ORIGINAL RESEARCH

Prevalence of Strabismus and Its Associated Factors Among School-Age Children Living in Bahir Dar City: A Community-Based Cross-Sectional Study

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Introduction: 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. Its prevalence reaches from 0.7% to 5% globally and 1.5% to 17.9% in Ethiopia.

Objective: This study aimed to assess the prevalence of strabismus and its associated factors among school-age children living in Bahir Dar city.

Methods: A community-based cross-sectional study was conducted from April 15 to May 25, 2019, in Bahir Dar city and a total of 632 participants were recruited using a multistage sampling technique. The data were collected with a face-to-face interview, Snellen acuity, prisms, pen torch, portable slit lamp, and ophthalmoscope. The collected data were entered into Epi Info version 7 and transposed to statistical package for social science version 20 for formal statistical analysis. Frequency (percentage), mean (standard deviation), tables and graphs were used to present the summary statistics. All variables with a p-value of less than 0.2 in bi-variable logistic regression were entered into multiple logistic regression and variables with a p-value of less than 0.05 were taken as significantly associated with strabismus. The strength of association between variables was shown with an odds ratio and a 95% confidence interval.

Results: A total of 611 children participated with a response rate of 96.7% and a mean age of 12.3 (±3.25). The prevalence of strabismus was 31 (5.0%), 95% CI: (3.45, 6.97). Family history of strabismus (AOR= 3.9 (95% CI: 1.71, 11.22)), hyperopia ≥ +3.00 diopters sphere (AOR=5.3 (95% CI: 2.01, 10.77)), and not with exclusive breastfeeding (AOR= 2.9 (95% CI: 1.14, 4.71)) were the only risk factors found for strabismus.

Conclusion: The prevalence of strabismus was 5% among children living in Bahr Dar city. A family history of strabismus, not with exclusive breastfeeding, and hyperopia ≥ +3.00 diopters sphere were associated with strabismus.

Keywords: strabismus, school-age children, Bahir Dar, Ethiopia

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),

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and rotated out (excyclotropia).[2,3] Horizontal deviation (XT, ET) is the most common type presented clinically worldwide.[4,5]

The pooled prevalence of any strabismus, exotropia, and esotropia was 1.93%, 1.23%, and 0.77%, respectively, globally[6] and in Ethiopia, its prevalence ranges from 1.53%[7] to 17.9%.[8] 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.[4,9] 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.[9]

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.[9,10]

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.[3] Surgery is indicated when the deviation cannot be corrected by the above methods and has large deviations.[11]

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 living in Bahir Dar city.

Methods
Study Design, Setting, and Period
A community-based cross-sectional study was conducted from April 15 to May 25, 2019 in Bahir Dar city which is located in the Northwest region of Ethiopia. It is the capital city of Amhara regional state and is located 565 kilometers away from Addis Ababa, the capital city of Ethiopia. The projected population size of the city is estimated to be more than 355,000 with 18 Kebeles (smallest administrative unit). Bahir Dar city is located at 6000 feet on Lake Tana with a hot and humid environment in the spring. The city has also 3 public hospitals, 2 private hospitals, and more than 10 governmental and private health centers.

Study Population, Inclusion, and Exclusion Criteria
All school-age children in Bahir Dar city were the source population and those children who were living in the selected Kebeles and participated during the data collection period were the study population.

All school-age children who had lived in Bahir Dar city in the past 6 months were included in the study and those children who were severely ill and unconscious due to different disorders were excluded from the study.

Sample Size Determination
The minimum sample size to carry out this study was determined using double proportion population formula using Epi-info by taking the following assumptions; 95% CI, 4% margin of error, power as 80%, ratio 1:1, and proportion of strabismus from the previous study as 17.9%.[8] Finally, from all healthy students from five weeks in spring 2019 in Bahir Dar city, Ethiopia, 632 recruited assuming 1.5 as design effect and only 10% non-response rate.

The city was sub-divided into 18 kebeles (smallest administrative unit). A multi-stage sampling technique was applied to select 4 kebeles by lottery method (20% of all 18 kebeles). Then, a systematic random sampling technique was applied to select the households after taking the list of households from each kebele administration. The interval K was calculated proportionally for each Kebele administration. Finally, one child per household was participated and a lottery method was used when the number of children is ≥ two in a single household. When the selected houses were unavailable for interview, the next listed household was interviewed after cross-checking. Next listed households were included also for an interview when children were not available at all.

