J Compr Ped. 2016 May; 7(2):e33173. doi: 10.17795/compreped-33173.

Published online 2016 April 26. **Research Article**

Prevalence and Risk Factors of Speech and Language Delay in Children Less Than Three Years of Age

Nivedita Mondal,[1,*] B.Vishnu Bhat,[1] Nishad Plakkal,[1] Mahalakshmy Thulasingam,[2] Payyadakkath Ajayan,[3] and D.Rachel Poorna[3]

[1]Department of Neonatology, Jawaharlal Institute of Postgraduate Medical Education and Research (JIPMER), Puducherry, India
[2]Department of Preventive and Social Medicine, Jawaharlal Institute of Postgraduate Medical Education and Research (JIPMER), Puducherry, India
[3]Department of Pediatrics, Jawaharlal Institute of Postgraduate Medical Education and Research (JIPMER), Puducherry, India

[*]*Corresponding author*: Nivedita Mondal, Department of Neonatology, Jawaharlal Institute of Postgraduate Medical Education and Research (JIPMER), Puducherry, India. Tel: +91-9943485612, E-mail: nive.m8@gmail.com

Received 2015 September 29; **Revised** 2016 March 20; **Accepted** 2016 April 05.

Abstract

Background: There is a large amount of data on the prevalence and risk factors of speech and language delay from the West, but relatively scanty data from India.
Objectives: The aim of this study was to assess the prevalence and risk factors of speech and language delay in children less than three years old, using the Langauge Evaluation Scale Trivandrum (LEST 0-3).
Materials and Methods: A descriptive, cross sectional study was conducted in the under-five clinic of our institute, on a sample of 200 children, less than three years old. Language was assessed using Language Evaluation Scale Trivandrum (LEST 0-3) and development in other domains was assessed using the Trivandrum Development Screening Chart (TDSC). The Home Screening Questionnaire (HSQ) was used to assess the home environment. Various biological and environmental risk factors were analyzed.
Results: The prevalence of speech and language delay was found to be 27%. In univariate analysis, parameters found to be significantly associated with speech and language delay were male gender, poor home environment (score $\leq$ 19 in the Home Screening Questionnaire) and family history of speech and language delay. In multivariate analysis, poor home environment (CI = 0.20 - 0.80, P = 0.01) and positive family history (CI = 0.09 - 0.72, P = 0.01) were significant risk factors. There was a significant association between delay in TDSC and speech delay. However, TDSC alone had a low sensitivity of 33% in detecting speech and language delay.
Conclusions: Prevalence of speech and language delay is high (27%) in children less than three years of age attending the Under-Five clinic for at-risk children. Negative home environment and family history of speech and language disorders are significant risk factors for speech and language delay. The strong association of speech delay with delay in TDSC reemphasizes the need for a complete developmental assessment in any child with speech delay. The TDCS alone fails to detect significant number of cases of speech delay, showing the need to perform a separate speech screening test.

Keywords: Speech and Language Delay, Prevalence, Risk Factors

1. Background

There is a wide variation in the prevalence of speech and language delay, as reported by different authors (1-5). The wide range is due to differences in the age groups studied, different screening/diagnostic tools used and variations in terminologies. Speech and language delay may be primary or secondary to a variety of conditions. There are several biological and environmental factors such as prematurity, low birth weight, perinatal disorders, low income and low parental education which are found to be associated with speech and language delay (6-8). There is a large amount of data on the prevalence and risk factors of speech and language delay from the West, but relatively scanty data from India (6, 7, 9).

Speech and language disorders need to be intervened into early. Delay in speech and language skills may be associated with other cognitive impairments including lower IQ scores, slower information processing skills and poorer literacy skills like reading and spelling (2, 3, 10-14). They are also known to have psychosocial deficits persisting to adulthood (15). Yet another reason for early detection of speech delay is that speech delay in a significant number of children is secondary to hearing impairment (16).

There are several screening tests for speech and language disorders, however no single test has been regarded as a gold standard reference. At present, there is no concrete data to support the use of risk factor-based screening programs and no consensus on the optimal timing of screening (8).

