ORIGINAL RESEARCH ARTICLE
pISSN 0976 3325 | eISSN 2229 6816
Open Access Article
www.njcmindia.org

Prevalence of Developmental Delay and Factors Affecting the Development Status among Under 5 Children in an Urban Slum of Agra City

Disha Agarwal[1], Shailendra Singh Chaudhary[2], Sandeep Sachdeva[2], Sunil Kumar Misra[3], Prashant Agarwal[4]

Financial Support: None declared
Conflict of Interest: None declared

How to cite this article:
Agarwal D, Chaudhary SS, Sachdeva S, Misra SK, Agarwal P. Prevalence of Developmental Delay and Factors Affecting the Development Status among Under 5 Children in an Urban Slum of Agra City . Natl J Community Med 2018;9(7):474-479

Author's Affiliation:
[1]Junior Resident; [2]Lecturer; [3]Professor & Head, Dept of Community Medicine, SN Medical College, Agra; [4]Senior Resident, Dept of Anaesthesiology, SGPGIMS, Lucknow

Correspondence
Dr. Disha Agarwal
agarwaldisha04@gmail.com

Date of Submission: 23-07-17
Date of Acceptance: 25-07-18
Date of Publication: 31-07-18

ABSTRACT

Background: Development during the early childhood, especially from fetus to two-year-old, is crucial in determining the nutrition, health and productivity status in the whole life course. The study was conducted to assess the developmental milestones' achievement of the children under study and also to find the association any between nutritional status and developmental achievement.

Material & methods: A cross sectional community based study was conducted among under 5 years age children, in an urban slum of Agra. Nutritional status was assessed and classified as per WHO 2006 Growth Standards. Developmental Milestone Chart (DMC) was used to assess the childhood developmental status.

Results: Overall 12.2 % of the children were found to be developmentally delayed. Prevalence of developmental delay increased significantly from infancy (0-11 months) (5.7 %) to 12-23 months of age, peaking at 12-23 months age (20.3 %), thereafter showing a decreasing trend to 15.3 % as the age of the child increased to more than 2 years. There was a close positive link observed between the nutritional status of the children and their development status. Mothers' education and low birth weight of the child were found to be significant influences on children's development.

Conclusion: Childhood nutrition has received due attention, but the overall development of the child needs more focus.

Keywords: Malnutrition, Underweight, Stunting, Wasting, Developmental delay.

INTRODUCTION

Development during the early childhood, especially from fetus to two-year-old (the first 1,000 days since life starts), is crucial in determining the nutrition and health status in the whole life course. Brain and nervous system development begins early in pregnancy and is largely complete by the time the child reaches the age of 2.[1] The timing, severity and duration of nutritional deficiencies during this period affect brain development in different ways, influenced by the brain's need for a given nutrient at a specific time.[2]While the developing brain has the capacity for repair, it is also highly vulnerable, and nutrient deficiencies during critical periods have long-term effects.[3]. A poor start in life can lead to poor health, nutrition, and inadequate learning, resulting in low adult productivity. Because of this poor start, affected individuals are estimated to suffer a loss of about a quarter of average adult income per year while countries may forfeit up to twice their current GDP expenditures on health and education.[2] Negative consequences impact not only present but also future generations.

More than 200 million children under 5 years of age in developing countries do not reach their developmental potential.[2,3]Various studies have esti-

mated a staggering 43 percent of children under five years of age—around 250 million—living in low- and middle-income countries at risk of suboptimal development due to poverty and stunting. The burden is currently underestimated because risks to health and wellbeing go beyond these two factors.[2]

There can be no two opinions to the fact that in order to address the problems of malnutrition and developmental delay appropriately among vulnerable population groups, the same need to be measured with suitable study instruments that in turn, warrant good reproducibility and validity to understand the needs of the children in the society and to tackle the problem. Thus, with the objective to assess the developmental milestones' achievement of the children under 5 years age and to analyze the bio social factors affecting the developmental achievement and also to find the association if any between nutritional status and development, the following study was conducted.

MATERIAL AND METHODS

The present study was a cross-sectional study carried out inthe urban field practice area of Department of the Social and Preventive Medicine, S.N. Medical College, Agra from June 2012 to July 2013[4]. With prevalence of malnutrition in under 5 children in Uttar Pradesh reported by NFHS 3,[5] 2005 as 42.4%, maximum allowable error of 15%, a minimum sample size of 458 was calculated. Simple random sampling was done to achieve the desired sample size. Informal verbal consent was taken from the parents of the study subject. Subjects whose parents did not consent to being a part of the study, who were very sick or those who were unavailable at two consecutive visits were excluded from the study.

