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Editorial

"Neonatal Resuscitation: An Update"



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EDITORIAL

Neonatal Resuscitation: An Update

Mahfuza Shirin

At birth, transition from intra to extra uterine life is crucial with rapid physiologic changes involving both the cardiovascular and respiratory systems. Failure of this adaptation results in cardiopulmonary compromise and the need for resuscitation. Most, but not all infants adapt well to extra-uterine life but some require help.¹ Newborn resuscitation programme is intended to provide this help in a structured way. Since 1980s, various societies have been developing guidelines and algorithms for neonatal resuscitation.^{2,3} In 1992 International Liaison Committee on Resuscitation (ILCOR) was formed, which provides a common platform for major organizations on resuscitation to work together globally.⁴ The guidelines of neonatal resuscitation initially based on common practices, is constantly evolving and now on evidence based.⁵ From the year 2000 every 5-year revised guidelines has been published by ILCOR, AHA and AAP. The latest version of neonatal resuscitation guidelines is published by AHA⁶ and ILCOR⁷ in 2020.

In the 2020 guidelines, there are changes in several practices of the existed 2015 algorithm (Fig. 1). The first and important change noted in the anticipating the need for resuscitation section, addition of team briefing as a mandatory action when anticipating a high-risk birth.⁶ This will help to identify potential interventions, assign roles and responsibilities to promote effective teamwork, communication and support patient safety during resuscitation. So, we should carry out pre-delivery team briefing for high-risk delivery.

This guideline adopted previous recommendation of delayed cord clamping longer than 30s for both preterm and term neonates who do not require resuscitation at birth with more evidence.⁶ But cord milking in preterm neonates <28 weeks is not recommended as there was no benefit and concerns of intraventricular hemorrhages.⁸ Thus, delayed cord clamping should be universally practiced unless the baby needs active resuscitation.

Interventions before proceeding to ventilation in depressed neonates collectively labelled as initial actions. In this part, there are two changes, one is to avoid hyperthermia (>38.0°C), which is adopted on evidence⁹ and the other is to maintain normal temperature of newly born, generalize the use of skin-to-skin contact in all settings which was recommended for only resource limited settings in NRP 2015. In case of clearing the airway of nonvigorous newborn delivered through meconium-stained amniotic fluid (MSAF), routine laryngoscopy with or without suctioning is not recommended. Suction is recommended only for those who have visibly obstructed airway.

For monitoring of heart rate during resuscitation recommendation of use of ECG remains as previous. On the other hand, the current guidelines recommended use of ECG for rapid and accurate assessment of heart rate during chest compression.

2020 guideline restated the previous recommendation to provide positive pressure ventilation (PPV) without any delay, within 60 sec from birth in newborns who are gasping or apnoeic or who are persistently bradycardic (<100/min) despite appropriate initial actions. For applying PPV, previously there was no pressure limit recommendation, but 2020 guideline recommended use of 20-25 cm H₂O peak inflation pressure to inflate the lung. In animal studies, positive end expiratory pressure (PEEP) has been shown to maintain lung volume during PPV, consequently improving lung function and oxygenation in preterm.¹⁰ So, 2020 guideline recommended that it is reasonable to provide PEEP for preterm neonates receiving PPV. Also there is recommendation to initiate PPV with an inspiratory time of ≤1s. Another notable change is, not to perform sustained inflation breath to initiate resuscitation in preterm infants which is potentially harmful.¹¹ So, we should avoid sustained inflation during initial PPV, if needed start PPV with PEEP within first 60s of birth and inspiratory time of 1 sec or less should be used while giving PPV irrespective of gestation.

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The 2020 guideline reiterated the previous recommendation for initiation of PPV with oxygen; 21-30% for <35 weeks gestation and 21% oxygen for ≥ 35 weeks. This version labeled use of 100% oxygen harmful¹² and recommended newborns of ≥ 35 wk, receiving respiratory support at birth should not receive 100% oxygen. However, 2020 guidelines recommended use of higher oxygen concentrations for ventilation during chest compressions. Latest guideline also recommended use of CPAP instead of intubation for spontaneously breathing preterm infants, who require respiratory support immediately after delivery.

There was no mention regarding vascular access in 2015 version. In 2020 guideline vascular access by umbilical vein catheter is added as a new recommendation based on expert opinion and with intraosseous access being the next best option as per the availability. Insertion of umbilical venous catheter is included in the algorithm and this is the only change from NRP 2015 algorithm. Previous recommendation about use of intravenous epinephrine during resuscitation remains unchanged. In addition, 2020 guideline recommend a larger dose of epinephrine (0.05 to 0.1 mg/kg) administration via ET tube while vascular access is being obtained and if the response is inadequate give an intravascular dose as soon as vascular line is established. Give further doses of epinephrine (10-30 $\mu\text{g}/\text{kg}$) every 3-5 min, preferably intravascularly, if the heart rate remains $< 60/\text{min}$.

