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Original Research Article

Assessment of Speech and Language Delay among 0-3 Year Old Children Attending Well Baby Clinics Using Language Evaluation Scale Trivandrum (LEST 0-3)

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Conflict of interest: Nil

Abstract

Objective: To assess the prevalence of speech delay among 0–3-year-old children using Language Evaluation Scale Trivandrum and to study the modifiable risk factors in speech and language delay among 0–3-year-old children.

Study design: Cross-sectional prevalence study.

Setting: Children attending Well Baby Clinic of Tertiary Care Hospital, Central India, aged 0-3 years from March 2014 to September 2014.

Participants: The cross-sectional study in central India involved assessment of speech delay among 200 children attending Well Baby Clinic of Tertiary Care Hospital, Central India, who were 0-3 years of age using Language Evaluation Scale Trivandrum (LEST) and simultaneously assessing the risk factors based on Risk Factor assessment Questionnaire and Home Screening Questionnaire (HSQ).

Results: The prevalence of speech delay among 0-3 years was found to be 28%. There was inverse relation between educational status of mother and prevalence of speech delay (χ^2 17.458 p-Value 0.008). Language delay was higher in families with income less than 7322 and lower in high income families with highest speech delay was seen in income group 982-2935 rupees (28.6%) (χ^2 17.53 p-Value 0.014). Speech delay was higher in children of Lower socioeconomic status according to kuppuswami scale (64.7% lower; 44.7% upper lower) and lower prevalence in higher socioeconomic status (16.7% upper; 16.3% upper middle class) ($\chi^2$18.04 p-Value 0.012). As the birth order increased in family, incidence of speech delay also increased with 23.9% delay in 1st child, 23.3% delay in 2nd child and 37% incidence in children born beyond 2nd order ($\chi^2$15.10 p-Value 0.010). Based on HSQ, Families with positive home environment had a lesser prevalence of speech delay (12.3%) than those with negative home environment (5.5%) (χ^2 11.762 p-Value 0.001).

Conclusion: The prevalence of speech delay among this population is 28% and the significant risk factors contributing to it are lower socio-economic scale, higher order of birth, low educational status of parents, presence of television in home and negative home environment.

Keywords: Speech Delay, Language Evaluation Scale Trivandrum, Home Screening Questionnaire.

Introduction

Language refers to the cognitive set-up of the sounds of a language, the rules for their combination into words and sentences and the meaning behind them. *Speech* refers to the articulated utterances and the motor act, and ability to perform them [1]. Normal development of speech and language is predicted on the infant's ability to hear, see, comprehend and remember [2]. Language in young children shows large variation in onset and development. Although most children acquire language without problems, delays or disorders in language development are very common in childhood. Language can either be delayed or disordered or a combination of the two which can be due to difficulties in the receptive, expressive and/or communication domain [3]. Language delay is identifiable at age 2(4). Several screening instruments for the detection of language disorders at a young age exist [4-7].

Most of the language delay screening studies were done in western population and there is paucity of data in Indian population and issues like malnutrition has not been evaluated in detail. There have been various tools developed for the assessment of speech delay in Indian children, but studies are lacking for the prevalence of speech delay among pre-schoolers. Hence the present study was done to evaluate the prevalence of isolated language delay among typically developing children using language evaluation scale of Trivandrum (LEST).

Materials and Methods

All children attending Well Baby Clinic of Tertiary Care Hospital of Central India, aged between 0-3 years were evaluated for language delay using Language Evaluation Scale Trivandrum (LEST) and risk factors for language delay were assessed using 30 items Home screening Questionnaire. Those children who had significant perinatal history, any known genetic cause and brain malformation were excluded from the study.

The Home Screening Questionnaire is a parent answered questionnaire designed for the assessment of home environment of a particular child related to language development which was validated in Child development centre (CDC) Trivandrum. It consists of 30 items; multiple choice, fill in the blanks, yes/no questions plus a toy inventory checklist which was written in 3rd or 4th grade reading level. Each item had different number of responses which were filled by parents, in return assessed by researcher and scored as 0 or 1, according to key provided with the questionnaire. Total score was then calculated, which if ≤19, then children were considered to have had negative home environment for language development and those with score ≥20 were considered to have had positive home environment [9].

