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Clinical Profile of Low Vision in Children

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ABSTRACT

Introduction

Visual impairment in children is more common in developing countries like Nepal. A low vision service has been found to be effective in significantly improving their overall development and quality of life. The main aim of this study was to determine the causes of low vision in pediatric population along with their refractive error distribution and visual functions.

Methods

A descriptive cross sectional study was carried out in Tribhuvan University, BP Koirala Lions Center for Ophthalmic Studies. A total of 50 low vision children were under went detail low vision examination. They were selected through purposive sampling. Data was analyzed by using the descriptive and inferential statistics with SPSS version 19.0.

Results

The study findings showed, most common cause of visual impairment in low vision children was refractive error (20%), followed by congenital cataract (18%) and macular dystrophy (16%). The most commonly prescribed low vision device for distance was telescope and for near was spectacle magnifier. There was average acuity improvement of five lines in distance visual acuity with low vision devices.

Conclusion

The study concluded that refractive error and congenital cataract being the commonest cause of low vision in children, which reflect poor accessibility of care service among Nepalese children. Refractive error, the major cause of visual impairment could have been managed even in primary eye care center in Nepal. Children with impairment have potential visual acuity that can be improved with low vision services.

Keywords
Congenital cataract, low vision, low vision devices, refractive error

INTRODUCTION

Childhood blindness is important because children have a lifetime of blindness ahead them. It is usually avoidable, being either preventable or treatable and its impact is significant on child's development, education, future work opportunities and quality of life. World Health Organization (WHO) defines a person with low vision as one who has impairment of vision even after treatment and/or standard refractive correction, who has visual acuity of less than 6/18 to light perception, or who has a visual field less than 10 degrees from the point of fixation.[1] Low vision describes any condition of functional vision loss that cannot be corrected by spectacles, contact lenses, or medical interventions.[2]. The ensuing visual impairment may interfere with an individual's ability to perform work and their ability to participate in activities of daily living and leisure activities.[3]

The earlier the detection of visual problem, the earlier intervention can be implemented. Visual loss in children has been shown to have widespread implications in the social and educational development of a child.[4,5] It has been estimated that 80 percent of school tasks are based on vision which highlights the essential role of a comprehensive visual assessment in all children with visual impairment.[4]

According to UNICEF, the prevalence and causes of visual impairment in children below 16 years old are variable across different regions of the world. These statistics are related to social, economic and cultural factors.[1,5-7] The main aim of this study was to prepare a clinical profile of low vision children attending pediatric ophthalmology clinic of the eye center.

METHODS

Descriptive cross sectional research design was used for this study. Non probability purposive sampling technique was adopted to collect the data of 50 children from B.P. Koirala Lions Center for Ophthalmic Studies (BPKLCOS), Institute of Medicine. Informed written consent was taken from each and every child's guardians. Subjects along with their guardians were thoroughly explained about the low vision assessment.

The entire patients in this study were examined in the Pediatric Ophthalmology Outpatient Department of BPKLCOS. Those with stable vision impairment were referred to the low vision clinic. Contrast sensitivity was assessed with Pelli-Robson Chart. Objective and subjective refraction was performed. Cycloplegic refraction was performed in required cases. Central visual field was tested by Amsler grid chart number 2. Color vision was screened by isochromatic plate and Farnsworth D-15 test.

Every child who participated in this study filled out a detailed history form with the help of their parents. Information gathered included chief complaints, medical history, family history, previous eye checkup, use of glasses, history of surgery, previous low vision assessment and use or disuse of low vision devices.

Visual acuity was assessed with either with Bailey-Lovie Log MAR chart, Snellen chart or kay picture chart in accordance with the cooperation and ability of the child. The patient chief complaints and visual needs were prioritized, and the low vision device was chosen accordingly. Those devices that best fulfilled the child's needs were prescribed.

Data was collected from November 2013 to October 2016, in three year period. Measure of central tendency was measured in mean. Measure of variation was measured in standard deviation and range. Level of significance was measured with paired t test and chi square test. Presenting visual acuity, visual acuity after refraction and visual acuity with telescope were compared and level of significance for difference were checked by paired t test and chi square test. Improvement of Visual acuity with magnifiers from base line was noted and level of significance was calculated from paired t test. The data were analyzed with SPSS version 19.0 and Microsoft Excel version 2010.

RESULTS

In this study, 50 children were assessed at their first visit. The mean age of the children was 10.74±3.58 years. Majority of the children (n=10, 20%) were 15 years of age. Male children accounted for 26 (52%) and rest were females 24 (48%). The majority of the children who presented to low vision clinic were enrolled in primary level school 25 (50%) followed by secondary level 17 (34%). Only one (2%) child was from pre-school, 2 (4%) children were Braille learner and 4 (8%) were illiterate. Most of the children (50%) were attending mainstream school along with their normally sighted peers. Only 4% were studying in the special school for the visually impaired. Forty six (92%) children had lost their visual acuity since birth and 4 (8%) children had lost their vision after two years. Eight (16%) children had family history similar to their condition causing low vision, while 42 (84%) had no such family history.

