Knowledge Assessment on Cortical Visual Impairment Among Ophthalmologists in Nepal

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ABSTRACT

Introduction: Cortical visual impairment (CVI) in children is a retro chiasmal visual tract disorder where there is with an impairment in the visual acuity and/or functionality of vision-guided task, including motor planning in the presence of normal ocular findings or minimal ocular morbidity. The study was conducted to assess the knowledge about CVI among ophthalmologists practicing in Nepal.

Materials and methods: This was a cross sectional study. Data collection was done by administering a preformed, validated questionnaire that was sent via email to all the ophthalmologists registered under the Nepal Ophthalmic Society. The email mentioned the aim of the study along with the questionnaire.

Results: A total of 146 (37.82%) ophthalmologists responded to the questionnaire. Forty four percent of the participants were general ophthalmologists, 28% were pediatric ophthalmologists and 67% were ophthalmologists from other subspecialty. The median age of participants was 37.6 years. Most of the ophthalmologist had a good knowledge about the cause, common risk factors, clinical risk factors, management and prognosis of CVI. However only 29.5% of participants were aware of the investigation of choice for diagnosing CVI and 31.7% were aware of the leading causes of visual impairment in the developed countries. The study also established that the knowledge score was higher in pediatric ophthalmologists than the general ophthalmologist and ophthalmologists from other specialties.

Conclusion: Most of the ophthalmologists had a good knowledge about the cause, common risk factors, clinical features, management and prognosis of CVI. However only a limited number of participants were aware of the investigation of choice for diagnosing CVI and the leading causes of visual impairment in the developed countries. Majority of the participants rarely examined patients with CVI which does not correlate with the high prevalence of perinatal hypoxia, the commonest cause of CVI, in our country.

Key words: Cortical visual impairment, Knowledge, Ophthalmologists.

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INTRODUCTION

Cortical visual impairment (CVI) is a retro chiasmal visual tract disorder where there is a reduction in vision in the presence of normal ocular findings or minimal ocular morbidity. (Lehman, 2012) In developed countries CVI is the commonest cause of visual impairment. (Ozturk *et al.*, 2016) This can be attributed to improved management of other causes of childhood blindness (McClelland *et al.*, 2007). The improved survival of children with severe neurological insult during the perinatal period is also responsible for the increase in the number of children with CVI (Rudanko, Fellman and Laatikainen, 2003). A study done at a tertiary center in India reported CVI as the commonest cause of severe visual impairment in children under 3 years old.(Pehere, Narasaiah and Dutton, 2019) However there is a scarcity of data on CVI in developing nations. There were 40 new cases of CVI in a year in a study done at an ophthalmic institute done in a developing nation. (Parajuli, Adhikari and Shrestha, 2020) The neonatal care has improved tremendously over the last 2 decades which is evident in the decrease in the neonatal mortality rate. (*Data Warehouse - UNICEF DATA*, no date) This leaves us with a group of children who have survived perinatal issues like prematurity, perinatal hypoxia, sepsis which are all major risk factors for the CVI. As the incidence of CVI will definitely increase, the ophthalmic fraternity needs to be aware of this condition. A study done to assess the knowledge regarding CVI in India revealed that ophthalmologists had limited knowledge regarding CVI in children and that it is essential to raise awareness regarding CVI among ophthalmologists. (Maitreya et al 2018)

Knowledge about CVI among ophthalmologists will aid in earlier detection and management. This study was performed to evaluate the knowledge of CVI among ophthalmologists in a developing nation.

MATERIALS AND METHODS

The study was cross-sectional in design. It was approved by the institutional review committee of Tilganga Institute of Ophthalmology. A validated questionnaire was sent via email to all the ophthalmologists for data collection . The email mentioned the aim of the study along with the questionnaire. The questionnaire was developed by Dr Amit Matrea who is a pediatric ophthalmologist working at Himalayan Institute of Medical Sciences, India. The permission to use the questionnaire was obtained. There were a total of 11 items in the questionnaire. Awareness about CVI was examined in the first item. The remaining

items were to be responded to by only those participants who have awareness of the term CVI. There were four responses in each item. The participants were directed to choose the best response for the given item. Prevalence, etiology and pathogenesis, clinical presentation, differential diagnosis, investigations, management, and prognosis of CVI were assessed in 9 items. "Knowledge score" was obtained by adding the correct responses from each item for each respondent. The correct and incorrect responses were given 1 and 0 marks respectively. The number of patients with CVI seen by the ophthalmologist in a given month was also inquired in one of the items. This was done to find out if there was any link between the knowledge score and the volume of patients seen by the participants.