The Language Evaluation Scale Trivandrum for 0-3 years-LEST (0-3) was designed and developed at the Child Development Centre, Government Medical College Campus, Trivandrum for assessment of speech delay in children younger than 3 years with validation from REELs [8]. For testing of language delay 33 test items were displayed in horizontal line with age of the child in X axis. For the administration of LEST, children need not go through the all 33 items of the measure. [8]. A vertical line was drawn by keeping a scale corresponding chronological age in months given horizontally in the X axis. All items (which are shown in blocks) completed fully to the left side of the scale were expected to be done by the child. If not attained by the child for that age, that item delay is assumed for the child (8). This test was done by the researcher himself who

was trained in the tool in CDC itself for the administration of test. For the assessment of each item first preference was given for observation of the child and testing of the items and if not possible then parental reporting was considered as valid for some of the items. Scoring of each time was done as 0 for the item not attained by the child and the item is left of the vertical for that age and score 1 was given to those items which were attained by the child. 6 Subsequent items were checked below and above for all children for assessment advanced language items and delayed language items. If child was delayed for more than 6 items, then we kept on checking items in left side of vertical line till we got an item pass by the child. If child attained the first item then we checked only upto 6 items on left of the vertical line and we assumed that rest of the items has been attained by the child. Then total 0 and 1 were calculated and those children having two or more than two items had score of zero were considered to have language delay and was deisgnatd as group A . Those children with zero or one item with score of zero were considered as normal and was designatd as group B [8].

Statistical analysis:

Data were analysed using statistical functions available in Microsoft excel (and using DAG_stat a Microsoft excel based statistical software for diagnostic test evaluation) and SPSS (version 22) statistical software. Prevalence of speech delay was calculated in this study. Risk factors analysis was done.

Results

The study was conducted in tertiary care centre in children attending the well-baby clinic to determine the prevalence of speech delay among children between ages 0-3 years using Language evaluation scale Trivandrum (LEST), which was found to be 28%.

Table 1: Distribution of cases according to age

Age (in months)	No Speech delay	Speech delay	Total	P Value
<12	86 (59.7%)	27(48.2%)	113(56.5%)	0.277
12-24	30 (20.8%)	18 (32.1%)	48 (24.0%)	
>24	28 (19.4%)	11 (19.6%)	39 (19.5%)	
Total	**144**	**56**	**200**	

Speech delay was more in girls (32.6%) as compared to boys (24.6 %) with ration of 1.3:1 although this finding was not statistically significant in our study (χ^2 1.555 p-Value 0.212).

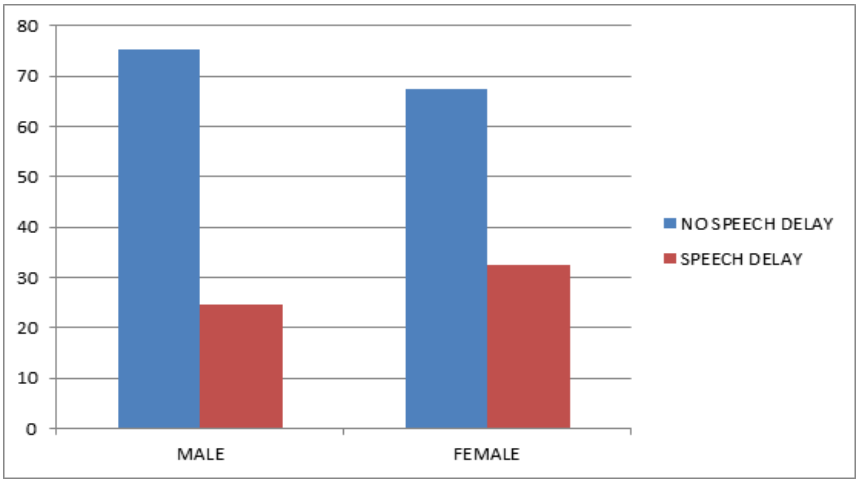

Figure 1: Distribution of cases according to gender

One of the major finding in the study, was an inverse relation between educational status of mother and prevalence of speech delay (Table no: 2) in a secular trend with child of illiterate mother had prevalence of 56.3 % while mothers with postgraduate degree had prevalence of 11.8%. There is a slight increase in mother with professional degree with 20% prevalence. These results were found to be statistically significant (χ^2 17.458 p-Value 0.008). So these findings shows the importance of educational level of mother in nurturing of a child especially its importance in language development.