The time for discontinuation of resuscitative efforts changed from 10 minutes to 20 minutes is a major modification in 2020 guideline. In newly born babies receiving resuscitation, if there is no heart rate and all the steps of resuscitation have been performed, continuation or discontinuation of resuscitation efforts should be discussed with the team and the family around 20 min after birth considering individual patient and contextual factors.

The last but important change in 2020 NRP is to provide individual or team booster training more frequently than every 2 years to individuals who have been trained in neonatal resuscitation. More frequent training was revealed to improve procedural skills (especially endotracheal intubation), decrease the use of bag-and-mask ventilation and decrease neonatal mortality at 24 hours of age.¹³

There are several important concerns while applying NRP 2020 guidelines in a developing country like Bangladesh. These are: 1. For administering oxygen with 21-30% FiO_2 additional requirements are compressed air and blender machine; 2. For monitoring oxygen status pulse oximeter is needed and HR

monitoring during chest compression ECG machine is required; 3. For PPV with PEEP T-piece resuscitator is needed; 4. Laryngeal mask airway (LMA) is an emerging alternative to endotracheal intubation especially when the personnel are not skilled in intubation, is not available in our market. 5. Inserting umbilical venous catheter for venous access during resuscitation, umbilical venous catheter (UVC) with skill to introduce UVC is not available. To make this guideline in practice in our country first we have to make the instrument available and then we have to develop skills to use those. Another problem is trained manpower and individual or team booster training is very limited, so training facilities should make available round the year to solve this problem. Though we have various limitations, GoB with professional bodies like BPA, BNF and development partners is working to improve services through HBB programme. To implement standard NRP and 2020 revised guideline we need to adopt 2020 NRP guidelines in our country context by combined efforts.

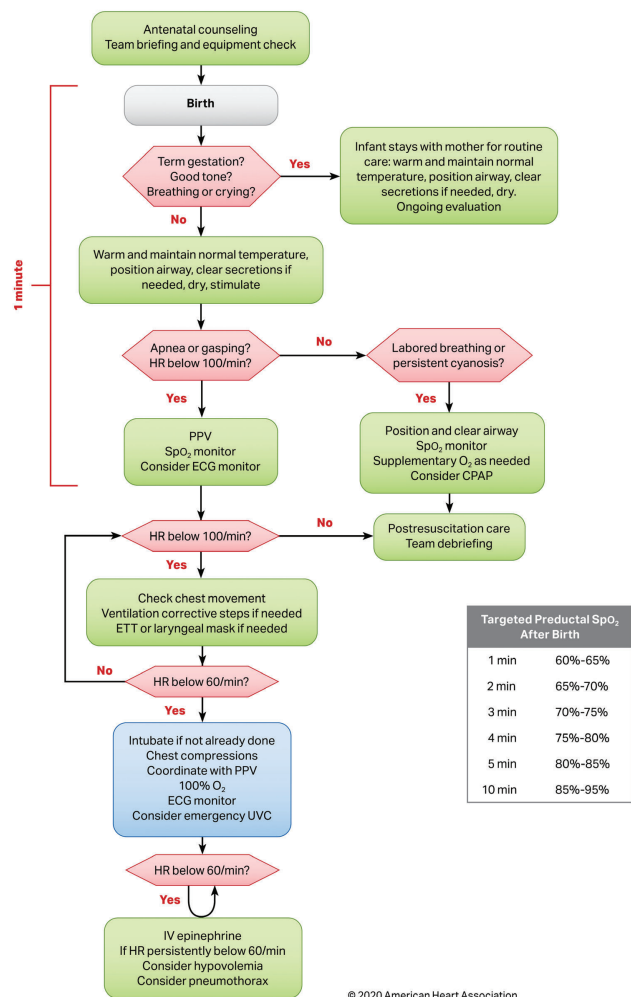


Fig.-1 Neonatal resuscitation algorithm

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LEADING ARTICLE

Role of Vitamin D in Dengue Fever

Rabi Biswas

Introduction

The World Health Organization recently warned that diseases such as dengue, Zika, chikungunya and yellow fever caused by mosquito-borne viruses are spreading faster and further because of climate change. Dengue virus has worldwide distribution and remains a grave public health problem in Bangladesh. In Bangladesh's ongoing 2023 dengue epidemic season, the country has been witnessing the deadliest outbreak of dengue fever ever since the first outbreak in Bangladesh in 2000. As of 10 October 2023, the Directorate General of Health Services (DGHS) has reported 228,799 hospitalizations and 1,100 deaths due to the *Aedes* mosquito-borne tropical disease in the 2023 outbreak year.¹ The U.N. children's agency says the actual numbers are higher because many cases are not reported. The previous highest number of deaths was in 2022, when 281 people are reported to have died during the entire year. Prevention and control of dengue and DHF has become the need of time with the expanding geographic distribution of disease and increased disease incidence in the past 20 years.² Unfortunately, tools available to prevent dengue infection are very limited. Despite considerable work on vaccine for DF and DHF over the years, an effective safe vaccine is yet to be developed because of various obstacles. Mosquito prevention is also an important step in eradication of dengue fever.³⁻⁵ It is fascinating to note that 25-hydroxy vitamin D3 has been found as an important modulator of immune response to several pathogens including dengue virus and vitamin D deficiency is another concern of Bangladeshi population where 27-75 per cent at different studies suffering from some level of vitamin D deficiency or insufficiency.⁶

