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Screening for Neurodevelopmental Impairments among less than 2 Years Old Children in a Tertiary Care Hospital in Dhaka city

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Abstract

Background: Neurodevelopmental impairment is an important issue in the context of normal growth of the children. **Objective:** The purpose of the present study was to find out the magnitude of neurodevelopmental impairments (NDIs) in young children in a tertiary care hospital **Methodology:** This cross sectional study was conducted in the Department of Paediatrics at Dhaka Medical College Hospital (DMCH) from January 2010 to June 2010 for a period of six months. All children with the age of 0 to 2 years irrespective of sex attended at the study place were selected as study population. Children getting developmental therapy, physiotherapy and anticonvulsant or muscle relaxant were excluded from this study. Development Screening Questionnaire (DSQ) was administered to mothers of children from birth to less than two years of age to assess their child's neurodevelopment. Then again neurodevelopmental assessment was done using a validated Rapid Neurodevelopmental Assessment (RNDA) method of evaluations of all children with positive screening results. RNDA was administered to identify the type of impairments and grades of severity. Items are arranged under the developmental parameters like gross motor, fine motor, vision, hearing, speech, cognition, behavior, and seizures for all age groups and for the age 0 to 1 month, additional primitive reflexes are examined along with other parameters. **Result:** Among 234 cases NDIs positive was found in 20(8.5%) cases. Among 20 children 16 (80%) were affected by cognitive impairment, 12 (60%) of each were affected by gross motor and behavioral impairment; 11 (55%) were affected by fine motor, 10(50%) speech, 8(40%) hearing, 7 (35%) visual impairment and 7 (35%) had seizure disorder. **Conclusion:** In conclusion NDIs are present in the general population of the Bangladesh with a very significant rate of which cognition is the most frequently involved and affected domain. [Journal of National Institute of Neurosciences Bangladesh, 2015;1(2): 57-61]

Keywords: Neurodevelopmental Impairments; children; NDIs; cognitive impairment

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Introduction

The WHO estimates that about 10% of the world's population has some form of disability[1]. According to the International Classification of Functioning of the World Health Organization impairments are defined as problems in body function or structure as a significant

deviation or loss which may be temporary or permanent[2]. Early identification can remedy the problem of some children; limit the effect of the disability and prevent the development of secondary disabilities in many children. Many children with clinically identifiable developmental problems present late for medical help due to low rate of early recognition[3].

Prevalence of childhood disability was reported 15.2% in Jamaica, 14.7% in Pakistan and 8.2% in Bangladesh[4]. Routine screening of newborn or children do not exist among high risk groups for the lower socioeconomic group. Congenital deafness is reported in 49.1% child births taking place at home with annually in developing countries[4]. In an epidemiologic survey of disabilities among 2 to 9 years old children in Bangladesh, an estimated 68 of 1000 had some form of disability related to motor, vision, hearing, cognitive disabilities and seizure disorders[5]. Pediatricians use developmental screening tests infrequently and probably only after evidence of developmental delay has been established by other criteria[6]. Therefore large unrecognized populations of children in low-income countries are at risk for neurodevelopmental impairments (NDIs) from an early age. In Bangladesh there is the rise in prevalence of children who are at risk for disabilities from 8% in 1988 to 20% in 2005[7].

The Development Screening Questionnaire (DSQ) is a validated screening tool for identification of at risk for NDIs of 0-2 years old children[8]. Moreover, the establishment of multidisciplinary like physician, psychologist, therapist Shishu Bikash Kendros in government medical college hospitals in Bangladesh has provided the opportunity for those screened positive to avail comprehensive evaluation and appropriate intervention services. The neonatal and infant mortality rates are declining but the incidence of chronic morbidities and adverse outcomes among survivors has not declined. Rather the prevalence of neurodevelopmental impairments and disabilities is increasing. There is no study in Bangladesh so far about the extent of NDIs of neonates, infants and young children attending the various services within tertiary care hospitals. The children with NDIs can be benefited from early identification and appropriate intervention. The purpose of the present study was to find out the magnitude of neurodevelopmental impairments (NDIs) in young children in a tertiary care hospital.