Data entry, cleaning and coding were done in Microsoft Excel. Statistical analysis was done with SPSS software for windows version 20. Mean, standard deviation, proportion with 95% CI values were calculated as descriptive statistics. For average comparison of more than two groups of normally distributed data, one-way Analysis of variance (ANOVA) test was used and the Bonferroni test was also done for post hoc analysis. A p value < 0.05 was considered statistically significant.

RESULTS

A total of 146 ophthalmologists (37.82 %) responded to the questionnaire. Seven of them had not heard of the term CVI. Hence, they were excluded from the study. Among the remaining 139 participants, 41.7% were male and 58.3% were female. 44% of the participants were general ophthalmologists, 28% were pediatric ophthalmologists and 67% were ophthalmologists from other subspecialties. The median (IQR) age of participants was 37.6 (8.0) years. Table 2 shows the number and percentage of the correct answers for each question given by the participants. Most of the ophthalmologists had a good knowledge about the cause, common risk factors, clinical risk factors, management and prognosis of CVI. However only a limited number of participants were aware of the investigation of choice for diagnosing CVI and the commonest causes of visual impairment in the developed countries.

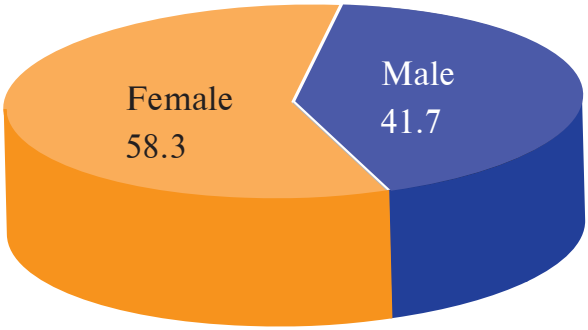

Figure 1: Pie chart representing the proportion of gender distribution (n=139).

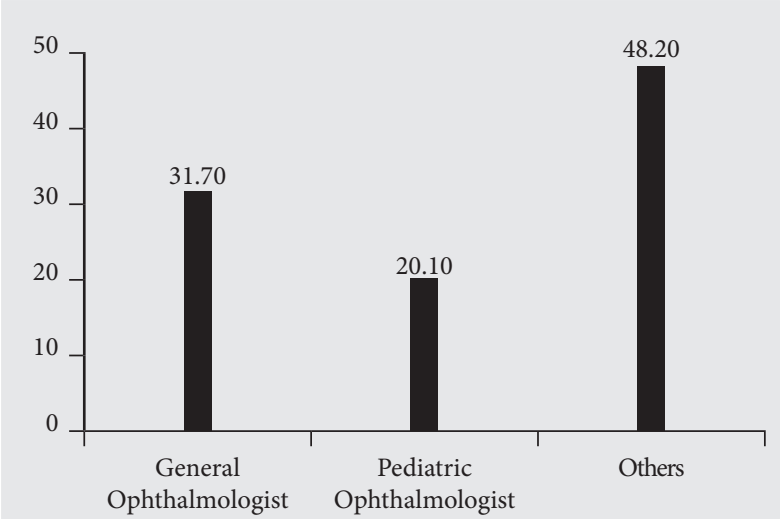

Figure 2: Distribution of specialty among the participants in percentage (n= 139).

Table 1: Responses with correct answer.

Question	Correct answer	Number (%)	95% CI
What is the cause of CVI in children?	Damage to the visual areas of brain	121 (87.1)	81.3 - 92.1
What are the three leading causes of visual impairment in children in developed countries?	ROP, CVI, optic nerve hypoplasia	44 (31.7)	24.5 - 40.3
Common risk factor of CVI	Perinatal hypoxia	114 (82)	75.5 - 88.5
What are the clinical features of CVI in children?	Variable loss of vision , visual defects and abnormal visual behavior	85 (61.2)	53.2 - 69.1
What is the investigation of choice in CVI in children?	MRI Brain	41 (29.5)	22.3 - 37.4
Which is NOT a differential diagnosis of CVI in children?	Refractive Error	89 (64)	55.4 - 71.2
Do children with CVI need an eye examination?	Always	128 (92.1)	87.8 - 96.4
How often do you diagnose CVI in children in ophthalmology OPD (/month)	< 5 cases	50 (36)	27.3 - 43.9
	5- 10 cases	6 (4.3)	1.4 - 7.9
	Rarely	83 (59.7)	51.1 - 68.3
Management	Multidisciplinary rehabilitative approach	130 (93.5)	89.2 - 97.1
Does vision improve in CVI?	Sometimes	96 (69.1)	61.2 - 77

Number of participants with correct answers (n=139).

