



Frequency of Strabismus in Children Adopted from Russia, Ukraine and Kazakhstan: Relationships with Perinatal History and Medical Diagnosis

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Abstract

Introduction: Studies performed on adopted children from Eastern Europe have communicated that present a high frequency of visual and ocular abnormalities. This study aimed to determine the frequency of strabismus in a cohort of children adopted from Russia, Ukraine and Kazakhstan, and relate their presence with perinatal history and medical diagnoses upon arrival.

Methods: We studied 348 children (mean age 2.7 years; 60.9% males) adopted from Russia (84.8%), Ukraine (8%) and Kazakhstan (7.2%) to Spain during 2000-2017. Upon arrival, the pre-adoptive medical records were reviewed and a complete medical examination was performed according to national protocols. Regarding background from pre-adoptive medical records, information was available in 314 (90.2%) children. Children with and without strabismus were compared (two-tailed Z-test; statistical significance level of $p < 0.05$).

Results: Forty two (12.1%) of the adopted children had strabismus (61.9% males; 88.1% from Russia). The adopted children with strabismus had a significantly higher frequency ($p < 0.05$) for preterm birth and perinatal asphyxia background, and for the diagnoses upon arrival of stunting, cerebral palsy and fetal alcohol syndrome. They also had a higher frequency, although not significant, for prenatal alcohol and drugs exposure background, and for the diagnosis upon arrival of microcephaly. The ophthalmological examination showed a significantly higher frequency ($p < 0.05$) of amblyopia and optic nerve hypoplasia.

Conclusion: In this cohort of adoptees from Eastern Europe, strabismus was related to prenatal, perinatal and postnatal adverse events resulting in growth deficiency and central nervous system damage.

Keywords: Adoption, Child, Eastern europe, Strabismus

Introduction

Studies performed on adopted children from Eastern Europe have communicated that present a high frequency of visual and ocular abnormalities [1-5]. Eastern Europe in one of the main geographic areas of the children adopted from abroad in Spain [6].

The aim of this retrospective study was to determine the frequency of strabismus in a cohort of children adopted from Russia, Ukraine and Kazakhstan, to find out if any relationship exists between the presence of strabismus with prenatal and perinatal background, as well as with the medical diagnoses upon arrival.

Patients and Methods

We studied 348 children (60.9% males) adapted from Russia (84.8%), Ukraine (8%) and Kazakhstan (7.2%) to Spain during 2000-2017. Upon arrival (mean age of 2.7 years), the pre-adoptive medical records were reviewed and a complete medical examination was performed according to national protocols [7-10]. Children who showed strabismus were referred to specialists in ophthalmology, who confirmed the diagnosis and performed a detailed ophthalmological examination.

Information regarding the prenatal and perinatal background from pre-adoptive medical records was available in 314 (90.2%) children. We analysed the maternal medical and obstetric history, gestational age, Apgar score, weight, length and head circumference at birth, and neonatal

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Table 1: Children adopted from Russia, Ukraine and Kazakhstan (n=348) with/without strabismus: data from the prenatal and perinatal background and medical diagnoses upon arrival.

	Strabismus (-)	Strabismus (+)	p-value
	n (%)	n (%)	
Adopted children	306 (87.9)	42 (12.1)	
Mean age upon arrival (years)	2.7	2.91	
Male	186 (60.8)	26 (61.9)	NS
Female	120 (39.2)	16 (38.1)	NS
Russia	258 (84.3)	37 (88.1)	NS
Ukraine	24 (7.8)	4 (9.5)	NS
Kazakhstan	24 (7.8)	1 (2.4)	NS
Background available in medical reports	276 (90.2)	38 (90.5)	NS
Prenatal alcohol exposure	82 (29.7)	14 (36.8)	NS
Prenatal drugs exposure	26 (9.4)	7 (18.4)	NS
Preterm birth (< 37 weeks' gestation)	85 (30.8)	18 (47.4)	0.0414
Preterm birth (< 32 weeks' gestation)	15 (5.4)	4 (10.5)	NS
Low birth weight (\leq 2.500 g)	98 (35.5)	18 (47.4)	NS
Very low birth weight (\leq 1.500 g)	17 (6.2)	2 (5.3)	NS
Intrauterine growth restriction ^a	46 (16.7)	7 (18.4)	NS
Perinatal asphyxia ^b	31 (11.2)	12 (31.6)	0.0006
Congenital syphilis	13 (4.7)	2 (5.3)	NS
Congenital cytomegalovirus infection	13 (4.7)	2 (5.3)	NS
Neonatal bacterial meningitis/sepsis	2 (0.7)	0 (0)	NS
Medical diagnoses upon arrival			
Stunting ^c	130 (42.5)	27 (64.3)	0.0078
Wasting ^d	4 (1.3)	2 (4.8)	NS
Microcephaly ^e	36 (11.8)	8 (19.0)	NS
Cerebral palsy	2 (0.7)	2 (4.8)	0.0193
Fetal alcohol syndrome ^f	9 (2.9)	4 (9.5)	0.0348
Optic nerve hypoplasia	2 (0.7)	4 (9.5)	0
Amblyopia	6 (2.0)	9 (21.4)	0
Sensorineural hearing loss	1 (0.3)	0 (0)	NS

NS: Not Significant; SD: Standard Deviation

^aWeight, length and/or head circumference at birth \leq -2 SD for gestational age (based to the WHO Child Growth Standards 2006 for born term, and to the Hall et al. 1989 reference values for born preterm).