Methodology

This was a cross sectional study conducted in the Department of Paediatrics at Dhaka Medical College Hospital (DMCH) from January 2010 to June 2010 for a period of six months. Purposive sampling technique was applied to collect the sample. All children with the age of 0 to 2 years irrespective of sex attended at the study place were selected as study population. Children getting developmental therapy, physiotherapy and anticonvulsant or muscle relaxant were excluded from this study. The sample for the screening was obtained from the EPI center, maternity ward and general paediatric ward of DMCH. A two-stage design was followed for screening of NDIs. In stage I the Development Screening Questionnaire (DSQ) was designed to be administered to mothers of children from birth to less than two years of age to assess their child's neurodevelopment. Questions were grouped by age in months. Once a child's age was determined, eight questions related to the following eight functional domains were asked like gross motor; fine motor; vision; hearing; cognition; socialization, behavior; and speech. A 'yes'/'no' format for each item was recorded in the pre-coded form. At the end of the interview, any child positive on one or more functional domain was considered 'screen positive'. Most of the questions were adapted from a validated neurodevelopmental assessment tool like the Rapid Neurodevelopmental Assessment (RNDA), which was developed for direct administration by trained professionals for under 2-year-old children9. DSQ is developed at Shishu Bikash Kendro of Dhaka Shishu Hospital and its validity test has been done in the community[7]. In stage II neurodevelopmental assessment was done using a validated Rapid Neurodevelopmental Assessment (RNDA) method of evaluations of all children with positive screening results. RNDA was administered to identify the type of impairments and grades of severity. The Rapid Neurodevelopmental Assessment (RNDA) is developed for use in children aged 0 to 24 months and consisted of 8 forms, 1 each for the following age groups: 0 to 1 month, 1 to 3 months, 3 to 6 months, 6 to 9 months, 9 to 12 months, 12 to18 months, 18 to 24 months, and 24 months. Items are arranged under the developmental parameters like gross motor, fine motor, vision, hearing, speech, cognition, behavior, and seizures for all age groups and for the age 0 to 1 month, additional primitive reflexes are examined along with other parameters. All items are designed for individual administration by a tester except for hearing testing for older children, for which a "distractor" is used along with the primary tester. The time required for assessment with RNDA was recorded by using stop watch. Children were tested on all age-appropriate

items in each parameter. A summary sheet was completed at the end of the assessment. A yes/no format for impairment were recorded in each of the 9 parameters for children aged 0 to1 month and 8 parameters for children aged 1 to 24 months. This evaluation was done at the same time of screening by DSQ. All interview forms were translated into Bangla. Data generated from the DSQ and RNDA results was computed. Analysis was done by statistical program for social science (SPSS V 16.0, USA). Data was collected by using a structured questionnaire. Informed written consents of the attendants were taken before data collection. Permission from the local Ethical committee of DMCH was taken. There was no financial burden to the patient. After identification of NDIs the child was referred to Shishu Bikash Kendro of DMCH for further management.

Results

The DSQ was administered to 234 children of 0-2 years of age of which 80 from EPI center, 75 from maternity ward and another 79 from general paediatric ward. Among 234 cases NDIs positive was found in 20(8.5%) cases. Male was predominant than female which were 13(10.2%) and 7 (6.6%) respectively (Table 1).

Table 1: Distribution of Neurodevelopmental Impairments (NDI) Positive Children (n=20)

Gender	NDI Present	NDI Absent	Total
Male	13(10.2%)	115(89.8%)	128(100.0%)
Female	7(6.6%)	99(93.4%)	106(100.0%)
Total	**20(8.5%)**	**214(91.5%)**	**234(100.0%)**

Among 20 DSQ positive children 18 were RNDA positive. The frequency of DSQ positivity in the diagnosis of NDIs was 90% (Table 2). Among 20 children 16 (80%) were affected by cognitive impairment, 12 (60%) of each were affected by gross motor and behavioral impairment; 11 (55%) were affected by fine motor, 10 (50%) speech, 8(40%) hearing, 7 (35%) visual impairment and 7 (35%) had seizure disorder (Table 3).