There is reliable data supporting the effectiveness of therapies for speech-language disorders. Primary expres-

sive language disorders respond better to intervention than receptive disorders (17).

2. Objectives

2.1. Primary Objective

- To assess the prevalence of speech and language delay in children less than three years of age using the Language Evaluation Scale Trivandrum (LEST 0-3)

2.2. Secondary Objective

- To study the risk factors for speech and language delay in children less than three years of age.

3. Materials and Methods

This cross-sectional descriptive study was conducted at the under-five clinic of JIPMER, Puducherry between September and December 2014. The services offered by the clinic to under-five year-old children include immunization, regular health checks and follow-up of neonates discharged from the neonatal intensice care unit (NICU). Approval for the study was obtained from the institute ethics committee. Assuming the prevalence of speech delay to be 13% (9), degree of variability as 5% and 95% confidence interval, sample size was calculated as 181. A final sample size of 200 was taken. The inclusion criterion was any child less than 3 years of age attending the under-five clinic. Children of mothers less than 18 years of age were excluded. On each clinic day, a total of 15 subjects were selected, after taking informed consent from the parents. This selection was done from the first 50 patients registering for the clinic, using computer generated random number tables.

The tools used were:

i) Language Evaluation Scale Trivandrum (LEST 0-3)

ii) Trivandrum Development Screening Chart (TDSC 0-6)

iii) Home Screening Questionnaire (HSQ)

iv) Kuppuswamy scale for socioeconomic status

The three screening tests TDSC, LEST and HSQ have been validated in India.

Language Evaluation Scale Trivandrum for 0 - 3 years (LEST): LEST is a thirty-three test items screening test validated for children up to three years of age, against Receptive-expressive emergent language scale (REELS). With one item delay the sensitivity and specificity of LEST were 95.8% and 77.5% respectively. Positive predictive value and negative predictive value were 14.2% and 99.8% (18).

Trivandrum Development Screening Chart (TDSC): TDSC consists of 51 items taken from various existing developmental charts/scales, validated for children up to six years of age. With one item delay considered as 'TDSC delay' the sensitivity and specificity were 84.62% and 90.8% respectively. The negative predictive value was 99.23% and LR (negative) was 0.17 (19).

Home Screening Questionnaire (HSQ): HSQ is a parent answered questionnaire consisting of 30 questions for assessment of home environment. It has been validated against the gold standard Home Observation for the Measurement of Environment Inventory. A cut-off point of less than or equal to 19, has a sensitivity of 83% and specificity of 82% in detecting poor home environment. The positive and negative predictive values are 83.3% and 81.6% respectively (20).

Kuppuswamy scale: The Kuppuswamy scale measures socioeconomic status (SES) based on three variables - education and occupation of the head of the household and income of the family (21).

One item delay was considered as delay in both LEST and TDSC. The tests were administered by the researchers. Data regarding sociodemographic profile, antenatal, natal and post natal periods were recorded from case sheets in most cases and by interviewing the parents when the details were not available in the case sheet.

Categorical data were analyzed using the Chi-square or Fischer's-exact test. For parental age at child birth, Student's t test was used. Multivariate analysis using logistic regression was done. All tests were carried out at 5% significance level. Analysis was done using IBM, SPSS software version 20.

4. Results

The age of the subjects ranged from 2 to 36 months, with a median of 11 months. The age groups were divided into three categories 0 - 12, 13 - 24 and 25 - 36 months. Maximum number of children belonged to the 0 - 12 months age group. The total prevalence of speech and language delay was found to be 27% (Table 1). All the children were subjected to TDSC for development screening (Table 2). The odds of delay in LEST was 8.6 times higher in children who had delay in TDSC ($P < 0.01$).

Table 1. Prevalence of Speech and Language Delay

Age Group, mo	No Speech and Language Delay	Speech and Language Delay	Total No. of Children
0 - 12	102 (86.4)	16 (13.6)	118
13 - 24	26 (47.3)	29 (52.7)	55
25 - 36	18 (66.7)	9 (33.3)	27
0 - 36	146 (73)	54 (27)	200

Table 2. The Association of Speech and Language Delay with Delay in Trivandrum Development Screening Chart (TDSC)[a,b]

TDSC	Speech and Language Delay	No Speech and Language Delay	Total
Delay	18 (69.2)	8 (30.8)	26
No Delay	36 (20.7)	138 (79.3)	174

[a]Values are expressed as No. (%).
[b]OR = 8.6, CI = 3.47 - 21.42, P = 0.00.

