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Collaborative Services of Pediatric Neurosciences Department for the Early Detection of Neurodevelopmental High-Risk Neonates in Dhaka Shishu (Children) Hospital (DSH)

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Abstract **Original Research Article**

Introduction: A majority of neonates present with histories of brain insult in the antenatal, natal and post-natal periods. Identification, appropriate assessment and intervention are crucial for best neurodevelopmental outcomes. In DSH the Pediatric Neuroscience Department (PND) is working in this regard in the neonatal ward as well as in its Child Development Center (CDC) with a multi-disciplinary team of professionals. ***Objectives:*** To describe the activities of PND in the management of high risk neonates. ***Methods:*** This was an observational study. From July 2017- December 2017every high risk neonate admitted in the neonatology department of Dhaka Shishu Hospital, the largest children hospital was assessed for neurodevelopmental assessment by the Rapid Neurodevelopmental Assessment (RNDA) tool by a Developmental Therapist. RNDA is a validated tool for neurodevelopmental assessment applied for ages between 0-16 Years. Different domains like gross motor, fine motor, vision, hearing, speech, cognition, behavior and seizures are seen and categorized into normal, mild, moderate and severe impairments. Neonates with moderate to severe impairments are then referred to the CDC for a general developmental assessment under the supervision of a pediatric neurologist; with regular follow ups. Interventions for different comorbidities are provided nutritional and feeding advice. Mild groups are also followed up by developmental therapists up to a maximum of 2 years. In the walk-in OPD of the department this same protocol is followed. ***Result:*** Approximately 650 patients were seen; among them 220 needed general developmental assessment on the basis of moderate to severe impairment. Among the impaired and non-impaired group there were difference in Term, preterm, birth weight and gestational age, Soocoidemography showed irregular antenatal care, bad obstetrical history and malnutrition has important impact. ***Conclusion:*** Every neonate who is at high risk needs assessment, evaluation, intervention and follow-ups, which can prevent future impairments and disabilities. This is possible by establishing a sound communication network between the different sub-specialties and neurology and child development services in tertiary care hospitals.

Keywords: Neurodevelopmental assessment, neurology, Pediatric.

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INTRODUCTION

A majority of neonates present with histories of brain insult in the antenatal, natal and post natal periods. Identification, appropriate assessment and intervention are crucial for best neurodevelopmental outcomes. Intrauterine and neonatal insults substantially affect the global burden of disease, measured in disability-adjusted life-years, because they contribute to both premature mortality and long-term disability [1]. However, little is known about the severity and distribution of long term impairments after intrauterine or neonatal insults. As a result, squeal from intrauterine and neonatal insults have not been adequately captured in estimates of the global burden of disease [2, 3].

Developmental challenge in children is an emerging problem across the globe, which is largely associated with improved neonatal survival [4].

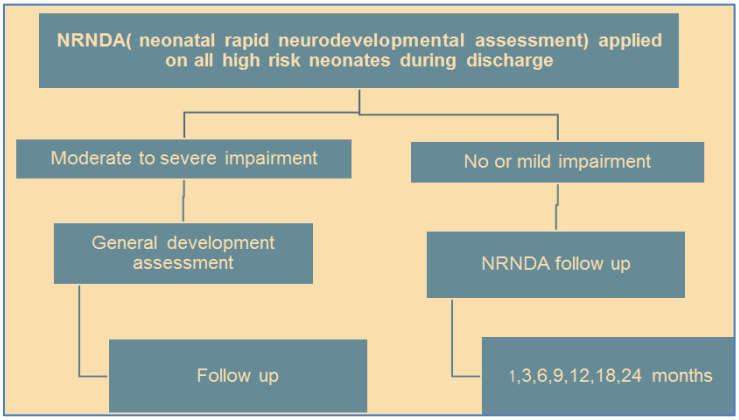
The prevalence of developmental delay among SNCU graduates is found to be quite high (31.6%) [5]. in last few years in Bangladesh neonatal mortality rates is reduced but disability has become a big problem. In DSH the Pediatric Neuroscience Department (PND) is

working in this regard in the neonatal ward as well as in its Child Development Center (CDC) with a multi-disciplinary team of professionals. The aim is to describe the activities of PND in the management of high risk neonates

METHODOLOGY

This is an observational study From July 2017-December 2017every neonate admitted in the neonatology ward was screened for any neurodevelopmental impairment by a screening tools, Rapid Neurodevelopmental Assessment (RNDA) by a developmental therapist. RNDA is a validated tool for neurodevelopmental assessment applied for ages between 0-16 Years. RNDA is a set of unique tools which have been developed over several years by a team of committed researchers so that single professionals are able to conduct the assessment on children's universal functional abilities [6].