Table 2: Distribution of cases according to education of mother

Educational qualification Mother	No Speech Delay	Speech Delay	Total	P Value
1. Illiterate	10 (43.5%)	13 (56.3%)	23	0.008
2. Primary school	5 (55.6%)	4 (44.4%)	9	
3. Middle school	31 (66%)	16 (34%)	47	
4. High School	51 (78.5%)	14 (21.5%)	65	
5. Plus-2/Post high school diploma	13 (76.5%)	4 (23.5%)	17	
6. Graduate / Postgraduate	30 (88.2%)	4 (11.8%)	34	
7. Professional	4 (80 %)	1 (20%)	5	
Total	144 (72%)	56 (28%)	200	

Based on Kuppuswami scale, socioeconomic status of the families was analysed and it was found that prevalence of language delay was higher in families with income less than 7322 and lower in high income families. Highest speech delay was seen in income group 982-2935 rupees (28.6%). This finding also was found to be statistically significant (χ^2 17.53 p-Value 0.014). Prevalence of speech delay was higher in children of Lower socioeconomic status according to kuppuswami scale (64.7% lower; 44.7% upper lower) and lower prevalence in higher socioeconomic status (16.7% upper; 16.3% upper middle class). These results were statistically significant ($\chi^2$18.04 p-Value 0.012) probably pointing that with parents of higher socioeconomic status create more stimulating environment for their children.

Table 3: Distribution of cases according to socioeconomic status

Socio-economic classification	No Speech Delay	Speech Delay	Total	P Value
26 – 29 (upper)	20 (83.3%)	4 (16.7%)	24	0.012
16 – 25 (upper middle)	36 (83.7%)	7 (16.3%)	43	
11 – 15 (lower middle)	57 (75%)	19 (25%)	76	
5 – 10 (upper lower)	30 (55.5%)	24 (44.5%)	54	
<5 (lower)	1(33.3%)	2 (64.7%)	3	
Total	144 (72%)	56 (28%)	200	

As the birth order increased in family incidence of speech delay also increased with 23.9% delay in 1st child, 23.3% delay in 2nd child and 37% incidence in children born beyond 2ndorder. This risk factor was found to be statistically significant ($\chi^2$15.10 p-Value 0.010) probably showing that mother was less able to take care of as number of children increased in numbers.

All the 30 items in HSQ with the prevalence of speech delay were analysed to find out association between the items and speech delay. Families who did not subscribe any sort of magazine in their homes and incidence of speech delay was higher among these children (33.8%) which had a very high statistical significance ($\chi^2$11.043 p-Value 0.001). Families who subscribed any sort of magazines had very low incidence of speech delay (8.7%).

Parents (55.5%) who did not have any special place to keep toys, these children has higher incidence of speech delay (37.8% %) with significant P-value of 0.001(χ^2 11.975). Only 15.7 % of children with speech delay had special place for keeping their toys.

Prevalence of speech delay was higher (31.9%) in children of those parents who did not have or had less number of books in their home with statistically significant values (χ^2 4.343 p-Value 0.037).

Delay in starting to talk with children was significantly associated (χ^2 11.668 p-Value 0.001) with delay in speech with 39.2% children in this category, while 17.5% parents started talking with their child timely still child's language was delayed.

Mothers who did not talk to their child while doing household work had a prevalence of speech delay of 45 % while those who did talked had prevalence of 23.9%. This finding was found to be statistical significant (χ^2 7.252 p-Value 0.007). significance of this question also indicated that good and language rich environment for children in home lead to early acquisition of language skills.

Reading stories to the children or showing picture to the children were significantly associated with low prevalence of speech delay (15.4%) as compared to those parents who do not have read stories or shown picture to their children (32.5%) (χ^2 5.547 p-Value 0.019). This finding also reiterated that language rich environment leads to early acquisition of language skills [119].

Prevalence of speech delay was higher (37.4%) with those children whose father did not participated in child care than those whose father did participated (23.3%) (χ^2 5.036 p-Value 0.081).

High educational level of family has been associated with better language development in children.

Those families with someone taking class at college level had lower incidence (12.5%) of speech delay as compared to those who families in which no one was teaching at college level (30.9%), this risk factor was significantly associated with speech delay (χ^2 4.540 p-Value 0.033).

Presence of Television was found to be positively associated with speech development with high prevalence (48.1%) of speech delay in those families where there was no Television in home while only 20.9 % speech delay was seen in homes with television in it this finding was highly statistically significant P-value 0.00001

Families with positive home environment had a prevalence of speech delay of 12.3% while those with negative home environment had an incidence 35.5% of speech delay with high statistical significance (χ^2 11.762 p-Value 0.001).