Table 2: Distribution of Children by DSQ Positivity in RNDA Positive Cases

Age (mon)	DSQ Positive	RNDA Positive
0-6	8	7
6-12	6	5
12-24	6	6
Total	**20**	**18**

Discussion

Disability is a restriction or loss of ability due to impairment in performing an activity in a manner or range considered normal for a human being of that developmental stage[2]. Handicap is the disadvantage for an individual, arising from a disability that limits or prevents the achievement of desired goals[10-11]. Global developmental delay is a subset of developmental disabilities defined as significant delay in two or more of the following developmental domains: gross/fine motor, speech/language, cognition, social/personal, and activities of daily living. Global developmental delay describes a clinical presentation that has a heterogeneous etiologic profile and is associated with age-specific deficits in adaptation and learning skills[12]. Many children are born with risk factors that predispose them to delayed development and developmental disorders; other children will show delayed or disordered development in early childhood, which if undetected and untreated, can contribute to early school failure and attendant social and emotional problems. Some children will have delayed development attributable to a specific medical condition for which medical treatments may be indicated. Early identification of developmental disorders is critical to the well-being of children and their families[13].

Table 3: Distribution of Children by Type of NDIs by RNDA (n =20)

Types of NDIs	Frequency	Percentage
Gross Motor	12	60.0
Fine Motor	11	55.0
Vision	7	35.0
Hearing	8	40.0
Speech	10	50.0
Cognition	16	80.0
Behavior	12	60.0
Seizures	7	35.0
Stunting	11	55.0
Nutrition	7	35.0

Improvements in child survival in many low-income and middle-income countries in recent decades have coincided with a growing global awareness of children functional status and the effects of childhood disabilities on individuals, families and populations. Despite rising interest in child disability, little is known about the frequency and situation of children with disabilities in countries with low and middle incomes[14]. In the present study the frequency of NDIs is observed 8.5% where males are more affected than

females. Almost similar observation was also reported by a collaborative study where disability had been found as 7% and the frequency was also slightly higher in boys than girls[3]. Another community based study has found at risk for NDIs is 17% which seems much higher than the present study[5]. It may reflect that hospital admission/visit frequency is less among the developmentally impaired children. Another thing is that about one third of present study sample was taken from early neonatal age where DSQ positivity was found very low. The most common at risk for NDIs identified in that study were for speech (48.1%) and cognition (48.1%) which is consistent with the present study[15]. This study is hospital based; therefore it does not reflect the situation prevailing in the community.

In the present study cognition is found as the mostly affected domain followed by gross motor and behavioral impairment. Though the previous study done in Bangladesh showed the mostly affected areas were hearing and speech, cognition was the major problem among seriously disabled children[4]. In another study speech and language problem are reported as the mostly affected domain[1]. Cognitive delays and disorders are the delays or deficits in problem solving skills, memory skills, and general learning skills. Deficits in problem-solving skills are exhibited as atypical or delayed development of basic concepts such as object permanence, means-ends, and recognition of object functions. Memory deficits can be demonstrated as reduced or absent fast-mapping abilities like the ability to remember an event after one instance of that event[12]. Deficits in general learning skills occur as reduced ability to acquire new skills or to generalize old skills to new events comparably to same-age cognitively normal peers[16].

The most marginalized disabled people are the people with visual, mental, physical and hearing impairments[17]. Disability could be seen as a manifestation of a physical or mental impairment. Impairment only becomes a handicap in the context of a given society, often because the society does not accommodate the needs and the rights of citizens living with impairments[18]. Handicap, therefore, is not a natural, but a social fact. The Rapid Neurodevelopment Assessment Instrument (RNDA) for Bangladesh children less than two years of age reported by Khan et al[7] basically provides an instrument to further evaluate in detail previously screened youngsters who have been thought to be at possible risk for developmental delays and handicaps. Bangladesh has been classified as one of the least developed countries by the United Nations and has very limited resources to spend on social services. There are no reliable national surveys have been carried out in Bangladesh to ascertain the precise magnitude of the problem of disability. Families living in rural Bangladesh have no access to services for children with disabilities, due to lack of facilities and lack of knowledge about early detection and rehabilitation[17]. Assessment and education are delayed until the child is of school going age or older. Gender disparity also aggravates the situation, giving the girl child a double burden of being a girl, and having a disability[18]. Thus there is a great need in Bangladesh for programmes that provide services of early identification and intervention that reach out to children with disability living in rural and remote areas.

Conclusion

In conclusion NDIs are present in the general population of the Bangladesh with a very significant rate. Cognition is the most frequently involved and also severely affected domain. RNDA is less time consuming method for identification of NDIs. DSQ should be used routinely at tertiary care hospital for identification of at risk for NDIs. Multicenter study should be carried out to validate DSQ in detection of at risk for NDIs.

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