International Journal of Medical Science and Clinical Research Studies

ISSN(print): 2767-8326, ISSN(online): 2767-8342

Volume 02 Issue 10 October 2022

Page No: 1110-1115

DOI: https://doi.org/10.47191/ijmscrs/v2-i10-19, Impact Factor: 5.365

A Prospective Observational Cross-Sectional Study on Developmental Delay and Associated Socioeconomic, Demographic and Clinical Factors among Apparently Neurologically Normal Children Aged 2 Months to 36 Months in Eastern India

Rahul Ghosh[1], Sudip Saha[2]

[1]MD (Paediatrics), Senior Resident, Dept. of Pediatrics, Chittaranjan Seva Sadan, Kolkata-26, West Bengal, India.

[2] Associate professor, MD (Paediatrics), Dept. of Pediatrics, Chittaranjan Seva Sadan, Kolkata-26, West Bengal, India.

ABSTRACT

INTRODUCTION: Prevalence estimates for developmental delay are scarce for eastern India. The main objective of the study was to estimate the prevalence of developmental delay amongst apparently neurologically normal children admitted to the general paediatrics ward. We also aimed to ascertain associations between developmental delay and known or suspected precedents and risk factors for developmental delay.

METHODS: A prospective, cross-sectional and observational study was conducted on in-patients in the general paediatrics ward. A pretested and predesigned questionnaire was administered to the attendant on the day of the discharge. Information was gathered regarding patients' demographics, parent's socio-economic and educational status, relevant history that is known or suspected to cause developmental delay. Achievement of developmental milestones was assessed as per the Trivandrum Development Screening Chart (TDSC) for 0-3 years. Chi-square tests were done and $p<0.05$ was considered statistically significant.

RESULT: The prevalence of developmental delay was 23.13% amongst 134 children. Developmental delay had a significant association with child's age (p-value:0.0007), preterm delivery (p-value:0.0012), histories of birth asphyxia (p-value:0.0066) and neonatal seizure (p-value:0.0093).

CONCLUSION: A significant proportion of apparently normal children have developmental delay. Measures to detect these cases can help to institute early intervention and prevent long-term sequelae.

ARTICLE DETAILS

Published On:
25 October 2022

KEY WORDS: Developmental delay; neurologically normal; prevalence; Trivandrum Development Screening Chart

Available on:
https://ijmscr.org/

INTRODUCTION

Development in humans is a complex multifactorial process which continues from the cradle to the grave. A major chunk of it is completed in the first few years of life [1]. Any significant delay in achieving the milestones in even one domain constitutes developmental delay. The multitude of negative impacts that developmental delay has on children has been well described in numerous studies.[2,3]

Previous research has well established the fact that intervention programs are economical and cost-effective, have possible lifelong benefits and are most effective when started early [4,5,6,7,8]. Whilst prevalence estimates are scarce in the Indian context, it is estimated that at least 10% of Indian children are affected by it in early childhood [9]. While most studies in under-2-year children have found a prevalence of 1.5 to 2% [10,11,12], a clinic-based study in Bhopal by Zafar Meenai and Sheela Longia found a prevalence of 9.5% using the TDSC [13]. Albeit numerous isolated studies have been done in various parts of our country to study the status of developmental delay in children, to the best of our knowledge, an exhaustive database on it for eastern India is still absent.

Therefore, the main objective of this study was to estimate the prevalence of developmental delay among apparently neurologically sound children aged 2 months to 36 months admitted in the in-patient ward of our department. Additionally, this study aimed to investigate the association between developmental delays and the various known precedents and risk factors for developmental delay because only assessment for developmental delay in children (as is practiced under RBSK) will not help policy makers take reformative or corrective action in the form of either course corrective measures for already implemented schemes and programs or formulation and implementation of new ones; various factors associated with developmental delay should also be investigated before taking measures.

METHODS

It was a prospective, observational and cross-sectional study conducted in a tertiary care hospital in eastern India for a period of 1 year (2020 to 2021). Clearance was taken from college ethical committee and scientific committee before commencement.