Discussion

In this study Prevalence of speech delay was found to be 28% using LEST. This was nearly the same prevalence reported by other researchers [10]. Higher prevalence in this study is because sample was from lower socioeconomic strata attending well baby clinic in a government hospital and many may also have been malnourished.

We studied age wise delay in children and found that most of the children reported as delay were less than 12 months of age (48.2%). Nearly 32% children were in there 2nd year and 19% children with delay were above 2 years in studied sample. Although this difference in prevalence of speech delay among different age groups was not statistically significant (p-Value 0.277). A Cochrane review summarized prevalence data on speech delay, language delay, and combined delay in preschool- and school-aged children . For preschool-aged children, 2 to 4.5 years old, studies that evaluated combined speech and language delay have reported prevalence rates ranging from 5% to 8%,[98,99] and studies of language delay have reported prevalence rates ranging from 2.3% to 19% [11,12].

In our study we found that speech delay was more in girls (32.6%) as compared to boys (24.6 %) with ration of 1.3:1 although this finding was not statistically significant in our study (χ2 1.555 p-Value 0.212) . It was in contrast to other studies which reported more incidence of speech delay in males as compared to females. Male gender was a significant factor in 3 studies that examined it [9,13,14].. In our study higher incidence of speech delay in girls may be due to less stimulatory environment for girls in rural population due to neglect and higher incidence of malnutrition in girls. Propensity for marked speech and language delays to be more common in males than females is generally confirmed by the studies. Gender ratios (M:F) derived are 1.25:1 [15], 2.26:1 [16]., 2.30:1 [17]., 1.25:1 for both speech and language at 4 years [18]. and 2.3:1(speech), with 1.2–1.6:1 (language) [19].. There are two exceptions to this pattern. One is Beitchman et al., who found the reverse pattern for speech only (0.98:1), language only (0.98:1) and speech or language (0.82:1), and a most unexpected 0.46:1 for the speech and language diagnosis [20].. The other is Tomblin et al., who suggest that while boys are more likely to present with SLI, the ratio is nearer equivalence [9].

One of the major finding in our study there was an inverse relation between educational status of mother and prevalence of speech delay in a secular trend with child of illiterate mother had prevalence of 56.3 % while mothers with postgraduate degree had prevalence of 11.8%.. These results were found to be statistically significant (χ^2 17.458 p-Value 0.008).So these findings shows the importance of educational level of mother in nurturing of a child especially its importance in language development. Many studies in the past have evaluated this our results were in concordance with these studies [9,13,21]. This finding may have explanation that maternal education has great impact on developmental milestone acquisition in children.

Educational qualification of father was also significantly associated with prevalence of speech delay ($\chi^2$16.09 p-Value 0.024). Educated parents may produce more stimulating environment for their children which may lead to early acquisition of language milestones [9,13,22]. There is substantial evidence showing that maternal educational level is significantly correlated with income, health, nutrition, home environment and cognitive and language stimulation [23-26].

We analysed family income groups according to kuppuswami groups. We found that prevalence of language delay was higher in families with income less than 7322 and lower in high income families. Highest speech delay was seen in income group 982-2935 rupees (28.6%). This finding also was found to be statistically significant (χ^2 17.53 p-Value 0.014) [10].. Similar finding were seen in a study done by Tomblin et al [22].

Prevalence of speech delay was higher in children of Lower socioeconomic status according to kuppuswami scale (64.7% lower; 44.7% upper lower) and lower

prevalence in higher socioeconomic status (16.7% upper; 16.3% upper middle class). These results were statistically significant ($\chi^2$18.04 p-Value 0.012) probably pointing that with parents of higher socioeconomic status create more stimulating environment for their children. Besides lower socioeconomic status contribute to delays in speech development through various pathways. For example relatively lower stimulation of language input by parents with low socioeconomic status and higher stimulating environment created by higher socioeconomic status parents [27,28]. which could result in higher perceptual and motor experience with early phonological forms. At the same time physiological or neurological impairments associated with inadequate health care and nutrition [25]. increased exposure to environmental toxins such as lead [29]. in low income homes could plausibly delay or disrupt the acquisition of the process involved in speech production.

