye doctor told us you must go to Khartoum as there is no specialist for this disease here.' (Focus group 5, participant 2, 50-year-old, father of primary school child)

The parents mentioned other difficulties they faced whilst seeking eye care such as lack of eye services, including eye drops, long waiting lists, distance and no transportation, mistrust in the eye doctor and dishonest pharmacists. The following are examples of their comments:

'It is difficult to find some medications in South Darfur State. Sometimes the eye specialist prescribed to you the right medicine, but the pharmacist gives you the wrong medication.

Pharmacist became a dealer if they do not find the medication that was prescribed by the doctor. Gives you another medication and tells you this is alternative medication.' (Focus group 3, participant 7, 53-year-old, father of primary school child)

### Possible solutions

The parents reported several solutions when asked about how to overcome the barriers for accessing eye care. The most cited solutions by the child's parents were supporting the eye care services and treatment from the government (60.7%), raising community awareness about the causes and consequences of the eye disease (53.6%), increasing the number of eye specialists (39.3%) and that the health insurance must cover all the types of medications. Other factors included training of the eye care providers and equal distribution of them through the country. Training and qualifications of the pharmacists must be raised to ensure that people working in the drug stores must be qualified pharmacists and the provision of free treatment for schoolchildren.

### Parent-doctor relations

Most of the parents (53.6%) reported that they were not reassured when the eye doctors treated their children in the public hospitals and clinics. They mentioned that there were many medical mistakes that occurred because of the doctors and some people had lost their sight because of these mistakes. However, 46.4% reported they would be reassured when an eye specialist in a private hospital treated their children. Some (10.7%) of the participants reported they would not trust the treatment in public hospitals even by an eye specialist. Almost 11.0% also stated that they assessed the doctor based on their first impression and after that they decided to choose him or her in the treatment of their children. This was evident by the following comments:

'I am personally; if the doctor met me in good way and dealt me in kind way I will be full of confidence in his treatment. If he/she met me in an angry way I would not trust in his treatment.' (Focus group 2, participant 7, 42-old-year, mother of schoolchild)

## Discussion

### Knowledge and attitudes about refractive error

Childrens' knowledge about refractive error and its symptoms would help their families to seek eye care early, and this could lead to timely diagnosis and treatment of the childhood eye condition as well as help in eliminating the avoidable childhood vision impairment. In the present study, 33.07% of the respondents reported that they had never heard the term 'refractive error'. This figure is lower if compared to that reported from Nigerian students, where 68.0% had not heard about refractive errors.<sup>11</sup> Students need programmes to fill this lack of misunderstanding of refractive errors. In the current study, 70% of the students responded that uncorrected refractive errors could lead to visual impairment. However, 21% of the students believed that uncorrected refractive error could not cause loss of vision. Sixty-three percent of respondents felt that wearing spectacles was an effective

method for the correction of refractive errors. This result is similar to that reported by Chawla and Rovers,<sup>12</sup> where 66.7% of the participants understood the use of spectacles. Yet a significant number of students (30.5%) believed that the use of spectacles was not effective in the treatment of refractive errors. One fifth (20.8%) of respondents stated that the most common symptom of refractive error was blurred vision at distance, with 7.5% reporting this as blurred near vision and only 8.7% stated headaches. These results are comparable to those reported by Aldebasi<sup>13</sup> in Saudi Arabia who found that only 26% of respondents with basic education have an idea about blurred vision, eye strain and headaches as being symptomatic of refractive errors.

Over half of the parents (53.6%) reported that they believed the cause of childhood refractive error was a nutritional deficiency. In addition, the respondents voiced several factors that may lead to refractive error such as the consequence of eye disease, reading in poor illumination and watching TV for long time. This is similar to the results of a survey, which was conducted in India, where the parents' perception was that eye problems could be treated with food such as eggs and carrots.<sup>14</sup> This result is also comparable to the results of a study by Dhoble *et al.*<sup>15</sup> in India, where 68% of the participants believed that the common reasons for poor vision was nutritional deficiency. Most of the parents (89.3%) reported that when their children made mistakes during writing, reading and walking, they knew that they had a refractive error and they sought treatment from an eye doctor. This is similar to the finding by Balasubramaniam *et al.*<sup>16</sup> in India, where the parents expressed the symptoms blurred vision, making mistakes whilst writing and not writing in a straight line in their children to be of concern and as the reason to visit an eye care centre.

