Original Article

Developmental delay and its associated factors among children of 9 months and of 18 months attending primary health facilities in an urban resettlement area of East Delhi

Bhavana Verma[1], Pragti Chhabra[1], Amir K. Maroof[1], Anju Aggarwal[2]

[1]Department of Community Medicine, University College of Medical Sciences and Guru Teg Bahadur Hospital, New Delhi, India, [2]Department of Pediatrics, University College of Medical Sciences and Guru Teg Bahadur Hospital, New Delhi, India

Abstract

Background: Early identification of developmental delay in children can help in making early intervention for its management. Routine developmental screening is not being practised in India due to lack of trained field workers, lack of awareness among parents and lack of feasible assessment screening tool. There is lack of studies that focuses on home environment provided to the children as it is associated with developmental delay. **Methods:** A cross sectional study was conducted in immunization clinic of two Maternal and Child Welfare (MCW) centres of Nand Nagari, an urban resettlement colony in East Delhi among children of 9 months and 18 months of age. New Delhi Development Status Questionnaire (ND-DSQ) was used for assessment of developmental status. Data on socio-demographic profile, home stimulation of the child and anthropometric measurements including weight, height was collected. Chi-square test was used for univariate analysis and binary logistic regression was used to find out the predictors of developmental delay. **Results:** The prevalence of DD was found to be 17.7% in children 9 m of age, and 10% in 18 m. On univariate analysis preterm gestation, low-birth weight of the child, lower mother's education status and presence of complications at birth were significantly associated with developmental delay. The independent predictors of DD were presence of complications at birth, preterm gestation, lower mother's education status and underweight children. **Conclusion:** This study reports a higher prevalence of DD. More follow up studies on DD is needed to see the course of achievement of developmental milestones. Screening for developmental milestones can be done during visit for immunization.

Keywords: Developmental delay, home-stimulation, infants, young children

Introduction

Early childhood development forms an important part of health and well-being and is recognized as a component of Sustainable Development Goals. Developmental milestones are important component of early childhood development. Developmental milestones are age specific tasks that a child achieves at a particular age, if that is not achieved it is known as developmental delay. Development assessment at a younger age helps to make early diagnosis and management and provides an opportunity to encourage developmental stimulation by parents at an earlier age.[1]

Development of a child is affected by various factors among which home stimulation (play activities in which a child is

Address for correspondence: Dr. Bhavana Verma,
H. No. B1173, B Block Palam Vihar, Gurugram - 122 017,
Haryana, India.
E-mail: bhavnalhmc91@gmail.com

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involved, play materials type and source, involvement of parents with child) plays an important role. Though, Integrated Child Development Services (ICDS) and Rashtriya Bal Swasthya Karyakaram (RBSK) focuses on early childhood development in India,[2] but there is lack of routine screening as there are many challenges like lack of proper guidelines and trained field workers to identify children at risk of developmental delay. Also, parents are not aware of these services. There is lack of studies that mention about home stimulation given to children. Therefore, the present study was conducted with an aim to find out the developmental status and its associated factors including home stimulation given to the children and to see the feasibility of routine screening practice during immunization.

Subjects and Methods

A cross sectional study was conducted between April 2019 to October 2021 in two Maternal and Child Welfare (MCW) Centres in Nand Nagari, an urban resettlement colony in East Delhi.

Children aged 9 m and 18 m who were visiting for immunization were recruited by consecutive sampling. For an estimated prevalence of DD as 7.1%,[3] an absolute error of 5.5% and 95% confidence level, the sample size was found to be 85 in each age group i.e 9 months and 18 months. (Epi Info 7 for Windows). Thus, a total of 170 children were planned to be included in the study. Data was collected using a pre-structured, pre-tested and interviewer administered questionnaire. Information regarding socio-demographic profile, socioeconomic status, and home stimulation of the child, breastfeeding and complementary feeding practices of the child were recorded. Modified Kuppuswamy scale was used for classification of socio-economic status. Anthropometric measurements including weight, height was measured using standard methods recommended by WHO.[4]

