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Original Research Article

Assessment of developmental delay among children aged 0-3 years attending well baby clinic in a tertiary care hospital in South Chennai using TDSC (0-3 years) and LEST (0-3 years)

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ABSTRACT

Background: Global developmental delay can lead to long term impairment in academic performance, social interactions, and overall quality of life. Prevalence of global developmental delay ranges from 1-3%. Early identification and intervention of developmental delay limits disability and improves outcome.
Methods: The aim of this cross-sectional study was assessment of developmental delay among children aged 0-3 years attending the well-baby clinic in Dr Kamakshi Memorial Hospital, a tertiary care pediatric centre in south Chennai using Trivandrum development screening chart (TDSC) (0-3 years) and Language evaluation scale Trivandrum (LEST) (0-3 years). We also aimed to describe the socio-demographic factors associated with developmental delay.
Results: Developmental delay was defined as TDSC and/or LEST delay. 21 children out of 251 children had developmental delay i.e., TDSC and /or LEST delay. Prevalence of developmental delay in our study was 8.4%. 13 children (5.2%) had delay only in TDSC scale, 14 children (5.6%) had delay only using LEST scale and 6 children (2.4%) had delay in both TDSC and LEST. 7 children had only motor delay, 8 children had only language delay and 6 children had delay in both motor and language domains. IVF conception was found to have statistically significant association (p=0.002) with developmental delay.
Conclusions: The prevalence of 8.4% developmental delay emphasizes need for early developmental screening programme as a routine clinical practice. Early recognition of developmental delay enables early intervention practices. It is recommended to use both TDSC and LEST scales for screening developmental delay in children.

Keywords: Developmental delay, Screening, TDSC, LEST, Intervention, Outcome

INTRODUCTION

Development of a child is a continuous and sequential process wherein skills are acquired in various inter-related developmental domains such as gross motor, fine motor, speech, language and social. It is influenced by a combination of genetic, biological and psycho-social factors.[1] Some of the problems in development may be temporary and easily correctable but a significant proportion may actually be indicators of neuro-developmental disorders.

Global developmental delay (GDD) is defined as significant delay (at least 2 SD below the mean with standardized tests) in at least two developmental domains from the following: gross or fine motor, speech/language, cognition, social/personal and activities of daily living in children under 5 years of age.[2]

Prevalence of global developmental delay globally ranges from 1-3%.[3] Various studies in India report a prevalence ranging from 3-13%. This wide range might be due to the different tools used, differences in age group and the variety of places where the studies were conducted.[4,5]

Children with developmental delay face a lot of emotional, social, behavioral, and cognitive problems in adulthood. This can affect their socio-communicative skills, academic performance and hence quality of life.[6]

There are numerous risk factors associated with developmental delay. Some of them are prematurity, IUGR, birth asphyxia, low birth weight, sepsis and seizures in neonatal period, family history of developmental delay.[7]

Early identification of developmental delay by following up children with risk factors helps us to optimize their development by early use of intervention strategies which will provide the required positive experiences and significantly minimize the social, behavioral, or learning difficulties for these children.[8]

Indian Academy of Pediatrics recommends routine developmental surveillance for all children during immunization visits till two years of age by asking the parents questions pertaining to age-appropriate milestones and developmental examination. Developmental screening using a validated tool is recommended at 9-12 months, 18-24 months of age and at school entry.[2]

It is important that an ideal screening tool for screening developmental delay should be brief, inexpensive tool with good psychometric properties, available in vernacular language, comprising of purely developmental/culturally-adapted items, that has been validated on representative healthy Indian children and requires minimal training.[9]

Trivandrum developmental screening chart for children aged 0-6 years [TDSC (0-6)] and language evaluation scale Trivandrum for 0-3 years [LEST (0-3)] are tools which were developed at the Child Development Centre, Government Medical College, Thiruvananthapuram for screening developmental delay and speech and language delay respectively.[10,11]

TDSC (0-6 years) validated against Denver developmental screening test (DDST) consists of 51 items. The sensitivity and specificity were 84.62% and 90.8% respectively when one item delay was taken as 'TDSC delay'. The negative predictive value was 99.23% and LR negative was 0.17. The initial 27 items constitute milestones for first 3 years of life [TDSC (0-3)] and the rest 24 items constitute for 3-6 years [TDSC (3-6)].