As the birth order increased in family incidence of speech delay also increased with 23.9% delay in 1st child, 23.3% delay in 2nd child and 37% incidence in children born beyond 2nd order. This risk factor was found to be statistically significant ($\chi^2$15.10 p-Value 0.010) probably showing that mother was less able to take care of as number of children increased in numbers .Similar finding were observed by souhlas et al with significant correlation between birth order and language delay [30].. In a review of potential risk factors that could predict children's preschool language outcomes Reily S et aldetermined that birth order (along with 11 other potential risk factors) was not a reliable risk factor for language outcomes at age 24 months [31,32]. Studies have found minor, stylistic differences in the language development of first-born and later born children. These differences are likely related to differences in the environments of children of different birth orders [33]..

Another item in HSQ was regarding magazine subscribed by the parents and majority of parents in this present study were not prescribing any sort of magazine in their homes and incidence of speech delay was higher among these children (33.8%) which had a very high statistical significance ($\chi^2$11.043 p-Value 0.001).Families who subscribed any sort of magazines had very low incidence of speech delay (8.7%). In a recent phase of the Avon Longitudinal Study of Parents and Children (ALSPAC), Roulstone and colleagues looked at features of the child 'communication environment' such as the number of books available to the child, the frequency of visits to the library, parents teaching a range of activities and the number of toys available, which are all important predictors of the child's expressive vocabulary at two years, and found that they all predicted language performance at this age [34].

Then it was asked to parents that whether they have a special place to keep toys for their children. Most of the parents (55.5%) did not have any special place to keep toys, these children has higher incidence of speech delay (37.8% %) with significant P-value of 0.001(χ^2 11.975). Only 15.7 % of children with speech delay had special place for keeping their toys. Importance of toys has been stated by roulstone et al [34].

At which age you Start talking with child since birth was asked in HSQ to parents and delay in starting it was significantly associated (χ^2 11.668 p-Value 0.001) with delay in speech with 39.2% children in this category, while 17.5% parents started talking with their child timely still child's language was delayed. So starting early interaction with child is very important for language development as language is a learned skill. In cases of environmental deprivation, such as low socioeconomic status and poor verbal input, language skills are often delayed, particularly in the semantic and syntactic domains [27].

We asked mother that whether they talk to your child as you are doing the household tasks and most of them talked to their child and those who did not talked to their child had a prevalence of speech delay of 45 % while those who did talked had prevalence of 23.9%. This finding was found to be statistical significant (χ^2 7.252 p-Value 0.007).significance of this question also indicated that good and language rich environment for children in home lead to early acquisition of language skills [27]. Improvements in the quality and quantity of environmental input can improve at least the short term prognosis [35].

Reading stories to the children or showing picture to the children were evaluated by us in this study and we found that doing these activities with the children were significantly associated with low prevalence of speech delay (15.4%) as compared to those parents who do not have read stories or shown picture to their children (32.5%) (χ^2 5.547 p-Value 0.019). This finding also reiterated that language rich environment leads to early acquisition of language skills.

Another item in HSQ we asked to parents was that does father provides some care such as baby sitting, feeding, putting to bed etc.) for the child. Prevalence was higher (37.4%) with those children whose father did not participated in child care than those whose father did participated (23.3%) (χ^2 5.036 p-Value 0.081). Also further we inquired that whether father take care of child frequently or occasionally language delay was higher (29.5%) in those children whose father participated occasionally than those whose father participated regularly (22.5%) with significant P value 0.039 (χ^2 4.275). Father has a unique role in child development although we could not find any study particularly addressing fathers role in language development but there is ample amount of evidence that active role of father in child's rearing improve overall development of child. [36].

Those families with someone taking class at college level had lower incidence (12.5%) of speech delay as compared to those who families in which no one was teaching at college level (30.9%), this risk factor was significantly associated with speech delay (χ^2 4.540 p-Value 0.033).High educational level of family has been associated with better language development in children. [37].

Presence of TV was found to be positively associated with speech development with high prevalence (48.1%) of speech delay in those families where there was no TV in home while only 20.9 % speech delay was seen in homes with television in it this finding was highly statistically significant P-value 0.00001. We further evaluated the duration of TV viewing in families and found that if duration of hours increased then it was negatively associated with speech delay. Higher prevalence (50%) was seen in those children whose mother viewed TV for more hours, similar finding (30.4%) was also seen if child himself watched TV for long duration in home. (P value 0.0001).

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