Children included in the study were those who had completed 2 months of age up to the completion of the 36th month of life, had a healthy general condition and were admitted as in-patients in the general paediatrics ward of the hospital. We excluded children who had otoacoustic emission studies suggestive of hearing loss, were receiving any anticonvulsant medication, were syndromic or dysmorphic, had obvious developmental delay related to neurological causes, had known chromosomal abnormality or congenital malformations, were severely ill, provisionally diagnosed as having an underlying neurological condition in the current hospital stay, suffering from or having a history of severe acute malnutrition or whose mothers who did not give consent for the study.

Assuming a 9.5% prevalence of developmental delay as shown by Meenai and Longia in Bhopal, a 95 percent confidence interval, absolute precision of 5 %, and design effect of 1, sample size was calculated to be 133 using the software OpenEpi (version 3.01, updated 2013/04/06) available on https://www.openepi.com/SampleSize/SSPropor.htm

For the purpose of the study following operational definitions were used.

Developmental delay was defined as failure to achieve any age-appropriate milestones as per the TDSC (0-3years). Nuclear family was one comprising single married couple with or without their unmarried children[14]. Joint family was one comprising 2 or more married couples of a single generation (horizontal level) or 3 or more couples if multiple generations (vertical levels) [14]. Occupations were divided into 4 categories [15] viz.

- Skilled – Workers involved in work that requires no specific education or experience.
- Semi-Skilled – Workers possessing some skills but not enough to do specialized work. They are involved in work that requires paying attention to detail or protecting against risks but it doesn't include complex job duties.
- Unskilled – Involved in work that requires workers to use their judgment to make decisions. May require workers to measure, calculate, read, or estimate. Often need specific educational degrees or professional training.
- Professional - Individuals with the highest level of knowledge-based education and managerial skills.

In-patients who fit our inclusion and exclusion criteria and were scheduled to be discharged on that day were selected for the study. The care giver of these children was informed about the study including all the possible benefits and side effects and their right to refuse. A predesigned and pretested questionnaire was administered to consenting patients' care givers after collecting written informed consent. Pretesting was performed beforehand with 15 children to examine the feasibility of the questionnaire, and appropriate modifications were made.

We collected data regarding their demographics, socioeconomic condition & education status of parents and relevant antenatal, natal, and postnatal history that is known or suspected to cause developmental delay, on a predesigned data abstraction form. Developmental delay was assessed based on TDSC for 0-3 years.

TDSC originally consisted of 17 items and was used for children aged 2years or less.

TDSC was expanded upon by Chuahan VH, Vihekar KY and Kurundwadkar M in their original research published in the New Indian Journal of Pediatrics in 2016 [16]. They developed a modification of the original TDSC for children of 0-3 years age and validated it against the Denver Development Screening Test (DDST) as the reference standard. They included 27 items in this TDSC. A cross sectional study was done on 400 children in the well-baby clinic which found that single item delay on TDSC (0-3y) had a sensitivity of 86.7% and specificity of 100% with negative predicate value of 99.5% for detecting developmental delay. We used this modification of the original TDSC.

Each anthropometric parameter was measured thrice, and the average value was calculated and recorded.

Weight was measured on a tared electronic weighing scale with minimal clothing over child's body, using a Hicks W8-101 electronic weighing scale. Weight was recorded to the nearest 10gm.

Height or length were measured using Infantometer (for children <2 years of age) or Stadiometer (for children >2 years of age), to the nearest 0.1cm. For length measurement,

the child was laid on an infantometer with his or her head placed firmly against the fixed hardboard and with child looking forward. The knees were kept extended with the help of firm pressure applied over them, and the feet were kept flexed at right angles to the legs and placed on the board. For height measurement, the child was made to stand on a stadiometer with the back of the head, shoulder blades, buttocks and heels touching the fixed board and both feet together and knees and hips in extension. The child was made to look straight forward and the sliding headpiece was brought down so as to barely touch child's head. This was taken as height, measured to the nearest 0.1cm.

A non-stretchable flexible measuring tape and body marking pencil were used to measure for head circumference, chest circumference and mid upper arm circumferences.

Head circumference was measured by passing the measuring tape over the superciliary border, above the ears and around the prominence of the occiput, to the nearest 0.1cm.