We studied the association of speech delay with eight environmental factors: religion, age of parents at child birth, maternal education, socioeconomic status as assessed by Kuppuswamy's scale, place of residence, type of family, number of members in the family and home environment in the form of HSQ score (Table 3). Out of these rural residence (OR = 1.4), joint family (OR = 1.5) and large family size (OR = 1.5) showed a trend towards association, though not statistically significant. The only environmental factor that was significantly associated with speech and language delay was poor home environment as evidenced by low score ($\leq$ 19) in the Home Screening Questionnaire (OR = 2.4).

The studied biological risk variables were gender, birth order, antenatal complications-hypertensive disorders of pregnancy and others (gestational diabetes mellitus, hypothyroidism, oligohydramnios, anti-phospholipid antibody syndrome, anemia and rheumatic heart disease), intrapartum complication of fetal distress, post natal factors-hypoxic ischemic encephalopathy (HIE)/ neonatal seizures of other causes, neonatal sepsis, prematurity, term neonates who were low birth weight (LBW), cleft palate and family history of speech and language disorder (Table 4). A greater number of boys were found to have delay as compared to girls with the difference being statistically significant (OR = 2, CI = 1.06 - 4.04). Birth order $\geq$ 3 (OR = 1.8), HIE/neonatal seizures (OR = 1.7), neonatal sepsis (OR = 1.4), term low birth weight (OR = 1.3) and cleft palate (OR = 2.7) showed a trend towards association, which was not statistically significant. Apart from gender, the only other factor found to be significantly associated was family history of speech and language disorders (OR = 3.9, CI = 1.45 - 10.54).

5. Discussion

There have been extensive studies on speech and language delay in western literature (1-5). However, there is a paucity of similar data from our country. We found the prevalence of speech delay to be 27%. This appears to be high as compared to the prevalence described by other authors (1, 2, 5, 6). However, there are a few studies which have described a high prevalence. In a study by Tomblin et al. on kindergarten children, 26.2% failed the language screening test for specific language impairment (22). Binu et al. used the same tool (LEST) and reported three or more items delay in 13.7% and one item delay in 18%, in his sample of 102 children aged 0 - 6 years (9). The high prevalence in our study may be due to the following three reasons. Firstly, prevalence of speech and language delay depends to a large extent on the tool used. Our study used a language screening test. We chose LEST as it is easy to administer, can be completed quickly in a busy clinic and has a high sensitivity of 96%. The second reason is that since our centre is a refferal center, it is visited by children at a higher risk for delayed development. This is supported by the 13% prevalence of delay in TDSC in the same sample. The third reason for the high prevalence is the one-item cut-off, which we have chosen for delay in LEST. If two items cut off is taken, the prevalence comes down to 14%. We chose one-item delay because we wanted a screening test with a high sensitivity. The LEST with one-item delay as positive, has a high sensitivity and negative predictive value of 96% and 99.8% respectively, though with a low positive predictive value of 14%. As the children visiting our under-five clinic are an at-risk population for developmental delay, we believe that the positive predictive value of the test will not be compromised by choosing a one-item cut-off.

A significant association was found between delay in TDSC and speech and language delay. We attempted to analyse the performance of TDSC in detecting speech delay against LEST (one-item delay) as the 'gold standard'. We found that our sample size of 200 was adequately powered to do so. The TDSC has a sensitivity of 85% in detecting overall development delay. For an expected sensitivity of 85% in detecting speech delay, considering 10% precision and the prevalence of speech delay as 27%, a total of 188 children would have to be screened with TDSC. Out of 54 children, who had failed LEST, only 18 had failed TDSC giving TDSC a sensitivity of only 33% in detecting speech delay. The low sensitivity is possibly because TDSC has very few language items before 24 months of age. It had a high specificity of 94.5%. Positive and negative predictive values were 79% and 69%, respectively. The negative predictive value may fall even further in community samples as the prevalence of speech delay in the community may be lower than that in our sample. The TDSC alone may not suffice as a screening tool for speech and language delay and we recommend the simultaneous administration of LEST along with TDSC.