Dengue fever: Etiology and pathogenesis

Dengue is a febrile illness that is a major cause of morbidity throughout the tropical and subtropical

regions. It is caused by a flavivirus with four distinct serotypes (DV-1, DV-2, DV-3, and DV-4). DHF is characterized by all the symptoms of Dengue fever (DF) along with haemorrhagic manifestations such as spontaneous bleeding, decrease in platelet count and evidence of increased vascular permeability noted as increased haemo-concentration or pleural effusion or ascites.⁷ Virus spreads between humans by mosquito vectors of the *Aedes* genus, i.e, *Aedes aegypti* and *Aedes albopictus*.⁸ Approximately 2.5 billion people are at risk of getting infection and 50 million cases of dengue fever are reported every year.⁹ Infection with any of the serotypes may be asymptomatic in the majority of cases or may result in a wide spectrum of clinical symptoms, known as Dengue fever. The symptoms of dengue fever range from a mild flu-like syndrome to the most severe forms of the disease, DHF, which includes coagulopathy and increased vascular permeability. DHF may progress to hypovolemic shock known as DSS.¹⁰ In Asia the risk of developing severe disease is greater in Dengue fever- infected children (≤ 15 years) than in adults.¹¹

The life-threatening DSS stage occurs at the time of or shortly after drop in blood pressure, which is characterized by a rapid, weak pulse, narrow pulse pressure (≤ 20 mm Hg) or hypotension with cold, clammy skin in the early stage of shock. This may soon progress to more serious form of shock if patients do not receive prompt and appropriate treatment, in which pulse and blood pressure become undetectable, resulting in death within 12 to 36 h after onset of shock.¹²

How vitamin D plays role in Dengue fever

In vitamin D deficiency, calcium absorption is insufficient and cannot satisfy the body's need. Low blood calcium levels have been associated in Dengue fever.¹³ Calcium has proven to be essential for

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cytotoxic activity of the dengue type 2 viruses (DV) - induced macrophage cytotoxic (CF2).¹⁴ Calcium appears to play a role in the induction of dengue-specific T-helper cells. Dengue antigen has been shown to increase the influx of calcium into T-cells. The proliferation of dengue-specific T-helper cells appears to be dependent on calcium and is inhibited in the absence of calcium.¹⁵ There is some evidence that the production of nitrite in response to dengue virus infection is also calcium dependent.¹⁶

Few studies have discussed the role of vitamin D in reducing the severity of DF, DHF and DSS. A case series published in 2009 showed 5 patients receiving vitamin D had overall improvement of clinical condition and reduced symptoms of DF.¹⁷ A Brazilian study found increase in vitamin D binding protein in DF.¹⁸ The possible explanation of anti-dengue effects of vitamin D is because of involvement of cathelicidin (in the form of LL-37), human beta defensin 2, and through the release of reactive oxygen species.¹⁹ Presently it is believed that patient of DF will never progress to DHF or DSS but wide variation in severity and outcome of disease make this doubtful.

Possible role of vitamin D in Dengue fever

A study in Pakistan showed that group of patients with Dengue fever receiving vitamin D had fewer progression of DF to DHF. The relationship between vitamin D supplements and progression to DHF was significant as well as vitamin D decreases the risk and severity of DHF.²⁰ Puerta-Guardo et al²¹ in Mexico investigated the effect of treatment with vitamin D3 on two types of human cell lines (hepatic Huh-7 and monocytic U937) infected with DENV. Puerta found that exposure to 1,25-dihydroxy vitamin D3 significantly reduced the number of infected cells, particularly in monocytic cells, and lowered the production of pro-inflammatory cytokines. Vitamin D3 significantly reduced the levels of pro-inflammatory cytokines (TNF- α , IL-6, IL-12p70 and IL-1 α .) produced by infected U937 cells. These results suggest that vitamin D3 may represent a potentially useful antiviral compound.