In 2016, Chauhan et al validated TDSC (0-3 years) in a community sample of 400 children against DDST and found the sensitivity and specificity to be 86.7% and 100% respectively with a negative predictive value of 99.5% when one item delay in TDSC (0-3 years) was considered as TDSC delay.[12]

Language evaluation scale trivandrum for 0-3 years [(LEST (0-3)] is a 33-test item scale validated 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% respectively.

When two item delay is used, there is a drop in sensitivity to 66.7% but specificity increases to 94.8%. Therefore, using two item delay as LEST positive provides acceptable sensitivity of 66.7 % with higher positive predictive value of 33.3% as against 14.2% for one item delay and negative predictive value of 98.7% making it a good screening tool.[11]

In 2015, Mondal et al while studying the prevalence and risk factors of speech and language delay in children <3 years of age in Pondicherry reported that though TDSC has a sensitivity of 85% in detecting overall development delay, it had sensitivity of only 33 % in detecting speech delay. Items pertaining to language are less represented in TDSC before 24 months of age.[13]

Hence, we proposed to assess the prevalence of developmental delay in children attending a well baby clinic of a tertiary care centre in south Chennai which caters to almost 20000 outpatients per year using both TDSC (0-3 years) and LEST (0-3 years) in order to get a complete picture of developmental delay in our population.

METHODS

Study design

It was a descriptive study of cross-sectional design.

Study setting

The study was carried out at Well Baby clinic, Department of Pediatrics and Neonatology, Dr Kamakshi Memorial Hospital Private Limited, Chennai.

Duration of study

The study took place for a period of 6 months (September 2024 - February 2025).

Study population

All children attending Well Baby Clinic, Department of Pediatrics and Neonatology, Dr Kamakshi Memorial Hospital Private Limited, Chennai during the study period.

Inclusion criteria

All children in the age group of 0-3 years attending the outpatient and well baby clinic of pediatric department for routine check-up and vaccination whose parents have given consent.

Exclusion criteria

Children with developmental delay, children with genetic syndromes, children whose parents have not given consent were excluded.

The institutional ethics committee of Dr Kamakshi Memorial Hospital, Chennai reviewed and approved the study proposal.

Informed written parental consent was obtained from the parents. Parents who consented were given a predesigned study proforma which was used as data collecting tool to collect information which contained age, sex, birth order, parents' age during birth, type of family.

Education, occupation and socio-economic status of parents assessed by modified Kuppuswamy scale, details of birth including birth weight, gestational age in weeks, single or multiple gestation, mode of delivery and history of NICU admission.

After this, developmental assessment was done using TDSC chart (0-3 years) and speech and language assessment was done using language evaluation scale Trivandrum (0-3 years).

One item delay was considered as delay in TDSC (TDSC positive). Two item delay was considered as delay in LEST (LEST positive). TDSC and/or LEST positive was taken as developmental delay.

Statistical analysis was done using SPSS software version 22.0. Descriptive analysis was carried out by calculating mean and standard deviation for quantitative variables. Frequency and proportions were calculated for qualitative variables. Data tabulated and Chi-square test was applied to find the association of developmental delay with demographic and socio-cultural factors. P<0.05 was considered significant.

RESULTS

Prevalence of developmental delay

Developmental delay is defined in the present study as TDSC and/or LEST delay. 21 children out of 251 children had developmental delay i.e., TDSC and /or LEST delay. Prevalence of developmental delay in our study was 8.4% (Table 1).

5.2% i.e., 13 children had delay only in TDSC scale, 14 children (5.6%) had delay only using LEST scale and 6 children (2.4%) had delay in both TDSC and LEST (Table 1).

Table 1: Interpretation of results.

Interpretation	Number	Percentage
TDSC	13	5.2
LEST	14	5.6
TDSC and/or LEST	21	8.4
TDSC and LEST	6	2.4

Age distribution

Out of the 251 children in the age group 0-3 years in the present study, 44.6% were in the age group of 0-6 months, 28.7% were in the age group 7-12 months, 6.4% in the age group 19-24 months, 2% between 25-30 months, and 1.2% between 31-36 months. Present study was limited to age group of 0-3 years and children were sampled as random sample (Figure 1).

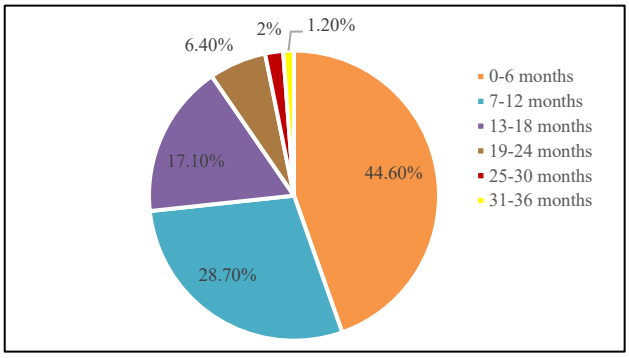

Figure 1: Age of children.

