

Original Article

# Demographic Characteristics and Causes of Low Vision in Children: A Hospital–Based Study from Khartoum, Sudan

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## ABSTRACT

**Purpose:** To determine the demographic characteristics and causes of low vision in children who attended Alfaisal eye center, Khartoum Sudan.

**Place and Duration of Study:** Alfaisal eye Center, Khartoum, Sudan, from February 2018 to October 2020.

**Study Design:** Cross sectional observational study.

**Methods:** Clinical record of 105 patients who visited the low vision clinic were retrieved. Demographic features, history, ocular examination, cause of low vision, refractive state of the eye (by self-luminance streak retinoscope, and auto refractometer), and type of low vision devices used by the patients were noted. Data was analyzed by using SPSS software version 20.

**Results:** Mean age was  $11.70 \pm 2.19$ . Seventy three percent patients had Visual Acuity(VA) less than 6/60. Majority (59%) were male patients. Commonest refractive error associated with low vision was myopia (65.71%). Retinitis Pigmentosa, congenital glaucoma, and albinism were other major causes of pediatric low vision (19.5%). Progressive Myopia was seen in 15%. About 9.5% of children presented with cataracts, nystagmus in 9.5%, and congenital refractive error in 9.5%.The cause of low vision among children was not statistically different between males and females  $P=0.890$ . More than half of the children 78.1% used glasses and about 21.9% were corrected by telescope.

**Conclusion:** Retinitis pigmentosa, albinism, and congenital glaucoma were the most common causes of pediatric low vision. Common low vision devices prescribed to these children were glasses and telescopes.

**Key Words:** Retinitis Pigmentosa, Congenital glaucoma, Albinism, Myopia, Cataract.

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## INTRODUCTION

Global estimates indicate that there are around 17.5 million children with low vision and most of them are in developing countries. Childhood low vision has a long-term effect on motor and cognitive development resulting in poor quality of life.<sup>1,2</sup> Low vision was defined by World Health Organization(WHO) as an impairment of visual functioning even after treatment and/or standard refractive correction and has a visual acuity of less than 6/18 to light perception, or the

visual field less than  $10^\circ$  from the point of fixation in the better eye.<sup>3</sup> The major causes of childhood visual impairment are varying widely from region to region, being largely determined by socioeconomic development. Causes include albinism, congenital cataract, congenital glaucoma, congenital idiopathic nystagmus, high refractive error, and myopic degeneration.<sup>4,5</sup> Etiological factors, age of onset, presence of other impairments, environmental aspects, and the interactions among these will determine the child's difficulties and delay in development.<sup>6,7</sup>

The eye care professionals such as ophthalmologists and optometrists could help visually impaired children with visual and non-visual aids.<sup>8</sup> Low vision aids (optical, non-optical) aim to improve visual resolution through changes in the retinal image (magnification, displacement, filtering, or condensation) or enhance the environmental condition and by rehabilitation.<sup>9,10</sup> These supports are prescribed when children start experiencing visual difficulties at school, which is usually around the age of 8 or 9 years. Often, learning to use a Low Vision Aids (LVA) at that age turns out to be too demanding for a child. This is the period when several novel academic skills, in particular reading and writing, must be mastered as well. Children with visual impairment already have difficulties with reading and pre-school mastering of aid will be beneficial in at least partly preventing developmental delays. Additional factors are that at this age, children tend to reject the use of an LVA, because they are afraid of stigmatizing.<sup>11</sup> Studies regarding low vision in Sudan are scarce. Therefore, this study was conducted to assess pediatric low vision in Khartoum, Sudan.

## METHODS

This was a descriptive cross sectional hospital-based study, conducted at Alfaisal eye Center, Khartoum Sudan. Data was retrieved from the low vision clinics from 2018 to 2020. One hundred and five pediatric low vision patients were included in this study, their ages ranged between six to sixteenth years. All patients underwent detailed ocular examination by a pediatric ophthalmologist and optometrist, then referred to a low vision clinic for low vision assessment. Ethical permission for the performance of the research was obtained from Al-Neelain University and permission to use the patients' records was sought from AL-Faisal eye hospital. Informed consent was waived because of the retrospective nature of the

study. However, efforts were made to ensure that patients' confidentiality was guaranteed. It was made sure that the data would only be used for the current research purpose. Data included patients' identification data, history and cause of low vision, vision, and visual acuity (by Snellen chart), refractive state of the eye (by self-luminance streak retinoscope, and auto refractometer), and type of low vision devices which was prescribed.