Different domains like gross motor, fine motor, vision, hearing, speech, cognition, behavior and seizures are seen and categorized into normal, mild, moderate and severe impairments. Total 600 patients were included among them 220 had impairment and was included for General development assessment and regular follow up.



Flow chart of assessment of neonate

Those who had normal or no impairment were on regular follow up considering the risk factors. Neonates with moderate to severe impairments are then referred to the Child development center (CDC) for a general developmental assessment under the supervision of a pediatric neurologist with regular follow up. Interventions for different comorbidities like seizure, growth impairment were provided. Mild groups were also followed up by developmental therapists up to a maximum of 2 years. In Outpatient department (OPD) of the department this same protocol is followed.

RESULT

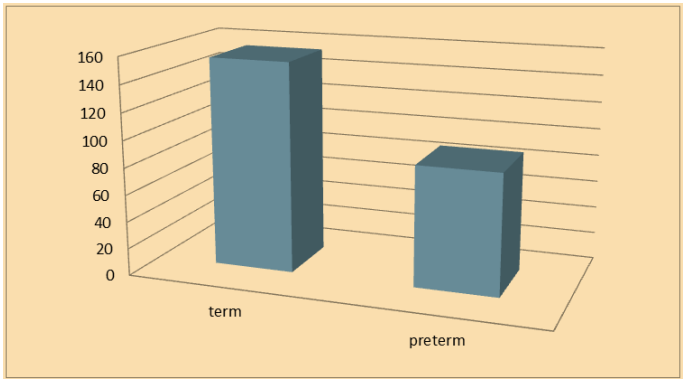


Fig-I: Term, preterm ratio. Term infants were more in High risk group. In the study population it is seen that term infants were more than preterm but neurodevelopmental impairment was more in preterm which was 75.5%

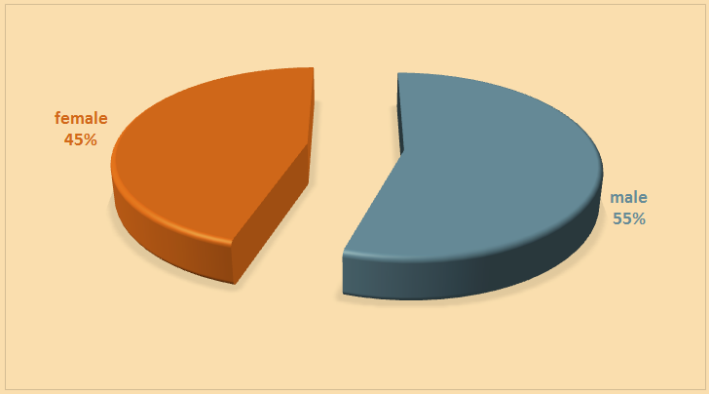


Fig-II: Distribution of sex revealed male were more 55% and female were 45%

Table:-I: Sociodemographic characteristics in impairment group (n=220)

		In %	P value	OR
Antenatal follow up	Regular Irregular	25.5 74.5	0.02	18.96-27.40
Residence	Urban Rural	2.7 97.3	0.000	18.3-25.5
Facilities during delivery	Well Not well	5.3 94.7	0.000	18.3-25.5
Socioeconomic condition	Average Below average	32.5 67.5	0.5	1.78-6.87
Maternal nutrition	Well nourished Under nourished	29.7 71.3	.015	1.35-20.41
Any bad obstretical history	Present Absent	84.5 15.5	.000	13.5-18.5
Birth weight	Average Below average	20.2 79.8	.000	2.96-13.4
Gestational age	Term Preterm	27.5 75.5	.031	1.132-15.71

P value< .05

In the table I antenatal follow up was irregular in 74.5% cases which was statistically significant with high risk of developing impairment. In case of residence it was seen 97.3 % child came from rural area that had neurodevelopmental impairment. Well-nourished mother was 29.7% and undernourished were 71.3 % which was statistically significant with high risk of having neurodevelopmental impaired child. Poor socioeconomic condition and previous bad obstetrical history was significantly associated with neurodevelopmtal impairment due to lack of antenatal visit. Preterm neonate had 75.5% impairment and term had 27.5% impairment which was significant and OR is also high.