New Delhi-Development Screening Questionnaire (ND-DSQ) was used to assess the developmental status of children. It has been validated in India and available in Hindi language. The questionnaire consists of 20 items for each age group. The sensitivity and specificity of the tool is 100% and 87.2% respectively.[5] A score of less than or equal to 52 in both the age group was considered as developmental delay (DD). Weight for age and height for age z-score classification was used to categorize the underweight and stunting status of the children based on WHO guidelines.[4]

Approval from Institutional Ethics Committee-Human Research of the University College of Medical Sciences was taken. Permission to use New Delhi-Development Screening Questionnaire (ND-DSQ) was obtained from its authors before the beginning of the study.

Statistical analysis

The data collected was entered in a computer-based spreadsheet and cleaned. Categorical variables such as DD status of children, socioeconomic status, home stimulation, child feeding, nutrition, pregnancy and delivery related factors are presented as proportions. The association between DD and sociodemographic and environmental variables was computed using chi square test. Fischer exact test was applied where expected cell count in any cell was less than 5. Odds ratios was used to explore the association of certain sociodemographic factors, environmental factors and DD. Binomial logistic regression was used to find out the independent predictors of DD. The data was analysed using SPSS software 20.0. All tests were two tailed and a P value of less than 0.05 was considered as statistically significant.

Results

A total of 90 children aged 9 months and 80 children aged 18 months were studied. The prevalence of developmental delay was found to be 17.7% in children 9 months of age, while in children of 18 months it was 10%. Sociodemographic profile of the children and its association with DD is shown in Table 1. The prevalence of developmental delay was found to be higher among mothers who studied till primary school or below in both the age groups [Table 1].

Majority of the mothers attended more than four ANC visits (92.2% in 9 months and 100% in 18 months age group) and all the mothers in both the age groups received Iron-Folic Acid tablets and Td immunization. In complications during pregnancy gestational diabetes mellitus (2% in 9 m and 5% in 18 m), hypertension (3% in 9 m and 5% in 18 m), and thyroid disorder (5% in 9 m and 2% in 18 m) were reported. Majority of the children were the first child of their parents in both the ages (45.6% in 9 months and 50% in 18 months). In both the age groups majority of the participants (58.8% in 9 months and 66.2% in 18 months) were reported to have received exclusive breast feed till 6 months of age. Majority of the children (84.4% in 9 months and 78.8% in 18 months age group) were being breast fed at the time of study. 92.2% children of 9 months and 85% children of 18 months were registered in Anganwadi at the time of study.

Developmental delay was found to be significantly associated with the duration of gestation, birth weight and complication at the time of birth [Table 2], weight for age of the child (only in 9 months) and mother's education. Home stimulation was not found to be associated with developmental delay [Table 3]. To find out the independent predictors of developmental delay among children binary logistic regression was done [Table 4]. On univariate analysis birth weight, complication at birth, duration of gestation, mother's education and weight for age of the child were found to be statistically significant with p value <0.05. Out of these, mother's education, complication at birth and duration of gestation were selected and rest were excluded as based on available literature. Birth weight and gestational age of the child were found to be corelated therefore out of these only one was selected [Table 4].

Discussion

In the present study the prevalence of developmental delay in 9 m old children was found to be 17.8% while in 18 m it was 12.5%.

