Developmental delay among children under two years of age in slums of Burdwan Municipality: A cross-sectional study

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Abstract

Context: Development is an ongoing process through which an individual acquires competence to function adequately. Developmental delay is said to occur when a child fails to reach the age-appropriate anticipated milestones. This imparts long-term direct as well as indirect effects on the health of a community obviating routine measurement of its prevalence especially in high-risk populations. **Aim:** To find out the prevalence and correlates of developmental delay among children under two years of age in slums of Burdwan Municipality, West Bengal. **Settings and Design:** A community-based descriptive cross-sectional study. **Methods and Materials:** This study was conducted between September-November 2019 among 240 study subjects selected by multistage simple random sampling. Data were collected by interviewing the respondents using a predesigned, pretested schedule. Developmental status was assessed by applying Trivandrum Developmental Screening Chart (TDSC). Chi-square test and logistic regression was done to find associations. **Results:** Prevalence of developmental delay was 6.6%(95%CI 3.6-9.8) and proportion was more among male infants. 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 multivariable 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. **Conclusion:** Developmental delay is considerably high in the study area. A larger study using appropriate tool and follow-up may elicit the burden and associated determinants.

Keywords: Developmental delay, milestone, slums, TDSC, under two years

Introduction

Development is the composite ongoing process through which an individual acquires competence to function adequately in a social setting. Majority of the developmental process takes place within the first few years of life.[1] Developmental delay occurs when a child exhibits a significant delay in the acquisition of milestones or skills which is often hard to measure by its very nature. The various domains of development include gross motor, fine motor, language and hearing and social behavior which are complex and interrelated.

The value of early identification of children with developmental delays has been well documented.[2] Any delay in reaching the milestones during the first few years of life will ultimately affect the way a person interacts with the surrounding society. Hence, developmental assessment is required at the earliest.[3] If one can diagnose developmental delay in early stages of growth, then interventions can reduce long-term sequelae.[4] The need

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for determining the extent of developmental delay and early interventions has well been emphasized in the national strategies through Rashtriya Bal Swasthya Karyakram (RBSK).

Globally every year 180-200 million under five children exhibit developmental delay and 86% take place in the developing world like India compared to a mere 8% in the developed economies.[5,6] It is common in early childhood affecting at least 10% of the Indian children.[7]

Although many isolated efforts have been undertaken in different parts of India to assess and document the developmental status of children, a comprehensive database on the above is still lacking. Studies done in West Bengal are scarce and only one rural field-based study on prevalence of developmental delay in Bhatar block of West Bengal could be accessed.[3] In this context, the present study was planned with the objectives to find out the prevalence of developmental delay among children below two years' age in slums of Burdwan Municipality and to determine its correlates.

Materials and Methods

Study design and setting

This community-based cross-sectional study was conducted in slums of Burdwan Municipality area of Purba Bardhaman District, West Bengal between September and November 2019. As per census 2011, the population of Burdwan Municipality was 314638. The municipality consists of 35 wards and 144 slums.[8] This study was conducted in selected slums of the municipality.

Study population

Children of 2-23 months of age residing continuously for last three months prior to data collection were the study population. Mothers/care givers of the aforesaid children were the primary respondents. Mothers unwilling to participate or children absent during the day of visit or severely ill were excluded from the study. Children below 2 months of age were excluded as the tool used can only assess delay in milestone from two months of age.

Sample size and sampling technique

Based on 7.9% prevalence of developmental delay in a similar study in Bhatar block of Bardhaman district,[3] 95% confidence interval, 5% relative error, design effect 2 and 5% non-response rate, the minimum sample came to be 235. Multistage sampling technique was adopted for choosing the sample. Initially 15% of the slums was selected by simple random sampling (SRS) and total sample of 235 children were selected from these slums in equal numbers by SRS i.e., 235/22 ~ 11 from each slum. Thus, a total 242 children were selected as final sample of the study. Two children could not be found in spite of repeat visit, thus finally 240 study subjects were studied.

Ethical considerations

Ethical clearance was obtained (Memo no. BMC/3321) from the Institutional Ethics Committee of Burdwan Medical College and Hospital. Necessary permissions were taken. On the days of data collection, the nature and the purpose of the study were briefed to the respondent, informed written consent taken, confidentiality and anonymity was maintained. Approval from ethics committee has been obtained, Date: 23/12/19.

