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Original Research Article

Developmental delay among children below two years of age: a cross-sectional study in a community development block of Burdwan district, West Bengal

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ABSTRACT

Background: Developmental delay is a public health problem worldwide. Globally every year approximately 200 million under-five children exhibit significant delay; 86% being in developing countries. Thus screening and early detection has been emphasized for effective measures. The objectives of the study were to estimate the prevalence of developmental delay among children below two years of age and to determine association of demographic and socio-economic factors.
Methods: A community based cross-sectional study was conducted between July-November 2016 among 2 – 23 months aged children at Bhatar block, Burdwan district. Calculated sample size was 277; considering 9.5% prevalence (as elicited by Meenai et al in Bhopal), 95% confidence interval, 5% absolute error, design effect 2 and 5% non-response. By simple random sampling, one village was chosen from each of the fourteen gram panchayats of Bhatar block and then equal numbers of children from each selected village. Data were collected by interviewing the respondents with a pre-designed schedule. Developmental status was assessed using Trivandrum developmental screening chart. Chi-square test and logistic regression were applied, $p<0.05$ was considered statistically significant.
Results: Overall prevalence of developmental delay was 7.9%. Chi-square test revealed gender ($p=0.04$), birth weight ($p=0.00$), maternal education ($p=0.01$) and place of delivery ($p=0.00$) to have significant association; in logistic regression also these factors remained significant. Gestational duration, age at delivery, socio-economic status had no significant association.
Conclusions: Developmental delay is substantially high among rural children. Larger study with appropriate diagnostic tool might ascertain the actual burden and determinants to indicate necessary measures.

Keywords: Developmental delay, Screening, Trivandrum Developmental Screening Chart

INTRODUCTION

Development is a complex procedure through which a person acquires various capabilities for functioning optimally in a social setting and the process goes on since childhood till death. However, majority of the developmental process takes place within the first few years of life.[1] Generally, development is described into five different domains - gross motor, fine motor, speech and language, cognitive and socio-emotional.[2] Developmental delay is said to occur when a person exhibits a significant delay in the acquisition of milestones or skills, in one or more domains of development.[1] 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.

Various instruments are available for assessing developmental status among children. A simplified version of Bayley scales of infant development named Trivandrum developmental screening chart (TDSC) was prepared and validated for use particularly by the peripheral level health workers in Kerala, India.[3,4] This is also recommended for use under the Rashtriya Bal Swasthya Karyakram (RBSK).[5]

Globally every year 180-200 million under five children exhibits developmental delay and 86% takes place in the developing world like India compared to mere 8% in the developed economies.[6,7] It is common in early childhood affecting at least 10% of the Indian children.[5] Most of the studies have found prevalence of 1.5-2.5% of developmental delay in children under 2 years of age.[4,8,9] A study conducted by Vora et al among children less than 2 years in well baby clinic with TDSC found prevalence of 9.5%.[4,10]

Only mere assessment of developmental milestones of the children under RBSK will not help policy makers to take necessary action; various factors associated with the outcome should also be searched for taking measures. Any delay in development of children and its contributory factors may be suggestive of the need for strengthening the existing programs or the need for exploring and initiating newer possibilities. 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. Field based studies depicting prevalence of developmental delay among children aged less than two years are lacking in West Bengal. In this context, the present study was planned to assess the prevalence of developmental delay among children below two years of age and its associated factors in Bhatar community development block of Burdwan district, West Bengal.

METHODS

Study design and setting

This community based cross-sectional study was conducted at Bhatar block in Burdwan district of West Bengal between July - November, 2016. Bhatar is one of the 31 blocks in the district and is the rural field practice area of the department of Community Medicine, Burdwan Medical College. It is served by one rural hospital, six primary health centres and thirty eight sub-centres. The Bhatar block has fourteen gram panchayats (GP) with one hundred four inhabited villages.