Sampling Tools and Procedure

A Cronbach alpha 75% questionnaire, Snellen 3-meter, and 40 centimeters acuity, prisms, pen torch, translucent occluder, portable slit lamp and direct ophthalmoscope were used for data collection. The data were collected by 3 Masters and 4 Bachelor of sciences holder Optometrists with two supervisors.

Interview

Socio-demographic, medical, developmental, and behavioral factors of study participants were collected by structured Amharic version of the questionnaire through a face-to-face interview.

Examination and Visual Acuity (VA)

Visual Acuity

Both the unaided (for children presented without refractive corrections) and the habitual (for children presented with their refractive corrections) visual acuity of each participant was taken using a reduced 3-meter Snellen chart for distance and 40 centimeters for near vision in ambient light condition. Monocular VA was taken by occluding the untested eye and binocular vision was taken with both eyes open.

Ocular Examination

All children carried out comprehensive eye screening and examination with trained BSc holder and Master's level Optometrists. Evaluation of the anterior segment of the eye was carried out with a portable slit-lamp biomicroscope and the posterior segment of the eyes was evaluated with direct ophthalmoscopes. All children who were diagnosed with the clinically significant refractive error were given formal spectacle prescriptions and those children with other eye problems were referred to Felege Hiwot comprehensive specialized hospital.

Ocular Alignment

The assessment/diagnosis of strabismus at 40 centimeters and 6 meters was carried out by using unilateral cover/uncover test or alternating cover test without correction and with correction (if worn) using accommodative target. Hirschberg and krimisky tests were done at near when simultaneous prism and cover/uncover test could not be done. The degree/magnitude of strabismus was measured by changing the prism bar/cells in front of the deviating eye. So, any detectable movement of the uncovered eye to take up fixation while covering the other eye or any deviation of the corneal reflex from the center of the pupil in the primary position in which in both cases, the amount is estimated to be 8 PD and above (easily detectable deviations) in either eye was taken as strabismus.

Refraction

Clinically significant refractive error was determined after double cyclopentolate 1% drops with spectacle prescription given. The refractive status of children under 15 years was determined by cycloplegic refraction after the installation of 2–3 drops of 1% of cyclopentolate within a 5-minute interval. After 30 minutes of installation, the refractive status of each child was measured separately for each eye using a streak retinoscope. The refractive status of children with the age of 15 years and above was determined with dry refraction using streak/spot retinoscope and subjective refraction.[12]

Operational Definitions

Strabismus was defined as the presence of any manifested deviation (whether constant or intermittent) at any fixation distance (at near or distance) as it is objectively determined by the cover/uncover test alternating/Hirschberg test.[1,13]

Maternal alcohol drink was defined as any positive history of alcohol drink of the mother during the period of pregnancy of the study participants.[3]

Unilateral amblyopia was defined as best-corrected visual acuity of ≤ 20/40 in the worse eye and ≥ two line difference in best VA between the two eyes in the presence of known amblyogenic factors (significant refractive error, occlusive factors of a visual axis).[5]

Bilateral amblyopia was defined as best corrected VA in both eyes < 20/40 in the presence of amblyogenic factors (significant refractive error, occlusive factors of a visual axis).[5]

Family history of strabismus was defined as the presence of one or more first or second-line relatives with known eye turn/deviation/crossed eyes.[14]

Clinically significant refractive error (CSRE) was defined as having hypermetropia of ≥ +3.00 Ds in both/either eye or myopia of ≥ −0.50 Ds in both/either eye and/or astigmatism of ≥ 1.00 Ds in any meridian of the eye.[15,16]

Anisometropia was defined as refractive measurement deference of ≥ 1.00 Ds (sphere +1/2 cylinder power) between the two eyes.[8]

Data Quality Assurance

The English version of the questionnaire was translated into Amharic language and back to English by language professionals to ensure accuracy and consistency. The data collectors and the supervisors were given a two-day training on how to approach and assess strabismus before the data collection period. Interobserver and intraobserver agreements were determined between Optometrists with the measurements of visual acuity, ocular alignments, and in the determination of the refractive status of the children. A preliminary data collection trial with 10% of the sample were carried out in another town to check language and protocol consistency. Data quality was also assured by close follow with the data collectors and completeness of the data was cheeked on a daily basis by the principal investigator.

