

ASSESSMENT AND MANAGEMENT OF STRABISMUS AMONG PAEDIATRIC PATIENTS IN A TERTIARY CARE TEACHING HOSPITAL

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ABSTRACT

Background: Strabismus is a manifest deviation of the eye that exceeds the control of the fusional mechanism so that the eyes are misaligned under binocular conditions. Strabismus is a manifest deviation of the eyes that exceeds the control of the fusional mechanism so that the eyes are misaligned under binocular condition. Strabismus is a common childhood ocular disorder that causes vision loss due to strabismic amblyopia. In addition, impaired binocularity/depth perception, cosmetic impairment, poor academic performance, social isolation/phobia, and surgical trauma from repeated surgical corrections are the most common hindrances raised by strabismic patients.

Materials and methods: This is a prospective and single center study was conducted in the Department of Ophthalmology, Chalmeda Ananda Rao Institute of Medical Sciences. We recruited patients aged 18 years or less who were seen at the ophthalmology clinic of our hospital and were diagnosed with strabismus. A total of 130 medical records were reviewed; among these, 90 patients met our inclusion criteria. Patients with missing data were excluded from the study. Data were extracted from the electronic-based medical record system of KAUH (Phoenix). The extracted data included demographic data, age at the time of diagnosis, type of strabismus, test/s performed, laterality of the affected eye, and other associated conditions. The patients were categorized into three groups according to their age at the time of this study: one to six years, seven to 12 years, and 13 to 18 years.

Result: A total of 90 pediatric patients attended the center during the study period. Cases with different types of strabismus were 35 cases with a prevalence of 38.9%, about two-thirds of them (62.9%) were rural and 51.4% were in the age group of 3-6 years. Esotropia was found in 42.9%, latent squint in 25.7% and pseudo strabismus in 8.6%. Surgical correction was used in treatment of 42.6% of cases with satisfying outcome in 97.6% of them.

Conclusion: The prevalence of strabismus was relatively high among patients in this study. Early screening for childhood strabismus is essential. A well-controlled community-based study is needed to confirm strabismus prevalence and predictors.

Keywords: Children, strabismus, Hawassa, southern Ethiopia, amblyopia, anisometropia, refractive error, cataract

INTRODUCTION

Strabismus is a manifest deviation of the eyes that exceeds the control of the fusional mechanism so that the eyes are misaligned under binocular condition.^[1] The condition of the deviation could either constant or intermittent based on the fusional status and the deviation could also either turned in esotropia (ET), out or exotropia (XT), down or hypotropia, up or hypertropia, rotated in (incyclotropia), and rotated out (excyclotropia).^{2,3} Horizontal deviation (XT, ET) is the most common type presented clinically worldwide.^[2]

The pooled prevalence of any strabismus, exotropia, and esotropia was 1.93%, 1.23%, and 0.77%, respectively, its prevalence ranges from 1.53%⁷ to 17.9%. Family history, ethnicity, genetic conditions, smoking, prematurity, low birth weight, refractive error, and neuro disability are the most common risk factors associated with the development of strabismus.^[3] Hyperopic refractive error of +3.00Diopters (Ds) and above is highly associated with esotropic strabismus and the odds of developing strabismus increases as the spherical equivalent of hyperopia and degree of astigmatism identified increases.^[4]

Strabismus is a common childhood ocular disorder that causes vision loss due to strabismic amblyopia. In addition, impaired binocularity/depth perception, cosmetic impairment, poor academic performance, social isolation/phobia, and surgical trauma from repeated surgical corrections are the most common hindrances raised by strabismic patients.^[5]

Early detection and diagnosis of strabismus can upset its worrisome impacts both in vision and socio-economic related quality of lives. Refractive correction and vision therapy are the most effective non-invasive management options which restore the vision and deviation of the eyes when they are practiced in the earlier ages of children. Earlier correction and management of strabismus reduces also the development of amblyopia which is the main cause of visual impairment/blindness due to laziness of the eye. Surgery is indicated when the deviation cannot be corrected by the above methods and has large deviations.^[6]

Even though strabismus is a common ocular disorder that affects the visual and academic performance of children, there are no prior studies conducted in the study area that determines the prevalence and possible risk factors of strabismus. In addition, most of the studies conducted in different areas of the world are institution-based and carried out under the age of 72 months. So, this is the first community-based cross-sectional study done in Ethiopia that aims to assess the prevalence of strabismus and its associated factors among school-age children.