Study population

Children of 2-23 months of age residing continuously for last six months prior to data collection were study population for assessment of developmental delay. Mothers/care givers of the aforesaid children were primary respondents. Mothers unwilling to participate or children absent during the day of visit or severely ill were excluded from the study.

Sample size and sampling technique

Based on 9.5% prevalence of developmental delay elicited by Meenai et al in Bhopal with 95% confidence interval, 5% absolute error, design effect 2 and 5% non-response rate, the sample size became 277.[11] Multistage sampling technique was adopted for choosing the sample. Initially one village was selected by simple random sampling (SRS) from each of the fourteen GP and total sample of 277 children was selected from these selected villages with equal representation by SRS i.e. 277/14 ~ 20 from each villages. Thus, a total 280 children were selected as final sample of the study.

Data collection and assessment

Data were collected at the household level with a predesigned, pretested schedule for socio-demographic variables of the primary respondents and developmental delay of the children was assessed with TDSC.[4] TDSC consists of seventeen items which are represented as horizontal bars. Left side of the bar represents age at which 3% of the children should have achieved the milestone whereas right side represents 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 child fails to achieve any item that lays left side of the vertical line, then the child is considered to have developmental delay.

The selected households were visited only once. Information regarding age, gender, birth weight of the baby, family type, parents' education, 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. Education was categorized into less than primary (illiterate, just literate and up to class III passed) and completed primary education (class IV passed and above). Socio-economic status was assessed as per modified B G Prasad scale (July, 2016).[12] Gestational duration was classified as preterm (babies born before 37 weeks of pregnancy), term (babies born anytime from 37 completed weeks to 42 weeks) and post term (babies born after 42 completed weeks of pregnancy).

Data analysis

Collected data were entered in MS Excel and was double checked for any erroneous entry. Collated data after checking were imported into SPSS software version 20, IBM, New York, USA. 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. Predictors which came out to be significant ($p<0.05$) in chi-square test were analyzed using binary logistic regression test.

RESULTS

22 out of 280 participating children were found to have developmental delay, leading to the prevalence of 7.9% (C.I 4.9 -10.9) (Table 1).

Mean (standard deviation) age of the study population was 11.9 (6.416) months and 59.6% of the children were female. Excluding one respondent, all 279 mothers were homemaker. No family belonged to upper and upper middle socio-economic class as per modified B G Prasad scale (July, 2016). Out of the total sampled population 17.9% children were low birth weight. 177 (63.2%) mothers were primipara.

Table 1: Bivariate analysis between socio-demographic factors and developmental delay.

Factors	Developmental Delay		Total (n = 280)	Bivariate Analysis (χ^2 test applied)
	Present (n = 22)	Absent (n=258)		p value
Age (completed months)				0.23
< 6	8 (14.5)	47 (85.5)	55 (19.6)	
6 – 11	6 (6.4)	88 (93.6)	94 (33.6)	
12 – 17	4 (6.8)	55 (93.2)	59 (21.1)	
18 – 23	4 (5.6)	68 (94.4)	72 (25.7)	
Gender				0.04
Male	14 (11.8)	105 (88.2)	119 (42.5)	
Female	8 (4.8)	153 (95.2)	161 (57.5)	
Birth weight				0.00*
Low Birth Weight	10 (20)	40 (80)	50 (17.9)	
Normal	12 (5.2)	218 (94.8)	230 (82.1)	
Family Type				0.88
Nuclear	9 (7.6)	110 (92.4)	119 (42.5)	
Joint	13 (8.1)	148 (91.9)	161 (57.5)	
Father's education				0.78
Less than primary	8 (6.9)	108 (93.1)	116 (41.4)	
Primary and above	14 (8.5)	150 (91.5)	164 (58.6)	
Mother's education				0.01
Less than primary	13 (15.1)	73 (84.9)	86 (30.7)	
Primary and above	9 (4.6)	185 (95.4)	194 (69.3)	
Father's occupation				0.65
Agricultural worker	10 (9.2)	99 (90.8)	109 (38.9)	
Daily wage labourer	11 (7.6)	134 (92.4)	145 (51.8)	
Employed	1 (3.9)	25 (96.1)	26 (9.3)	
Socioeconomic class#				0.63
Middle	0 (0)	10 (100)	10 (3.6)	
Lower middle	8 (8.5)	86 (91.5)	94 (33.6)	
Lower	14 (8)	162 (92)	176 (62.8)	

→Modified B G Prasadscale (July, 2016), * → Fishers exact test.

