SHORT COMMUNICATION

Developmental Evaluation Clinic – CDC Experience

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We describe our five year experience of conducting developmental evaluation clinic at CDC. We have also assessed the prevalence of developmental delay (defined as delay in any two areas in Denver Development Screening Test II [DDST II]), documented the possible prenatal, natal, postnatal risk factors for developmental delay and, also identified the pattern of developmental disorders. A total of 2111 children were screened. DDST II results were abnormal for 953 (45.1%) children. On multivariate analysis, delayed cry at birth, increasing age of the child, presence of feeding problems, assisted delivery, and birth injury were found to be associated with increasingly abnormal DDST II results. Nearly 50% of referred babies had developmental delay without a specific clinical diagnosis, 13.9% had speech problems, 9.5% had neurological problems and 5.2% had chromosomal anomalies. Birth related events are important risk factors for developmental delay.

Keywords: *DDST II, Developmental delay, Developmental evaluation clinic, Risk factors.*

Child development is a dynamic process optimally utilizing the genetic potential of the baby, within the context of the available environment, enabling achievement of full potential. It has been shown that 40% reduction in poor performance could be achieved by CDC model early stimulation(1,2). Severe forms of disability are less common and are often due to congenital, genetic, metabolic causes or intrauterine infections and need specific preventive strategies(3). The observed 2.5% prevalence of developmental delay in the less than 2 year olds of deprived urban settlements, the presence of risk factors for developmental delay like low birthweight, birth asphyxia, coupled with poor environment of home and alternate child care services, highlights the need for simple cost-effective community model for promoting early child development(4). Although simple developmental assessment in the community could be done using Trivandrum Developmental Screening Chart (TDSC)(5), it is important that there are regional Child Development Clinics, where more sophisticated testing could be done in suspected cases and also developmental therapy could be offered.

Developmental evaluation clinic at Child Development Centre has been functioning for the last 5 years as a regional referral clinic for children under six years with suspected developmental delay or deviation. Assessment, therapy and counseling services are offered by prior appointment. A consultant pediatrician does detailed clinical assessment for confirming the type and extent of the developmental problem and to identify potential risk factors. A physiotherapist provides therapy service and a child psychologist counsels the parent. Wherever necessary, the services of a consultant neurologist, physiatrist, speech pathologist and ophthalmologist are made available in the clinic. The objective of this paper is to describe our experience of conducting developmental evaluation clinic at CDC,

assess the prevalence of developmental delay document the possible prenatal, natal and postnatal risk factors for developmental delay, and to identify the patterns of delay, deviation or disorder identified by DDST II and clinical examination results together.

METHODS

Over a period of 5 years, 2111 children below the age of 6 years were referred to the clinic for detailed developmental assessment. Developmental screening was done in all the children using Denver Developmental Screening Test (DDST II)(6) by a developmental therapist, with at least five years experience in developmental assessment. An experienced pediatrician examined all children initially, recorded the clinical findings and the same was reviewed by a consultant pediatric neurologist and physiatrist. After the clinical diagnosis was confirmed, the children were referred to the appropriate speciality clinic at CDC for more specific tests and for therapy services by a physiotherapist and developmental therapist specialized in speech stimulation. A standard performa was used to record known prenatal, natal and postnatal risk factors. For the purpose of this study, an abnormal DDST was taken as delay in any two of the four areas of development-gross motor, fine motor, personal social and language.

The data was coded and checked for accuracy. Statistical Package for Social Sciences (SPSS) 13.0 was used to analyse the data. Bivariate analysis was done taking abnormal DDST as the dependant variable and family history of mental retardation and other study variables as independent variables. The study variables, which were significant at 20% level at the bivariate analysis were included in the logistic regression analysis to control the effect of confounders.

RESULTS

Out of the 2111 children below 6 years referred to developmental evaluation clinic, DDST II results were abnormal for 953 (45.1%) children and normal (no delay in all the four areas) in 1130 children. The mean age of the group with abnormal DDST II was 18.1 (12.5) months and that of normal DDST II was 15.93 (11.54) months. There were 1286 (60.9%)

TABLE I BIVARIATE ANALYSIS OF RISK FACTORS FOR ABNORMAL DDST II RESULTS

Presence of variable	DDST II		RR (95%CI)	*P* value
	Abnormal (*n*=953) *n* (%)	Normal (*n*=1130) *n* (%)		
Family history of MR	75 (51)	72 (49.0)	1.13 (0.9-1.78)	0.18
Family history of Epilepsy	73 (40.1)	109 (59.9)	0.87 (0.7-1.0)	0.11
Maternal Diabetes	64 (40)	96 (60.0)	0.87 (0.71-1.1)	0.13
Maternal haemorrhage	91 (37.3)	153 (62.7)	0.80 (0.67-0.94)	0.00
Threatened abortion	120 (41.1)	172 (58.9)	0.88 (0.76-1.02)	0.08
Mother's weight gain <10 kg	141 (51.1)	135 (48.9)	1.14 (1.0-1.29)	0.06
Labor induction	256 (43.3)	335 (56.7)	0.93 (0.83-1.03)	0.16
Assisted delivery	23 (76.7)	7 (23.3)	1.69 (1.38-2.07)	0.001
Low birth weight	324 (49.2)	334 (50.8)	1.12 (1.01-1.23)	0.03
Delayed cry at birth	138 (62.2)	84 (37.8)	1.42 (1.27-1.59)	<0.001
Birth injury	263 (49.1)	273 (50.9)	1.10 (1.0-1.22)	0.07
Neonatal convulsions	105 (52.5)	95 (47.5)	1.17 (1.01-1.34)	0.04
Respiratory distress	158 (51.6)	148 (48.4)	1.15 (1.02-1.3)	0.03
Feeding problem	223 (56.6)	171 (43.4)	1.31 (1.18-1.45)	<0.001

DDST: Denver Developmental Screening Test, MR: Mental retardation

children with gross motor delay, 773 (36.6%) with fine motor delay, 719 (34.1%) with personal social delay and 940 (44.5%) with language delay.