^bWith two or more definition criteria of moderate-severe neonatal hypoxic-ischemic encephalopathy [8,9]: Apgar score 0-6 at 5 mins; mechanical ventilation; seizures; dysfunction signs of the cerebral stem; evidence of acute cerebral injury by neuroimaging techniques.

^cHeight-for-age \leq -2 SD based on the WHO Child Growth Standards 2006.

^dWeight-for-height \leq -2 SD based on the WHO Child Growth Standards 2006.

^eHead circumference \leq -2 SD based to the WHO Child Growth Standards 2006.

^fDiagnosed according to the FAS 4-Digit Diagnostic Code (Diagnostic Guide for Fetal Alcohol Spectrum Disorders 2004).

symptoms, signs and diagnoses [11,12].

From the cohort of children studied, two groups were distinguished for comparison: children with strabismus versus children without strabismus. The values for the variables under study were entered in an Excel[®] spreadsheet. We used the two-tailed Z-test to compare group proportions, with statistical significance defined as $p < 0.05$.

Results

Among 348 adopted children from Eastern Europe, 42 (12.1%) had strabismus, 15 (4.3%) had amblyopia, and 6 (1.7%) had optic nerve hypoplasia.

In Table 1 are described and compared the prenatal and perinatal

background and the medical diagnoses upon arrival in the adopted children with and without strabismus.

There was no difference regarding sex, age, country of origin and availability of pre-adoptive medical reports between children with and without strabismus.

The adopted children with strabismus had a significantly higher frequency ($p < 0.05$) for the background of preterm birth (<37 weeks' gestation) and perinatal asphyxia with criteria of moderate-severe neonatal hypoxic-ischemic encephalopathy, and for the diagnoses upon arrival of stunting, cerebral palsy and fetal alcohol syndrome. They also had a higher frequency, although not significant, for the background of prenatal alcohol and drugs exposure, and for the diagnosis upon arrival of microcephaly. The ophthalmological

examination showed a significantly higher frequency ($p < 0.05$) of amblyopia and optic nerve hypoplasia. Adoptees with optic nerve hypoplasia, with and without strabismus, had fetal alcohol syndrome.

Discussion

In a study performed in Spain [5] on 95 adopted children from Eastern Europe (mean age 3.9 years, 69.5% males) during 2010-2012, the authors found strabismus in 15.8%, amblyopia in 5.3% and optic nerve hypoplasia in 4.2%. These data are slightly higher than those observed in the present study. This study [5] did not evaluate pre-adoptive medical histories or medical diagnoses upon arrival.

In studies carried out in Sweden [1,2,4] on 77 adopted children from Eastern Europe (mean age 2.8 years, 57% males) during 1993-97, the pre-adoptive medical reports (available in 93%) and medical diagnoses at examination were evaluated. Children were examined upon arrival and after a mean period of 5 years post-adoption (mean age 7.5 years). From the pre- and perinatal medical histories, they detailed the following data: prenatal alcohol exposure, 33%; born preterm (< 37 weeks' gestation), 30%; low birth weight (≤ 2.500 g), 48%; birth length ≤ -2 SD, 16%; birth head circumference ≤ -2 SD, 29%; small for gestational age, 44%; symptoms or diagnoses of potentially serious perinatal central nervous system pathology, 34%. From the medical examination upon arrival, they detailed the following data: weight ≤ -2 SD, 47%; length ≤ -2 SD, 45%; microcephaly, 49%. From the medical and ophthalmological examination performed after the post-adoption follow-up period, they detailed the following findings: weight z-score, -0.5; length z-score, -0.7; head circumference z-score, -1.3; microcephaly, 29%; cerebral palsy, 3%; fetal alcohol syndrome, 21%; strabismus, 32%; amblyopia, 15%; optic nerve hypoplasia, 8%.

These studies [1,2,4], compared to the present study, found a higher frequency of prenatal alcohol exposure, low birth weight, intrauterine growth restriction, microcephaly, fetal alcohol syndrome, strabismus, amblyopia and optic nerve hypoplasia, and a similar frequency of preterm birth and stunting.

The researchers found that adopted children with strabismus had a significantly higher frequency of preterm birth and fetal alcohol syndrome, compared with adoptees without strabismus. Adoptees with fetal alcohol syndrome had a significantly higher frequency of optic nerve hypoplasia, compared with adoptees without fetal alcohol syndrome.

The present study also found that adopted children with strabismus, compared with adoptees without strabismus, had a significantly higher frequency of preterm birth and fetal alcohol syndrome, as well as of perinatal asphyxia, cerebral palsy and stunting. Adoptees with optic nerve hypoplasia, with and without strabismus, had fetal alcohol syndrome.

Numerous investigations have observed that the diagnoses of preterm birth [13-15], low birth weight [16-18], intrauterine growth restriction, perinatal asphyxia, fetal alcohol syndrome [19-23], as well as stunting in the early stages of life [24,25], interferes with ocular and vision development and have been shown to be associated with strabismus and other ophthalmic morbidities. Other studies have found that these medical background and diagnoses are frequent in children residing in Eastern Europe orphanages [26-29].

Based on these investigations [13-29], and on the findings of the Swedish studies [1,2,4] and of the present Spanish study, we take into consideration that in children who are adopted, the existence of

strabismus is significantly related to prenatal, perinatal and postnatal adverse events resulting in growth deficiency and central nervous system damage.

We think that the information contributed in this study is outstanding for the adoptive families and for the providers of health and educational services, due to the possible repercussion of these adverse factors on long-term neurosensorial and cognitive functioning in this specific population of adopted children [30].

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