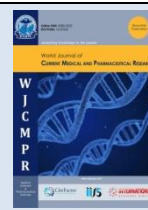




# World Journal of Current Medical and Pharmaceutical Research

Content available at [www.wjcmpr.com](http://www.wjcmpr.com)

ISSN: 2582-0222



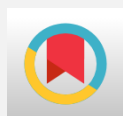
## RISK FACTORS OF STRABISMUS IN CHILDREN IN MADAGASCAR

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Article History	Abstract
Received on: 26-10-2023 Revised on: 12-11-2023 Accepted on: 15-12-2023	Background: The aims of this study were to determine risk factor of strabismus in malagasy children. Methods: It was a case-control study doing at Hospital University Joseph Ravoahangy Andrianavalona from 1st June to November 2023. Children who had strabismus were the case. The control was children who didn't have strabismus and came to the hospital for vision anomaly and had similar demography specificity like case. The number of controls was twice the number of cases. All children with organic ophthalmic pathologies were excluded. The data was processed by Epi.info 7.0 software. We used Odds Ratio (OR) test to find association between strabismus and risk factor. Confidence interval (CI) was fixed at 95%. Association was significant for a value of $p < 0,05$ . Results: Forty one cases was found for 88 controls. A significant association was found for strabismus and low birth weight OR: 3,69 CI[1,68-8,10] $p < 0,00$ ; prematurity OR :2,57 CI[1,15-5,73] $p < 0,01$ ; neonatal asphyxia OR : 3,28 CI[1,35-7,97] $p < 0,00$ ; febrile convulsion OR :3,08 CI[1,42-6,68] $p < 0,00$ ; and neonatal septicemia OR : 9,90 CI[4,20-23,34] $p < 0,00$ . Conclusion: Strabismus was associated in children with neonatal pathology. A systematic vision field is necessary for patient with risk factor. Key words: low birth weight; febrile convulsion; neonatal septicemia; neonatal asphyxia; prematurity; strabismus.



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DOI: <https://doi.org/10.37022/wjcmpr.v5i6.307>

### Introduction

Strabismus, defined as a deviation from perfect ocular alignment, is a common ocular disorder in children. It was classified in tropia and phoria. If it was a tropia, it was constant at both near and distance fixation, otherwise, it was intermittent[1]. When left untreated, children with strabismus could decrease binocularity and increase risk of amblyopia. It can have a dramatic effect on quality of wellbeing, affecting self-image and social interactions of preschool and early school age children[2]. The cause of strabismus was not well established. Its screening was necessary because it can cause irreversible visual loss, justifying an ophthalmological examination in all children before the age of 3 or 4 years. In developing country like Madagascar, accessibility of health care service was more difficult. Knowledge of risky situations improved detection of strabismus in children. The purpose of this study was to identify associated factors with strabismus in children in Madagascar.

### Method

A case-control study was carried out at University Center Joseph Ravoahangy Andrianavalona Hospital of Antananarivo from 1st June to November 2023. The cases were all children who had strabismus during this period. The controls were all children who had eye examination during this period, the same demographic profiles as the cases, and who did not have a strabismus. The number of controls was twice the number of cases. All children with organic pathologies were excluded. All children with organic ophthalmic pathologies were excluded. The data was processed by Epi.info 7.0 software. We used Odds Ratio (OR) test to find association between strabismus and risk factor. Confidence interval (CI) was fixed at 95%. Association was significant for a value of  $p < 0,05$ . All children had complete ophthalmological examination. Each parent was asked for children's personal history. To identify strabismus, cover-uncover tests for near (33 cm) and distance (6 m) were performed. The data collected was processed by Epi.info 7.0. The Odds Ratio (OR) test was used to investigate the association between strabismus and risk factors. The confidence interval (CI) was set at 95%. The association was significant for a value of  $p < 0.05$ .

### Result

Fourty one cases was found for 88 controls. A significant association was found for strabismus and low birth weight OR:

3,69CI[1.68-8.10]p<0,00 ; prematurity OR :2,57CI[1,15-5,73]p<0,01 ; neonatal asphyxia OR : 3,28 CI[1,35-7,97]p<0,00 ; febrile convulsion OR :3,08 CI[1,42-6,68]p<0,00 ; and neonatal septicemia OR : 9,90 CI[4,20-23,34]p<0,00. (Table 1).

