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Original Article

Paediatrics Section

Environmental and Biological Risk Factors Associated with the Prevalence of Language Delay in Children Upto 6 Years of Age from Rural South India

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ABSTRACT

Introduction: There is large amount of data on the prevalence and risk factors of speech and language delay in children up to three years of age, but the data from three to six years of age group is very limited.

Aim: To assess the speech and language delay in children from birth to six years of age and its association with environmental and biological risk factors.

Materials and Methods: A total of 400 children aged zero to six years attending well baby clinic and daily paediatric outpatient department for routine check-up and immunization were evaluated using Language Evaluation Scale Trivandrum (LEST) zero to three and three to six. The prevalence and the association with risk factors in each age group was calculated and analysed using SPSS version 18.0. Chi-square test and Fisher's exact test were used in the statistical analysis.

Results: Language delay was seen in 38 (9.5%) children among the 400 children studied. The children of age group 49 to 60 months (p-value 0.839) and male gender (p-value 0.923) showed more delay, though not statistically significant. Among the various environmental factors studied, second born child [Odds Ratio (OR-3.5)], children who were not single in family (OR-1.9) and children not living together with their both parents (OR-4.3) showed significant association. The biological risk factors like preterm children (OR-3.11), babies who were born of caesarean section(OR-3.9), who had significant birth history (OR-11.1) and those who were not exclusively breast fed (OR-4.4) showed significant association.

Conclusion: A nurturing home environment with exclusive breast feeding and harmony in family in early years of life help a lot in achieving language skill.

Keywords: Birth order, Exclusive breast feeding, Maternal education, Speech delay

INTRODUCTION

Speech and language are the means by which people communicate and share thoughts and ideas. Good language skill is one of the main pre-conditions for success in the school. The most intense period of language development in children is between three to five years of age, a development that is parallel to the maturation of the brain structures. Children those who are developing normally master the basic components of language by the age of three to four years [1]. Speech and language disorders are one of the main reasons for referral to paediatric services accounting for about 40% of cases [2].

Any delay in speech and language will affect the communication skills of the child. So, to detect language delay a validated simple tool like LEST can be used to detect the delay earlier so that early intervention can be done [3,4]. Speech is defined as a motor act of producing sounds and expression of language orally. Speech and language disorders are in several forms like stuttering or dysfluency, articulation disorders or disorders related to voice inequality. Language includes varying forms of communication as writing, speaking and facial expressions. Receiving and understanding speech messages is called receptive language and sending speech messages is called expressive language. Expressive language delay exist without receptive delay but most often they are found together [2].

There are many studies assessing speech and language delay in children from birth to three years of age. However, data are less in age group from three to six years of age [3-7].

This study was conducted to assess the prevalence of language and speech delay in children from birth to six years of age. Preschool children having speech and language delay are at high risk for learning disabilities once they attain school age. They may have difficulties in reading, understanding and writing skills. Early identification and intervention can prevent other consequences.

The aim of the study was to assess the prevalence of speech and language delay in children from birth to six years of age and its association with various environmental and biological risk factors.

MATERIALS AND METHODS

The cross-sectional descriptive study was conducted in the Department of Paediatrics in a tertiary care centre named Dr. SMCSI Medical College, Kerala, India. For a period of one year from February 2016 to January 2017, the study was done in the children from birth to six years of age attending well baby clinic and paediatric outpatient department for routine check-up, with minor illness and also for immunizations. Assuming the prevalence of language delay to be 30%, margin of error at 5% and confidence level at 95% (standard value of 1.96), the calculated sample size was 323 [8]. A total of 400 children were included in our study finally in which 224 (56%) were females and 176 (44%) were males.

The children with severe illness and those having developmental delay in other domains like gross motor, fine motor and social development were excluded. The children who satisfied the selection

criteria were evaluated after getting informed consent from parents or guardians of the children. Ethical clearance was obtained from the Institutional Ethical Committee.

Tools for the Study

The data for the baseline characteristics and risk factors were collected using a predesigned parent answered proforma consisting of three parts. First part included basic details like name, age group, sex etc. and the second part consisted of biological risk factors like preterm, mode of delivery, significant birth history and exclusive breast feeding. Significant birth history was considered in the babies who had complications during birth and postnatal period like birth asphyxia, pathologic neonatal jaundice, seizures, sepsis and other conditions which required nursery admissions. The third section consisted of environmental risk factors like birth order, single or not a single child, child living with parents, maternal education, maternal occupation and socioeconomic class as per modified Kuppuswamy scale.

The speech and language assessment was done using the validated tool LEST which was developed by Child Development Centre (CDC), Trivandrum. LEST is divided into two sections and the items were arranged like the pattern of Trivandrum Development Screening Chart (TDSC). First section is called LEST (0-3) for the age group from 0 to 36 months of life and it has 33 items [3]. Second is called LEST (3-6) for the age group of 36 to 72 months of life and it has 31 items [4].