In our study, 21.4% of the parents reported looking for traditional treatment for their children, whilst other parents believed that childhood eye diseases, being part of the stages of child's development, would disappear spontaneously. This is similar to previous results of a study in Nigeria, where 21.33% reported that they neglected seeking healthcare for childhood eye diseases with 9.26% and 7.76% using self-medication and traditional treatments, respectively.<sup>17</sup> Most of the respondents in the current study (89.3%) stated that if their children developed squint, they would seek treatment from eye care centres, whilst others reported looking for traditional treatment. Furthermore, a significant number of parents believed that the squint was an untreatable eye condition. This is similar to results of a survey conducted by Isawumi *et al.*,<sup>18</sup> who reported that 54% of the patients visiting a tertiary eye clinic in southern Nigeria had no knowledge of the treatment of the strabismus.

Poor knowledge of refractive error and the negative perception towards spectacles as the method for treatment by the community in Sudan are of concern and barriers for correcting childhood refractive error. There are lack of eye care services and absent of interventions with healthcare

practitioners to influence the community about using of spectacles and to eliminate the social stigma towards spectacles wear as well as absent of the health education programme about the benefits of spectacles wear and consequences of uncorrected refractive error.

### Sources of information about eye health

Almost 60% of the students reported having some information about eye healthcare. This and the sources of information is similar to the findings from Nigeria,<sup>19</sup> where the main sources of the participant's knowledge about eye diseases were relatives (55.9%), friends (45.3%) and public media (12.2%). The results of this study indicate that the respondents have generally poor information about eye care. Furthermore, education programmes to increase the knowledge of the community through mass media, schools, hospitals and public presentations are urgently needed. Specifically, the campaign should focus on eye care topics such as signs and symptoms of eye problems, complications of eye disease if not treated, methods of prevention being regular examinations, early treatment of eye conditions, consequences of delays in treatment of eye diseases and where to seek eye treatment.

### Barriers for accessing eye care and practices towards eye disease

The majority of the respondents (80.6%) reported that they had never had an eye examination by an eye care providers. In a previous study that was conducted in India where the participants who did not undergo routine eye check-ups, the reasons were stated as being personal by 49.5% and economic by 30.8% of participants.<sup>20</sup> From the results of the current study, it is important to raise the awareness of the community about the benefit of routine eye examinations as the prevalence of visual impairment because uncorrected refractive error could be reduced if people undergo routine eye examinations. In this study, 30.0% of respondents agreed that the main barrier for accessing eye care was the cost. The results of studies, conducted in many African countries, reveal that the main reason that people underused eye care services was because of cost. In Ethiopia, Melese *et al.*<sup>21</sup> reported that the main barrier for seeking eye services was the cost of services. Moreover, in South Africa, Mashige *et al.*<sup>22</sup> reported that 36.4% of respondents did not receive the recommended treatment because of affordability. Such efforts are needed from governments, private sector, NGOs and other stakeholders in order to create the mechanism to resolve the barriers of cost.

With regard to health insurance, about 39% of respondents reported that they did not have health insurance. This impacts on affordability and acts as a barrier in both high-income countries and poor countries. In 2011, the American Public Health Association reported that the children without health insurance had approximately five times greater risk of having their vision care needs unmet.<sup>23</sup> In the current study, the respondents reported accessing refractive error services

from different sectors such as ophthalmologists and optometrists in private and public sectors and a similar result was reported by Yasmin and Minto in 2007,<sup>24</sup> where they reported that the majority of respondents accessed refractive error services in private sectors rather than public sectors. The reason for this could be that in the private sector, they could access both refraction and spectacle-dispensing services at the same time. In the present study, a significant percent of respondents reported that they sought treatment of refractive error from places other than optometric practices, such as the 11.9% who stated that they looked for traditional treatment and 9.6% from a drug shop. This is similar to a previous study, conducted in Nigeria,<sup>17</sup> where 7.8% of the children's parents reported that they used local medication in the treatment of their child's eye problem. It is thus evident that health education programmes are widely needed to raise the awareness of the community about the consequences of using traditional eye medications in the treatment of childhood eye conditions. In summary, most of the parents reported cost, lack of eye care providers, lack of awareness and mistrust in eye care providers as barriers to accessing childhood eye care. This is comparable to the results found by Elam and Lee<sup>25</sup> who reported that the most cited barriers by the participants were cost, trust, communication, clinical accessibility and doctor-patient relations.