Data collection and assessment

Data were collected at the household level with a pre-designed, pre-tested schedule for socio-demographic characteristics of the respondent and developmental delay in children was assessed with Trivandrum Developmental Screening Chart (TDSC).[9] TDSC consists of seventeen items which are represented as horizontal bars. Left end of the bar represents age at which 3% of the children should have achieved the milestone whereas the right end represents the age by which 97% of the children should have achieved the milestone. A plastic ruler is kept vertically at the level of chronological age of the child being tested. If the ruler is beyond the right end of the horizontal bar, the child has failed to achieve that particular milestone and considered to have developmental delay. The tool has positive predictive value 100% and negative predictive value 96.8%.[10] Those children found to be delayed were referred to early intervention centre.

Information regarding age, gender, birth weight of the baby, family type, parents' education and occupation, socio-economic status, parity, mother's age in completed years at delivery, mode of delivery, place of delivery, gestational duration of pregnancy and birth spacing were collected. Review of documents like mother and child protection card, discharge certificate was done as and when required.

Data analysis

Collected data were entered in MS Excel and was double checked for any erroneous entry and then imported into SPSS (V.23). Basic descriptors of the study subjects were presented in the form of tables and percentages. Chi-square test was done to see any association between developmental delay and basic descriptors. Factors which came out to be significantly associated ($p < 0.05$), were considered as independent variables in multivariable logistic regression model. After necessary tests for assumptions and model fitting, the final model was used to estimate the effect sizes of independent predictors.

Results

Background profile of study subjects

The mean age of study population was 11.5 months (SD ± 5.86) and 51.6% of them were female. 71% of the population belonged to caste other than general caste, majority (68%) of their parents were working, 86% belonged to nuclear family and 95% were from upper-lower socio-economic class according to Modified Kuppuswamy scale updated for 2019.[11] Among the 240 study subjects, 48 (20%) children were low birth weight and 111 (46.3%) were first born.

Prevalence of developmental delay and its determinants

Out of the 240 study subjects, 16 children were found to have developmental delay giving a prevalence of 6.6% (95%CI 3.6-9.8). Bivariate relationships were seen using Chi square test between various socio demographic and pregnancy-related factors and presence of developmental delay [Tables 1 and 2]. Among these factors 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) were found to have significant association whereas age of the child, type of family, paternal education, parental occupation, mother's age at delivery, mode of delivery, gestational duration of pregnancy were not found to be significantly associated.

Binary logistic regression was performed to predict the presence of developmental delay from covariates which were found significantly associated with presence of delay in bivariate analysis. All of them were found to significantly predict developmental delay except gender and birth spacing [Table 3].

Table 1: Relationship between developmental delay and socio-demographic factors

Factors	Total (n=240)	Developmental delay		Test of significance^	
		Present (n=16) n (%)	Absent (n=224) n (%)	χ^2	p
Age (completed months)				1.31	0.30
≤12	132	11 (8.3)	121 (91.6)		
>12	108	5 (4.6)	103 (95.3)		
Gender				4.88	0.03
Male	116	12 (10.3)	104 (89.6)		
Female	124	4 (3.2)	120 (96.7)		
Family Type				0.74	0.49*
Nuclear	208	15 (7.2)	193 (92.7)		
Joint	32	1 (3.1)	31 (96.8)		
Mother's Education				12.46	0.00
Less than primary	61	10 (16.3)	51 (83.6)		
Primary and above	179	6 (3.3)	173 (96.6)		
Father's education				2.82	0.12
Less than primary	116	11 (9.4)	105 (90.6)		
Primary and above	124	5 (4.0)	119 (96.0)		
Mother's occupation				0.01	1.00
Homemaker	164	11 (6.7)	153 (93.3)		
Working	76	5 (6.6)	71 (93.4)		
Socio-economic status				23.3	0.00
Lower	13	5 (38.5)	8 (61.5)		
Upper-lower	227	11 (4.8)	216 (95.2)		

* Fishers Exact test; ^df=1

Table 2: Relationship between developmental delay and pregnancy related factors

Factors	Total (n=240)	Developmental delay		Test of Significance^		
		Present (n=16) n (%)	Absent (n=224) n (%)	χ^2	df	p
Parity				5.70	1	0.02*
<2	111	12 (10.8)	99 (89.2)			
≥2	129	4 (3.1)	125 (96.9)			
Birth Spacing (n=131)#				8.27	2	0.01
Inadequate	95	1 (1.1)	94 (98.9)			
Adequate	36	3 (9.1)	33 (90.9)			
Place of delivery				5.56	1	0.07
Institutional	233	14 (6.0)	219 (94.0)			
Others	7	2 (28.5)	5 (71.5)			
Gestational duration				2.59	2	0.24
Preterm	62	5 (8.1)	57 (91.9)			
Term	174	10 (5.7)	164 (94.3)			
Post-term	4	1 (25.0)	3 (75.0)			
Birth weight				19.35	1	0.00
Normal	192	6 (3.1)	186 (97)			
Low birth weight	48	10 (20.8)	38 (79.2)			
Maternal age at delivery				0.029	1	1.00
≤19 years	49	3 (6.1)	46 (93.9)			
>19 years	191	13 (6.8)	178 (93.2)			