The interpretation is done in two ways.

1. Normal – All items done
2. Delay – two or more items not done

The Questionnaire was duly filled by the representative of the study team and the child was assessed using LEST tool. The children from the age birth to 72 months were further classified into six age groups like 0-12 months, 13-24, 25-36, 37-48, 49-60 and 61 to 72 months.

STATISTICAL ANALYSIS

The collected data were entered into a Microsoft Excel Sheet. Statistical analysis was done using SPSS version 18.0. In addition, to simple arithmetic calculations, Chi-square test and Fisher's exact test were also used. Odd's ratio was also calculated to determine the association of variables with the prevalence of delay. For statistical significance, $p<0.05$ was considered to be significant.

RESULTS

The total prevalence of language delay was 9.5% (38 children out of total 400). The maximum prevalence of language delay was observed in the age group 49-60 months which was 13.11% [Table/Fig-1]. The prevalence of language delay was more in males (9.6%) compared to females (9.3%) but was not statistically significant (p-value 0.923).

Among the various environmental factors studied, statistically significant association was found in second born child (OR-3.5), children who were not single in family (OR-1.9) and children not living with their both parents (OR-4.3). The maternal education and the socioeconomic class showed no association with language delay but children of working mothers had a trend to association (OR-1.1) but not significant [Table/Fig-2]. Biological risk factors were also studied for the association with language delay. The factors which had significant association with language delay were preterm children (OR-3.11), babies who had caesarean section (OR-3.9), who had significant birth history (OR-11.1) and who were not exclusively breast fed (OR-4.4) [Table/Fig-3].

The children who were found to have language delay were evaluated for treatable causes and hearing assessment. They were advised to have speech therapy and counselling as indicated.

Age group (Months)	Children with delay N(%)*	Children with no delay N(%)*	Total Children in each group	p-value†‡
0-12	4 (6.3)	59 (93.7)	63	0.839
13-24	5 (7.4)	62 (92.6)	67	
25-36	9 (9.8)	82 (90.2)	91	
37-48	6 (10.5)	51 (89.5)	57	
49-60	8 (13.11)	53 (86.89)	61	
61-72	6 (9.8)	55 (90.2)	61	

[Table/Fig-1]: Prevalence of Language Delay as per different age groups.
*Values are expressed as Number (Percentage) †For statistical Analysis Chi Square test used ‡p-value <0.05 is considered to be significant

Risk factors	Delay (%)*	No delay (%)*	p-value†,‡	Odds ratio
Single child	19 (7.4)	236 (92.6)		
Not a single child	19 (13.1)	126 (86.9)	0.049∞	1.9
Birth order				
1st	25 (7.4)	311 (92.6)	0.003∞	3.5
2nd	13 (21.3)	48 (78.7)		
3rd	0	3		
Maternal education				
10th fail	29 (10)	259 (90)	0.177	0.908
10th pass	9 (10.9)	73 (89.1)		
Degree	0	30		
Maternal occupation				
House wife	32 (9.4)	308 (90.6)	0.88	1.1
Working	6 (10)	54 (90)		
Socio economic class				
Class III	0	31	0.062	0.6
Class IV	23 (8.8)	236 (91.2)		
Class V	15 (13.6)	95 (86.4)		
Staying with				
With both parents	35 (8.9)	355 (91.1)	0.025∞	4.3
With one parent	3 (30)	7 (70)		

[Table/Fig-2]: Analysis of prevalence of language delay associated with environmental risk factors.
*Values are expressed as number (percentage) †For statistical Fischer exact test used ‡p-value <0.05 is considered to be significant. ∞These values were significant

Risk factors	Delay (%)*	No delay (%)*	p-value†,‡	Odds ratio
Sex				
Female	21 (9.3)	203 (90.7)	0.923	0.96
Male	17 (9.6)	159 (90.4)		
Gestation				
Term	23 (7)	301 (93)	0.001∞	3.11
Preterm	15 (19.7)	61 (80.3)		
Delivery				
Normal	18 (5.9)	286 (94.1)	0.001∞	3.9
LSCS	20 (20.8)	76 (79.2)		
Birth History				
Significant#	19 (39.5)	29 (64.5)	<0.001∞	11.1
Not significant#	19 (5.3)	333 (94.7)		
Exclusive Breast Feeding				
No	17 (22.9)	57 (77.1)	<0.001∞	4.4
Yes	21 (6.4)	305 (93.4)		

[Table/Fig-3]: Analysis of prevalence of language delay with biological risk factors.
*Values are expressed as number (percentage) †For statistical Fischer exact test used ‡p-value <0.05 is considered to be significant. #Significant birth history included those babies who had complications during birth and post natal period like birth asphyxia, pathologic neonatal jaundice, seizures, sepsis and other conditions which required nursery admissions. ∞These values were statistically significant

DISCUSSION

There have been many studies regarding the prevalence of language delay in children from Western literature and from India. The majority of studies are of age group zero to three years but studies including children upto six years of age are limited. The total prevalence of language delay from our study was 9.5%. In the study done by Abraham B et al including children upto six years the prevalence was 13.7% [5]. In other studies which included children upto three years of age the prevalence varied from 4.5 to 27% [5-10].