Data Processing and Analysis

After cleaning and editing, the data were entered into Epi Info software version 7 and then exported to statistical package for social science (SPSS) software version 20 for formal statistical analysis. The summary statistics were presented with a mean (standard deviation), frequency(percentage), tables, and graphs. The effect/relationship of each independent variable on each other was tested with Cronbach alpha(a) and evidence of good fitting was checked with the Hosmer-Lemeshow goodness of fit test. A binary logistic regression statistical model was fitted between socio-demographic, medical and behavioral characteristics and strabismus. All variables with a p-value of less than 0.2 in bi-variable logistic regression were included in multivariable logistic regression. Finally, the strength of statistical association between independent variables and the outcome variable(strabismus) was showed by odds ratio (OR) with a 95% confidence interval (CI), and variables with a p-value of less than 0.05 were taken as statistically significant.

Ethical Approval

Ethical clearance was taken in accordance with the protocols and declarations of Helsinki. The ethical process was approved by Gondar University, College of Medicine and Health Sciences Ethical Review Committee. After explaining the purpose of the study and getting permission to conduct the study, written informed consent was taken from parents/guardians and additional informed assent was taken for those children aged 12 years and above. Participants had given full

rights to withdraw from the study at any time during the study. Confidentiality of the participants was kept by avoiding identifiers like names of the participants.

Results

Socio-Demographic Characteristics

A total of 611 study participants partook in this study with a response rate of 96.7% and a mean age of 12.3 (±3.25). Almost half 304 (49.8%) and 319 (52.2%) of the study participants were in the age group of 14–18 years and males, respectively. Nearly three-fourths 445 (74.0%) of the participants had an educational level of primary school. Only 137 (22.4%) of mothers/caregivers of the children had an educational level of college/university and 153 (25.0%) of families of the participants had a monthly income of above 150 $USD (United States Dollar) (Table 1).

Medical, Developmental, and Behavioral Characteristics

Most 509 (83.3%) of the participants had no clinically significant refractive error and only 44 (6.5%) of the participants had amblyopia of which most 26 (59.1%) account for unilateral amblyopia. Slightly higher than two-thirds 409 (67.2%) of the participants had a normal vaginal delivery and 46 (6.8%) of the participants had incomplete immunization coverage. Most 497 (81.9%) of the participants had a history of exclusive breastfeeding and 515 (84.3%) of them a birth weight of 2.5–3.5 kilograms (KGs). Only 98 (15.5%) of the participants had a medical history of systemic illness and 22 (2.8%) of the participants had a known family history of strabismus (eye turn). Almost half 275 (45.0%) of the participants had only up to 2 children in their houses (Table 2).

Prevalence of Strabismus

The prevalence of strabismus among school-age children living in Bahir Dar city was 5% with 81% esodeviations and 19% exodeviations. Almost half of the strabismus cases 15 (48.38%) were in the age group of 14–18 and only 3(9.68%) were in the age group of 6–9 years. From the total of 31 strabismic children, 6 (19.35%) had strabismic amblyopia (Figure 1).

Factors Associated with Strabismus

In bi-variable logistic regression 10 variables including; gestational age, mother alcohol drink, asphyxia during birth, family history of strabismus, educational status of

Table 1 Socio-Demographic Characteristics of Study Participant in Bahir Dar City, Northwest Ethiopia, May 2019

Variables	Frequency (n)	Percentage (%)
Age group		
6–9 years	52	8.5
10–13 years	255	41.7
14–18 years	304	49.8
Sex		
Male	319	52.2
Female	292	47.8
Ethnicity		
Amhara	566	92.6
Tigray	18	2.9
Agew	17	2.8
Others*	10	1.7
Religion		
Orthodox	512	83.8
Muslim	70	11.4
Protestant	26	4.3
Others**	3	0.5
Educational level of the child		
No schooling	9	1.5
KG	12	2.0
Primary	445	72.8
Secondary	145	23.7
Educational level of mother/ caregiver		
Unable to read &write	42	6.9
Able to read and write	130	21.3
Primary school	133	21.8
Secondary school	169	27.7
College/university	137	22.4
Family size		
1–2 children	275	45.0
3–6 children	243	39.8
≥ 7 children	93	15.2
Family monthly income (USD)		
Up to 57.50	159	26.1
57.51.-100	184	30.1
100.1–150	115	18.8
≥ 150.1	153	25.0

Notes: Others *Kimant, Oromo; Others **Catholic, no religion; United States Dollar.

mother, exclusive breastfeeding, history of eye compliant, NICU admission during birth, type of CSRE, and birth weight during delivery were independently associated with the development of strabismus with a p-value of less than 0.20.