Information regarding pertinent variables to the child's nutrition were recorded on a predesigned, pretested, semi structured questionnaire. Mother was chosen as the preferred responder, if mother was not available grandmother or father or any elderly was chosen as the responder. The exact age in months of the child was computed from the child's date of birth as told by respondent. When the exact date of birth was not known, the age as told by respondent was used, corrected to the nearest month.

Anthropometry: Height and weight measurements were recorded following standard techniques. Weight was measured using the weighing scale specially for children under 5 years of age, supplied to the Aganwadi workers under ICDS by GoI. Zero error was checked and adjusted for before every measurement. The weighing scale used could measure maximum 25 kg weight, closest to 100 gm. The weighing scale was standardized after every 50 measurements by using known weights. Weight of the subjects was measured with minimal clothing and bare feet. The supine length for children up to two years of age was recorded to the nearest of 0.1 cm using an infantometer. For children aged >2 years, height was measured by stadiometer.

Assessment of Nutritional Status: The nutritional status of the children was assessed by plotting the weight and height of the children on WHO 2006 Growth Standards growth charts using z - scores. Children falling below the -2 S.D. cut off were considered to be underweight (weight for age), stunted (height for age) and wasted (weight for height).

Development status: To assess the childhood developmental status, a simple, easily visible, one-page Developmental Milestone Chart (DMC)[6] was used. The design of the DMC was based on using age-group expectation of milestones rather than linear listing of milestones by chronological age. The following age groups were selected for inclusion: Months: 1–3,4–6, 7–9, 10–12, 13–15, 16–18, 19–23; and Years: 2–3, 3–4, 4–5. This design of the DMC was used so that the instrument could enable brief evaluations through a simple check-off of the appropriate age group. A total of 50 representative developmental milestones have been identified for these age groups in the following categories: gross motor, fine motor, language and speech, and social development. Milestone items have been selected and modified from those existing in the Denver Developmental Screening Test, Denver II, and the Center for Disease Control and Prevention's National Center for Birth Defects and Developmental Disabilities, as well from the personal experience of Cambodian physician-trainees and staff, and from a Cambodian dissertation study of child development (Chanpheaktra, 2008).[6]The scale was adapted as per the local requirements.

Ethical approval was taken from Institutional Ethical Committee before commencing the study.

Statistical Analysis: The data thus collected was analyzed by using SPSS & EXCEL package. Using appropriate statistical tests significance of differences in the outcome variable was measured.

RESULTS

Overall 12.2 % of the children were found to be developmentally delayed. Development status of the children was found to be significantly associated with the age of the child. The prevalence of developmental delay increased significantly from infancy (0-11 months) (5.7 %) to 12-23 months of

Table 1: distribution of developmental status in relation to age of the child

Age Group (months)	Development		Total	P value
	Delayed (%)	Normal (%)		
0-11	6 (5.7)	82 (94.3)	35	0.0053
12-23	24 (20.3)	94 (79.7)	118	
>=24	26 (15.3)	226 (84.7)	85	
Total	56 (12.2)	402 (87.8)	458	

Table 2: distribution of developmental status of the child in relation to various nutritional factors

Factors	Development		P value
	Delayed (%)	Normal (%)	
Weight /Age			
Normal (262)	17(6.5)	245(93.5)	0.000
Underweight (196)	39(19.9)	157(80.1)	
Height or Length/Age			
Normal (266)	27(10.2)	239(89.8)	0.110
Stunted (192)	29(15.1)	163(84.9)	
Weight /Height or Length			
Normal (354)	35(9.9)	319(90.1)	0.005
Wasted (104)	21(20.2)	83(79.8)	

Table 3: distribution of developmental status of the child in relation to various biological factors

Factors	Development		P value
	Delayed (%)	Normal (%)	
Sex			
Female (244)	29(11.9)	215(88.1)	0.812
Male (214)	27(12.6)	187(87.4)	
Birth weight			
Normal (341)	31(9.1)	310(90.9)	<0.001
Below normal(117)	25(21.4)	92(78.6)	
Cry after birth			
Immediate (429)	48(11.2)	381(88.8)	0.009
Delayed (29)	8(27.6)	21(72.4)	
Congenital malformation			
Present (8)	2(25)	6(75)	0.266
Absent (450)	54(12)	396(88)	
Duration of gestation			
Term (430)	52(12.1)	378(87.9)	0.731
Preterm (28)	4(14.3)	24(85.7)	