The age group with maximum number of children having language delay was from 49-60 months of age (13.1%) in our study. In the studies done by Abraham B et al., and Beitchman JH et al., the findings were also 13.3% and 11.7% respectively for the same age group [5,11]. This highlights the importance of including preschool children in language delay screening programs. The most common affected age group was variable in different studies. In the study done by Abraham B et al., it was 25-36 months but in the study done by Mondal N et al., and Kondekar SV et al., it was 13-24 months [5-7]. This shows the importance of screening for language delay in all age groups which will help in the early detection of this problem.

For the age group 0-12 months, the prevalence was 6.34% which was comparable to the study done by Sowmya DS et al., (6.6%) and Kondekar SV et al., (4.8%) [12,7]. For the age group 13-24 months the prevalence was 7.4%. In the study done by Abraham B et al., it was 4.8% but in the study done by Kondekar SV et al., it was 21%. For the age group 25-36 months, the prevalence was 7.8%. In the study done by Burden V et al., it was 6.9% but Silva PA et al., showed 2.6% [13,14]. This highlights the importance of a simple and age specific screening tool for the assessment of language delay as the language development is different in each age.

Male sex was considered to be a risk factor in the studies done by Tomblin JB et al., and Choudhury N et al., [15,16]. The delayed maturation of nervous system compared to females and effect of testosterone may be the possible explanations. However, in our study the number of male children with language delay was more but not statistically significant. Similar finding was also observed by Kondekar SV et al., [7]. Regarding the type of language delay as per expressive/receptive or mixed, all children from our study showed mixed delay. However, Sowmya DS et al., and James L et al., documented expressive delay to be more [12,17].

Various environmental factors are known to have a major role in the language development. In our study the second born child was found to be more significantly associated than first born child. Similar observation was seen in the studies done by Brookhouser PE et al., and Kondekar SV et al., [18,7]. It is logically expected that large family size give more contact for stimulation and communication but overcrowding, busy home environment and increased family tension may be the reason for delayed language development [19]. It is worth to be noted that contrasting findings were seen in the studies done by Abraham B et al., Ganavi R et al., and Nelson HD et al., in which the first born child was significantly associated with language delay [5,9,20]. We have studied the association of maternal education and socioeconomic status of parents with the prevalence of language delay and these factors were not found to be associated. Similar findings are reported by Kondekar SV et al., and Abraham B et al., [7,5]. In the study done by Nelson HD et al., younger mothers and older parents were risk factors for language delay [20]. In the study done by Campbell TF et al., lower maternal education was associated with language delay [21]. Lower paternal education and lower socioeconomic class were associated in the study done by Tallal P et al., [22]. However, one important association which need to be mentioned was that the language delay was significantly associated with the children not living together with their both parents. Similar finding was also reported by Frisk MA et al., [23]. The prevalence of language delay was found to be more in the children of working mothers but it was not statistically significant. Similar finding was also reported in the study done by Abraham B et al., [5].

Among the biological risk factors studied, strong association was seen in children who were premature and in children who were born of caesarean section. In the study done by Cohen S et al., similar finding was seen in preterm [24]. Another study by Tresa A et al., also showed language delay was more common in children who were born of any sort of assisted delivery [25]. Those children who had significant birth history had strong association with language delay compared with the children who had uneventful postnatal period. This finding was also supported by the study done by Tresa A et al., [25].

A major finding which have got a great social implication was that the language delay was less common in the children who were fortunate to have exclusive breast feeding. This finding was found to be statistically very significant. The practice of exclusive breast feeding till six months of age helps the mother and baby to spend more time together. This helps to develop a strong emotional bond and improvement in the neuro developmental domain of the baby. This lead to a strong foundation for the development of language acquisition skills in the early years of life as well as in cognitive improvement. The study done by Olof HJ et al., also supported this finding [26].

The delay in linguistic development is considered to be the most common developing disorder affecting young children. Our study highlights the important environmental and biological risk factors associated with speech and language delay. The findings of increased prevalence of language delay in children of age group four to five years, children not living with their parents and who never got exclusive breast feeding deserve special attention. The screening of preschool children is equally important along with the screening programs of infants and toddlers.

LIMITATION

The limitations of our study were that the study population was hospital based and home environmental risk factors were not fully evaluated using a validated home screening questionnaire. Further studies are needed to understand the association with various risk factors with language delay in depth using multivariate analysis.

CONCLUSION

A nurturing home environment with exclusive breast feeding and harmony in family during the early years help a lot in the optimum acquisition of language skill. With the use of LEST we can easily identify language delay early even in a community setting which help us a lot in giving early intervention. This will ensure an enjoyable quality childhood with less learning disabilities for our budding generation.

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