Table 1: Association of developmental delay among children aged 9 m and 18 m with certain sociodemographic characteristics

Variables	Children aged 9 m (*n*=90)			Children aged 18 m (*n*=80)		
	n	With developmental delay (*n*=16)	*P*	*n*	With developmental delay (*n*=10)	*P*
Gender						
Male	56	10 (17.9%)		40	4 (10.0%)	
Female	34	6 (17.6%)	0.98	40	6 (15.0%)	0.73
Mother's age at the time of delivery (years)						
18-25	41	6 (14.6%)		29	4 (13.8%)	
26-30	33	8 (24.2%)	0.5	37	4 (10.8%)	0.8
31-35	16	2 (12.5%)		14	2 (18.2%)	
Educational status of mothers						
< = Primary	16	5 (31.2%)		11	4 (36.4%)	
High school	33	2 (6.1%)	0.08	9	1 (11.1%)	0.02*
Intermediate	25	6 (24.0%)		38	5 (13.2%)	
Graduate/higher	16	3 (18.8%)		22	0	
Socio economic status						
Upper lower	40	6 (15.0%)		23	4 (17.4%)	
Lower middle	35	6 (17.1%)	0.3	42	5 (11.9%)	0.9
Upper middle	14	3 (21.4%)		11	1 (9.1%)	
Upper	1	1 (100.0%)		4	0	
Consanguineous marriage						
No	88	16 (18.2%)		78	9 (11.5%)	
Yes	2	0	1	2	1 (50.0%)	0.23

*Statistically significant

It has been reported that prevalence of developmental delay increases from infancy (5.7%) to 12-23 months of age, peaks at 12-23 months age (20.3%), thereafter showing a decreasing trend to 15.3% as the age increased to more than 2 years.[6] Other population-based studies in India showed that the prevalence of any developmental delay ranges from 3.5% to 10%.[7,8] These wide variations in the prevalence of developmental delay could be due to usage of different scales in different population.

There are many tools available for assessment of developmental delay in children like DASII (Developmental Assessment Scale for Indian Infants), ASQ (Ages and Stages Questionnaire), PEDS (Parents Evaluation of Developmental Status). The present study used the New Delhi- Development Screening Questionnaire (ND-DSQ), this questionnaire is available in Hindi and prepared only for 9 months and 18 months age groups. The questionnaire has 20 questions related to the activity performed by the children and is easily understood by the parents of the children.[5] This is the first study which uses this questionnaire.

In the present study birth factors which may affect the development of the child were studied. Among them duration of gestation, birth weight and complications at birth were found to be significantly associated with developmental delay (P value < 0.05). The odds of developing developmental delay were 15 times higher in pre term children as compared to term children. Also, the odds of developmental delays were 9 times higher in children having complications at birth like asphyxia. Similarly, it was seen that low-birth weight children have 10 times higher risk of developing delay (Kieviet *et al.*),[9] Bello *et al.*[10] A child who is born at preterm gestation is more likely to have low birth weight and brain may be less developed as compared to the normal birth weight and term gestation child. Birth complication like asphyxia leads to the deficiency of oxygen in the brain and may cause cerebral palsy. All these factors can lead to poor growth of the children and developmental delay.

Among factors associated with pregnancy like number of ANC visits, complications during pregnancy, place of delivery, mode of delivery and feeding practices of the children like initiation of breastfeeding, number of meals per day, current status of the breast feeding were not significantly associated with developmental delay (P value > 0.05). Similar findings have been reported in a study conducted by Sharma *et al.*[11] Very few children belonged to higher birth order in this study. Birth order of the participants was not associated with developmental delay while it has been reported that having more children in a family had higher risk of developing social and cognitive delay.[12] The difference could be due to small sample size in the present study.

Sociodemographic factors like mother's age, father's age, type of the family, socioeconomic status of family and consanguineous marriage were not found to be significantly associated with development of the child in present study. While mother's education (in 18 m age group) showed the significant association with developmental delay. The children of mothers who studied till primary school had 14 times higher odds of being affected by developmental delay as compared to the children of mothers who were graduate or had a higher qualification. Educated parents are able to provide more home stimulation that may affect the development of the child.