CVI: Cortical visual impairment, LGB: Lateral geniculate body, ROP: Retinopathy of prematurity, MRI: Magnetic resonance imaging, OPD: Outpatient department, CI: Confidence Interval

Table 2: Correlation between patient load and average awareness of cortical visual impairment.

CVI children	Count	Knowledge Score (Mean, SD, SEM)	P value			
			Overall	(<5 vs 5-10)	(<5 vs Rarely)	(5-10 vs Rarely)
< 5 cases	50	6.6 (1.4, 0.2)	<0.001	0.959	0.002	0.042
5- 10 cases	6	7.2 (1.2, 0.5)				
Rarely	83	5.7 (1.4, 0.1)				
Total	139	6.1 (1.4, 0.1)				

CVI: Cortical visual impairment, SD: Standard deviation, SEM: Standard error of mean

Table 3: Percentage of correct answers among participants about cortical visual impairment in children.

Percentage of correct answer	Count	Percent
<25	15	10.8
25-50	68	48.9
>50	56	40.3
Total	139	100.0

Table 4: Comparison of knowledge score among various specialties of ophthalmologist.

Ophthalmologists	Count	Knowledge Score (Mean, SD, SEM)	P value			
			Overall	General vs Pediatric	General vs Other	Other vs Pediatric
General	44	5.8 (1.4, 0.2)	<0.001	<0.001	1.000	<0.001
Pediatric	28	7.2 9 (1.3, 0.2)				
Others	67	5.9 (1.3, 0.2)				
Total	139	6.1 (1.4, 0.1)				

SD: Standard deviation, SEM: Standard Error of Mean

The relation between the patient load in a month and awareness was analyzed and the p value was significant (Table 3). Table 4 shows that 68% of the participants gave 25- 50 % correct answers. The study also established that the knowledge score was higher in pediatric ophthalmologists than the general ophthalmologist and ophthalmologists from other specialties

DISCUSSION

Most of the ophthalmologists were correct regarding the cause and common risk factors of CVI. These results are similar to those seen in a study conducted in India. (Maitreya, Rawat and Pandey, 2018) However majority of the participants were unaware of the commonest causes of visual impairment in developed countries which are CVI, optic nerve hypoplasia and retinopathy of prematurity.(Kong *et al.*, 2012) In a developing nation there is very little data on the prevalence of CVI. A recent hospital based study done in a developing nation showed that 40 new cases of CVI were diagnosed in a year. (Parajuli, Adhikari and Shrestha, 2020) A study done by Shrestha et al in 2012 showed that CVI was seen in 0.2 % of children enrolled in 67 integrated schools for the blind.(Shrestha, Gnyawali and Upadhyay, 2012) CVI, however , was the commonest cause of severe visual impairment in children under 3 years of age in India. (Pehere, Narasaiah and Dutton, 2019). This contrast in the number of cases of CVI in the two neighboring countries could be due to undetected cases of CVI in our country.

Perinatal hypoxia is the most common risk factor of CVI.(Pehere, Chougule and Dutton, 2018) 82 % of the participants were aware of this fact. Countries with limited resources reportedly have a high incidence of perinatal hypoxia. In Nepal a study showed that 15.9% newborns had birth asphyxia with the rate of 21.1/1000 live births. (Shrestha, Shrestha and Sharma, 2016) In India the incidence of birth asphyxia varies from 2 to 16.2% in community-based studies. (Daga *et al.*, 1992) This is in contrast to European countries where 1−4 per 1000 live births are affected in Europe .(Kurinczuk, White-Koning and Badawi, 2010) Another report showed that the incidence of perinatal hypoxia has decreased to less than 0.1% in developed countries . (Costello and Save the Children (U.S.), 2001) The higher rates of birth asphyxia in developing countries would lead to more cases of CVI in comparison to the developed nations. The scarcity of data in literature on CVI from developing nations could be due to cases going undiagnosed or misdiagnosed.