Chest circumference was measured at the level of the nipple in end expiration, to the nearest 0.1cm.

MUAC was measured as the circumference of the left arm midway between the tip of the acromion process and the olecranon process with the forearm hanging down.

All measurements were taken using the measuring tape cross-over technique.

Collected data was entered in Excel datasheet of Microsoft office version 2019 (office 365) and was double checked for any erroneous entry. Collated data after checking were imported into SPSS software version 26, IBM, New York, USA. Subsequently suitable statistical analysis was done.

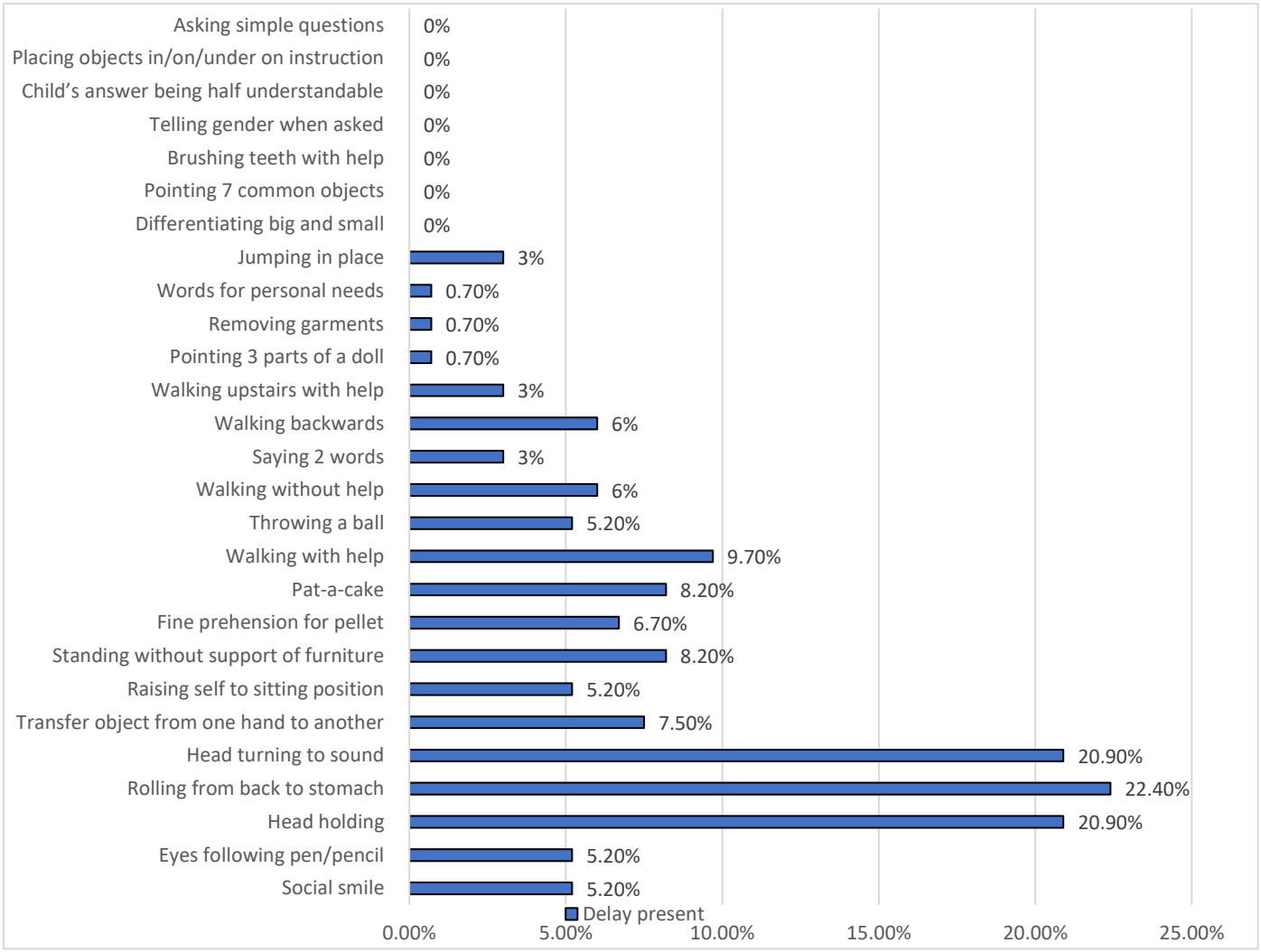
RESULTS

Developmental delay was found in 31 children out of 134 included in our study, giving a prevalence of 23.1%. The study population had 49.3% males, 52.2% were aged 2-12 months, 63.4% belonged to nuclear families, 41% of mothers and 29.9% of fathers had completed secondary education, 91.8% of mothers were housewives, 56.7% were semi-skilled workers, 38.8% belonged to middle socioeconomic class as per modified B.G. Prasad scale for January 2019, 38.1% had birth weight below 2.5kg, majority (54.5%) of the mother had parity 1, 17.2% of the mother had their child birth at age of <20 years, 60.4% were born by vaginal delivery, 84.3% were institutional deliveries, 1.5% were born early preterm and 29.1% were born late preterm, 64.2% were first order babies, 60.4% had birth spacing between 1-2y.

11.9% were underweight, 7.5% were severely underweight, 13.4% were stunted, 2.2% were severely stunted, 11.2% were wasted and 11.2% were severely wasted, 9% had microcephaly,

None of the children's mothers had any exposure to harmful drugs or toxins during pregnancy. 1 mother had a prenatal infection. 11.9% of the children had history of birth asphyxia, 1.5% had neonatal seizures, 2.2% had neonatal meningitis, 9% had respiratory problems in neonatal life, 1.5% had congenital cardiac anomaly, 4.5% had neonatal sepsis and 9% had neonatal hyperbilirubinemia.

Diagram 1: Distribution of various types of developmental delay (n=134).



Above diagram show distribution of various types of development delay in the study population.

