Risk Factors Associated with Delayed Language Development

Original Article

Mona El Rabie Ahmed[1], Montaser Mohamed Mohamed[2], Rasha Abd Elhameed Ali[3], Mohammed Elrabie Ahmed[1], Ahmed Elsayed Gelaney[1] and Megahed Mohamed Hassan Ahmed[1]

[1]Unit of Phoniatrics-Department of Otorhinolaryngology-Head and Neck Surgery, [2]Department of Pediatrics, [3]Public Health and Community Medicine, Faculty of Medicine, Sohag University, Egypt

ABSTRACT

Introduction: Identifying the risk factors associated with language disorders in Arabic speaking children is important priority to strengthen primary prevention strategies and mandatory for early identification and early intervention.
Objective: The aim of this study is to identify risk factors related to delayed language development (DLD).
Material and Methods: A case-control study conducted on 592 children attended Phoniatrics clinic and diagnosed as DLD (subjects group). Children with typical language development were recruited from different day cares and schools as a control group (n= 693). Both groups were matched for age, sex, geographic distribution and socio-economic factors. Full history was taken from both groups emphasizing on possible risk factors for DLD.
Results: Consanguineous marriage, caesarian section, premature delivery, low birth weight, and neonatal hyperbilirubinemia were identified as risk factors for delayed language development.
Conclusions: The most consistently identified risk factors among participated cases were consanguinity, cesarean mode of delivery, pre-term, low birth weight, hyperbilirubinemia, and postnatal risk factors language delay.

Key Words: Arabic speaking children; caesarian section; delayed language developmental; risk factors.

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Corresponding Author: Mona El rabie Ahmed MD, PhD, Unit of Phoniatrics-Department of Otorhinolaryngology-Head and Neck Surgery, Sohag University, Egypt, **Tel.:** +18193423429, **E-mail**: daimahmoud@yahoo.com

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INTRODUCTION

Delayed language development (DLD) represents one of the most common pre-school developmental difficulties. Prevalence estimation varies according to definition and cut point. The prevalence is higher when criteria include all children with language delay, nearly 20% of 4 years old[1]. DLD is quite heterogeneous disorders. In some cases, children may have other developmental, sensory, and or physical problems. For others, the language delayed occurs in a normal developmental trajectory and has no specific reason for language delay[2]. Moreover, many children do not fall into a single diagnostic group, and others may change between categories as their language develops. DLD considered a public health concern, associated with long-term sequels. These problems may lead to further difficulties such as educational failure and/ or learning disabilities, neuropsychiatric disorders, poor employment outcomes and social, emotional, and behavior problems[3,4]. In fact, early identification and intervention of a child's language problems are internationally well-acknowledged as they prevent the negative impact and offers better quality of life for the children and their parents which also cost the government less in the long run. Research suggests that best approach to early identification of children with DLD should include identifying risk factors associated with language delay. It can provide a useful guide for early identification of children who may someday develop any kind of language disorder[5].

Unfortunately, there is a lack of a standardized list of risk factors linked to DLD. Even the available data have focused on English speaking children. Little is known about the associated risk factors in Arabic speaking children. The etiological risk factors cannot be generalized as the language development is considerably influenced by social and demographic factors. Therefore, the current study aim is to recognize the possible risk factors related to delayed language developmental on Arabic speaking children.

MATERIAL AND METHODS

Research design

A case-control study was carried out in the period from November 2020 to October 2021. The ages of subject and control groups ranged from 2-8 years. Here, age distribution (range 20- 244 months, mean 48 months, and SD 29.4 months) and sex distribution (67.5% males and

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32.5% females). Both groups were matched for age, sex, geographic distribution, and socioeconomic status. Control group were randomly chosen from different day cares and schools. An exclusion criterion is any DLD children due to hearing difficulties.