Table 1.Ocular condition associated with strabismus.

Risk factor	Strabismus (%) n=41	Non Strabismus (%) n=88	Odds Ratio [CI] 95%	P
<b>Low birth weight</b>				
Yes	22 (53.56)	19 (46.34)	3.69 [1.68-8.10]	<0.00
No	21 (23.86)	67 (76.14)		
<b>Prematurity</b>				
Yes	17 (41.46)	24 (58.54)	2.57 [1.15-5.73]	<0.00
No	19 (21.59)	69 (78.41)		
<b>Neonatal asphyxia</b>				
Yes	14 (34.15)	27 (65.85)	3.28 [1.35-7.97]	<0.00
No	12 (13.64)	76 (86.36)		
<b>Febrile convulsion</b>				
Yes	22 (53.66)	19 (14.47)	3.08 [1.42-6.68]	<0.00
No	24 (27.27)	64 (72.73)		
<b>Neonatal septicemia</b>				
Yes	30 (73.17)	11 (26.83)	9.90 [4.20-23.34]	<0.00
No	19 (21.59)	69 (78.41)		

## Discussion

This study had some limitations. First, the study population comprised children who visited the department of ophthalmology care; this might be not representative compared with study doing in the community-based studies. Despite, an important information was found about strabismus risk' factor in population. Children living with risk' factor must had a systematic ophthalmological examination.

### Low birth weight

Children who had low birth weight had 3.69 times to have a strabismus more than children born with normal weight. We found same result like Guilati et al. in analysis of 1320 infants with strabismus within this cohort found an increased risk of esotropia with birth weight<2000g (RR=2.20, [CI 1.60–3.05]), 2000–2499g (RR=2.35, [CI 1.80–3.07]), and 2500–2999g (RR=1.29, [CI 1.04–1.58]) relative to normal weight (>3000g)[2]. The number of premature newborns surviving with neurologic handicaps and visual problems has increased recently in conjunction with the increasing survival rate of premature newborns with low birth weight[2–4].In this

analysis of 38 055 premature children who were monitored longitudinally for at least 6 months found that birth weight appears to affect the risk of strabismus. Premature infants who had weight less than 2000 g at birth were found to have a 61% increased hazard of strabismus1.47 (1.22-1.76) p<.001[2]. The association of low birth weight and strabismus might be explained by anomaly of neurologic development in children with low birth weight.

### Prematurity

Prematurity (OR=2.57, 95% CI 1.15 to 5.73, p<0.001) remained significantly associated with incident of strabismus. Guilati and al. found the same result. Prematurity was significantly associated with higher risk of intermittent exotropia [5]. Another studies reported prematurity to be associated with strabismus [2,3,6,7]. William and al. found that strabismus was associated with prematurity 2.67 (1.78 to 4.00) p = 0.001 [8]. Cotter and al. found Gestational age less than 33 weeks was independently associated with increased risk of both esotropia and exotropia [9]. Compared with children born in gestational weeks 37–41, children born in week 32 or earlier had a 19% (95% CI 34 to 114) increased risk of strabismus, whereas children born in weeks 33–36 had a 39% (95% CI 8–80) increased risk of strabismus. Children with malformations of the head and neck and children with other malformations had elevated risks of congenital esotropia and other esotropia, but not of accommodative esotropia [6,8,10–12]. In various studies, complications of prematurity such as sepsis, intraventricular hemorrhage, and necrotizing enterocolitis have been suggested to be responsible for retinopathy of prematurity (ROP) and cortical visual dysfunction [3]. It was associated with higher risk of both prevalent and incident strabismus. The incidence of strabismus, important with regard to impairment of binocular vision and amblyopia, was between 3% and 57% in premature neonates. The risk of developing any ophthalmologic abnormality later in infancy and early childhood was 14 times higher in premature newborns [13]. Presence of risk'factor required treatment and need follow-up and ophthalmologic examination. Strabismus is a neurological pathology associated with cerebral dysfunction. Several studies have shown prematurity is associated with reduced brain volume and an impaired neurodevelopmental outcome, indicating common pathways of impaired neural and neurovascular development in the brain and retina [14]. However, reduced visual acuity, visual fields, contrast sensitivity, accommodation and colour vision have been reported in preterm children with a prior prematurity history [15]. Huang and al. found that low birth weight (<2500 g; OR, 4.725; P = .003) and late preterm birth (34 to 36 weeks; OR, 4.192; P=0.008) had increased the risk of infantile esotropia compared with normal birth weight (2500 to 3999 g) and full-term birth (≥37 weeks), respectively [2]. Association of strabismus and prematurity can be explained by suddenly exteriorization of the visual system to the extra uterine environment. Visual function was immature and complications can appear in children with prematurity. The visual system of the premature newborn is exposed to many environmental stimuli like much more oxygen and nutritional factors, which are not active in utero and become effective due to preterm delivery. It has been reported that premature neonates are at