Age of the child had a statistically significant association with developmental delay. The proportion of development delay is more in 13–24-month age group (48.4%) as compared to 2–12-month age group (14.3%) or 25–36-month age group (18.2%) and the results are statistically significant (p-value < 0.001). Neonatal seizure and birth asphyxia had statistically significant association with developmental delay. P values is 0.007 and 0.009 respectively. The proportion of development delay is more in those with a history of neonatal seizure (100%) than those without it (21.9%). The proportion of development delay is also more in those with a history of birth asphyxia (50%) than those without it (19.5%). Gestational duration and developmental delay had statistically significant association between them as p value is 0.001. The proportion of development delay is more in those born at early preterm (100%) as compared to those born at late preterm (46.9%) or at term (15.9%).

In our study, no statistically significant association was found between developmental delay and sex of the child, type of family, either parent's education, either parent's occupation or socioeconomic status. parity, mode of delivery, place of delivery, birth weight, mother's age at delivery, prenatal infections, neonatal meningitis, neonatal sepsis, neonatal hyperbilirubinemia, congenital cardiac problems or respiratory problems. any anthropometric parameters viz weight for height or length, weight for age, height or length for age, BMI for age, head circumference, chest circumference to head circumference ratio, mid upper arm circumference.

DISCUSSION

The prevalence of developmental delay found in this study was 23.1% which is higher than that reported earlier in various studies Most studies in under-2-year children have found a prevalence of 1.5 to 2% [10,11,12]. However, prevalence of developmental delay has been variously estimated at 9.5% by Zafar Meenai and Sheela Longia [13] in children under 2 years of age, at 6.2% by Arti Gupta et al. [17] with respect to six WHO gross motor milestones described in the Who Motor Development Study and at 7.9% by Tridibes Bhattacharya, S

Ray and DK Das [18] amongst children aged 2 to 23 months in Bhatar block of Burdwan district of West Bengal using TDSC.

The three most common delays, from most common to least common, were delays in rolling from back to stomach, head holding and in head turning to sound, all of which involve the gross motor domains. Delay was most frequently seen in the gross motor domain in the Norwegian clinic-based longitudinal study by Valla, L., Wentzel-Larsen, T., Hofoss, D. et al. [19] on 1555 infants using the Norwegian translation of the Ages and Stages Questionnaires (ASQ). In the study done by MKC Nair et al. in Kerala, India on under 5 children [20,21] found that speech and language problems were the most common disability (29.8%).