Table 2: Association of developmental delay with factors related to birth and anthropometric measures

Variables	Children aged 9 m (*n*=90)			Children aged 18 m (*n*=80)		
	n	With developmental delay (16)	*P*	*n*	With developmental delay (10)	*P*
Complication during pregnancy						
No	80	14 (17.5%)		69	10 (14.5%)	
Yes	10	2 (20.0%)	1	11	0	0.34
Place of delivery						
Home	4	1 (25.0%)		3	0	
Institutional	86	15 (17.4%)	0.55	77	10 (13.0%)	1
Mode of delivery						
Normal	69	12 (17.4%)		61	5 (8.2%)	
LSCS/Assisted	21	4 (19.0%)	0.79	19	5 (18.8%)	0.09
Birth order						
≤2	79	15 (19.0%)		69	9 (13.0%)	
≥2	11	1 (9.1%)	0.68	11	1 (10.0%)	0.89
Duration of gestation						
Pre term	6	4 (66.7%)		5	3 (60.0%)	
Term	83	12 (14.5%)	0.008*	73	7 (9.6%)	0.02*
Post term	1	0		2	0	
Birth weight						
Very low	7	2 (50.0%)		4	2 (50.0%)	
Low	18	6 (33.3%%)	0.02*	20	3 (15.0%)	0.02*
Normal	65	8 (12.3%)		51	3 (5.8%')	
Complication at birth						
No	82	12 (14.6%)		78	9 (11.6%)	
Jaundice	5	2 (40.0%)	0.03*	0	0	1
Asphyxia	3	2 (66.7%)		2	1 (50.0%)	
Initiation of breast feed						
Early initiation	74	11 (14.9%)		60	7 (11.7)	
Late initiation	16	5 (31.2%)	0.15	20	3 (15.0)	0.7
Weight for age						
Normal	70	11 (15.7%)		45	4 (8.9%)	
Underweight	15	1 (6.7%)	0.03*	26	3 (11.5%)	0.1
Severe Underweight	5	4 (80.0%)		9	3 (33.3%)	
Height for age						
Normal	83	14 (16.9%)		63	7 (11.1%)	
Stunting	4	1 (25.0%)	0.3	13	3 (23.1%)	0.4
Severe stunting	3	1 (33.3%)		4	0	

*Statistically significant

Many studies showed association between socioeconomic position gradients and child health outcomes.[13-22] All the sociodemographic factors like parental education, occupation and socioeconomic status are interrelated, a person who belongs to upper socioeconomic class will have better education especially if a female is well educated can improve her child's development, she will be aware of needs of the child and can provide better stimulation which ultimately improves the child nutritional as well as intellectual development. In contrast if a female is illiterate or belongs to poor family may not have good nutrition during pregnancy which could lead to poor development of foetus and may lead to preterm birth which ultimately affects the child development. Also, children belonging to poor families are more likely to have poor nutrition that is a risk factor for poor development.

In present study home stimulation of the children was assessed based on the availability of books, source of play material, varieties of play material and play activities in which the child was involved at the time of study. The study showed that in the 9 months children, the most common activity performed by the children was playing with the toys bought from the stores, followed by toys that moves around like ball (65.7%), listening to songs, stories and going out with the parents to park (52%), having dolls (49.5%), playing with the household objects (22%) while less common were having books (4%) and playing with household objects. Play activities performed by a child depends on the place of living, environment, culture and age. A study was conducted in Brazil among 12 months old children where the most common activity performed by the child was going out to someone's else house (53%) and the least common was going to park followed by having books.[16] In present study the most common activity among 18 m old children was playing with toys bought from the store (91%), while least common activities were playing with household objects and homemade toys (8.8%) and 16.3% of the children was having books. A study done by Hamdani *et al*.[17] in Bangladesh among 18 months children

Table 3: Distribution of children according to their home stimulation related to development and it's association with developmental delay