Table 4: distribution of developmental status of the child in relation to various social factors

Factors	Development		P value
	Delayed (%)	Normal (%)	
Social class			
I,II,III (100)	12(12)	88(88)	0.9203
IV,V (358)	44(12.3)	314(87.7)	
Mother's education			
Illiterate (240)	38(15.8)	202(84.2)	0.0199
Literate (218)	18(8.3)	200(91.7)	
Family size			
2-5 (218)	33(15.1)	185(84.9)	0.007
6-9 (158)	9(5.7)	149(94.3)	
>=10 (82)	14(17.1)	68(82.9)	
Health problem during pregnancy			
Yes (53)	8(15.1)	45(84.9)	0.498
No (405)	48(11.9)	357(88.1)	
Antenatal checkup			
Yes (398)	48(12.1)	350(87.9)	0.779
No (60)	8(13.3)	52(86.7)	

age, peaking at 12-23 months age (20.3 %). Further on, the prevalence of developmental delay decreased significantly to 15.3 % as the age of the child increased to more than 2 years (**Table 1)**.

Table 2 shows that a significantly higher prevalence of developmental delay was seen in underweight (19.9 %) and wasted children (20.2 %)as compared to children having normal weight for their age (6.5 %) and normal weight for their height (9.9 %). It was also found to be more prevalent among stunted children (15.1 %) as compared to normal children (10.2 %), though the association was not statistically significant.

Table3 shows association of development status of the child with biological factors. Developmental delay was found to be almost equally distributed between males (11.9 %) and females (12.6%). However, it was found to be significantly associated with the children's birth weight and with history of delayed cry after birth. A significantly higher percentage of children who were reported to have been born with below normal birth weight were found to be developmentally delayed (21.4%) as compared to those born with normal birth weight (9.1%) and a significantly higher percentage of children who had history of delayed cry after birth were found to have delayed development status (27.6%) as compared to children with normal immediate cry after birth(11.2%).

The prevalence of development delay was almost double among children who had congenital malformation (25 %) as compared to the children who did not have congenital malformation (12%), and was also higher among children who were born preterm (14.3 %) as compared to the children who were born term (12.1 %), although the difference was statistically insignificant.$p<0.05$

Table 4 shows distribution of developmental status of the child in relation to social factors. The prevalence of developmental delay was almost equal irrespective of whether the child belonged to higher social class (12 %) or to lower social class (12.3%).

A significantly higher percentage of children of illiterate mothers were found to be developmentally delayed (15.8 %) as compared to children whose mothers were literate (8.3 %).

Developmental delay was found to be significantly higher if family size was less than six (15.1 %) or more than ten (17.1 %) as compared to families which had 6-9 family members (5.7 %).

A higher prevalence of developmental delay was observed among children whose mothers had health problem during pregnancy (15.1 %) as compared with children whose mothers did not have

Table 5: Stepwise binary logistic regression analysis for selected dependant variables with respect to developmental delay

Variables	Estimated coefficient	SE of estimate	Odds ratio	P value
Weight for age	0.920	0.335	2.508	.006
Weight for height	0.306	0.333	1.358	.359
Family size	-0.116	0.195	0.891	.553
Maternal education	-0.247	0.120	.781	.040
Birth weight	0.775	0.307	2.171	.012
Cry after birth	0.639	0.448	1.895	.153

any health problem during pregnancy (11.9 %), though the difference was not statistically significant.

Prevalence of developmental delay was slightly higher, although not statistically significantly, among children whose mothers did not go for antenatal checkup (13.3 %) as compared to children whose mothers did go for antenatal checkup (12.1 %).

On applying stepwise binary logistic regression analysis for selected dependant variables with respect to developmental delay, factors like underweight (Odd's ratio 2.508), illiterate mother (Odd's ratio 0.781), and low birth weight (Odd's ratio 2.171), were found to be significantly associated with developmental delay of the child (**Table 5**).