A wide variety of ocular conditions were found to be the causes of visual impairment in the subjects. Refractive error was the main cause of low vision in our study population, accounting for 10 (20%) of the children. Congenital cataract (aphakia, pseudiphakia) were the second commonest cause of low vision impairment accounting for 9 (18%) of the study population. Similarly, other common causes of low vision in children were retinal dystrophy, macular dystrophy etc (Table 1).

Table 1. Major causes of pediatric visual impairment (n=50)

Disorders	Frequency (%)
Refractive error	10 (20%)
Congenital catarct	9 (18%)
Macular dystrophy	8 (16%)
Retinal dystrophy	4 (8%)
Albinism	3 (6%)
Chorioretinal coloboma	3 (6%)
Congenital glaucoma	2 (4%)
Corneal opacity	2 (4%)
Cortical blindness	1 (2%)
Chorioretinal scar	1 (2%)
Optic atrophy	1 (2%)
Retinitis pigmentosa	1 (2%)
Other disorders	5 (10%)

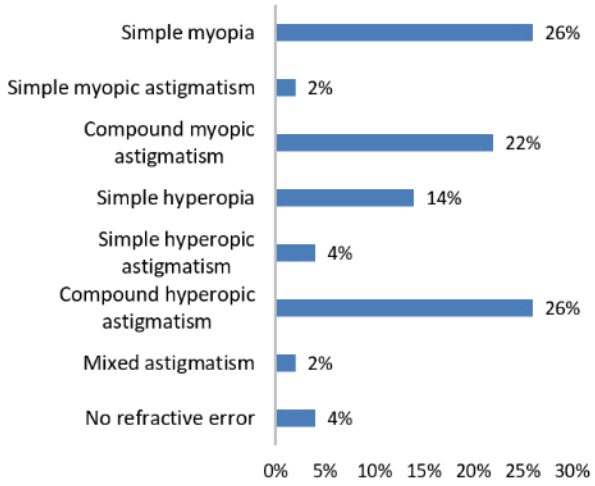

Figure 1. Horizontal bar chart showing types of refractive error of visual impairment children

Forty percentage (20) of children had a chief complaint of difficulty with both distance as well as near vision. Fifty eight percentage (29) had a chief complaint of difficulty with distance vision only. Some sort of mobility problem was present in 12% of children and 88% did not have any mobility problem. General health assessment of our clinical population revealed that 6% of children were present with mental retardation, 6% with cerebral palsy 65 with ear problem. Other condition such as hydrocephalus and diabetes mellitus were present in 8% of the condition. Forty six percentage children were using the spectacle at the time of examination.

Visual acuity of each and every child was categorized according to the WHO classification of visual performance (Table 2). Out of total 50 children on which visual acuity could be recorded, 14 were classified as moderately visually impaired (6/18-6/60), 28 were severely visually impaired (6/60-3/60) and 8 were blind (3/60- PL).

Near visual acuity was measured in 42 children out of 50 subjects. Better eye near visual acuity 0.8M in 6 children (12%), 1M in 15 children (30%), 1.20M in 5 children (10%), 1.50M in 6 children (12%), 1.60M in children (12%), 2M in 6 children (12%). The mean presenting visual acuity of the participated children was 1.35±0.54M.

Color vision was assessed in 42 children out of 50 subjects. Protanopia was found in three children (7.14%), deuteranopia was found in two children (4.76%), non specific defect was found in eight children (19.04%). Among them, 29 children (69.04%) had normal color vision and in eight children (19.04%) color vision could not be assessed.

Central visual field was measured in 40 children out of the total 50 subjects. Central visual field defect was found in three (6%) children, 37 (74%) children had normal central visual field and in 20% children's central visual field could not be assessed. Peripheral visual field was measured in 40 children out of total 50 subjects. Seven children (17.5%) were found to have peripheral visual field constricted, 33 children (82.5%) had normal peripheral visual field. Contrast sensitivity was assessed in 42 children out of 50 and the mean contrast sensitivity was 1.43±0.22 Log unit, ranging from 0.75 to 1.90 Log units.

The higher amount of refractive error was contributed by aphakic and highly myopic children. After precise refraction, there was statistically significant (paired t-test $t=19.149$, $p<0.05$) improvement of visual acuity. Most of the children showed average improvement of less than one line on the Log MAR chart. Spectacle prescription was provided to all who had refractive error, based not only on the improvement in letter acuity, but also depending upon their perception of contrast and brightness with the spectacle.