Proportion of development delay is more in 13–24-month age group. In the community-based study by Tridibes Bhattacharya, S Ray and DK Das [18] amongst children aged 2 to 23 months developmental delays were found to be more prevalent among male children (AOR 3.3, CI 1.1-10). They found statistically significant association between developmental delay and LBW (AOR 8.33, CI 2.5-25), mothers with less than primary education (AOR 5, CI 1.4-12.5) and non-institutional delivery (AOR 16, CI 4.8-52.9). We did not find any such associations in our study.

Gestational duration was associated with developmental delay. Neonatal seizure and birth asphyxia had statistically significant association with developmental delay. In a study from CDC, Kerala by Babu George et al. [20,22] it was found that among 41 children with grade I HIE at birth 15 (36%) had normal intelligence and only 4 (9.8%) had mental retardation (MR). 7 babies had grade 2 and 3 HIE and amongst them 2 children had MR, 3 had borderline IQ and only 2 had low average IQ. In the study by Zafar Meena and Sheela Longia[13], amongst those with developmental delay 57.89% had antecedent history whilst 15.78% had birth asphyxia, 10.52% had history of sepsis,10.52% had history of seizures, 10.52% had history of respiratory problems, 10.52% had neonatal jaundice. 15.78 % had congenital cardiac problems.

The study done by Arti Gupta, Mani Kalaivani, Sanjeev Kumar Gupta, Sanjay K. Rai and Baridalyne Nongkynrih [17] in North India found that birth order of 2 or more to be associated with delay in achieving gross motor milestones. We did not find such associations with birth order.

CONCLUSIONS

Firstly, the prevalence of developmental delay found in this study was 23.1% which is higher than that reported earlier in various studies. It may be taken as a wake-up call to strengthen and embolden our efforts to detect developmental delays seeing as early intervention can significantly improve outcome for the individual and society.

Secondly, we found associations between developmental delay & neonatal seizures, birth asphyxia and earlier period of gestation. All of these infants are generally followed up routinely as high-risk infants up to 1 year of age. Possibly these children may have been lost to follow-up.

Lastly, we found that apparently neurologically normal children in the second year of their life have a higher burden of developmental delay. Routine screening for developmental delay should extend beyond infancy to include children in the second year of their life.

As for limitations of the study, it should ideally have been done in the community or in a well-baby clinic to ascertain the true burden in the community and to limit the number of confounding variables introduced into the study. However, the COVID-19 pandemic at the time precluded from such an endeavour. Secondly, more exhaustive tools to determine developmental delay than TDSC might have been better but they were prohibitively time consuming to administer in the context of our study.

REFERENCES

I. Illingworth R. The Development of the Infant and Young child: Normal and abnormal. In: Illingworth Ronald S, Nair MKC, Russell Paul, editors. 10th edition. Elsevier; 2012: 408.

II. Baker BL, McIntyre L, Blacher J, Crnic K, Edelbrock C, Low C. Pre-school children with and without developmental delay: Behaviour problems and parenting stress over time. J Intellect Disabil Res. 2003;47(4-5):217–30. https://doi.org/10.1046/j.1365-2788.2003.00484.x

III. Emerson E, Einfeld S. Emotional and behavioural difficulties in young children with and without developmental delay: a bi-national perspective. J Child Psychol Psychiatry. 2010;51(5):583–93. https://doi.org/10.1111/j.1469-7610.2009.02179.x

IV. Manning M, Homel R, Smith C. A meta-analysis of the effects of early developmental prevention programs in at-risk populations on non-health outcomes in adolescence. Child Youth Serv Rev. 2010;32(4):506–19. https://doi.org/10.1016/j.childyouth.2009.11.003

V. Anderson LM, Shinn C, Fullilove MT, Scrimshaw SC, Fielding JE, Normand J, et al. The effectiveness of early childhood development programs. A systematic review. Am J Prev Med. 2003;24(3 Suppl):32–46. https://doi.org/10.1016/S0749-3797(02)00655-4

VI. McCormick MC, Brooks-Gunn J, Buka SL, Goldman J, Yu J, Salganik M, et al. Early intervention in low birth weight premature infants: results at 18 years of age for the Infant Health and Development Program. Pediatrics.