Study instrument

All children underwent thorough routine language evaluation protocol. The first section included socio-demographic data of the children and their parents. The second section included detailed history about prenatal, natal, and postnatal period especially data with potential risk factors for language disorders. Detailed data about the parent-child language interaction were also included. More specifically, language assessment undertaken with standardized tests for language scale and quantitative measures of communication difficulties determined by age

Ethical considerations

This study complies with regional and institutional ethical guidelines and with the declaration of Helsinki. A written informed consent in the study was obtained from the parents/caregivers of the children to participate in the study. Approval of Faculty of Medicine Ethical Committee was also obtained prior to data collection.

Statistical analysis

All statistical analyses of the current study were carried out using the SPSS software for Windows (version 16.0, Chicago, IL, USA). Categorical data were analyzed using the Fischer's-exact test by GraphPad Prism software version 7. Associations of variables with outcomes were expressed by odds ratio (OR) with 95%, statistical significance was set at $p < 0.05$.

RESULTS

A subject group included 592 Arabic speaking Egyptian children with DLD and a control group (n= 693) of typically developed children were enrolled in the present study. The domain of this study was to identify the possible contributing biological and environmental risk factors related to the children and their parents associated with delayed language development and the pertaining data were illustrated in (Table 1). 505 of subject group had a history of consanguineous marriage between parents in comparison to 43 in control group that it is highly positive ($P < 0.001$). In addition, the number of children in the family and the orders of the child in the family are shown to be highly linked to DLD. However, positive family history of speech and language disorders has no relationship to the DLD in this study (P = 0.26). It was interesting to notice that there was a highly significant association between cesarean births and preterm with language delay ($P < 0.001$).

The predominant risk factors in infants with DD were hyperbilirubinemia that reported in 376 cases, weak or delayed first cry after birth, postnatal cyanosis, and low birth weight ($P < 0.001$). For the maternal risk factor, pre-eclampsia and oligohydramnios or polyhydramnios were noted to be the most frequent factors and significant connected with DLD.

Table 1: Relations of delayed language development with different possible risk factors

Factor	Condition	DLD (n = 592)	Controls (n = 693)	Fisher's exact test
Consanguinity	Yes	505	43	*** $P < 0.001$ Odds ratio = 87.7
	No	87	650	
Family history	+	179	190	ns P =0.26 Odds ratio = 1.147
	-	413	503	
Type of Delivery	CS	369	190	*** $P < 0.001$ Odds ratio = 4.38
	SVD	223	503	
Term	Preterm	14	0	*** $P < 0.001$ Odds ratio = 4.5 to infinity
	Full term	538	693	
Birth order	1st – 2nd	360	375	*** $P < 0.001$ Odds ratio = 25.5
	3rd- 4th	238	310	
	5th- or more	34	8	
LBW	Yes	18	0	*** $P < 0.001$ Odds ratio = 6.15 to infinity
	No	574	693	
First cry	Delayed	80	28	*** $P < 0.001$ Odds ratio = 3.711
	Immediate	512	665	
Postnatal cyanosis	Yes	94	11	*** $P < 0.001$ Odds ratio = 11.7
	No	498	682	
Postnatal jaundice	Yes	376	199	*** $P < 0.001$ Odds ratio = 4.32
	No	216	494	
Incubation	Yes	203	0	*** $P < 0.001$ Odds ratio = 91 to infinity
	No	389	693	
maternal risk factor	yes	144	4	*** $P < 0.001$ Odds ratio = 55.37
	no	448	689	

DISCUSSION

There are no available data about possible risk factors related to DLD in most of the developing countries, especially Upper Egypt. Having reliable data considered to be the main stone to strengthen primary prevention strategies and early intervention.