MATERIALS AND METHODS

This is a prospective and single center study was conducted in the Department of Ophthalmology, Chalmeda Ananda Rao Institute of Medical Sciences. We recruited patients aged 18 years or less who were seen at the ophthalmology clinic of our hospital and were diagnosed with strabismus.

A total of 130 medical records were reviewed; among these, 90 patients met our inclusion criteria. Patients with missing data were excluded from the study. Data were extracted from the electronic-based medical record system of KAUH (Phoenix). The extracted data included demographic data, age at the time of diagnosis, type of strabismus, test/s performed, laterality of the affected eye, and other associated conditions. The patients were categorized into three groups according to their age at the time of this study: one to six years, seven to 12 years, and 13 to 18 years.

All data were entered into Microsoft Excel version 2010. The Statistical Package for Social Sciences (SPSS) version 21 (IBM Corp., Armonk, NY, USA) was used for data analysis. Categorical variables were expressed as frequencies and percentages, whereas continuous data were presented as means \pm standard deviations. The chi-square test was used to calculate the correlations between variables. A p-value of 0.05 or less was considered statistically significant.

RESULT

During the study period, a total of 90 pediatric patients attended our center. Of these, 25 cases (27.8%) were ophthalmologically free however; cases with different types of strabismus were 35 cases with a prevalence of 38.9% (Table, 1).

Table (1): Number of the total pediatric patients included in the study and their categorization

Variable		Descriptive
Pediatric patients (<15 years old) attending during the 3 years		90
Categorization of all of these patients	Ophthalmologically free	25 (27.8%)
	Strabismus	35 (38.9%)
	Isolated refractive error	9 (10%)
	Lens opacity	6 (6.7%)
	Congenital retinal or optic nerve disease	4 (4.4%)
	Corneal opacities	1 (1.1%)
	Lid disease	10 (11.1%)

Table (2): Baseline data and types of strabismus

Variable		Descriptive (n=35)
Sex	Male	15 (42.8%)
	Female	20 (57.2%)
Age (years), mean ± SD(Range)		4.61 ± 2.58 (3-15)
Age groups	3-6 years	18 (51.4%)
	>6-9 years	10 (28.6%)
	>9-12years	4 (11.4%)
	>12-15years	3 (8.6%)
Residence	Rural	22 (62.9%)
	Urban	13 (37.1%)
Types of strabismus	Pseudostrabismus	3 (8.6%)
	Latent squint	9 (25.7%)
	Esophoria	10 (28.6%)
	Exophoria	12 (34.3%)
	Esotropia:	15 (42.9%)
	Non accommodative	15 (42.9%)
	Partially accommodative	5 (14.2%)
	Fully accommodative	9 (25.7%)
	Exotropia	1 (2.8%)
	Hyper- or Hypotropia	1 (2.8%)
	Paralytic squint :	2 (5.7%)
	6 th nerve palsy	1 (2.8%)
	4 th nerve palsy	1 (2.8%)
Specific syndromes	2 (5.7%)	

Table (3): Types of strabismus in relation to sex and age groups

Types of strabismus		Sex			Age groups (years)				
		Male	Female	Total	3-6	>6-9	>9-12	>12-15	Total
Pseudostrabismus		6	8	14	5	2	1	1	9
Latent squint	Esophoria	1	1	2	4	3	1	0	8
	Exophoria	2	2	4	1	0	0	0	1
Esophoria		2	3	5	2	0	0	0	2

Exophoria		0	2	2	0	4	0	1	5
Hyper - or hypotropia		1	1	2	4	1	0	1	6
Paralytic squint		3	3	6	2	0	2	0	4
Specific syndromes		15	20	35	18	10	4	3	35

According to gender, esotropia, latent squint and pseudostrabismus were higher in females than males, while paralytic squint cases were higher in males than females. According to age grouping, strabismus was common in 3-6 years group, the majority of them had esotropia (Table, 3).

Table (4): Different treatment modalities used for management of strabismus and their outcome

Treatment modalities	Number (%)	Descriptive (n=35) Outcome	
		Satisfying	Not satisfying
Muscle exercise	89 (12.9%)	22 (24.7%)	67 (75.3%)
Amblyopia therapy	13 (1.8%)	9 (69.2%)	4 (30.8%)
Glasses	285 (41.1%)	210 (73.7%)	75 (26.3%)
Refractive surgery	4 (0.6)	4 (100%)	0
Surgical correction	295 (42.6%)	288 (97.6%)	7 (2.4%)
Redo surgery for under or over correction	7 (1.0%)	7 (100%)	0

Regarding treatment modalities used for management of strabismus, surgical correction was used more frequently than each of the other modalities; which were glasses, muscle exercise, amblyopia therapy, and redo surgery. The majority of cases had satisfactory outcome with different treatment modality with the exception of muscle exercise, which had mostly unsatisfactory outcome (Table 4). Many of these patients were submitted to more than one modality of these treatments as many patients were submitted to muscle exercise then surgical treatment or glasses and amblyopia therapy then surgical treatment in order to reach full correction of their condition.