Tab II: Impairment of different domain in high-risk neonates

	No(%)	Mild (%)	Moderate (%)	Severe (%)	P value
Gross motor	20	31	29	20	.000*
Fine motor	27	32	25	16	.000*
Vision	43	24	19	14	.000*
Hearing	23	17	35	25	.038*
Cognition	91	4	2	3	.217
Primitive reflexes	23	39	29	9	.000*

P value < .05

Tab II: The table II shows on initial assessment of high-risk neonates. In RNDA impairment is graded in no, mild, moderate and severe. Developmental domains were assessed and gross motor, fine motor, vision, hearing and primitive reflexes are significant.

DISCUSSION

In this study priority was given for the early detection of neuro disability in high-risk neonate. In Dhaka Shishu hospital neonates are admitted from different sites of the country as a tertiary care center. The complicated neonatal cases are treated here and

during discharge RNDA was applied. Term infants were more in High risk group. In the study population it is seen that term infants were more than preterm but neurodevelopmental impairment was more in preterm which was 75.5%. Similar findings were seen by Nandita et al. [5, 7]. Distribution of sex revealed male were more 55% and female were 45% in the high-risk group.

The difference in care seeking for male and female newborns shows the families are more concerned about the survival and wellbeing of male off-springs than the females, rather than neuro-developmental outcome [5]. Sociodemography shows important findings in neurodevelopmental impairment. Antenatal follow up was irregular in 74.5% cases which was statistically significant with high risk of developing impairment. In case of residence it was seen 97.3 % child came from rural area that had neurodevelopmental impairment. In a developing regions, the proportion of women receiving the World Health Organization (WHO) recommended four or more antenatal visits is 67% in urban areas versus only 34% in rural areas. Training skilled birth attendants in neonatal resuscitation is also a missed opportunity: only 1 in 4 infants in six African countries is delivered by an attendant skilled in neonatal resuscitation and equipped with the appropriate supplies [8].

Well-nourished mother was 29.7% and undernourished were 71.3 % which was statistically significant with high risk of having neurodevelopmental impaired child. Poor socioeconomic condition, and previous bad obstetrical history was significantly associated with neurodevelopmental impairment due to lack of antenatal visit. Pre-pregnancy underweight was associated with an increased risk for preterm birth (OR 1.75; 95% CI: 1.13 to 2.71) [9] (OR 1.41; 95% CI: 1.37 to 1.35) [10], (OR 2.11; 95% CI: 1.03 to 4.32) [11]. Pre pregnancy underweight was also found to significantly increase the likelihood of SGA babies (OR 1.95; 95% CI: 1.52 to 2.50) [12], (OR 1.90; 95% CI: 1.70 to 2.12) [13], stillbirths (OR 1.39; 95% CI: 0.33 to 5.86) [14] and LBW babies (OR 1.54; 95% CI: 1.04 to 2.28) [15]. As expected, pre-pregnancy underweight reduced the risk of Cesarean section (OR 0.65; 95% CI: 0.44 to 0.95) [16].

Preterm neonate had 75.5% impairment and term had 27.5% impairment which was significant and OR is also high. In another study it is seen low birth weight and prematurity were found to be the major contributory factors for neuro-developmental delay. There is strong evidence demonstrating the interdependent relationship between maternal and neonatal health. Strategies for improving maternal and newborn health are therefore closely related. Maternal infections and other poor health conditions often contribute to neonatal morbidity and mortality (including stillbirths, neonatal deaths and other adverse clinical outcomes) [17].

In RNDA impairment is graded in no, mild, moderate and severe. Developmental domains were assessed and gross motor, fine motor, vision, hearing and primitive reflexes are significant.

CONCLUSION

Every neonate who is at high risk needs assessment, evaluation, intervention and follow-ups, which can prevent future impairments and disabilities. This is possible by establishing a sound communication network between the different sub-specialties and neurology and child development services in tertiary care hospitals.

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