Bivariate analysis was done by chi square test between socio demographic and pregnancy related factors and developmental delay (Table 1 and 2). Among these factors gender (p=0.04), birth weight (p=0.00), education of the mother (p=0.01) and place of delivery (p=0.00) were found to have significant association whereas age of the child, type of family, paternal education, parental occupation, socio-economic status of the family, parity, mother's age at delivery, delivery mode, gestational duration of pregnancy and birth spacing came nonsignificant. Subgroup analysis excluding the primiparous mother (n=103) revealed no association with birth spacing (p=0.7).

Binary logistic regression was performed with the four factors which were significant in bivariate analysis and all of them were found to have significant association with developmental delay (Table 3). Model performed well as indicated by Omnibus chi-square test (p = 0.00) and Hosmer-Lemeshow test (p = 0.7). Here independent variables could explain 34.8% of variance in the dependent variable (Nagelkerke R^2).

Table 2: Bivariate analysis between pregnancies related factors and developmental delay.

Factors	Developmental Delay		Total (n = 280)	Bivariate Analysis (χ^2 test applied)
	Present (n = 22)	Absent (n=258)		p value
Parity				0.67
1	15 (8.5)	162 (91.5)	177 (63.2)	
2	7 (8.1)	79 (91.9)	86 (30.7)	
3	0 (0)	17 (100)	17 (6.1)	
Mode of delivery				1*
Normal Vaginal	20 (8.1)	228 (91.9)	248 (88.6)	
Caesarian Section	2 (6.3)	30 (93.7)	32 (11.4)	
Place of delivery				0.00*
Institutional	13 (5.1)	244 (94.9)	257 (91.8)	
Others	9 (39.1)	14 (60.9)	23 (8.2)	
Gestational duration				0.38
Preterm	6 (9.2)	59 (90.8)	65 (23.2)	
Term	15 (7.1)	196 (92.9)	211 (75.4)	
Post term	1 (25)	3 (75)	4 (1.4)	
Maternal age at delivery				0.82
≤ 19 years	7 (9.1)	70 (90.9)	77 (27.5)	
> 19 years	15 (7.4)	188 (92.6)	203 (72.5)	
Birth spacing (n =103)				0.70*
≥ 3 years	2 (4.7)	40 (95.3)	42 (40.8)	
< 3 years	5(8.2)	56 (91.8)	61 (59.2)	

* → Fishers exact test.

Table 3: Multivariate analysis between significant factors and developmental delay

Factors	Adjusted Odds Ratio	Confidence Interval	p value
Gender			0.04
Male	3.3	1.1-10	
Female	1		
Birth weight			0.00
Low Birth Weight	8.3	2.5 -25	
Normal	1		
Mother's education			0.01
Less than primary	5	1.4 -12.5	
Primary and above	1		
Place of delivery			0.00
Others	16	4.8 - 52.9	
Institutional	1		

DISCUSSION

This study revealed a high prevalence of developmental delay 7.9 % (C.I 4.9-10.9) among rural children aged below two years. Various studies reported prevalence of delay ranging between 1.5%-19.8%.[4,8-12]Almost 6 out of 10 children with developmental delay were infants in our study. Early detection might thus likely to provide better outcome. RBSK, launched by government of India is a great step in this direction. Prevalence of developmental delay among rural children showed gender inequality; odds of having developmental delay was higher among male children (AOR 3.3,CI 1.1-10) when adjusted with birth weight, maternal education and place of delivery. This is in concurrence with findings from other studies across the world.[13-17]