## Conclusion

The level of knowledge and practices about eye care and refractive error amongst children and parents in South Darfur State of Sudan are low, and perceptions about spectacles as a method of treatment for refractive error were poor amongst students. The findings indicate the need to improve community awareness about common child eye diseases, the importance of early detection and treatment and to change incorrect perceptions and misunderstandings of the methods of treatment of eye diseases. There is a need for a structured educational programme to raise the awareness about childhood eye disease and visual impairment in order to improve the knowledge of parents and children. In terms of elimination, the clinical and financial barriers affecting access to childhood eye care services, for the government, non-government organisations and private sectors should be addressed because most people in South Darfur State are below the poverty line. The following are recommended:

- The promotion of awareness in the community about uncorrected refractive error and its impact on visual impairment.
- Finance should be made available from the government, private sectors and NGOs in order to support eye care services in the State. Special tax exemptions should be offered by government to make spectacles more affordable.
- Eye care services such as the spectacles and low vision device provision, as well as prescribed eye drops should be covered by health insurance.

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## Competing interests

The authors declare that they have no financial or personal relationships which may have inappropriately influenced them in writing this article.

## Authors' contributions

S.H.A. was the project leader who conducted research towards the PhD in Optometry. S.H.A. was responsible for the experimental and project design under the supervision of P.C.C-F. and K.S.N. S.H.A. conducted all clinical research. P.C.C-F. and K.S.N. made conceptual contributions and provided guidance for the research. S.H.A. was responsible for the writing of this paper with input and edits from P.C.C-F. and K.S.N.

## References

1. Mariotti SP. Global data on visual impairment 2010. Geneva: World Health Organization; 2012. WHO/NMH/PBD/12.01.
2. WHO. Global initiative for the elimination of avoidable blindness action plan 2006–2011. Geneva: World Health Organization; 2007. ISBN 978 92 4 159588 9.
3. Courtright P, Hutchinson A, Lewallen S. Visual impairment in children in middle- and lower-income countries. *Arch Dis Child*. 2011;96(12):1129–1134.
4. Naidoo KS, Jaggernath J. Uncorrected refractive error. *Indian J Ophthalmol*. 2012;60:432–437. <http://dx.doi.org/10.4103/0301-4738.100543>
5. Crowston T, Jonathan C. Centre for Eye Research Australia annual report 2011. Melbourne: Centre for Eye Research Australia, Department of Ophthalmology, The University of Melbourne; 2011.
6. Sudan. WHO. Saving the lives of the mother and children rising to challenge. Khartoum: Sudan; 2013. WRH/WP/13.16, 2013.
7. Kim G, Torbay R, Lawry L. Basic health, women's health, and mental health among internally displaced persons in Nyala province, South Darfur, Sudan. *Am J Public Health*. 2007;97(2):353–361. <http://dx.doi.org/10.2105/AJPH.2005.073635>
8. Ismail K, Khalfala M. Householders and housing characteristics 5th population census 2008. Khartoum: Central Bureau of Statistics Census; 2008.
9. Sudan Central Bureau of Statistics. Sudan household survey 2009 North Sudan. Khartoum: Central Bureau of Statistics (CBS); 2009. 3/2010.
10. UNICEF, WHO, World Bank. A situation analysis on basic social services in the Darfur States. Health, Nutrition, WASH and Education Thematic Working Group (TWG). Sudan: UNICEF, WHO, 2012.
11. Ebeigbe JA, Kio F, Okafor LI. Attitude and beliefs of Nigerian undergraduates to spectacle wear. *Ghana Med J*. 2013;47(2):70–73.
12. Chawla K, Rovers J. Survey of patient opinions on eyeglasses and eye care in rural and slum populations in Chennai. *Int J Epidemiol*. 2009;38(2):1–5.
13. Aldebasi Y. Young public's awareness to refractive error deficiency. *Int J Health Sci (Qassim)*. 2011;5(1):9–15.
14. Senthilkumar D, Balasubramaniam SM, Kumaran SE, Ramani KK. Parents' awareness and perception of children's eye diseases in Chennai, India. *Optom Vis Sci*. 2013;90(12):1462–1466. <http://dx.doi.org/1040-5488/13/9012-1462/0>
15. Dhoble P, Agarwal R, Patel C, Anand G, Sharma J, Sabde Y. Study to assess the psychosocial aspects of refractive errors and effectiveness of health education in correcting stigmas related to spectacle use in high-school students of rural India. *Int J Med Sci Public Health*. 2013;2(3):716–719.
16. Balasubramaniam SM, Kumar DS, Kumaran SE, Ramani KK. Factors affecting eye care-seeking behaviors of parents for their children. *Optom Vis Sci*. 2013;90(10):1–5. <http://dx.doi.org/1040-5488/13/9010-0000/0>
17. Ayanniyyi AA, Olatunji FA, Mahmoud AO, Ayanniyyi RO. Knowledge and attitudes of guardians towards eye health of primary school pupils in Ilorin, Niger. *Nigerian Postgrad Med J*. 2009;17:1–5.
18. Isawumi MA, Ulaikere M, Adejumo OO, Adebayo M, Kekunnaya M. Awareness, perceptions and knowledge of strabismus among patients visiting a tertiary eye clinic in Southwest Nigeria. *Int Ophthalmol*. 2014;34(5):1034–1042.