Among environmental factors, our study demonstrated rural residence (OR = 1.4), joint family (OR = 1.5) and family with more than four members (OR = 1.5) to have a trend towards association, though not statistically significant. Karbasi et al. found a large family to be a significant

Table 3. Environmental Factors and Speech and Language Delay[a]

Variable	Speech and Language Delay (N=54)	No Speech and Language Delay (N=146)	OR (CI)	P Value
Religion				0.33
Hindu	52 (28.4)	131 (71.6)		
Muslim	1 (11.1)	8 (88.9)		
Christian	1 (12.5)	7 (87.5)		
Age of parents at child birth				
Father	30.7 ± 5.38	30.37 ± 4.65		0.66
Mother	24.74 ± 3.57	25.61 ± 4.16		0.17
Maternal education				0.21
Illiterate	3 (30)	7 (70)		
Primary and middle school	11 (31.4)	24 (68.6)		
High school, Plus-2, post high school diploma	32 (30.8)	72 (69.2)		
Graduate, post graduate, Professional	8 (15.7)	43 (84.3)		
Socioeconomic status				0.76
Upper class	5 (21.7)	18 (78.3)		
Upper middle class	11 (27.5)	29 (72.5)		
Lower middle class	16 (24.2)	50 (75.8)		
Upper lower class	22 (31)	49 (69)		
Lower class	0	0		
Place of residence			1.4 (0.73 - 2.67)	0.39
Rural	35 (29.7)	83 (70.3)		
Urban	19 (23.2)	63 (76.8)		
Type of family			1.5 (0.78 - 2.81)	0.29
Joint/Extended	34 (30.4)	78 (69.6)		
Nuclear	20 (22.7)	68 (77.3)		
No. of family members			1.5 (0.78 - 2.94)	0.28
> 4 members	37 (30.1)	86 (69.9)		
≤ 4 members	17 (22.1)	60 (77.9)		
Home Screening Questionnaire score			2.4 (1.25 - 4.78)	0.01
≤ 19	22 (40.7)	32 (59.3)		
> 19	32 (21.9)	114 (78.1)		

[a]Values are expressed as mean ± SD or No.(%).

risk factor for speech disorder in primary school children (23). Though several authors demonstrated the effect of low parental education on speech development (6, 23-25). Choudhury et al. did not find any significant association between the level of paternal or maternal education and specific language impairment (26). Silva, Sidhu, Campbell and Singer et al. reported significant associations between poor SES and language delay (2, 6, 24, 27). Choudhury et al. could not demonstrate a similar result (26). Our study failed to show a relationship between speech delay and maternal education or low SES. We found poor home environment (≤ 19 HSQ score) to be the only significant environmental risk factor (OR = 2.44, CI = 1.25 - 4.78). The role of a poorly stimulating environment at home, that adversely effects language development has been reported previously (28, 29). The home screening questionnaire reflects the degree of caring and stimulating environment a child finds at his home, which depends to a certain

Table 4. Biological Factors and Speech and Language Delay [a]