DISCUSSION

This study showed that clinically significant refractive error, anisometropia, amblyopia, and dense cataract were present in considerable proportions of the study population. Many of the children with strabismus had another visual defect. Notably, this study showed that age <5 years, family history of strabismus, clinically significant refractive error, and amblyopia were significantly associated with childhood strabismus.

The current study indicated that 17.9% of the children had strabismus. Previous population-based studies have reported lower prevalence of strabismus: 1.61% in Baltimore (USA), 1.5% in a Native American cohort, 1.4% in Brazil, 2.8% in Australia, 5.65% and 3.24% in China, 0.8% in Singapore, 0.14% and 0.20% in a multiyear study in Japan, 1.68% in Iran, 2.1% in the United Kingdom, and 1.36% in Denmark. ^[7-16] Higher prevalences of strabismus were observed among patients in a general hospital in Cameroon (22%) and among patients with schizophrenia in South Africa (74%). ^[17] These variations might be attributable to disparities in genetic vulnerability, environmental factors, and lifestyles among the different locations. Notably, the inclusion of referral patients might have contributed to the increased prevalence of strabismus observed in the current study.

Additionally, the present study showed that 16.7% of the children had amblyopia. This finding is comparable with the results of a study conducted in a tertiary hospital in southern Nigeria (16%) and a study conducted in an ophthalmology clinic in a large hospital in Brazil (18.6%). However, lower prevalences were observed in other studies: 0.82% in schoolchildren in rural southwest China, 2.3% in a population based cross-sectional study in Iran, and 0.8% (in an urban area) and 0.2% (in a rural area) in schoolchildren in India. ^[18] Furthermore, of the children with amblyopia in this study, 56.7% had strabismus. In previous studies, 15% and 51.7% of Singaporean children in China and preschool children in southern Ethiopia had strabismic amblyopia, respectively. ^[19] The variations among studies might be due to differences in parental knowledge of amblyopia, age of the participants, public education regarding the condition, and/or referral challenges encountered by the patients.

In this study, the prevalence of anisometropia was 9.6%. However, a lower prevalence of anisometropia was reported by several studies, such as 3.9% in a population-based cross-sectional study in Iran, 2.2% in schoolchildren in Iran, 3% among preschool children in Australia, and 3.8% in another study of schoolchildren in Iran. ^[20] The variation might be attributable to the application of different criteria and methods for assessment of anisometropia among studies.

The present study revealed that 22.5% of the children had clinically significant refractive error. However, this prevalence was higher than the rates observed in a study of schoolchildren in India (5.46% in an urban area and 2.63% in a rural area) and in another study of schoolchildren in India (17.5% in an urban area and 12% in a rural area). Differences in the refractive error threshold might have led to the variability in refractive error prevalence among studies. ^[21]

In this study, children with clinically significant refractive errors were 13.3-fold more likely to have strabismus. In addition, strabismus severity was greater among children with amblyopia than among children without amblyopia. Although the association between amblyopia and

strabismus is unclear, a child with amblyopia is presumed to use his/her non-amblyopic eye for clear vision, while the amblyopic eye is permitted to deviate and become strabismic.^[22]

This study had some limitations. First, the study population comprised children who visited the Department of Ophthalmology & Optometry for ophthalmic care; this might have led to greater prevalence of strabismus, compared with previous community-based studies. Second, our study was cross-sectional in nature and thus could not conclusively demonstrate a relationship between strabismus and potential causative factors. Third, this study used a non-probability sampling method (i.e., a consecutive sampling approach) for the enrollment of study participants; therefore, it might have been influenced by the presence of outliers. Despite these limitations, this study provided important evidence regarding childhood strabismus in India.

CONCLUSION

The findings of this study indicated a relatively high prevalence of strabismus among children who visited the Department of Ophthalmology & Optometry for ophthalmic care. The presence of amblyopia, clinically significant refractive error, age and family history of strabismus were factors significantly associated with childhood strabismus. Therefore, early screening for childhood strabismus is essential. A well-controlled community-based study is needed to confirm strabismus prevalence and predictors.

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