greater risk for visual impairment during childhood due to perinatal cerebral dysfunction.

#### **Neonatal asphyxia**

In our study, neonatal asphyxia was associated with strabismus OR : 3,28 IC[1,35-7,97]p<0,00. Torp-pedersen found that neonatal asphyxia remained at elevated risk of strabismus 1.50 (1.25-1.80) p=0.001 [2,4,16]. The effect of several diseases and complications that premature newborns encounter. Complications of prematurity such as sepsis, neonatal asphyxia, have been suggested to be responsible for cortical visual dysfunction.

#### **Febrile convulsion and neonatal septicemia**

Compared with non strabismic group, risk of strabismus was weakly positive for low birthweight, birth hypoxia, abnormal postnatal history, neonatal jaundice, and hypoxic ischemic encephalopathy, neonatal septicemia [10]. Torp-pedersen found that neonatal septicemia was associated with strabismus in 1.48(1.02-2.15)p=0.05 [2]. Visual impairment itself may increase cognitive and psychomotor developmental delay and may lead to behavioural problems. Not surprisingly, retinopathy of prematurity treatment was found to be a risk factor for visual impairment associated with cerebral dysfunction. Several studies have shown that prematurity is associated with reduced brain volume and an impaired neurodevelopmental outcome, indicating common pathways of impaired neural and neurovascular development in the brain and retina. However, reduced visual acuity, visual fields, contrast sensitivity, accommodation and colour vision have been reported in preterm children with a prior prematurity history.

In this study, a majority of visually impaired children had neurological deficits. However, we found that the possible contribution of cerebral abnormalities to visual impairment had rarely been taken into account. In contrast to visual impairment due to ocular causes, brain injury may cause visual perceptual problems that are not captured by eye examinations and visual assessment. Dutton described five categories of cerebro-visual impairment affecting recognition, orientation, depth perception, motion perception and simultaneous perception, resulting in a wide range of characteristic behaviours [7]. Children with brain abnormalities may have difficulties recognising faces of family and friends, finding the way to school, judging the height of the pavement, seeing fast-moving objects and/or finding an object against a patterned background [15].

#### **Conclusion**

Strabismus is a common ophthalmic problem in young children. This study shows that low birth weight, prematurity, neonatal asphyxia, febrile convulsion were associated with strabismus. If untreated, strabismus can lead an amblyopia and children could lose vision. Ophthalmologist may participate to inform pediatricians about the importance of a screening at an early stage, and he also may participate at their practical formation for this first detecting. Children with risk factor were recommended for vision screening.

#### **Funding**

Self Funding

#### **Acknowledgement**

Ophthalmology Service Joseph Ravoahangy Andrianavalona Hospital.

#### **Conflict of Interest**

No conflict of Interest

#### **Informed Consent**

Each patient has consent writing for study.

#### **Ethical Statement**

Study Respects ethical Statement.

#### **Author Contribution**

Rakotoarisoa RTR: Writing

Randrianarisoa HL: treatment of data

Rafanomezantsoa R: Analysis and bibliography

Raobela L: Correction

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