Variable	Speech and Language Delay (N=54)	No speech and Language Delay (N=146)	OR (CI)	P Value
Gender			2.0 (1.06 - 4.04)	0.04
Male	38 (32.8)	78 (67.2)		
Female	16 (19)	68 (81)		
Birth order			1.8 (0.55 - 5.63)	0.3
Third and greater	5 (38.5)	8 (61.5)		
First and Second	49 (26.2)	138 (73.8)		
Antenatal factors				0.35
Hypertensive disorders	6 (35.3)	11 (64.7)		
Others [b]	1 (10)	9 (90)		
No antenatal complications	47 (27.2)	126 (72.8)		
Intrapartum factor			0.2 (0.02 - 1.66)	0.19
Fetal distress				
Present	1 (7.7)	12 (92.3)		
Absent	53 (28.3)	134 (71.7)		
Post-natal factors				
HIE/neonatal seizures			1.7 (0.58 - 4.92)	0.37
Present	6 (37.5)	10 (62.5)		
Absent	48 (26.1)	136 (73.9)		
Neonatal sepsis			1.4 (0.49 - 3.9)	0.58
Present	6 (33.3)	12 (66.7)		
Absent	48 (26.4)	134 (73.6)		
Maturity			0.4 (0.52 - 3.74)	0.67
Preterm	1 (14.3)	6 (85.7)		
Term	53 (27.5)	140 (72.5)		
Term LBW			1.3 (0.56 - 2.91)	0.70
Yes (< 2.5 kg)	10 (31.2)	22 (68.8)		
No ($\geq$ 2.5 kg)	44 (26.2)	124 (73.8)		
Cleft palate			2.7 (0.16 - 44.52)	0.46
Present	1 (50)	1 (50)		
Absent	53 (26.8)	145 (73.2)		
Family history of speech and language disorders			3.9 (1.45 - 10.54)	< 0.01
Present	10 (55.6)	8 (44.4)		
Absent	44 (24.2)	138 (75.8)		

[a] Values are expressed as mean $\pm$ SD or No.(%).
[b] Other antenatal complications included gestational diabetes mellitus, hypothyroidism, oligohydramnios, anti-phospholipid antibody syndrome, anemia and rheumatic heart disease.

extent on the level of parental education and financial status of the family (30). The influence of socioeconomic status and parental education, which were not found to be independent risk variables, is probably reflected to some extent by the HSQ scores.

Although various authors have demonstrated low birth weight, low Apgar and higher birth order to be risk factors (25, 31, 32), we did not find a significant association

Box 1. Conclusions and Implications

What is already known?
- Speech and language delay is a common disorder.
- There are several environmental and biological risk factors for speech and language delay.
- All children with speech and language disorders require a complete development assessment.
What this study adds:
- Prevalence of speech and language delay is 27% in children less than three years of age attending the Under-Five clinic for at-risk children.
- Negative home environment (score 19 in home screening questionnaire) is an independent risk factor for speech and language delay.
- The TDSC fails to pick up cases of speech delay in young children and administration of separate test for language screening is needed.

of speech delay with these variables. Significant associations were detected with male gender and presence of positive family history. Male gender has been shown to be a risk factor by several authors in earlier studies (8, 9, 23, 24). Those with a positive family history in the form of unclear speech, stuttering, late speaking and poor vocabulary, had nearly four times higher odds of suffering from speech and language abnormalities as compared to those with no family history. The affected member was most frequently a first degree relative. Positive family history is well known to be associated with speech and language disorders (8, 24, 33).

The model for multivariate logistic regression included gender, home environment and a positive family history. After adjusting, the variables found to be significantly associated were poor home environment (CI = 0.20 - 0.80, P = 0.01) and positive family history (CI = 0.09 - 0.72, P = 0.01).

The strengths of the study are that we had an adequate sample size for calculation of prevalence and that we had studied the influence of home environment in the form of the home screening questionnaire score. The limitations of the study are that it was inadequately powered to detect risk variables and the study population was hospital-based, which leads to selection bias.

5.1. Conclusions and Implications

In this hospital-based study, speech and language delay had a high prevalence of 27% in children less than three years of age. This prevalence is pertinent to Under-Five clinics for at-risk children. Negative home environment (score $\leq$ 19 in home screening questionnaire) and family history of speech and language disorders are significant risk factors for speech and language delay. The strong association of speech delay with delay in TDSC reemphasizes the need for a complete developmental assessment in any child with speech delay. The TDCS alone fails to detect significant number of cases of speech delay, showing the need to perform a separate speech screening test.