After controlling the confounding effect and entering all the above variables in the multivariable logistic analysis model, only 3 variables including; positive family history of strabismus, exclusive breastfeeding, and having CSRE of hypermetropia were independently associated with the development of strabismus with a p-value of less than 0.05. The odds of developing strabismus were 3.9 times more likely among participants who had a family history of strabismus as compared to those who did not report any positive family history of strabismus (AOR= 3.9((95% CI: 1.71, 11.22)). The odds of acquiring strabismus among children having hypermetropia of ≥ 3.00DS were 5.3 times more likely than those who had a low degree of refractive error/emmetropes (AOR=5.3 (95% CI: 2.01, 10.77)). In addition, participants who were not with exclusive breastfeeding during the first 6 months were 2.9 times more likely to develop strabismus as compared to those who get exclusive breastfeeding (AOR= 2.9 (95% CI: 1.14, 4.71)) (Table 3).

Discussion

Strabismus is one of the most common ophthalmic problems that needs earlier intervention to upset its vision and psycho-social impacts in children. This community-based cross-sectional study conducted in Bahir Dar city among school-age children indicated the prevalence of strabismus as 5% with 95% CI (3.45, 6.97).

The finding of the present study is higher than other similar studies conducted in Multi-ethnic study in America 2.5%,[17] Non-Hispanic American 3.24%,[18] Hispanic American 2.4%,[17] African American 2.5%,[17] United kingdom 2.4%,[13] China 0.80%,[5] Japan 1.28%,[19] Australia 2.8%,[20] Brazil 1.4%,[21] Iran 2.02%,[12] Nigeria 0.89%,[22] and Ethiopia1.53%.[7] The possible justification could due to certain types of strabismus like accommodative strabismus develops as the age of children increased and intermittent exotropia is delayed more in presentation.[3] Most of the above studies included ages below 72 months. In contrast, our study included all school-age children which increases also the better cooperation of the children that might contribute to easy detection of strabismus.

On the other side, the results of other similar studies done in Japan 18.3% at near and 13.5 at distance,[23] in Chile 9.86%,[24] and in Ethiopia 17.96%[8] are higher as compared to the result of the present study. This could due to the above studies were hospital/institution based in which children with the problem had a high chance to be

Table 2 Medical, Developmental, and Behavioral Characteristics of Study Participants in Bahir Dar City, Northwest Ethiopia, May 2019

Variables	Frequency (n)	Percentage (%)
History of deprivation		
Yes	37	5.3
No	574	94.7
Family history of strabismus		
Yes	22	2.8
No	589	97.2
Family history of amblyopia		
Yes	18	2.9
No	593	97.1
History of systemic illness for the child		
Yes	98	15.5
No	513	84.5
Mode of delivery		
Normal vaginal	409	67.2
Cesarean section	202	32.8
Admission to neonatal intensive care unit		
Yes	170	27.5
No	441	72.5
Birth history of asphyxia		
Yes	92	14.5
No	519	85.5
Birth milestones		
Normal	568	93.7
Abnormal	43	6.3
Child immunization history		
Incomplete	46	6.8
Completed	5605	93.2
Exclusive breastfeeding		
Yes	497	81.9
No	114	18.1
Child birth weight (in Grams)		
Below 2500	35	5.7
2500–3500	515	84.3
Greater than 3500	61	10.0
Systemic illness during delivery		
Yes	27	3.7
No	584	96.3
Family history of spectacle		
Yes	94	14.8
No	517	15.2

(Continued)

Table 2 (Continued).

Variables	Frequency (n)	Percentage (%)
History of spectacle use(child)		
Yes	37	5.3
No	574	94.7
Maternal alcohol consumption during pregnancy		
Yes	40	5.8
No	571	94.2
History of medical check up		
Yes	289	47.3
No	322	52.7
Presence of anisometropia (≥ 1Ds)		
Yes	77	13.0
No	534	87.0
CSRE		
No refractive error	509	83.3
Myopia (≥ 0.50 Ds)	47	7.7
Hyperopia (≥ 3.00 Ds)	44	7.2
Astigmatism (≥ 1 Ds)	11	1.8
Amblyopia		
Yes	44	6.50
No	567	93.50
Gestational age		
Below 37 weeks	67	10.3
≥ 37 weeks	544	89.7
Family size		
Up to 2 children	275	45.0
3–6 children	243	39.8
7 and above children	93	15.2

Abbreviation: CSRE, clinically significant refractive error.

included in the study that in turn increases the proportion of strabismus in the above studies.