Children with birth weight less than 2500 grams are more likely to undergo various cognitive problems. This may precipitate developmental delay among these children. In our study, low birth weight (LBW) was found to have a statistically significant association with developmental delay which persisted in the binary logistic regression after adjustment with gender of the child, maternal education and place of delivery (AOR 8.33,CI 2.5-25). Betty et al and Badshal et al found similar association of

LBW with developmental delay in their studies at USA and Pakistan respectively.[17,18]

Worldwide, several studies noted a significant association of poor parental education with developmental delay.[17,19,20] In our study, we found that developmental delay was associated with low maternal education level but not with the paternal educational level. Mothers with less than primary education had a higher odd (AOR 5,CI 1.4-12.5) of children with developmental problems. Hediger et al reported a similar finding in 2002 while researching the effect of birth weight on delayed development.[21] Betty et al, Guo et al, Rum et al reported role of paternal education on the cognitive growth of the child.[17,19,20] Poor literacy level of mothers probably acts as a barrier in spreading messages related to health education and various maternal and child health related services. This leads to inadequate use of the services provided under various government program making the population vulnerable to risk factors associated with delayed development (e.g., maternal anaemia, undiagnosed seizures during pregnancy). Shaw et al reported a significant association of delayed development of children with teenage pregnancy.[22] It has been observed that educated mothers tend to marry later in life. Thus, a risk factor related to the delay could be avoided with increasing maternal education.

Among biological factors associated with pregnancy, low gestational age may act as a risk factor for cognitive impairment. Palloto et al, Gutbrod et al, Kerstjens et al reported that lower the gestational age higher is the odds for having delayed development.[23-25] However, in the present study, no statistically significant association was found between the two factors. Bhatar being the rural field practice area of Burdwan Medical College and Hospital is under constant supervision and have a better coverage from Maternal Child Health point of view. This leads to a high proportion of term delivery among the beneficiaries which is reflected in the sample population as well (75.4%). Less number of children with low gestational age in the sample population may be a factor for the lack of association found in this study. Non-institutional delivery had 16 times higher odds of having delayed development in this study (AOR 16,CI 4.8-52.9).

Majority of the studies on delayed development were done on institutional set up (eg, Paediatric outdoor, well baby clinic, immunization clinic) leading to impaired generalizability of study findings. Conduction of the study in the household setting is one of the major strength of this study. However, a screening tool has the propensity to report false positives leading to higher prevalence of delay. On the other hand, a single visit for evaluation might leave out cases of delayed development. To counter these limitations, a study with a longer study period using a better diagnostic tool may be planned in future.

CONCLUSION

Our study concludes that developmental delay is still alarmingly high among rural children particularly in West Bengal. It is associated with some modifiable demographic factors like maternal literacy and pregnancy related factors like birth weight of the child, place of delivery; which needs to be addressed accordingly. Moreover, proper implementation of RBSK program is required for early identification of developmental delay and simple screening tool like TDSC could be helpful for this purpose especially at Anganwadi centres.

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REFERENCES

1. Illingworth R. Developmental Testing: An Overview. In: Illingworth Ronald S, Nair MKC, Russell Paul, editors. The Development of the Infant and Young child: Normal and abnormal. 10th edition. Elsevier; 2012: 408.
2. Ghai OP. Normal and abnormal development. In: Ghai OP, Paul Vinod K, BaggaArvind, editors. Essential Pediatrics, Delhi, Thomson Press (India) Ltd; 2010: 23-33.
3. Bayley N. Bayley scales of infant and toddler development (Third edition BayleyIII®) Pearson Assessment, San Antonio; 2005.
4. Nair MK, George B, Philip E. Trivandrum Developmental Screening Chart. Indian Pediatr.1991;28:869-72.
5. Government of India. Ministry of Health and Family Welfare. Rashtriya Bal Swasthya Karyakram (RBSK) - operational guidelines. February, 2013.
6. World Health Organization (WHO). World Health Statistics, 2010. Developmental problems in children. Available at: http://www.who.org Accessed on 27 February 2017.
7. United Nations Children's Fund (UNICEF). Inequities in Early Childhood Development: What the data say. February 2012. Available at: www.unicef.org/statistics Accessed on 22 February 2017.
8. Nair M, Radhakrishnan S. Early childhood development in deprived urban settlements. Indian Pediatr. 2004;41:227-37.
9. Nair M, George B, Padmamohan J, Sunitha R, Resmi V, Prasanna G, et al. Developmental delay

