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Detection Of At Risk Children Of Neurodevelopmental Disorder By Using The Ages And Stages Questionnaire

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Abstract

Background: In spite of the evident world-wide data, Neurodevelopmental disorders are not widely practiced in Indian setup. The present study was conducted to identify the children for neurodevelopmental delay by using a standard The Ages and Stages questionnaire (ASQ) 3 and to find the association of risk factors with neurodevelopmental delay.

Methodology: A cross sectional study was conducted in the department of paediatrics at Dr. D.Y Patil medical college and hospital, Pimpri, Pune where 420 children who fulfilled the inclusion criteria were enrolled in the study. The children were screened by ASQ3 questionnaires given to the parents which include five domains. Data collected was entered in Microsoft excel and analysed using SPSS version 21. chi-square test was used as test of significance.

Results: In the present study, there was statistical significant association of NDD with place of residence, education of father, education of mother, NICU admission. The other risk factors like type of family, father employment, mother employment, socioeconomic status, consanguinity, place of delivery, type of delivery, antental and intrapartum complication,,fetal distress,birth asphyxia,gestational age, post natal complication, were statistically not significant NDD.

Conclusion: This study helps to understand the association of risk factors with neuro developmental delay. The study shows the benefits of parents being active partners in the assessment of development of their kids.ASQ is an accurate, cost effective ,easy and user friendly method for screening and monitoring pre -school children.

Keywords: Children, Neurodevelopmental disorders, The Ages and Stages Questionnaire

Introduction:

Neurodevelopmental disorders are disabilities linked or connected primarily with the functioning of neurological system and brain. Examples of neurodevelopmental disorders in children comprise attention-deficit/hyperactivity disorder, autism, learning disabilities, intellectual disability, cerebral palsy, and impairments in vision and hearing.

Children with neurodevelopmental disorders might experience difficulties with language, speaking, motor skills, behavior, memory and learning. While the symptoms and behaviors of neurodevelopmental disabilities frequently interchange as the child grows older with some disabilities being permanent. Diagnosis and treatment of these disorders can be tough, treatment involves a blend of therapy,

pharmaceuticals and home- and school-based programs.

Based on parental responses to survey questions, approximately 15% of children in the United States ages 3 to 17 years were affected by neurodevelopmental disorders in 2006-2008. [1]

Among the conditions, ADHD and learning disabilities had the greatest prevalence. Many children affected have more than one of these conditions: for example, around 4% of U.S. children have both ADHD and a learning disability.[2]

A couple of researchers stated the prevalence autism and ADHD has been increasing over the last four decades.[3–5] Surveys of teachers and pediatricians have reported an increase in the number of children seen in class and exam rooms with behavioral and learning disorders.[6,7]

Genetics play a vital role in many neurodevelopmental disorders, and some cases of intellectual disability are associated with specific genes. A wide range of environmental risk factor affect neurodevelopment including maternal use of alcohol, tobacco, or narcotic drugs during pregnancy, lower socio-economic status, preterm births, low birth weight and prenatal or childhood exposure to certain environmental contaminants.[8,9] Lead, methyl mercury, and PCBs are widespread environmental contaminants associated with adverse effects on a child's developing brain and nervous system in multiple studies.[10]

Prevalence of neurodevelopmental disorders varied from place to place. Site-specific (five geographical areas in India) prevalence of any of seven NDDs in 2–<6year olds ranged between 2.9% and 18.7%. About one-fifth of these children had two or more disorders.[11]

Neurodevelopment is a dynamic inter-relationship between genetic, brain, cognitive, emotional and behavioral processes across the developmental lifespan. Significant and persistent disruption to this dynamic process through environmental and genetic risk can lead to neurodevelopmental disorders and disability.[12]

In spite of the evident world-wide data, Neurodevelopmental disorders are not widely practiced in Indian setup. This may be because of limited local research evidence in relation with the feasibility, acceptability, complexity, and outcome in the form of complications. So, there is a need to review the limitations in terms of outcome for Neurodevelopmental disorders and the feasibility of performing it, for increasing need to provide qualitative procedure in Indian setup. The present study was conducted to identify the children for neurodevelopmental delay by using a standard ASQ 3 questionnaire and to find the association of risk factors with neurodevelopmental delay.