DISCUSSION

In the present study, Overall 12.2 % of the children were found to be developmentally delayed. In India, it has been stated that developmental delays affect nearly 10% of children in early childhood[7]. Similarly in a community-based cross-sectional study carried out in 520 children in Delhi, for assessing Development using the Indian Council for Medical Research Development Screening Test, 10.6% of children <5 years old were found to be developmentally delayed.[8]

Age wise trends of development delay, similar to that found in the present study were found by **Zafar Meenai, Sheela Longia (2009)[9]**. In a Cross Sectional study by **Sachdeva et al (2010)** on Global Developmental Delay and Its Determinants Among Urban Infants and Toddlers**, t**he trend was of a marginal decline in the proportion of this group of children (from 7.0% to 6.2%) as the age group progressed from 0–12 months to 12–24 months, only to exhibit a steep fall to 3.5% in the 24–36 months age group .More girls were affected in comparison to boys among the 0–12 months age group. [10] In An observational cross sectional study conducted during the period of June 2017-Jan2018 in the clinical posting of department of physical therapy composite regional bemina Srinagar Jammu and Kashmir, India, Developmental delay was detected 39.1% of the study population. Over all incidence of developmental delay differ significantly among the various age groups but maximum was detected in the age group of >24-36 months. [11]

BIOLOGICAL FACTORS

In the present study development status of the children was found to be significantly associated with their birth weight and child's cry after birth. Delayed cry after birth, an indicator of birth asphyxia was also found to be associated with developmental lagby **Sachdeva et al (2010).[10]**

The impact of malnutrition on the developmental status of the child, as assessed in the present study was also seen in a study conducted in an urban slum in Delhi (**Meenakshi et al, 2005**).[12] Similarly, **Sachdeva et al** (2010) also reported that undernutrition (PEM) could be attributed as the major cause (21%) of developmental delay.[10] **Vazir et al** also observed early attainment of milestones in children with more than equal to 75% of standard weight for age in Hyderabad rural children (0-6yr). [13] Low Nutrient intake has been found to be associated with developmental delay .[14]

In the present study social class of the family to which the child belonged did not seem to have any significant impact on the child's development, however, more number of children of illiterate mothers were found to be developmentally delayed as compared to children whose mothers were literate. A significantly higher percentage of children of illiterate mothers were found to be developmentally delayed by **Meenakshi et al, 2005[12]**who observed that as the socio-economic status improved the percentage of infants achieving milestones in time showed a declining trend except for the irregular variation in gross motor milestones i.e., improvement in the development of infants as the socio-economic status was improving. This may be attributed to the effect of socio-cultural milieu and regional variation. Socio economic status was found to be associated with developmental delay[15].

Development status of the child was found to be significantly associated with the family size of the child. In the study conducted by **Sachdeva et al**

(2010) variables pertaining to home environment like social class and literate mother were found to be positive deviants towards developmental performance in these children.[10]

Meenakshi et al, 2005 observed that the percentage of infants achieving milestones in time (gross motor, vision and fine motor, hearing language and concept development and self help skills) was not influenced by the literacy status of the mother. Such difference could be due to variation in the infant rearing practices, directly affected by environment and culture which has nothing to do with the literacy of mothers.[12]

On applying stepwise binary logistic regression analysis for selected dependant variables with respect to developmental delay, factors like underweight (Odd's ratio 2.508), illiterate mother (Odd's ratio 0.781), and low birth weight (Odd's ratio 2.171), were found to be significantly associated with developmental delay of the child.

Other factors such as wasting, family size and cry after birth which were found to be significantly associated with the developmental performance of the child on univariate analysis were not found to be significantly associated on applying stepwise binary logistic regression analysis.

Under weight, which is a composite indicator of acute and chronic malnourishment, was found to be significantly associated with development delay, thus emphasizing the importance of proper nutrition in appropriate development of the child.

Delayed cry after birth was not found to be significantly associated with the developmental performance of the child, which could be because of poor history given by the mother as well as evidence showing resuscitation of child with 100 % oxygen without affecting the neurodevelopment of the child.

CONCLUSION

As many as 12.2 % children were found to be developmentally delayed. Development status of the children was found to be significantly associated with the age of the child. There was a close positive link observed between the nutritional status of the children and their development status. Mothers' education and low birth weight were found to be important influences on children's development. Thus, to ensure proper and timely development of children, it is essential to give due emphasis on the observed associated factors especially those that are modifiable, and take appropriate corrective measures. Ensuring skilled attendance at birth can also be instrumental in averting significant birth asphyxia and thereby consequent developmental lag that may ensue. Under developed child will be a predecessor of an under developed society, which is definitely not desirable.

The nutrition of the children has received due attention, but the overall development of the child has been a neglected zone. Though the two are inter dependent factors, still it is time that we give the much needed attention to the overall development of the child also.