References

1. Law J, Boyle J, Harris F, Harkness A, Nye C. Prevalence and natural history of primary speech and language delay: findings from a systematic review of the literature. *Int J Lang Commun Disord.* 2000;**35**(2):165–88. [PubMed: 10912250].
2. Silva PA, Williams S, McGee R. A longitudinal study of children with developmental language delay at age three: later intelligence, reading and behaviour problems. *Dev Med Child Neurol.* 1987;**29**(5):630–40. [PubMed: 2444484].
3. Stevenson J, Richman N. The prevalence of language delay in a population of three-year-old children and its association with general retardation. *Dev Med Child Neurol.* 1976;**18**(4):431–41. [PubMed: 955307].
4. King TM, Rosenberg LA, Fuddy L, McFarlane E, Sia C, Duggan AK. Prevalence and early identification of language delays among at-risk three year olds. *J Dev Behav Pediatr.* 2005;**26**(4):293–303. [PubMed: 16100502].
5. Haller RM, Thompson EA. Prevalence of speech, language, and hearing disorders among Harlem children. *J Natl Med Assoc.* 1975;**67**(4):298–301. [PubMed: 1159860] 325.
6. Sidhu M, Malhi P, Jerath J. Early language development in Indian children: A population-based pilot study. *Ann Indian Acad Neurol.* 2013;**16**(3):371–5. doi: 10.4103/0972-2327.116937. [PubMed: 24101819].
7. Sidhu M, Malhi P, Jerath J. Multiple risks and early language development. *Indian J Pediatr.* 2010;**77**(4):391–5. doi: 10.1007/s12098-010-0044-y. [PubMed: 20422325].
8. Nelson HD, Nygren P, Walker M, Panoscha R. Screening for speech and language delay in preschool children: systematic evidence review for the US Preventive Services Task Force. *Pediatrics.* 2006;**117**(2):e298–319. doi: 10.1542/peds.2005-1467. [PubMed: 16452337].
9. Binu A, Sunil R, Baburaj S, Mohandas MK. Sociodemographic profile of speech and language delay up to six years of age in Indian children. *Int J Med Res Health Sci.* 2014;**3**(1):98. doi: 10.5958/j.2319-5886.3.1.020.
10. Ozcebe E, Belgin E. Assessment of information processing in children with functional articulation disorders. *Int J Pediatr Otorhinolaryngol.* 2005;**69**(2):221–8. doi: 10.1016/j.ijporl.2004.09.002. [PubMed: 15656956].
11. Bird J, Bishop DV, Freeman NH. Phonological awareness and literacy development in children with expressive phonological impairments. *J Speech Hear Res.* 1995;**38**(2):446–62. [PubMed: 7596110].
12. Catts HW. The relationship between speech-language impairments and reading disabilities. *J Speech Hear Res.* 1993;**36**(5):948–58. [PubMed: 8246483].
13. Sices L, Taylor HG, Freebairn L, Hansen A, Lewis B. Relationship between speech-sound disorders and early literacy skills in preschool-age children: impact of comorbid language impairment. *J Dev Behav Pediatr.* 2007;**28**(6):438–47. doi: 10.1097/DBP.0b013e31811ff8ca. [PubMed: 18091088].
14. Lewis BA, Freebairn LA, Taylor HG. Follow-up of children with early expressive phonology disorders. *J Learn Disabil.* 2000;**33**(5):433–44. [PubMed: 15495546].
15. Whitehouse AJ, Watt HJ, Line EA, Bishop DV. Adult psychosocial outcomes of children with specific language impairment, pragmatic language impairment and autism. *Int J Lang Commun Disord.* 2009;**44**(4):511–28. doi: 10.1080/13682820802708098. [PubMed: 19340628].
16. Psarommatis IM, Goritsa E, Douniadakis D, Tsakanikos M, Kontrogianni AD, Apostolopoulos N. Hearing loss in speech-language delayed children. *Int J Pediatr Otorhinolaryngol.* 2001;**58**(3):205–10. [PubMed: 11335007].