The data was entered in an excel sheet and analyzed using a statistical program for social studies (SPSS 20) software. Descriptive statistics were used to describe the study parameters (The tests included means, standard deviations, and frequencies).

## RESULTS

A total of 105 pediatric patients who attended Al-Faisal eye Center complaining of reduced visual acuity and qualifying the definition of low vision were included in this study. The age of the participants

**Table 1:** Demographic and clinical characteristics of patients.

Characteristic (105 patients)		Frequency (%)
<b>Age (Mean <math>\pm</math> SD (Standard Deviation))</b>		
Range (yrs.)		11.70 $\pm$ 2.19 6 to 16
<b>Gender</b>		
Males		62 (59.0%)
Females		43 (41.0%)
<b>Visual Acuity (VA)</b>		
Mean VA	Right Eye	0.11 $\pm$ 0.08
Range VA		0.01 to 0.33
Mean VA	Left Eye	0.11 $\pm$ 0.07
Range VA		0.01 to 0.4
<b>Type of Refractive Error</b>		
Hyperopia		36 (34.3%) P-value = 0.37
Myopia		69 (65.7%) P-value = 0.001
<b>Hyperopia by Degree</b>		
Low (2-3D)		15 (41.6%)
Moderate (3-6D)		14 (38.8%)
High (6D and over)		7 (19.2%)
<b>Myopia by Degree</b>		
Low (1-3D)		23 (33.4%)
Moderate (3-6D)		23 (33.3%)
High (6D and over)		23 (33.3%)
<b>Devices for Management</b>		
Eyeglasses		82 (78.1) P-value = 0.001
Telescope		23 (21.9) P-value = 0.785

ranged between 6 and 16 years with a mean age of  $11.70 \pm 2.19$  years. Almost 68.4% of participants had their age between (11 – 16) years, followed by age group (6 – 10) years representing 31.6%. With regards to the distribution of gender, about 59% were males and 41% were females.

Majority (73.30%) of the children presented with visual acuity less than 6/60 in their right eye with a mean of  $0.11 \pm 0.08$ , and 33.20% had low vision in their left eye with a mean of  $0.11 \pm 0.07$ .

The leading causes of low vision among children were retinitis pigmentosa, albinism, and congenital glaucoma. Further details are given in table 2.

**Table 2:** Causes of childhood low vision.

Causes	Gender		Total (%)	P-Value
	Male (%)	Female (%)		
Retinitis pigmentosa	13 (21.0)	7 (16.3)	20 (19.04)	0.890
Albinism	10 (16.1)	10 (23.3)	20 (19.04)	
Congenital glaucoma	11 (17.7)	9 (20.9)	20 (19.04)	
Pathological myopia	10 (16.1)	5 (11.6)	15 (14.3)	
Congenital cataract	5 (8.0)	5 (11.6)	10 (9.5)	
Refractive error	6 (9.7)	4 (9.3)	10 (9.5)	
Nystagmus	7 (11.3)	3 (7.0)	10 (9.5)	
Total	62 (100)	43 (100)	105 (100)	

## DISCUSSION

Global estimations show that there are around 19 million visually impaired children. Of these, 1.4 million are blind and 17.5 million have low vision and most of them are found in poor countries.<sup>12</sup> While low vision among children is less common than adults, it has a serious significant negative impact on the lifespan of the child with an estimate of 60% of children dying within one year of becoming blind.<sup>13</sup>

This study revealed that majority 59% of the patients attending low vision clinics were males which was consistent with Uprety, et al.<sup>10</sup> They found that 63.7% of patients attending low vision clinics were males. The most common age group affected by the low vision in the current study was 10 to 16 years. This data also corresponds with the findings of Uprety, et al.<sup>10</sup> who reported that the high prevalence of low vision impairment was found among 11 to 16 years age group. From the above-mentioned results it is clear that an effort should be directed to diagnose childhood visual impairment as early as possible and to provide a treatment plan to reduce the serious deterioration of vision. This can reduce the negative impact of low

vision on child's development and academic activities. Low vision aids can be used at an appropriate time to maximize the visual functions which can reflect on their academic performance and productive activities.<sup>14,15</sup>