and disability among under-5 children in a rural ICDS Block. Indian Pediatr. 2009;46:75-8.
10. Vora H, Shah P, Mansuri SH. A study on developmental delay among children less than 2 year attending well baby clinic - Prevalence and antecedents factors. Int J Med Sci Public Health. 2013;2:1084-7.
11. Zafar M, Sheela L. A study on Prevalence & Antecedents of Developmental delay among Children less than 2 years attending Well Baby Clinic. People's J Sci Res. 2009;2(1):9-12.
12. Sadat AS, Balaji PA, Dhaded SM, Goudar SS. Assessment of growth and global developmental delay: a study among young children in a rural community of India. Int Multidisciplinary Res J. 2011,1(7):31-4.
13. Mangal A, Kumar V, Panesar S, Talwar R, Raut D, Singh S. Updated BG Prasad socioeconomic classification, 2014: A commentary. Indian J Public Health. 2015;59:42-4.
14. Der-Chung L, Yen-Cheng T, How-Ran G. Gender and geographic differences in developmental delays among young children: Analysis of the data from the national registry in Taiwan. Res Developmental Disabilities. 2011;32(1):63–9.
15. Lisbeth V, Wentzel-Larsen T, Hofoss D, Slinning K. Prevalence of suspected developmental delays in early infancy: results from a regional population-based longitudinal study. BMC Pediatr. 2015;15:215.
16. Simpson GA, Colpe L, Greenspan S. Measuring functional developmental delay in infants and young children: prevalence rates from the NHIS-D. Paediatr Perinat Epidemiol. 2003;17(1):68–80.
17. Vohr BR, Wright LL, Dusick AM, Mele L, Verter J, Steichen JJ, et al. Neurodevelopmental and Functional Outcomes of Extremely Low Birth Weight Infants in the National Institute of Child Health and Human Development Neonatal Research Network 1993-1994. Pediatrics. 2000;105(6):1216-26.
18. Badshal S, Mason L, McKelvie K, Payne R, Lisboa PJ. Risk factors for low birth weight in the public-hospitals at Peshawar: NNFP-Paskistan. BMC Publ Health. 2008;8:197.
19. Guo G, Harris KM. The mechanisms mediating the effects of poverty on children's intellectual development. Demogr. 2000;37(4):431–47.
20. Rhum CJ. Parental employment and child cognitive development. J Human Resources. 2004;39(1):155–92.
21. Hediger ML, Overpeck MD, Ruan WJ, Troendle JF. Birthweight and gestational age effects on motor and social development. Paediatr and Perinatal Epidemiol. 2002;16(1):33–46.
22. Shaw M, Lawlor DA, Najman JM. Teenage children of teenage mothers: psychological, behavioural and health outcomes from an Australian prospective longitudinal study. SocSci Med. 2006;62(10):2526–39.
23. Palloto EK, Kilbride HW. Perinatal outcome and later implications of intrauterine growth restriction. Clin Obstet Gynecol. 2006;49(2):257–69.
24. Gutbrod T, Wolke D, Soehne B, Ohrt B, Riegel K. Effects of gestation and birth weight on the growth and development of very low birth weight small for gestational age infants: a matched group comparison. Arch Dis Child Fetal Neonatal Ed. 2000;82:208–14.
25. Kerstjens JM, de Winter AF, Sollie KM. Maternal and pregnancy-related factors associated with developmental delay in moderately preterm-born children. Obstet Gynecol. 2013;121:727-33.

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