19. Onwubiko E, Eze BI, Udeh NN, Okoloagu C, Chuk-Okosa CM. knowledge and attitudes towards eye disease in a rural Southern-east Nigerian population. *J Health Care Poor Underserved*. 2015;26(1):199–210. <http://dx.doi.org/10.1353/hpu.2015.0013>
20. Dandona R, Dandona L, Naduvilath TJ, McCarty CA. Utilisation of eyecare services in an urban population in southern India. *Br J Ophthalmol*. 2000;84:22–27. <http://dx.doi.org/10.1136/bjo.84.1.22>
21. Melese M, Alemayehu W, Friedlander E, Courtright P. Indirect costs associated with accessing eye care services as a barrier to service use in Ethiopia. *Trop Med Int Health*. 2004;9(3):426–431. PMID: 14996373.
22. Mashige KP, Martin C, Cassim B, Ramklass S, Esterhuizen TM. Utilization of eye care services by elderly persons in the northern Ethekwini district of KwaZulu-Natal province, South Africa. *S Afr Optom*. 2011;70(4):175–181. ISSN 0378-9411.
23. American Public Health Association. Reducing barriers and increasing access to children's vision care services. American Public Health Association; 2011.
24. Yasmin S, Minto H. Community perceptions of refractive errors in Pakistan. *Community Eye Health*. 2007;20(63):52–53.
25. Elam AR, Lee P. Barriers to and suggestions on improving utilization of eye care in high-risk individuals. Focus Group Results. International Scholarly Research Notices, Hindaw Publishing Corporation; 2014. <http://dx.doi.org/10.1155/2014/527831>

Appendix starts on the next page →

# Appendix 1

## Knowledge, Attitudes and Practices Questionnaire

Assessment of Knowledge, Attitudes and Practices (KAP) in children regarding to perception to spectacles wear and barriers to access eye care in South Darfur State of Sudan.

### Survey instructions

This questionnaire look at your Knowledge, Attitudes and Practices (KAP) towards various issues related to your opinion on spectacles wear and barriers to access eye care in South Darfur State of Sudan. Please complete the survey below. The results will be used to develop eye care plan in South Darfur State of Sudan. The survey will take approximately 5 minutes to complete. All information will collect is confidential. Your name will be not written on any record your participation is voluntary, and you may stop the interview at any time without given any reasons.

Date: \_\_\_\_/\_\_\_\_/\_\_\_\_ Identity number: \_\_\_\_\_

(To be filled by the data entry person before entering the data of this questionnaire)

All questionnaires are completed anonymously. We would appreciate it if you answer all the questions and answer as honestly as possible. Please place a check mark (✓) in the box that best answers the question. Kindly make only one selection unless otherwise instructed.

### A. Demographic information

1. **What is your gender?**

Male

Female

2. **How old are you?**

years old

3. **What is level of your classroom?**

Seventh

Eighth

4. **Parents education level:** \_\_\_\_\_

### B. Knowledge and Attitudes about poor eyesight (refractive errors)

5. **Have you ever heard of poor eyesight (refractive errors)?**

Yes

No

I do not know

6. **Do you think that poor eyesight cause vision loss if it is untreated.**

Yes

No

I do not know

7. **Do you think that wearing spectacles are effective in treatment of poor eyesight?**

Yes

No

I don't know

8. **What are the signs and symptoms of poor eyesight? (Tick all that apply)**

Blurred vision for distant

Difficulty to see at night

Blurred vision for near

Itching

Diplopia (seeing 2 images instead of one)

Redness

Photophobia (fear of light)

Pain

Headache

I don't know

Other

If "other" describes: \_\_\_\_\_

**9. Have you get any information related to eye health? (Tick only one)**

- Yes  
 No  
 I don't know

**10. If yes, from which sources have you get information about eye health. (Tick all that apply)**

- |   |   |
|---|---|
| <input type="checkbox"/> Parents/family (at home) | <input type="checkbox"/> School                       |
| <input type="checkbox"/> Neighbor (village/town)  | <input type="checkbox"/> Mosque                       |
| <input type="checkbox"/> Radio                    | <input type="checkbox"/> Health centre (village/town) |
| <input type="checkbox"/> Television               | <input type="checkbox"/> Community health worker      |
| <input type="checkbox"/> Newspapers               | <input type="checkbox"/> Drug shop/pharmacy           |
| <input type="checkbox"/> Other                    |   |