Objectives of the study:

1. To assess neurodevelopment delay by using ages and stages questionnaire in determining whether a child is at risk of development delay.
2. To find the association of risk factors with neurodevelopmental delay.

Materials and methods:

Study area: The study was conducted in the department of pediatrics at Dr. D.Y Patil medical college and hospital, Pimpri, Pune.

Study design: Cross sectional study.

Duration of the study: september 2019 to August 2021

Sample size: 420

Sampling method: Universal sampling

Sample size estimation: Considering the prevalence of Neurodevelopmental disorders as 18.7% . the sample size was calculated for our study using the formula

N =4pq/L2 :

- p= 18.7%
- q= 81.3% (100-p)
- L=20%

Study Population: Children between the ages of 6 months and 60 months attending to the department of paediatrics of Dr. D.Y Patil medical college, Pune (in and out patient).

Inclusion Criteria:

1. Children more than six months to 60 months of age'

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2. Children with out congenital anomalies, syndromic features and endocrine disorders

Exclusion Criteria:

1. Children below 6 months and children above 60 months of age
2. Children with congenital anomalies and syndromic features and endocrine disorders
3. Children already diagnosed neurodevelopmental delay Children whose parents are unwilling to give consent

Methodology:

All children who fulfilled the inclusion criteria were enrolled in the study. the children were screened by ASQ3 questionnaires given to the parents which include five domains fine motor , gross motor , communication , problem solving and personal, social. Scores were interpreted as under

- White Area - normal expectation
- Grey Area -border line expectation
- Black Area -below expectation.

The children falling in grey and black area were referred for further evaluations.

Data collection:

Data collected was entered in Microsoft excel and analysed using SPSS version 21.

chi-square test was used as test of significance.

Results:

Mean age was 27.35 months (standard deviation – 16.39 months), with the minimum 6 months and maximum 60 months. There were 246 (59%) males and 174 (41%) female in the study while 145 (34.52%) samples were from 6-12months age group followed by 91 (21.67%) subjects were from 13-24 months age group. 70 (17.14%) from age group of 25 to 36 months followed by 65 (15.47%) samples from 37 to 48 months and 47 (11.19%) samples from the age group of 49 to 60 months.

Based on ASQ interpretation out of 420 cases276 (65.71%) subjects were normal (white area) without any neurodevelopmental delay followed by 95 (22.62%) subjects in grey area borderline delay and 49 (11.67%) subjects in black area. (delayed)

Based on place of residence, 191 (45.5%) were from rural area and 229 (54.4%) from urban area. The neurodevelopmental delay cases were more in rural areas than in urban area Which was statically significant.

Based on socio economic status, 247 (58.8%) were from lower middle class followed by 111 (26.4%) from upper middle class. There was no association between socioeconomic status with neuro-developmental status. 296 (70.5%) were from nuclear and 124 (29.5%) cases were from joint family. NDD is more in nuclear family than from joint family, but the difference was not significant.

Total illiterate fathers were 57 (13.6%), primary education-49 (11.7%), middle education-100 (23.80%), secondary-101 (24.0%), graduate 113 (26.9%). It was, significant more NDD in lower education group than in higher education group. As education of father increases NDD was less in higher education group as compared to lower education group

Mother education was primary 122 (29.04%), illiterates were 109 (25.95%) than graduates were 38 (9.04%) and secondary education 57 (13.57%). The NDD was more in illiterates and primary education mothers than in graduate mothers.

98.33% of the father were employed and 7 (1.66%) were unemployed. NDD was more in unemployed than in employed but not statistically significant. Employed mothers were 233 (55.47%) and unemployed mother were 187 (45.52%).