*Fishers Exact test. #first pregnancy excluded

Predictor variables	Categories	Total (*n*=240)	Presence of Developmental Delay-Number (%)	AOR	95% CI
	Table 3: Multivariable logistic regression between significant factors and developmental delay				
Sex	Female	124	4 (3.2)	1.0	0.9-16.7
	Male	116	12 (10.3)	4.0	
Mothers' education	Less than Primary	61	10 (16.3)	5.8	1.6-21.6
	Primary and above	179	6 (3.3)	1.0	
Socio-economic status	Lower	13	5 (38.5)	23.3	3.3-160.9
	Upper-lower	227	11 (4.8)	1.0	
Birth Weight	Normal	192	6 (3.1)	1.0	3.5-66.6
	Low Birth Weight	48	10 (20.8)	15.3	
Birth spacing	Adequate	36	3 (8.3)	1.4	0.25-8.18
	Inadequate	95	1 (1.1)	0.1	0.01-1.66
	Not applicable	109	12 (11.0)	1.0	

Hosmer and Lemenshow goodness of fit test *P*=0.43, Naegelkerke R^2=0.469

Model was found fit (Hosmer-Lemenshow test, p=0.40). 46.9% of variance in the dependent variable can be explained by the independent variables by this model (Nagelkerke R^2).

Discussion

The present study revealed a prevalence of developmental delay 6.6% (95%CI 3.6-9.8) among children of slums aged below two years. Various studies reported prevalence of delay ranging between 1.5% 7.9%,[3,4,12,13] among marginalized population in India using the same screening tool. However, with other scales like Ages and Stages Questionnaire,[14] Denver developmental screening tool,[15] etc., the reported prevalence ranges between 1.5 and 19.8% indicating significant magnitude of the problem. Primary care physician can play a pivotal role in early detection of delay so that effective intervention may be taken at this stage to reduce a long term sequaele. In this study, prevalence of delay among males was higher and bivariate analysis revealed a significance between them which is in consonance with the studies.[3,16-18] However, in the adjusted model, gender did not predict for developmental delay. Larger sample size in other studies may have led to this finding.

Among the biological factors that contribute to developmental delay are birth weight and gestational age and this study finding shows significant association with low birth weight which persisted in binary logistic regression after adjusting with other covariates (AOR 15.5; CI 3.5-66.6). Children with low birth weight may have lower cognition leading to more developmental delay and this is supported by findings in other studies across the globe.[3,19,20] In addition, Palloto *et al.*, Gutbrod *et al.*, Kerstjens *et al.* reported that lower the gestational age at delivery, higher is the risk for having delayed development[21-23] but our study did not find any statistical significance.

Lower level of education among the subject's mother and lower socioeconomic class had higher odds for presence of developmental delay among the study population. Macro environmental factors like these were also found to be significantly associated with developmental delay in other studies.[4,19,24,25] Poverty has impact on all round development of children in slums and thus acts as contributory factor for delay.

Conduction of this study at community level is a major strength of this study. However, the estimate of prevalence and effect sizes for relationships may be affected by the fact that poverty is closely associated with developmental delay and is also a predominant feature in slums. The major limitation of this study was less number of study subjects and shorter duration, follow up could not be done which would ascertain the actual burden in community as development is an ongoing process.

Conclusions

In general, proportion of developmental delay among infants was considerably high in the study area. Emphasis may be given on RBSK and facility-based awareness campaign to promote early diagnosis and interventions for children with delayed milestone.

Declaration of study subjects' consent

The authors certify that they have obtained all appropriate patient consent forms. In the form the study subjects have given his/her/their consent for his/her/their images and other clinical information to be reported in the journal. The study subjects understand that their names and initials will not be published and due efforts will be made to conceal their identity, but anonymity cannot be guaranteed.

Conflicts of interest

There are no conflicts of interest.

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