Regarding the refractive error, most of the children were myopic (65.7%) in both eyes. This indicates the importance of visual assessment at an early age before going to school.<sup>16</sup>

The leading cause of childhood low vision in the current study was albinism, retinitis pigmentosa, and congenital glaucoma with a percent of 19%, followed by progressive myopia 14.3%. However, the major cause of low vision among children was not significantly different between males and females ( $P = 0.890$ ). Our results are slightly different from those reported by Shah, et al. They showed the main causes were nystagmus followed by Stargardt's disease.<sup>17</sup> This difference could be due to the dissimilar geographic location of studies and socioeconomic status of study sample. On the other hand, the present results are comparable with a study from Brazil<sup>18</sup> which reported that the leading causes were congenital cataract, toxoplasmosis, and congenital glaucoma.

Our study showed that the hereditary/congenital ocular anomalies (albinism, retinitis pigmentosa, and congenital glaucoma) accounted for 57.1% of low vision patients, this is comparable with Shah, et al.<sup>17</sup> They found that 21% of low vision patients were affected by hereditary/congenital ocular anomalies. Our results are also in agreement with Uprety, et al.,<sup>10</sup> who revealed that 50% of the causes of low vision congenital. The reason for this high proportion of hereditary/congenital anomalies in this study may be due to inter-family marriages, which are common in Sudan.<sup>19</sup> Most of these conditions were not treatable but prevention is possible through genetic counseling.

The present study revealed that spectacles were prescribed for 78.1% of the low vision children, and telescopes for 21.9%. This is in contrast with a report by Shah et al,<sup>17</sup> which showed that spectacles were prescribed for 66.2% of low vision patients and telescopes to 33.8%.

The above results show lesser use low vision aids in our setup. The eye care professionals should encourage the parents of children with low vision to use low vision aids.<sup>20</sup> These devices can improve the child's quality of life through visual rehabilitation. Arrangements should be made to teach them how to

use their remaining vision more effectively.<sup>20</sup> Using a variety of visual and adaptive aids may help them to keep-up the pace of the developing world.

This study has some limitations. It was a retrospective study in which records are sometimes incomplete which decreases the sample size. Secondly, the study came from a low vision clinic which may not reflect the demographics of the general Sudanese population. The assessment of vision, refraction, and causes of childhood low vision in preverbal children may be exceedingly difficult and not as accurate as the measurement in an older age group. This can lead to bias. The refractive error was considered as hypermetropia or myopia, and astigmatism was added as minus equivalent sphere resulting in increase in the mean frequency of myopic refractive error.

## CONCLUSION

Low vision problems are common in children with a higher with frequency in males than females. Albinism, retinitis pigmentosa, and congenital glaucoma is the most common cause of low vision in children. Eye care professionals should teach the parents about the importance of early diagnosis and treatment of childhood vision problems and using low vision aids.

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## Ethical Approval

The study was approved by the Institutional review board/ Ethical review board.(18-07-10)

## Conflict of Interest

Authors declared no conflict of interest.

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### Authors' Designation and Contribution

Saif Hassan Alrasheed; Assistant Professor of Optometry: *Concepts, Design, Literature search, Statistical analysis, Manuscript preparation, Manuscript editing, Manuscript review.*

Eslah Saeed Awad; Optometrist: *Concepts, Design, Literature search, Data acquisition, Data analysis, Statistical analysis, Manuscript preparation.*

Zoelfigar Dafalla Mohamed ; Assistant Professor of Optometry: *Literature search, Data acquisition, Manuscript preparation, Manuscript editing, Manuscript review.*

### Disclaimer

All the autors are from Al-Neelain University Khartoum Sudan. However, Saif Hassan Alrasheed joined Qassim University in 2020 for a temporary position for five years. Zoelfigar Dafalla Mohamed from Sudan joined the University of Buraimi, Oman in 2021 for a temporary position. All the authors contributed to preparing and finalizing the manuscript.