Consanguinity was present in 87 (20.11%) cases and absent in 333 (79.29%). Out of 420 (100%) cases, there was one sibling in 244 (58.1%) cases, two siblings in 171 (49.19%) cases and more than two siblings in 5 (1.2%) cases . There was no statistical significance association of NDD with no of siblings

407 (96.91%) cases had institutional delivery and home delivery in 13 (3.09%) cases. 313 (74.52%) were vaginal delivery and LSCS were 107 (25.48%). Antenatal and intrapartum complications were present in 54 (12.86%) cases and absent in 336 (87.14%) cases. Fetal distress present in 33 (7.86%) cases and absent in 387 (92.14%) cases. Birth asphyxia was present in 21 (5%) cases and absent in 399 (95%) cases. Pre term baby were 91 (21.67%) cases and full term babies were 329 (78.33%). Full

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term babies were more compared to pre term babies. 119 (28.33%) cases were admitted in NICU and 301 (71.7%) were not admitted in NICU. NDD was significantly associated with NICU admissions.Post natal complications were present in 23 (5.5%) cases and absent 397 (94.5%) cases. There was no significant association of NDD with post natal complication cases and without post natal complication cases.

According ASQ interpretation, the communication domain affected in 16 (10.39%) cases, gross motor affected in 20 (12.99%) cases, fine motor domain affected in 21 (13.64%) cases and problem solving affected in 20 (12.99%), personal and social domain affected in 19 (12.34%) cases. The communication and personal social domain affected in 13 (8.44%). The gross and fine motor affected in 20 (12.99%) cases. In 15 (9.7%) cases over all domains were affected.

In the present study, there was statistical significant association of NDD with place of residence, education of father, education of mother, NICU admission. The other risk factors like type of family, father employment, mother employment, socioeconomic status, consanguinity, place of delivery, type of delivery, antental and intrapartum complication,,fetal distress,birth asphyxia,gestational age, post natal complication, were statistically not significant NDD.

Discussion :

Neurodevelopmental disorders are disabilities linked or connected primarily with the functioning of neurological system and brain. Examples of neurodevelopmental disorders in children comprise attention-deficit/hyperactivity disorder, autism, learning disabilities, intellectual disability, cerebral palsy, and impairments in vision and hearing. Surveys of teachers and pediatricians have reported an increase in the number of children seen in class and exam rooms with behavioral and learning disorders.[6,7]

Genetics play a vital role in many neurodevelopmental disorders, and some cases of intellectual disability are associated with specific genes. A wide range of environmental risk factor affect neurodevelopment including maternal use of alcohol, tobacco, or narcotic drugs during pregnancy, lower socio-economic status, preterm births, low birth weight and prenatal or childhood exposure to certain environmental contaminants.[8,9]

In The present study, 246 (59%) were males and 174 (41%) were female. Similar findings were reported by Lamsal R et al in which 49.9% were males and 50.1% were females[13].Iyer S G et al reported that 78.1% were males and 21.9% were females.[14] Chattopadhyay N et al reported 62.9% were males and 37.1% were females.[15] Majority of the studies reported a male preponderance which is similar to the present study.

In the present study, As per ASQ interpretation of NDD showed 95 (22.62%) subjects in grey area of borderline neurodevelopmental delay and 49 (11.67%) subjects in black area with neurodevelopmental delay. Comparable results were observed by Arim RG et al in which prevalence of neurodevelopmental disorders was found to be 8.3%.[16] Our study were compared with Chattopadhyay N et al in which prevalence of neurodevelopmental disorder was found to be 31.6%.[15]

Based on place of residence, 191 (45.5%) were from rural area and 229 (54.4%) from urban area. similar findings were reported by Raina SK et al in which 38.1% study subjects were residing in urban areas, 43.1% in rural areas and 18.6% in tribal areas.[17]

In The present study 247 (58.8%) were from lower middle class followed by 111 (26.4%) from upper middle class. Similar findings reported by Raina SK et al in which majority of study subjects belonged to middle class and lower middle class of socioeconomic status.[17] Chin – Lun Hung G et al reported that distribution of socioeconomic disadvantage in the baseline sample was that 14.8% belonged to high socioeconomic disadvantage category, 46.1% medium disadvantage and 39.1% low disadvantage category.[18] Comparable results by Sharma P et al where 38.4% belonged to lower middle class, 30.8% each to middle class and lower class respectively.[19]

In the present study 296 (70.5%) were from nuclear and 124 (29.5%) cases were from joint family. Comparable to a study by Iyer S G et al in which 78.1% had a nuclear family and 21.9% had joint family.[14] Sharma P et al reported 30.7% were

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living in nuclear family and 69.3% were living in joint family.[19]