17. Law J, Garrett Z, Nye C. Speech and language therapy interventions for children with primary speech and language delay or disorder. *Cochrane Database Syst Rev.* 2003(3):CD004110. doi: 10.1002/14651858.CD004110. [PubMed: 12918003].
18. Nair MK, Nair GH, Mini AO, Indulekha S, Letha S, Russell PS. Development and validation of language evaluation scale Trivandrum for children aged 0-3 years-LEST (0-3). *Indian Pediatr.* 2013;**50**(5):463–7. [PubMed: 23255695].
19. Nair MK, Nair GS, George B, Suma N, Neethu C, Leena ML, et al. Development and validation of Trivandrum Development Screening Chart for children aged 0-6 years [TDSC (0-6)]. *Indian J Pediatr.* 2013;**80 Suppl 2**:S248–55. doi: 10.1007/s12098-013-1144-2. [PubMed: 24014206].
20. Nair MK, Prasanna GL, Jeyaseelan L, George B, Resmi VR, Sunitha RM. Validation of Home Screening Questionnaire (HSQ) against Home Observation for the Measurement of Environment (HOME). *Indian Pediatr.* 2009;**46 Suppl**:s55–8. [PubMed: 19279371].
21. Kumar N, Gupta N, Kishore J. Kuppuswamy's socioeconomic scale: updating income ranges for the year 2012. *Indian J Public Health.* 2012;**56**(1):103–4. doi: 10.4103/0019-557X.96988. [PubMed: 22684186].
22. Tomblin JB, Records NL, Buckwalter P, Zhang X, Smith E, O'Brien M. Prevalence of specific language impairment in kindergarten children. *J Speech Lang Hear Res.* 1997;**40**(6):1245–60. [PubMed: 9430746].
23. Karbasi SA, Fallah R, Golestan M. The prevalence of speech disorder in primary school students in Yazd-Iran. *Acta Med Iran.* 2011;**49**(1):33–7. [PubMed: 21425069].
24. Campbell TF, Dollaghan CA, Rockette HE, Paradise JL, Feldman HM, Shriberg LD, et al. Risk factors for speech delay of unknown origin in 3-year-old children. *Child Dev.* 2003;**74**(2):346–57. [PubMed: 12705559].
25. Stanton-Chapman TL, Chapman DA, Bainbridge NL, Scott KG. Identification of early risk factors for language impairment. *Res Dev Disabil.* 2002;**23**(6):390–405. [PubMed: 12426008].
26. Choudhury N, Benasich AA. A family aggregation study: the influence of family history and other risk factors on language development. *J Speech Lang Hear Res.* 2003;**46**(2):261–72. [PubMed: 14700370].
27. Singer LT, Siegel AC, Lewis B, Hawkins S, Yamashita T, Baley J. Preschool language outcomes of children with history of bronchopulmonary dysplasia and very low birth weight. *J Dev Behav Pediatr.* 2001;**22**(1):19–26. [PubMed: 11265919].
28. Oxford M, Spieker S. Preschool language development among children of adolescent mothers. *J Appl Dev Psychol.* 2006;**27**(2):165–82. doi: 10.1016/j.appdev.2005.12.013. [PubMed: 16619087].
29. Malhi P, Sidhu M, Bharti B. Early stimulation and language development of economically disadvantaged young children. *Indian J Pediatr.* 2014;**81**(4):333–8. doi: 10.1007/s12098-013-1154-0. [PubMed: 23904067].
30. Totsika V, Sylva K. The Home Observation for Measurement of the Environment Revisited. *Child Adolesc Ment Health.* 2004;**9**(1):25–35. doi: 10.1046/j.1475-357X.2003.00073.x.
31. Prathanee B, Purdy SC, Thinkhamrop B, Chaimay B, Ruangdaraganon N, Mo-suwan L, et al. Early language delay and predictive factors in children aged 2 years. *J Med Assoc Thai.* 2009;**92**(7):930–8. [PubMed: 19626813].
32. Chaimay B, Thinkhamrop B, Thinkhamrop J. Risk factors associated with language development problems in childhood-a literature review. *J Med Assoc Thai.* 2006;**89**(7):1080–6. [PubMed: 16881445].
33. Tallal P, Hirsch LS, Realpe-Bonilla T, Miller S, Brzustowicz LM, Bartlett C, et al. Familial aggregation in specific language impairment. *J Speech Lang Hear Res.* 2001;**44**(5):1172–82. [PubMed: 11708534].