If "other" describes: \_\_\_\_\_

**11. Do you think you have enough information about eye health care? (Tick only one)**

- Yes  
 No  
 I don't know

**12. If No, what information would you like to get about eye health care?**

- |  |  |
|--|--|
| <input type="checkbox"/> Information on treatment    | <input type="checkbox"/> Information on prevention |
| <input type="checkbox"/> Information on complication | <input type="checkbox"/> Signs and symptoms        |

**13. Have you ever had your eyes tested by an eye health care provider?**

- Yes  
 No  
 I do not know

**C. Barriers for accessing eye care and practices towards eye disease****14. Do you think the barrier to access the eye care is Cost of eye care?**

- Yes  
 No  
 I do not know

**15. Do you have any kind of health insurance coverage?**

- Yes  
 No  
 I do not know

**16. Does your health insurance pay for any part of cost of glasses, contact lenses and eye drop?**

- Yes  
 No  
 I do not know

**17. If you feel with signs and symptoms of poor eye sight, where you seek for treatment?**

- |   |   |
|---|---|
| <input type="checkbox"/> Ophthalmologist in public hospital | <input type="checkbox"/> Drug shop/pharmacy   |
| <input type="checkbox"/> Ophthalmologist in private clinic  | <input type="checkbox"/> Look for local herbs |
| <input type="checkbox"/> Optometrist in public hospital     | <input type="checkbox"/> I do not know        |
| <input type="checkbox"/> Optometrist in private clinic      | <input type="checkbox"/> Other                |

If "other" describes: \_\_\_\_\_

**18. When was your last sight test?**

- |  |  |
|--|--|
| <input type="checkbox"/> 1 year ago or less  | <input type="checkbox"/> More than 3 years ago       |
| <input type="checkbox"/> 2 years ago or less | <input type="checkbox"/> I have never had sight test |

**19. What are the reasons you have not visited an eye care professional in the past 12 months?**

- Examination costs too much
- My eyes do not hurt
- I can see ok
- I do not want wear glass
- Far away, no transportation
- Examination might be painful
- I worried my eye may have something wrong
- Other

If "other" describes: \_\_\_\_\_

**20. Have you ever been told by an eye care provider that you have an eye condition or disease?**

- Yes
- No
- I don't know

Thank you for participating in this survey.

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## Appendix 2

### Parents Focus Groups Discussion Guide

Assessment of parents Knowledge, Attitudes and Practice (KAP) towards eye diseases and barriers for accessing child eye care in South Darfur State of Sudan.

Good morning/afternoon/evening: Parents or Guardians: Thank you for agreeing to participate of the focus group. We appreciate your willingness to share your opinions and knowledge about child eye care.

#### Purpose of Focus Groups

We propose to conduct study on the prevalence of visual impairment and thereafter to develop a child eye care plan for the South Darfur Sate of Sudan. We need to do interviews with parents of school children. We would like to know your Knowledge, Attitude and extent of Practice relating to eye disease and barriers to access eye care in South Darfur State. Your responses will help us develop this child eye care plan for South Darfur of Sudan. Please note that all information will be collected is confidence, and no reference will be made to any individuals when reporting the information.

#### Theme (1) Information about child eye care

1. Where do you get information about child eye care?
2. Which is your preferred source of information for example radio, TV, newspaper community presentation, clinic, hospital, health practitioner, and teacher?
3. Why do you prefer to obtain this information from this source/s?

#### Theme (2) Knowledge about poor eye sight (refractive errors)

1. Do you know about any conditions that causes poor eyesight?
2. How do you know when your child has poor eye sight?
3. What do you do when you first suspect your child has poor eye sight?
4. What type of eye diseases (eye problems) do you seek care for your child?
5. Where do you seek treatment when their vision becomes worse?
6. What would you do if your child developed a squint?

#### Theme (3) Barriers for accessing child eye care

1. What barriers are you aware that affect your child in accessing eye care?
2. Why?
3. Do you know where to go to receive eye care treatment?
4. Are you afraid of anything that stops you from taking your child for eye care services?
5. What can be done to overcome those difficulties?

#### Theme (4) Practice towards visual impairment prevention and treatment

1. In your opinion what actions you can take to prevent your child from having visual impairment?
2. Is there anything else you would like to say regarding the treatment and prevention for your child from visual impairment?
3. Do you think a child's performance at school may be affected by poor eyesight?
4. Do you think a child's performance at school may be affected by other eye conditions even if they can see clearly?