



# Assessment of Neurodevelopmental Impairments among 0-2 Years Old Children Attending a Tertiary Care Hospital by Development Screening Questionnaire

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## **Authors' contributions**

*This work was carried out in collaboration among all authors. All authors read and approved the final manuscript.*

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## **ABSTRACT**

**Background:** Pediatric neurodevelopmental disorders have a large burden on the health care system all over the world particularly in developing countries. Due to the constraints of the appropriate diagnostic tools many of these children report late and identification in appropriate time is not possible. These missed opportunities thus increase the number of children with disability. Therefore simple measures are needed to determine neurodevelopmental impairment (NDI) at an early age where professional expertise is sparse.

**Objective:** To determine the proportion of children having NDIs in a tertiary care hospital by using Development Screening Questionnaire (DSQ); and to estimate the specific types of NDIs within the study population.

**Methods:** It was a cross sectional observational study held in Department of Pediatric Neurology, Bangabandhu Sheikh Mujib Medical University (BSMMU), Dhaka, Bangladesh from January 2018 to December 2018. Children aged 0-2 years who were attending Pediatric Neurology out patient

department were included in the study. Screening of all children in the sample was done by DSQ for NDIs.

**Results:** Among the study subjects, 7.26% children were found to have DSQ positive for NDIs. Cognition (64.71%) and speech (64.71%) were the mostly affected domain. Detection of NDIs by DSQ in other domains were: gross motor (35.29%), fine motor (17.65%), hearing (29.41%), vision (25.53%), behavior (5.89%) and socialization (0.0%).

**Conclusion:** In this study group, the frequency of NDIs was 7.26%. In certain developmental domain (i.e. cognition, speech, gross motor, hearing) NDIs were detected more in this small scale study by using DSQ.

*Keywords: Neurodevelopmental impairment; DSQ.*

## 1. INTRODUCTION

According to World Health Organization (WHO), the estimated disability in different form is about 10% of the world's population [1]. Durkin et al in their study reported the childhood disability prevalence about 15.2% in Jamaica, 14.7% in Pakistan and 8.2% in Bangladesh [2]. Early identification is often missed in this population [3]. In Bangladesh, a lower middle income country, the burden of disability is high. In a survey, among 2-9 years old children, some form of disability was found in 68 of 1000 [4,5].

Various forms of developmental screening tests are used by the pediatric neurologists and developmental pediatricians to diagnose the developmental delay early. But most of the tools miss the NDI in early age [6]. Thus, large number of children are unrecognized and are at risk to develop disability [7]. In Bangladesh there is the rise in prevalence of children who are at risk for disabilities from 8% 1988 [4] to 20% in 2005 [8].

Early recognition of NDI is very important for early intervention and multidisciplinary approach [9,10]. This is a missed opportunity for low and middle income countries as many of the children are unrecognized and under-addressed which lead to permanent functional limitations, disabilities, and handicaps [11]. To combat this, tools for developmental screening are needed to identify children who may need more comprehensive evaluation [12].

The Developmental Screening Questionnaire (DSQ) was designed to be administer to mothers of children to screen neurodevelopment status. It is able to identify all children at risk for vision and hearing impairments, nearly three-fourth with speech impairments, two-third with gross motor impairments, and half with behavioral, cognitive and fine motor impairments [13]. This study intends to determine the neurodevelopmental impairments in children in a tertiary care center.

## 2. MATERIALS AND METHODS

The study was a cross-sectional observational study taken place in Department of Pediatrics, Bangabandhu Sheikh Mujib Medical University (BSMMU), Dhaka, Bangladesh from January 2018 to December 2018. All children who attended the OPD from 0-2 years were included in the study. Very sick children were excluded from the study.

The children identified with disability were advised to be enrolled as regular patient of pediatric neurology OPD of BSMMU for appropriate medical and other intervention services by the multidisciplinary team.

The developmental screening questionnaire (DSQ) was used to detect the neurodevelopmental status of children. The questions were grouped by age in months. In each group, questions related to the following eight functional domains were asked: 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. If positive result comes in any domain, the child is considered as 'screen positive'.

### 2.1 Data Analysis

Data analysis was done with Statistical Package for Social Sciences (SPSS-22 version) software (SPSS Inc, Chicago, IL, USA).

## 3. RESULTS

### 3.1 Baseline Characteristics of Children

A total of 234 children of 0-2 years old were included into this study. A slight male predominance was observed (male 50.85%) in the screened children. Mean age was 11.90±2.45

months. Most of the children were from the city area where the hospital is situated (Dhaka 72.65%) (Table 1).

### 3.2 Baseline Characteristics of Screen Positive Children

Out of 234 children 17 children were positive for NDI which is 7.26% of the total children. Here a slight male predominance has been seen (Male 52.94%). Mean age of the children were  $12.06 \pm 3.15$  months. Majority of the NDI positive families were from lower income group (52.94% had only 100- 300 USD/10000-25000 BDT

income per month). More than half of the NDI positive children were from the city area where this hospital is situated (Table 2).