Variables	Children aged 9 m (*n*=90)			Children aged 18 m (*n*=80)		
	n	With developmental delay (16)	*P*	*n*	With developmental delay (10)	*P*
Source of play material#						
Books						
No	86	15 (17.4%)	0.55	67	8 (11.9%)	0.6
Yes	4	1 (25.0%)		13	2 (15.4%)	
Household objects						
No	68	14 (20.6)	0.33	73	8 (11.0%)	0.2
Yes	22	2 (9.1%)		7	2 (28.5%)	
Things from outside						
No	77	16 (20.8%)	0.11	73	10 (13.7%)	0.5
Yes	13	0		7	0	
Toys from store						
No	21	0	0.01*	7	0	0.3
Yes	69	16 (23.2%)		73	10 (13.7%)	
Home made toys						
No	89	16 (18.0%)	1	79	10 (12.7%)	1.00
Yes	1	0		1	0	
Variety of play material#						
Things Play/make music						
No	52	8 (15.4%)	0.5	42	6 (14.3%)	0.7
Yes	38	8 (21.1%)		38	4 (10.5%)	
Stacking/constructing						
No	88	16 (18.2%)	1	66	9 (13.6%)	0.6
Yes	2	0		14	1 (7.1%)	
Things moves around						
No	25	4 (16.0%)	1	14	1 (7.1%)	0.6
Yes	65	12 (18.5%)		66	9 (13.6%)	
Doll, tea set						
No	41	7 (17.1%)	1	25	3 (12.0%)	1.00
Yes	49	9 (18.4%)		55	7 (12.7%)	
Play activities#						
Tell stories						
No	38	7 (18.4%)	0.89	38	5 (13.2%)	0.86
Yes	52	9 (17.3%)		42	5 (11.9%)	
Sing song						
No	38	6 (15.8%)	0.67	32	4 (12.5%)	1
Yes	52	10 (19.2%)		48	6 (12.5%)	
Go outside home						
No	38	5 (13.2%)	0.32	31	2 (6.5%)	0.3
Yes	52	11 (21.2%)		49	8 (16.3%)	

#Multiple responses were allowed, *statistically significant

Table 4: Binary logistic regression analysis for determinants of developmental delay in study participants

Independent variable	*B*	SE	*P*	Adjusted OR (95% CI)
Birth complication				
No*				
Yes	2.24	0.83	0.007	9.43 (1.84-48.4)
Duration of gestation				
Pre term	2.75	0.95	0.004	15.6 (2.38-102.53)
Term*				
Mother's education				
≤Primary	2.67	0.93	0.004	14.56 (2.31-91.54)
Middle school	-0.28	1.07	0.97	0.97 (0.11-8)
Intermediate	1.06	0.85	0.21	2.89 (0.54-15.3)
Graduate/higher*				

*Reference category

on family care indicators showed that most children played with the house hold objects (98%) and nearly all children were taken outside (99.3%), whereas toys for stacking or construction were rare. The socioeconomic condition of the families also affects varieties of play activity of the children. Children belonging to poor families are most likely to have less toys and will play with household objects as compared to children who belong to rich families. Also due to the COVID-19 pandemic people were avoiding taking out their children. Home based activities like storytelling, singing, and playing with household objects, expose young children to experiences, that promote early development.[17]

Nutritional status also plays an important role in the development of children. In this study weight for age of the child was significantly associated with developmental delay (*P* value = 0.03) in 9 months age group. Children who are suffering from chronic malnutrition may have deficiency of macronutrients and micronutrients which plays an important role in the development of the brain. It is also true in other way if a child has some form of developmental delay may not be able to eat properly that can lead to malnutrition or stunting.

This study reports a higher prevalence of developmental delay as compared to other community-based studies. Some of the risk factors were associated with both children and parents. Early identification of these risk factors could help policy makers to modify the programmes to deliver better child health services. Children with risk factors like preterm children, low birth weight children and children who had complication at birth and underweight children to be identified and followed up more frequently to detect developmental delay.

We could not follow the children to see the trends of their development due to resource constraints. However, the study was conducted in the same setting for children of both the age groups to make valid comparisons.

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Conflicts of interest

There are no conflicts of interest.

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