In the current study, there is a highly statistically significant association between DLD and consanguinity between parents; this is in agreement with previous research which reported that positive consanguinity was main risk factor for DLD[6,7]. Thus, highlight the importance of increase the public awareness on congenital and genetic disorders in offspring derived from consanguineous marriage and the importance of genetic counseling. Interestingly, DLD was significantly associated with prematurity and low birth weight. Indeed, previous literature showed that preterm and or low birth weight children showed alterations in language, social-emotional, and neuro-psychological profiles when compared to children with higher weight and closer to 37 weeks of gestational age[8,9]. The preterm birth was related with a six times or more higher risk of DlD[10,11]. Luu *et al*., 2009 reported that preterm children with and without brain injury required more support at reading, writing, and mathematics, as well as they had more behavioral issues[12]. Moreover, Eickmann *et al*. (2012) observed significant difference between preterm and full-term children regarding expressive language, with premature males showing worse performance[13]. Recently, a European cohort study in children born from 22 to 32 weeks of gestation describes language development outcomes at the age of two years of these children, 40% of them had a low expressive vocabulary and 25% fail to start combining words[14]. Therefore, it is essential that pediatricians are aware of the language development of these children to ensure proper treatment.

The result revealed a significant association between Caesarian section birth and language delay similar to previous studies. Recently, differences in behavioral and cognitive development have been noted in those children delivered vaginally vs. those delivered by section[15]. According to previous studies Caesarian delivery has been associated with emotional, attentional, and sleep disturbances in infants and young children[16]. Moreover, children delivered by cesarean section more commonly developed neurological disease and autism spectrum disorders[17-19]. Recent interesting study by Castillo-Ruiz *et al*., 2018 who studied the effect of birth mode on neonatal brain mice. they stated that vaginally born offspring had an abrupt, transient decrease in cell death in many brain regions, suggesting that a vaginal delivery is neuroprotective. While cell death was either unchanged or increased in C-section born mice[20]. Thus, alternation of delivery mode could impact brain development and may have lasting consequences. Cesarean birth may be directly and indirectly associated with negative child cognitive outcomes. The indirect association could be related to a reported association between cesarean and adverse child health outcomes, such as asthma, type I diabetes, and allergies[21]. The direct association may be explained by alterations to the infant's gut microbiota. Vaginally born children gut is seeded by passing through birth canal, however cesarean-born children gut is seeded through contact with mother's skin and hospital surfaces. Recently it is hypothesized that a chemical signaling from the gut microbiota to the central nervous system, could affecting memory, mood, and stress reactivity, that a disturbed microbiota composition could affect brain development at a sensitive time in its development[17]. Markedly increase rate of cesarean section delivery worldwide that exceeds the World Health Organization's recommended rate. The strong association of DLD with Cesarean section reemphasizes the need for further studies to test these findings on a larger cohort of children and examine whether the correlation exists in an older age group would be of value.

Among the various risk factors examined in the current study, the risk factors of the pre, peri, and postnatal periods were considered. hyperbilirubinemia was the major reported association with DLD. Johnson and Bhutani reported a significant correlation between neonatal hyperbilirubinemia in the absence of classical kernicterus and speech and language abnormalities. Also, they stated that the total serum/plasma bilirubin (TB) level is not the most precise indicator of neurotoxicity[22]. Thus, extensive study correlates bilirubin exposures to language development of children are needed as the available data are markedly limited. Moreover, the current study showed that in the pregnancy period, pre-eclampsia was the highest elicited risk factor among maternal causes.

In this study as previous studies shows poor language outcomes related to numbers and order of children in the home[23,24]. Recently, McFayden and his collague stated that birth order in lower-income families had a greater impact on language[25].

CONCLUSIONS

The most consistently identified risk factors among participated cases were consanguinity, cesarean mode of delivery, pre-term, low birth weight, hyperbilirubinemia, and postnatal risk factors language delay.

Preventive strategies regarding DLD in Arabic speaking children should consider those risk factors and to refer them for early detection and intervention if necessary. Special concern should be taken when formulating birth plans, especially when there are no apparent elevated health risks from vaginal birth. Informing mothers of the risks and benefits of cesarean birth should be a priority.

The primary goal of the current work was to provide a general platform for the problem and the associated solution of prohibiting risk factors; and it is recommended to collect an appropriate number of Delayed cases that will

allow to properly handle risk factors for each category of Etiology separately. The findings of this category-specific study can be compared to the findings of the current work.

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CONFLICT OF INTERESTS

There are no conflicts of interest.

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