Gender distribution

There were 145 male children (57.8%) and 106 (42.2%) were female children in our study (Figure 2).

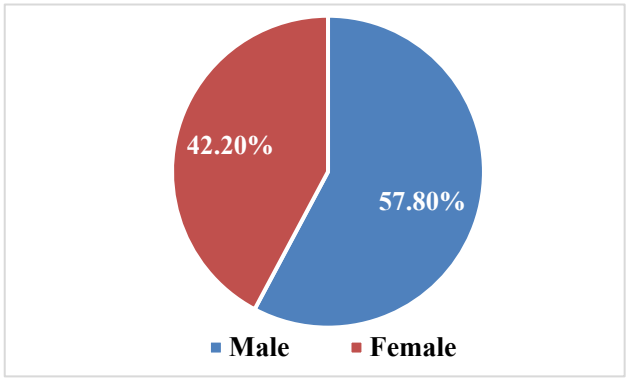

Figure 2: Gender of children.

Distribution of gestational age in the children

In the present study, 191 children (76.1%) were term gestation whereas 60 (23.9%) children were born

preterm. It has been recommended to use corrected age up to 24 months for pre-mature babies. There was no difference among both groups (p=0.417).

Birth weight distribution

47.8% children (120) had a birth weight of 2500-2999 grams and 26.3% children (66) had a birth weight of 3000-3400 grams. There was no significant statistical association between birth weight and developmental delay (p=0.673) (Figure 3).

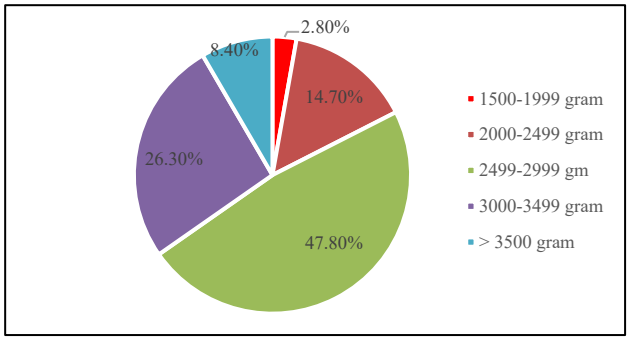

Figure 3: Birth weight distribution.

Screen time distribution among children

In the present study, 127 children (50.6%) had no screen time as opposed to 26 children (10.4%) who had screen time for more than 2 hours. There was no statistically significant association (p=0.255) between developmental delay and screen time.

History of seizures among children of the study

In the present study, 12 children (4.8%) had history of seizures at present. No statistically significant association was found between developmental history and history of seizures at present.

Type of conception distribution

232 children (92.4%) were born out of spontaneous conception and rest were born by IVF conception in the present study (Figure 4).

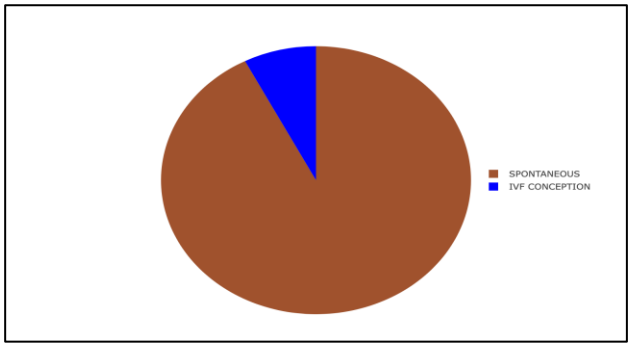

Figure 4: Type of conception.

There was statistically significant association (p=0.002) between developmental delay and type of conception (Table 2).

Table 2: Association between type of conception and developmental delay.

TDSC and/or LEST interpretation	Type of conception (%)		Total (%)
	IVF conception	Spontaneous	
No delay	18 (94.7)	212 (91.4)	230 (91.7)
Delay	1 (5.3)	20 (8.6)	21 (8.3)
Total	19 (100)	232 (100)	251 (100)

Chi square value =12.615; p value =0.002.