2006;117(3):771–80. https://doi.org/10.1542/peds.2005-1316

VII. Spittle AJ, Orton J, Doyle LW, Boyd R. Early developmental intervention programs post hospital discharge to prevent motor and cognitive impairments in preterm infants. Cochrane Database Syst Rev. 2007;2:Cd005495. https://doi.org/10.1002/14651858.CD005495.pub2

VIII. Reynolds AJ, Temple JA, White BA, Ou SR, Robertson DL. Age 26 cost-benefit analysis of the child-parent center early education program. Child Dev. 2011;82(1):379–404. https://doi.org/10.1111/j.1467-8624.2010.01563.x

IX. Government of India. Ministry of Health and Family Welfare. Rashtriya Bal Swasthya Karyakram (RBSK) - operational guidelines. February, 2013.

X. Nair MK, George B, Philip E. Trivandrum Developmental Screening Chart. Indian Pediatr.1991;28:869-72.

XI. Nair M, Radhakrishnan S. Early childhood development in deprived urban settlements. Indian Pediatr. 2004;41:227-37.

XII. 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 Jan;46 Suppl:s75-8.

XIII. Zafar Meenai, Sheela Longia. A study on Prevalence & Antecedents of Developmental delay among Children less than 2 years attending Well Baby Clinic. PJSR 2009;2(1):9-11. Available from: https://www.pjsr.org/Jan09_pdf/Dr.%20Zafar%20Minai%20-%203.pdf Accessed on 23 December 2019.

XIV. Sharma R. The Family and Family Structure Classification Redefined for the Current Times. *J Family Med Prim Care*. 2013;2(4):306-310. https://doi.org/10.4103/2249-4863.123774

XV. International Labour Organisation. (2012). International Standard Classification of Occupations: Structure, group definitions and correspondence tables (ISCO-08). International Labour Organisation. https://www.ilo.org/wcmsp5/groups/public/---dgreports/---dcomm/---publ/documents/publication/wcms_172572.pdf. Accessed on 20th November, 2021.

XVI. Chauhan VH, Vilhekar KY, Kurundwadkar M. Development And Validation Of Trivandrum Development Screening Chart For Children Aged 0-3 Years By TDSC (0-3). New Indian Journal of Pedaitrics 2017;5.3:137-143.

XVII. Arti Gupta, Mani Kalaivani, Sanjeev Kumar Gupta, Sanjay K. Rai, Baridalyne Nongkynrih. The study on achievement of motor milestones and associated factors among children in rural North India. 2016 Apr-Jun;5(2): 378–382. https://doi.org/10.4103/2249-4863.192346 Available from: https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5084565/#!po=69.0476 Accessed on 25 December 2019.

XVIII. Bhattacharya T, Ray S, Das DK. Developmental delay among children below two years of age: a cross-sectional study in a community development block of Burdwan district, West Bengal. Int J Community Med Public Health 2017;4:1762-7. https://doi.org/10.18203/2394-6040.ijcmph20171798

XIX. Valla, L., Wentzel-Larsen, T., Hofoss, D. *et al.* Prevalence of suspected developmental delays in early infancy: results from a regional population-based longitudinal study. *BMC Pediatr* 15**,** 215 (2015). https://doi.org/10.1186/s12887-015-0528-z

XX. Indian Pediatrics (2009). Supplement issue on child development: Indian Pediatrics. [online] Available from: http://www.indianpediatrics.net/suppl2009/supple.htm. [Accessed September, 2018].

XXI. Nair MKC, George B, Padmamohan J, Sunitha RM, Resmi VR, Prasanna GL, Leena ML. Developmental Delay and Disability among Under - 5 Children in a Rural ICDS Block, Indian J Pediatr. 2009;46(Suppl):S75-S78.

XXII. George B, Padmam MSR, Nair MKC, Indira MS, Syamalan K, Padmamohan J. Hypoxic Ischemic Encephalopathy – Developmental Outcome at 12 Years, Indian J Pediatr. 2009;46(Suppl):S67-S70.