This result of the present study is also similar to reports of studies done in America at 3.55%.[18] Generally, the prevalence of discrepancies could due to genetic, racial, anatomical, refractive, environmental, age groups included, and economical variations observed in different areas of the world.[4,6,14]

The prevalence of Anisometropia in our study was also 13.0% which is higher than other findings done in Japan 0.05%[19] and Iran 2.31%.[12] The most common type of deviation type in this study was esotropia and most of the strabismus diagnosed were found in the age group of 14–18 years
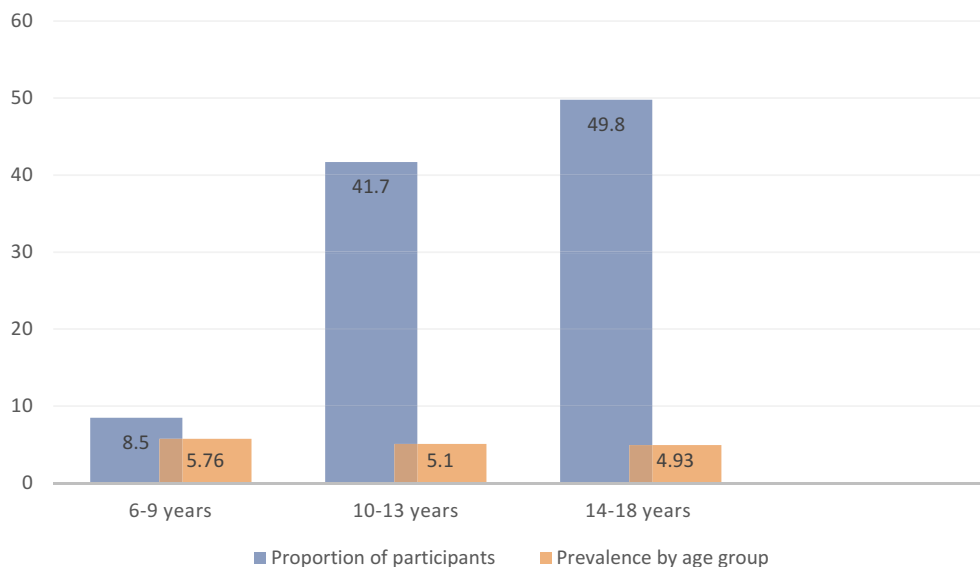
Figure 1 Bar chart showing proportion of participants and Prevalence of strabismus by age group among school children living in Bahir Dar city, Northwest Ethiopia, May 2019.

which is sported by studies conducted in Australia,[20,21] Spain, and Nigeria.[22] On the other side, Exotropia was most common in a multi-ethnic study done in America[17,18] and Japan.[23]

In line with other studies done in America,[17,18] the proportion of strabismus increases as age increases, ie 3 in the age group of 6–9, 12 in the age group of 10–13 years, and 15 in the age group of 14–18 years (p-value = 0.02). Similar to other studies done in Iran,[12,25] Nigeria,[22] California,[18] all the 31 cases of strabismus in this study were horizontal deviations (ET & XT) and most 25 (80.60%) of the participants had ET and the remaining 6 (19.35%) of them had XT deviations.

In agreement with other similar studies done in America,[9] Nigeria,[26] and Ethiopia[8] having a positive family history of strabismus was independently associated with the occurrence of strabismus (AOR= 3.9). The possible justification could due to most ocular disorders including strabismus being related to genetic conditions and the risk of developing strabismus increases as the children had an additional sibling with a history of eye turn/strabismus.[4,14,27]

In addition, having a hypermetropia of ≥ 3.00 Ds was statistically significant with the development of strabismus (AOR=5.3). This was supported by other similar studies done in America,[9] United Kingdom,[13] Australia,[20] Nigeria,[26] and Ethiopia.[8] Hyperopia of +3.00 Ds and more is highly associated with the occurrence of esotropia

and the odds of developing esotropic strabismus increases as the degree of hyperopia increases.[3,4]

On the other side, participants who were not with exclusive breastfeeding during the first 6 months were 2.9 times more likely to develop strabismus as compared to those who got exclusive breastfeeding (AOR= 2.9). Even though it is not clearly stated in different studies, low socio-economic conditions might expose mothers to a poor nutritional condition that could intern affect the nutritional status of the child during the first 6 months of breastfeeding.[3] This might contribute to the genesis of strabismus. Therefore, mothers with sufficient nutritional and economic status could give adequate nutritional supply during the first 6 months. In addition, the effect is manifested when breastfeeding is compromised in premature and low birth weight children.[20]

Limitation

Details of strabismus and other eye movement disorders were not assessed properly since we focused on the ocular alignment and possible risk factors. Since the study is conducted in the urban setting, it does not cover regional rural areas.