REFERENCES

1. Black M. M., Walker, S. P., Fernald, L. C. H., Andersen, C. T., Digirolamo, A. M., Lu, C., … Grantham-Mcgregor, S. (2017). Advancing Early Childhood Development: from Science to Scale 1 Early childhood development coming of age: science through the life course. The Lancet, 389, 77–90. https://doi.org/10.1016/S0140-6736(16)31389-7
2. Advancing Early Childhood Development: from Science to Scale An Executive Summary for The Lancet's Series. (n.d.). Retrieved from https://www.thelancet.com/pb-assets/Lancet/stories/series/ecd/Lancet_ECD_Executive_Summary.pdf
3. Improving Child Nutrition- The achievable imperative for global progress. (n.d.). Retrieved from https://www.unicef.org/gambia/Improving_Child_Nutrition_-_the_achievable_imperative_for_global_progress.pdf
4. Agarwal D., Misra, S. K., Chaudhary, S. S., & Prakash, G. (2015). Are we Under estimating the Real Burden of Malnutrition? An Experience From Community-Based Study. Indian Journal of Community Medicine□: Official Publication of Indian Association of Preventive & Social Medicine, 40(4), 268–272. https://doi.org/10.4103/0970-0218.164401
5. India National Family Health Survey (NFHS-3) Volume II. (n.d.). Retrieved from https://dhsprogram.com/pubs/pdf/frind3/frind3-vol2.pdf
6. Scherzer Alfred L. .Experience in Cambodia With the Use of a Culturally Relevant Developmental Milestone Chart for Children in Low- and Middle-Income Countriesjp. Journal of Policy and Practice in Intellectual Disabilities ,Volume 6 ,Number 4, pp 287–292 December 2009
7. Rashtriya Bal Swasthya Karyakram. Ministry of Health and Family Welfare, Government of India; 2013. Available from: http://www.mdm.nic.in/Files/School%20Health%20 Programme/Nutrition_Support/Rastriya_Bal_Swaasthya_ Karyakram.pdf.
8. Dabar D., Das, R., Nagesh, S., Yadav, V., & Mangal, A. (2016). A Community-based Study on Growth and Development of Under-Five Children in an Urbanized Village of South Delhi. Journal of Tropical Pediatrics, 62(6), fmw026. https://doi.org/10.1093/tropej/fmw026
9. Meenai Z, Longia S A study on Prevalence & Antecedents of Developmental delay among Children less than 2 years attending Well Baby Clinic
10. Sachdeva S& Amir A & Alam S & Khan Z & Khalique N & Ansari M.A. . Global Developmental Delay and Its Determinants Among Urban Infants and Toddlers: A Cross Sectional Study(2009). Indian J Pediatr (2010) 77:975–980.
11. Dar J A (2018). Developmental Delay and Disability among 0-6 Year Children in Rural and Urban Kashmir India. International Journal of Indian Psychology, Vol. 6, (1), DIP: 18.01.097/20180601, DOI: 10.25215/0601.097

12. Meenakshi, Pradhan S K, Prasuna J G. A cross-sectional study of the association of postnatal growth and psychosocial development of the infants in an urban slum of Delhi. Indian J Community Med 2007;32:46-8.

13. Vazir S, Naidu AN, Vidyasagar P. Nutritional status, Psychosocial development and the home environment of Indian rural children. IndPediatr 1998; 35:959-966.

14. Siegel EH, Stoltzfus RJ, Kariger PK, Katz J, Khatry SK, LeClerq SC, et al. Growth indices, anemia, and diet independently predict motor milestone acquisition of infants in south central Nepal. J Nutr 2005;135:2840-4.

15. Kolobe, T. H. (2004). Childrearing Practices and Developmental Expectations for Mexican-American Mothers and the Developmental Status of Their Infants. Physical Therapy, 84(5), 439–453. https://doi.org/10.1093/ptj/84.5.439

16. Gupta A, Kalaivani M, Gupta SK, Rai SK, & Baridalyne Nongkynrih. (n.d.). The study on achievement of motor milestones and associated factors among children in rural North Indi. Retrieved from http://www.jfmpc.com/temp/JFamMedPrimaryCare52378-1180251_031642.pdf

17. Hack, M., & Costello, D. W. (2007). Early childhood development: the global challenge. Clin Perinatol Semin Fetal Neonatal Med Pediatrics Martin JA, 33(7), 251–267.

18. Lo, S., Das, P., & Horton, R. (2017). A good start in life will ensure a sustainable future for all. Comment 8 Www. Thelancet. Com, 389. https://doi.org/10.1016/S0140-6736 (16) 31774-3

19. Park K. Textbook of Preventive and Social Medicine. 22nd ed. Jabalpur: M/s Banarsidas Bhanot; p. 563.

20. Kishore J. National Health Programs of India. 11th ed. India: Century Publications; p. 461.