DISCUSSION

Developmental delay is defined in the present study as TDSC and/or LEST delay. 21 children out of 251 children had developmental delay i.e., TDSC and/or LEST delay. Prevalence of developmental delay in our study was 8.4 %.

In a state wide cross sectional survey done in Kerala with the help of the integrated child development services (ICDS) network, 3.4% was found to have using TDSC and/or LEST positive.[14]

In a community based descriptive study in slums of Burdwan Municipality done by Gupta et al, prevalence of developmental delay was 6.6 % using TDSC scale.[7]

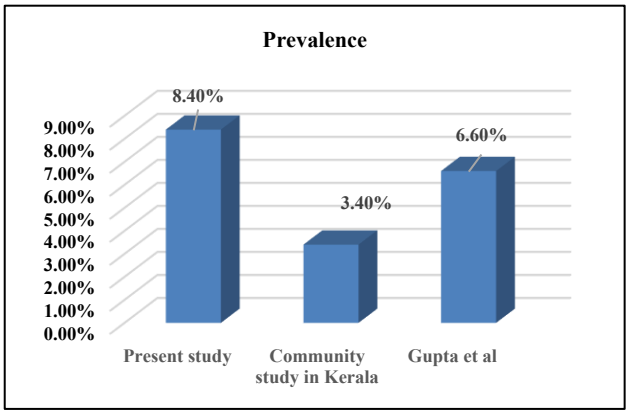

Figure 5: Prevalence of developmental delay in various studies.

All of the above studies showed a varied prevalence between 3-9% (Figure 5).

In our study, 5.2 % i.e., 13 children had delay only in TDSC scale, 14 children (5.6%) had delay only using LEST scale and 6 children (2.4%) had delay in both TDSC and LEST.

7 children had only motor delay, 8 children had only language delay and 6 children had delay in both motor and language domains.

In the cross-sectional survey done in Kerala with ICDS network 2.5% prevalence of developmental delay was observed using TDSC and 2.8% using LEST 0-3 years and 3.4% using TDSC and/or LEST positive.[14]

In the present study, there was no significant statistical association between developmental delay and gender, education of mother, education of father, occupation of father, occupation of mother, monthly family income, socio-economic status, place of residence, type of family, number of members in the family, age of mother at child birth, age of father at child birth, birth order, problems during antenatal period, mode of delivery, gestational age, birth weight, problems during neonatal period, languages used at home, screen time, family history of psychiatric illness, history of seizures in the child.

IVF conception was found to have statistically significant association (p=0.002) with developmental delay in our study.

In a prospective cohort study done by Noda et al in Japan, which aimed to examine the association between infertility treatment and neurodevelopment in children at 2 and 3.5 years of age, it was found that the odds of having developmental delay at 2 years of age was higher in children conceived through ovulation induction (OI), and artificial insemination with husband's sperm (AIH) (OR, 1.36; 95% CI 1.00 to 1.85) and assisted reproductive technology (ART) (OR, 1.36; 95% CI 1.07 to 1.72) than in those conceived naturally.[15]

In the study done by Gupta et al, Chi square test revealed gender (p=0.03), mothers' education (p=0.00), socio-economic status (p=0.00), parity (p=0.02), birth spacing (p=0.01), birth weight (p=0.00) to be significantly associated with developmental delay and multivariate analysis showed all the factors to be significant predictors except gender, parity and birth spacing. Gestational duration, maternal age at delivery, mode of delivery was not found to be significantly associated with developmental delay.[7]

In a community-based cross-sectional study done in rural Nagpur, lower literacy level of mother and Composite Index of Anthropometric Failure were significant variables for any developmental delay. Hospitalization of the child during the 1st month of life and lower parenting scores were the significant factors associated with global delay.[16]

Out of the 21 children in our study, 8 children had only language delay. All these children were identified using LEST scale. None of them were identified by TDSC. This may be due to the low sensitivity of TDSC to pick up language and speech delay due to very few language items in TDSC before 24 months of age. 96.8% of children in our study belonged to the age group 0-24 months.

Limitations of the study was the smaller sample size.

CONCLUSION

The prevalence of 8.4% developmental delay in children aged 0-3 years attending well baby clinic emphasises the need for early developmental screening programme as a routine clinical practice.

Early recognition of developmental delay enables early intervention practices.

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Conflict of interest: None declared
Ethical approval: The study was approved by the Institutional Ethics Committee of Dr Kamakshi Memorial Hospital, Chennai Reference number: 24/BC-033/IEC/2024.

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