Conclusion

This community-based cross-sectional study showed a relatively high prevalence of strabismus among school-age children in Bahr Dar city. Having a positive

Table 3 Bivariable and Multivariable Logistic Regression to Identify Factors Associated with Strabismus Among School-Age Children in Bahir Dar City, Northwest Ethiopia, May 2019

Variables	Strabismus				
	Yes	No	COR (95% CI)	AOR (95% CI)	P-value
Birth weight					
Below 2.5 KG	6	30	2.2(0.62, 7.12)	1.03(0.42, 4.94)	0.12
2.5–3.5 KG	20	495	0.47(0.20, 1.14)	0.44(0.14, 1.35)	0.07
Greater than 3.5 KG	5	55	1.00		
Type of CSRE					
No refractive error	18	487	1.00		
Myopia	4	51	2.12(0.88, 6.11)	1.70(0.64, 5.92)	0.11
Hypermetropia	9	42	5.80(2.45, 13.71)	5.28(2.01, 10.77)	0.0002
NICU admission					
Yes	14	156	2.23(1.10, 4.64)	1.23(0.81, 3.07)	0.07
No	17	424	1.00		
History of eye compliant					
Yes	7	89	1.61(0.67, 3.84)	1.14(0.41, 2.10)	0.12
No	24	491	1.00		
Exclusive breast feeding					
Yes	18	479	1.00		
No	13	101	3.43(1.63, 7.21)	2.85(1.14, 4.71)	0.001
Educational status of mother					
Unable to read and write	5	37	2.95(0.85, 10.21)	1.65(0.57, 5.35)	0.07
Able to read and write	7	123	1.24(0.41, 3.81)	1.05(0.35, 2.35)	0.31
Primary school	5	128	0.87(0.29, 2.68)	0.68(0.31, 2.11)	0.40
Secondary school	6	163	0.80(0.25, 2.53)	0.56(0.21, 1.86)	0.30
College/university	6	131	1.00		
Family history of strabismus					
Yes	7	30	5.35(2.13, 13.46)	3.91(1.71, 11.22)	0.001
No	24	550	1.00		
Asphyxia					
Yes	7	87	1.65(0.70, 3.95)	0.92(0.63, 2.21)	0.14
No	24	493	1.00		
Alcohol consumption					
Yes	6	35	3.73(1.44, 9.71)	1.12(0.97, 5.74)	0.07
No	25	545	1.00		
Gestational age					
Below 37 weeks	6	61	2.04(0.81, 5.17)	1.29(0.74, 3.16)	0.15
37 weeks and above	25	519	1.00		

Abbreviations: CSRE, clinically significant refractive error; NICU, neonatal intensive care unit.

family history of strabismus, exclusive breastfeeding, and having a significant refractive error of hypermetropia was significantly associated with the development of strabismus.

Abbreviations

CSRE, clinically significant refractive error; CI, confidence interval; ET, exotropia; NICU, neonatal intensive care unit; OR, odds ratio; VA, visual acuity; XT, exotropia.

Data Sharing Statement

The data will be available upon request from the corresponding author.

Ethical Approval and Consent to Participate

Ethical clearance was taken in accordance with the protocols and declarations of Helsinki. The ethical process was approved by Gondar University, College of Medicine and Health Sciences Ethical Review Committee. After explaining the purpose of the study and getting permission to conduct the study, written informed consent was taken from parents/guardians and additional informed assent was taken for those children aged 12 years and above. Participants had given full rights to withdraw from the study at any time during the study. Confidentiality of the participants was kept by avoiding identifiers like names of the participants.

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Author Contributions

All authors made a significant contribution to the work reported, whether that is in the conception, study design, execution, acquisition of data, analysis, and interpretation, or in all these areas; took part in drafting, revising, or critically reviewing the article; gave final approval of the version to be published; have agreed on the journal to which the article has been submitted; and agree to be accountable for all aspects of the work.

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Disclosure

We, the authors, declare that we have no conflicts of interest for this work.

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