Regarding myopic error, simple myopia was found in 26% of children, simple myopic astigmatism in 2% and compound myopic astigmatism in 22% of

Table 2. Presenting Snellen visual acuity (n=50)

Visual impairment	Visual acuity	Frequency (%)
Moderate visual impairment	6/18 - 6/60	14 (28%)
Severe visual impairment	6/60 - 3/60	28 (56%)
Blind	3/60-Perception of light (PL)	8 (16%)

Table 3. Comparison of presenting visual acuity, corrected visual acuity after low vision refraction and visual acuity with telescope

Visual impairment	Number	Minimum	Maximum	Mean	SD
Presenting visual acuity (better eye)	44	0.5	1.6	0.85	0.2
corrected visual acuity (after low vision refraction)	44	0.48	1.56	0.8	0.2
visual acuity with telescope	39	0	0.3	0.16	0.1

Table 4. Low vision management (n=50)

Disorders	Frequency
Low vision devices with spectacle	39
Appropriate spectacle only	9
Referral to Rehabilitation center	2
Absorptive lens and non-optical devices	0

children. Similarly considering hyperopia, simple hyperopia was found in 14% children, simple hyperopic astigmatism in 4% and compound hyperopic astigmatism was found in 26% of children. Mixed astigmatism was found in 2% of children and 4% of children had no refractive error (Figure 1).

Trial of telescope was performed and among them, 39 children (78%) accepted the telescope as a low vision device, with an average improvement of six lines on the Log MAR visual acuity chart. The entire telescope was monocular keplerian type with variable magnification. Even though there was significant improvement in visual acuity, only a few telescopes were dispensed. This may be due to these items being cosmetically unattractive and difficult to get used to (Table 3). The most commonly prescribed low vision device for near was spectacle magnifier (34%) followed by stand magnifiers (12%) (Table 4).

DISCUSSION

In our population, one of the main causes of visual impairment was refractive error. This accounted for 20% of visual impairment. This signifies that provision of refractive services and a quality pair of spectacle can significantly reduce the prevalence of visual impairment in many of these children. Most of the children who presented at low vision clinic were in between the primary and secondary school years. The reason that they presented during these school levels was often due to poor school performance, as noted by their parents. Ideally, a child with visual impairment should be referred for initial low vision assessment in the pre-school years.[8]

In this study, 46% of the children were previous spectacle wearers. This data is almost similar to study done by Lennon et al.[9] Following refraction, 54% of the former non spectacle wearers were found to have refractive error. In total, 48 out of 50 children required refractive correction, which was also similar to the study by Lennon and associates (89%). On an average there was one line improvement in log MAR chart with the best refractive correction only, and various children benefited with tints incorporated in their prescription. This study agrees with several previous studies in that significant numbers of children with visual impairment have refractive errors and benefit from refractive correction.[9,10]

Twenty percent (20%) of the children in our sample were prescribed bifocals, which was almost similar as the previous studies (9%)[9], (14.6%)[11] and (35%).[12] This may be due to the fact that we only prescribed bifocals for aphakia and pseudophakia. However, as described by Woodhouse et al.[13] and Leat[14], children with visual impairment and some special condition may have reduced accommodation, so accommodative evaluation should be incorporated into a routine low vision evaluation. There was mean improvement in visual acuity of 0.60±0.16 Log MAR with the distance low vision aid which almost similar in the study of Lenon et al.[9] In contrast with the Lenon and associates study, the predicated visual acuity was not achieved in our study.

Regarding near vision, 52% of children had acuity of 1M or greater without any low vision aid. The most tenable reason for the relatively good near acuity is abundance of accommodative ability in children. After appropriate low vision device, an extra 23 children achieved near visual acuity of 1m or greater. The most commonly prescribed low vision device was spectacle magnifier (34%). Though some children had near visual acuity sufficient to read their desired texts in school without low vision aids, we prescribed them some devices in order to maintain comfortable reading for prolonged period of time and to maintain comfortable posture.

The number of children in our tertiary low vision center over a year is relatively low as compared to studies in other countries.[6,7] This may reflect the lack of awareness among the eye care practitioners regarding low vision care for children with visual impairment. We found very few cases referred from outside and almost all cases were referred from the pediatric ophthalmology department to low vision clinic.

CONCLUSION

The main cause of low vision in children in our study was refractive error followed by congenital disorders of lens and retina. Considering refractive error, the main findings were simple myopia, compound myopic astigmatism and compound hyperopic astigmatism. Majority of them had normal color vision and even normal near vision with intact central and peripheral visual field. But most of the children had poor contrast sensitivity. The choice of low vision device in majority of them was spectacle magnifier for near and hand help telescope for distance. Both near as well as distance visual acuity was satisfactorily improved with spectacles incorporated with bifocals, magnifiers and with the help of telescopes.

CONFLICT OF INTEREST

None declared.

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