The present study observed, as education of father increases NDD was less in higher education group as compared to lower education group. Present study findings differed with a study by Lamsal R et al in which 17.77% had secondary school education, 60.77% had graduation degree and 9.17% had education less than secondary level. [13]

The present study observed that the NDD was more in illiterates and primary education mothers than in graduate mothers. Our study findings differed with a study by Lamsal R et al in which 17.77% had secondary school education, 60.77% had graduation degree and 9.17% had education less than secondary level.[13]

The present study observed NDD was more in unemployed than in employed. The present study findings differed with a study by Lamsal R et al. [13]

The present study didn't find an association with NDD among consanguinity and non consanguinity. Our study findings were similar to a study by Venkatesh C et al in which 21.6% had consanguineous marriage.[20] The present study findings were different to a study by Iyer S G et al in which 3.1% had consanguineous marriages and 96.9% had no degree of consanguinity. [14]

In the present study, Antenatal and intrapartum complications were present in 54 (12.86%) cases and absent in 336 (87.14%) cases. Our study findings were different to a study by Iyer S G et al in which around 30% mothers had antenatal complications and around 6% intrapartum complications. [14] Our study findings were similar to a study by Venkatesh C et al in which 31.4% had one or more antenatal complications.[20]

The present study showed no significance of NDD in fetal distress positive or negative cases. Our findings were comparable to a study by Hadjkacem I et al in which perinatal factors like fetal distress as one of the factors of NDD.[21]

In the present study, birth asphyxia was present in 21(5%) cases and absent in 399(95%) cases. Our study findings were similar to a study by Geetha B et al which show relationship with neurodevelopmental disorder with birth asphyxia.[22] The present study findings concurred with a study by Kumar R et al in which delayed cry at birth as a significant risk factor for neurological disorder.[23]

Pre term baby were 91 (21.67%) cases and full term babies were 329(78.33%). Full term babies were more compared to pre term babies. The present study findings were similar to a study by Iyer S G et al in which 68.7% were term babies and 31.3% were preterm and none were post term babies. [14] The present study findings were different to a study by Chattopadhyay N et al in which 39.3% were preterm babies, 60.7% were term babies. [15] Study by Kumar et al showed the pre term babies as one of the risk factor for neurodevelopmental delay.[23] Study done by Hadjkacem I et al also showed the pre term babies as one of the risk factor for neurodevelopmental delay.[21] Pre term birth as one of the risk factor for neurodevelopmental delay shown by study Mamidala MP et al.[24]

Ours study showed a significant association between NDD with NICU admission. Similar findings was observed by Iyer S G et al[14], Geetha B et al[22].and Mamidala MP et al.[24]

Post natal complications were present in 23(5.5%) cases and absent 397(94.5%) cases. Iyer S G et al correlated which show post natal factor association with NDD. [14] Study by Chattopadhyay N et al post natal factors like neonatal sepsis, convulsions showed the association with NDD. [15] The present study similar to Geetha B et al in which post natal factors associated with NDD. The present study findings concurred with a study by Kumar R et al in which one of significant risk factor for NDD was post neonatal meningoencephalitis.[23]

In the present study the communication domain affected in 16 (10.39%) cases, gross motor affected in 20 (12.99%) ,fine motor domain affected in 21 (13.64%) cases ,problem solving affected in 20 (12.99 %) cases and personal social domain affected in 19 (12.34%) cases. The communication and personal social domain affected in 13 (8.44 %),the gross and fine motor affected in 20 (12.99%) cases. In 15(9.74) cases over all domains are affected.

Conclusion:

This study helps to understand the association of risk factors with neuro developmental delay. The study shows the benefits of parents being active partners

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in the assessment of development of their kids.ASQ is an accurate, cost effective ,easy and user friendly method for screening and monitoring pre -school children. This study can be used for early detection of risk factors for NDD, so that early evaluation and further treatment can be done. Early detection of risk factors is done in this study so that NDD can be prevented. The developmental delay caused by preventable causes like jaundice, perinatal asphyxia, neonatal infections can be identified early and managed which gives good quality of life in children. The timely obstetrical intervention and neonatal care may still play significant role in improving outcome. Thus, there can be increasing need to reinforce existing mother and child health care services. Early detection and intervention for children with NDD is essential part of good health care to optimize outcome for children and families.

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