### 3.3 Profile of DSQ Positive Children

More than one third of the children were from 18-24 month age group (35.29%) however, least number of children were from less than 6 month group as well as from 12-18 month group. Most affected domain in which delay observed were speech and cognition (64.71%). Gross motor delay was observed in 35.29% children (Tables 3, 4).

**Table 1. Characteristics of the screened children (n= 234)**

Characteristics	Number	%
<b>Gender</b>		
Male	119	50.85%
Female	115	49.15%
Age in months (mean $\pm$ SD)	11.90 $\pm$ 2.45	
<b>Residence</b>		
Dhaka	170	72.65%
Outside Dhaka	64	27.35%

*Among screened children male are slightly higher than female and mean age of the children is 11.90 $\pm$ 2.45 months*

**Table 2. Characteristics of screening positive children (n=17)**

Characteristics	Number	%
<b>Gender</b>		
Male	9	52.94%
Female	8	47.09%
Age in months (mean $\pm$ SD)	12.06 $\pm$ 3.15	
<b>Monthly income of household (in taka)</b>		
<10000	4	23.53%
10000- <25000	9	52.94%
25000- <50000	2	11.76%
>50000	2	11.76%
<b>Residence</b>		
Dhaka	10	58.82%
Outside Dhaka	7	41.18%

*Screening positive children are mostly associated with lower income (<25000 Tk./ month) group of families*

**Table 3. Age distribution of children in DSQ positive cases (n=17)**

Age in month	Number	%
0-6	3	17.65%
6-12	5	29.41%
12-18	3	17.65%
18-24	6	35.29%
Total	17	100%

*Highest number of DSQ positive cases were in the age group of 18-24 months*

**Table 4. Distribution of NDIs in DSQ positive cases (n=17)\***

Parameters	Number of children affected	%
Gross motor	6	35.29%
Fine motor	3	17.65%
Vision	4	25.53%
Hearing	5	29.41%
Speech	11	64.71%
Cognition	11	64.71%
Behavior	1	5.89%
Socialization	0	0.0%

*\*Total will not correspond to 100% for multiple NDIs in the same individual.  
DSQ was positive for NDIs in the highest number both in speech and cognition*

#### 4. DISCUSSION

Due to various risk factors at birth, many children in developing countries are predisposed to neurodevelopmental disorders. Timely identification, evaluation and proper management is critical for the overall well-being these children and their families [14]. Although disability is a great burden for the society, limited survey and research have been done in pediatric disabilities due to financial constraints in countries with low and middle income [15]. With this view, the present study was done to highlight the NDI in a developing country in children.

In this study, the frequency of NDIs was 7.26% where males were (52.94%) more affected than females (47.09%). This study result has similarity with a collaborative study where disability had been found as 7%. A slight male dominance was also found in that study [16]. However, in another community based study the risk for NDIs was 17% which is higher than the present study. As this is a hospital based study, this might not reflect the situation prevailing in the community [13].

In the present study the most affected domains were speech (64.71%) and cognition (64.71%). Other domain were gross motor (35.29%) and hearing (29.41%). The previous study done in Bangladesh showed the mostly affected areas were hearing, speech and cognition among seriously disabled children [16]. Another study in India also reported speech and language problem as mostly affected domain [1].

As an initial step of screening it can, indeed, be a useful tool to identify those who are at risk for disability and should be referred for comprehensive evaluations as needed, and possible early intervention considering DSQ as

simple and easy tool. The DSQ can detect disability in different domains such as speech, gross motor, behavior, fine motor and cognition, the sensitivity is 70%, 63%, 53%, 48%, 45% respectively [13].

This study showed the effectiveness of DSQ in gross motor (35.29%), fine motor (17.65%), cognition (64.71%), speech (64.71%), vision (25.53%), hearing (29.41%), behavior (5.89%) and socialization (0.0%). So, DSQ screening has potential to detect NDIs. In a busy clinical setting and for large population DSQ may be simple, and effective to detect NDIs.

In Bangladesh, there is limited numbers of national surveys to determine the magnitude of the problem of disability. Children particularly living in rural areas are most affected with disability due to delayed diagnosis. Thus their assessment and intervention are delayed. Thus simple tools like DSQ can be used in rural area to prevent delayed diagnosis of disability.

#### 5. CONCLUSION

In this study, the frequency of NDIs was about 7.26% in studied children. In certain developmental domain (i.e. gross motor, cognition, speech and hearing) NDIs were detected more in this small scale study by using DSQ. Thus, DSQ may be a simple, effective method for identification of NDIs in large population in low resource countries however multi-center nationwide study is needed to validate this result.

#### CONSENT

Informed written consent from parents of eligible children was taken. History was collected comprising date of birth and corrected age was determined in case of prematurity.

## ETHICAL APPROVAL

Ethical clearance was taken from the Institutional Ethical Committee to perform the study.

## COMPETING INTERESTS

Authors have declared that no competing interests exist.

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