Majority of the participants agreed upon the clinical features CVI. The visual cortex is responsible for factors like a visual acuity, color vision, contrast sensitivity and visual field. A poor image clarity, inability to perceive colors and contrast and visual field defects occur when there is an insult in this area. (Milner, 2017) The visual information is then transmitted to the posterior parietal lobe via the dorsal stream and the inferotemporal lobes via the ventral stream. The dorsal stream is responsible for analyzing a visual scene,

directing attention to the object of interest, creating a three-dimensional map of the external world in relation to ones' body and planning and bringing about visually guided body movements. The ventral stream on the other hand is responsible for the visual recognition of what we see, route finding. Pathology in the dorsal stream hence leads to optic ataxia (lack of visual guidance of movements), simultanagnosia (inability to given visual attention to multiple things at the same time), apraxia of gaze (inability to explore a scene with the eyes and to shift the gaze from one location to another) and occasionally homonymous lower visual field impairment as the superior optic radiations serving the lower visual field pass through the posterior parietal lobe. (Dutton, 2003)

64% of the participants also agreed on the fact that refractive error was not a differential diagnosis of CVI. This result is similar to a study done in India in which 58.4 % agreed that refractive error was not a differential diagnosis of CVI. Majority of the participants agreed that children with CVI always need an examination and that vision sometimes improved in these patient. In contrast to adults with cortical blindness, a substantial proportion of children with CVI experience improvement in visual acuity.(Chang and Borchert, 2020)This can be a result of the presence of extra geniculostriate visual pathways or recruitment of uninjured adjacent neurons to sub serve visual functions. (Lambert *et al.*, 1987) The reported rate of improvement ranges from 46 to 83%. (Chang and Borchert, 2020)

It was interesting to notice that only 29.5 percent were correct about the investigation of choice in CVI which is MRI Brain. 64.7 % opted for VEP as the investigation of choice. VEP is useful to detect abnormalities of the visual pathways or visual cortex . (Creel, 2019) As discussed earlier the dorsal and the ventral stream are also affected in CVI. There is a large variability in VEP tracings produced by normal children in infants and young children which complicates the interpretation of VEP results. (Chang and Borchert, 2020) VEP response may be nonspecific in children with neurologic disorders. Thus, VEP may have limited utility in diagnosis of childhood CVI. MRI of the brain can accurately identify lesions that cause CVI, the most common being periventricular leukomalacia. (Casteels *et al.*, 1997) Studies have also shown that there is a strong association between the severity of visual impairment and the damage seen in optic radiations. (Serdaroglu *et al.*, 2004)

Only 4.3% of the participants examined 5-10 cases of CVI per month. Almost 60 % of the participants rarely examined

patients with CVI. This result is similar to the study done in India.(Maitreya, Rawat and Pandey, 2018) This does not correlate with the high prevalence of perinatal hypoxia, the commonest cause of CVI , in developing countries.

The majority of the participants agreed that the management of CVI requires a multidisciplinary approach. An ideal team would include a team of pediatricians, pediatric ophthalmologists, parents, classroom teachers, teachers for the visually impaired, occupational therapists, speech pathologists, orientation and mobility specialists, physical therapists, and a CVI expert.

Visual rehabilitation is done primarily to encourage the maximum use of functional residual vision.(Good, 2001) Functional visual assessment should include questions like, "is the child visually curious? Will the child only look at someone only after they speak? Does the child respond better to a novel stimulus or to a familiar one?". The findings of the evaluation should provide the basis for the vision intervention which will help the eye care provider to educate the family and participating caregivers. (Merabet *et al.*, 2017)

This study has a few limitations. The first is the lack of questions related to attitude and practice. Another limitation is that there was participation of only 146 ophthalmologists. Thus the results cannot be generalized. This study however suggests that there is a necessity to increase awareness among ophthalmologists.

CONCLUSION

Most of the ophthalmologists had good knowledge about the cause, common risk factors, clinical features, management, and prognosis of CVI. However, only a limited number of participants were aware of the investigation of choice for diagnosing CVI and the commonest causes of visual impairment in developed countries. The majority of the participants rarely examined patients with CVI which does not correlate with the high prevalence of perinatal hypoxia, the commonest cause of CVI, in our country.

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