***Table* I** shows the results of the bivariate analysis of prenatal, natal and postnatal risk factors against DDST II results (normal or abnormal). ***Table* II** shows the results of the multivariate analysis. Delayed cry at birth, increasing age of the child, presence of feeding problems, assisted delivery and birth injury were found to be associated with increasingly abnormal DDST. History of antenatal bleeding was identified as a probable protective factor with RR 0.67. This may be due to better antenatal and natal care received by the mothers with a history of antenatal bleeding. ***Table* III** shows that nearly 50% of babies referred for developmental evaluation had developmental delay without a specific clinical diagnosis and nearly 17% were normal on DDST II evaluation.

DISCUSSION

DDST II is a developmental screening test with good track record and can be used across the age group of 0 -6 years. The real advantage of DDST II is that the area or areas of delay in a particular child being tested can be made out easily and this helps the pediatrician to plan further management. In routine clinical practice, some known risk factors may be identified in the majority of cases of developmental delay. The results of this study showing that delayed cry at birth, assisted delivery, birth injury and presence of feeding problems are associated with increasingly abnormal DDST II, highlight the strong association of birth related events to developmental delay. However, the report of the National Institutes of Health Task Force on "Joint Assessment of Prenatal and Perinatal Factors Associated with Brain Disorders" found that, although it was simple to say that a specific event such as birth trauma or asphyxia caused brain disorders, it is not usually possible to pinpoint a single cause and its effect. The normal brain's ability to repair or compensate for even major developmental disruptions, combined with the gross and subtle interactions of biologic, social and environmental factors, confounds the task of assigning etiologies to brain disorders. The causes of severe mental retardation are primarily genetic,

TABLE II LOGISTIC REGRESSION ANALYSIS TO IDENTIFY RISK FACTORS FOR ABNORMAL DDST

Presence of variable	Odds Ratio (95 % CI)	*P* value
Family history of MR	1.27(0.89-1.82)	0.18
Family history of epilepsy	0.72(0.51-1.00)	0.05
Maternal diabetes	0.82(0.58-1.16)	0.26
Maternal hemorrhage	0.63(0.46-0.85)	0.003
Threatened abortion	0.88(0.67-1.16)	0.36
Pregnancy weight gain <10 kg	1.23(0.94-1.60)	0.13
Labor induction	0.85(0.7-1.04)	0.12
Assisted delivery	3.23(1.35-7.73)	0.008
Low birthweight (<2500g)	1.14(0.94-1.39)	0.19
Delayed birth cry	1.91(1.40-2.60)	<0.001
Birth injury	1.24(1.01-1.53)	0.04
Neonatal convulsions	1.09(0.79-1.49)	0.61
Respiratory distress	1.00(0.76-1.32)	0.96
Feeding problem	1.55(1.21-1.98)	0.001
Age of the child (mo)	1.02(1.01-1.03)	<0.001

MR: Mental retardation

TABLE III DIAGNOSIS USING DDST AND CLINICAL EXAMINATION TOGETHER (*N*=2111)

Diagnosis	Number	Percentage
Developmental delay (fine motor, gross motor delays)	1053	49.9
Normal	349	16.5
Speech and language delay	293	13.9
Neurological problems (cerebral palsy, mental retardation, attention deficit hyperactivity disorder)	201	9.5
Chromosomal anomalies (Downs syndrome, Turner syndrome, others)	110	5.2
Visual abnormalities (cataract, ptosis, blindness)	20	0.9
Pervasive Developmental Disorders (autism, Retts syndrome)	18	0.8
Deformities (congenital talipes equino varus,limb defects)	11	0.5
Hearing impairment	8	0.4
Others	6	0.3

WHAT THIS STUDY ADDS?

- Nearly 50% of babies referred to developmental evaluation clinic had developmental delay without a specific clinical diagnosis.
- Delivery type other than normal delivery, delayed cry at birth, birth injury, and feeding problems were identified as significant risk factors for abnormal DDST II.

biochemical, viral, and developmental and not related to birth events(7).

The observation that as the age of presentation of the child increases there is 1.02 times chance to be abnormal on DDST II suggest that developmental delay should be detected earlier. Paramleen, *et al.*(8) showed that among the utilizers of their early intervention program clinic, 88% were mentally retarded, 50% were children with cerebral palsy, 24% with learning disorder, 12% with ADHD and 4% with autism. Among these children, 66% were unable to communicate verbally, 25% suffered from epilepsy and 21% had strong evidence of genetic disorders. However, the mean age of these children was 4.0 ± 1.4 years as against 18.1 and 15.9 months in children with abnormal and normal DDST, respectively in our study. This suggests a high referral of suspected cases at early years at our center.

The presented study had some limitations. The focus was on biological risk factors and all the known and unknown family and environmental risk factors were not studied. Moreover, as the children are referred from far away places, it was not possible to give sustained early intervention therapy for developmental delay. Hence in the Indian context, to reach out to all babies, a more appropriate strategy would be to do simple developmental screening using TDSC by trained anganwadi workers and follow it up with DDST II by trained pediatricians.

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