Alagarasu et al²² showed that there might be an association related to the inducing effect of vitamin D on Fc γ receptor expression. Fc γ receptor enhances viral entry into cells, possibly leading to higher viral load in dengue cases with secondary infection and the development of DHF or dendritic cell-specific intercellular adhesion. Studies showed that vitamin

D might influence viral entry into cell. Albuquerque et al¹⁸ compared protein levels in the plasma of patients with severe DF with the protein levels of healthy individuals and found that a one of the proteins showing a significant increase in DF patients was vitamin D-binding protein. Bharara et al²³ showed in their study that 25-hydroxy vitamin D3 may contribute in the pathogenesis of dengue infection; thus, vitamin D levels might serve as useful prognostic marker for predicting disease progression.

Iqtadar et al²⁴ showed their results suggest that there may be a possible association between VDD and susceptibility towards severe dengue illness. Hence, maintaining sufficient vitamin D levels in the body either through diet or supplementation may help provide adequate immune protection against severe dengue fever illness. Sadarangani et al²⁵ in Singapore found low systemic 25-(OH) D was associated with increased dengue disease severity, particularly for severe bleeding that was not explained by thrombocytopenia.

Vitamin D supplementation in Dengue fever

No significant number of studies has been published considering the supplementation of vitamin D to reduce morbidity or mortality of dengue illness, still few studies revealed, in group receiving vitamin D (2,00,000 IU single dose), there was fewer progression of DF to DHF. The relationship between vitamin D supplements and Progression to DHF was significant (N=170, $\chi^2=16.43$, p= 0.000). Vitamin D decreases the risk and severity of DHF.²⁰ Jahnyer Martínez-Moreno et al²⁶ showed that MDDCs from donors who received 4000 IU/day of vit D were less susceptible to DENV-2 infection than MDDCs from donors who received 1000 IU/day of vit D. In another study, Diana Marcela Giraldo et al²⁷ showed a supplement of 4000 IU/day of vitamin D may represent an adequate dose to control dengue progression and DENV replication. Sánchez-Valdeiz et al¹⁷ observed a significant increase in platelet count on receiving vitamin D in their clinical trial. According to another study²⁸, vitamin D supplementation altered IL-12 expression and dendritic cell maturation there by giving vitamin D to dengue patients improved clinical condition.

Conclusions

The studies on vitamin D levels indicate that high concentrations of vitamin D could restrict the infection and replication of the virus in the target cells by reducing the entry receptors and enhancing

antimicrobial peptide levels. Furthermore, vitamin D plays an immunoregulatory role by reducing the production of pro-inflammatory cytokines and enhancing macrophage segregation. Globally, most of the people are suffering from either from vitamin D deficiency or insufficiency. Vitamin D supplementation during Dengue fever may be considered to prevent disease severity although no significant data on clinical improvement is available in current literature. Further research on definite role of vitamin D in reducing Dengue illness and its mode of supplementation in Dengue patients are warranted.

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ORIGINAL ARTICLE

Clinical Evaluation of Dengue Cases in Bangladesh Shishu Hospital & Institute

Md. Jahangir Alam¹, Reaz Mobarak², Md. Kamruzzaman³, Abu Tayab⁴, Probir Kumar Sarkar⁵, ABM Mahfuj Hassan Al Mamun⁶

Abstract

Background: In Bangladesh, the re-emergence of dengue patients has created a huge burden on our children's morbidity and mortality. A dengue outbreak erupted in Bangladesh in 2019, resulting in the highest number of deaths to date.

Objective: To see the clinical and laboratory profile and hospital outcome of the children admitted in Bangladesh Shishu Hospital & Institute.

Methods: A prospective observational study was conducted among the children having dengue infection at the inpatient department of Bangladesh Shishu Hospital & Institute from 1st August 2022 to 31st January 2023. A total of 385 confirmed dengue cases were finally enrolled. Data collected from a standard questionnaire were analysed using SPSS 26.0 statistical software.

Results: Mean age of the dengue patients were 6.09(±4.74) years. Most of the patients suffering from dengue were male 227(59%). According to their BMI, underweight 254(66%), normal weight 97(25.2%), overweight 24(6.2%) and obese 10(2.6%). Most underweight patients age group were 1-5 years age 106(75.7%), according to the association of BMI with age considering p value 0.058. A diagnostic confirmation test revealed that 296 patients (76.9%) were NS1 positive, 65(16.9%) were IgM positive, 21(5.5%) were IgG positive, NS1 & IgM both positive 2(0.5%) and NS1 & IgG positive 1(0.3%). Most of the respondents according to their symptoms had fever 383(99.5%), less urine output 359(93.2%), anorexia 225(58.4%), abdominal pain 136(35.3%), nausea/vomits 126(32.7%), headache 94(24.4%), cough 86(22.3%), joint pain 54(14.0%), rash 44(11.4%), retro orbital pain 34(8.8%), diarrhoea 31(8.1%), back pain 30(7.8%), chill 26(6.8%), others 33(8.6%), etc. Respondents according to sign had enlarged lymph node 40(10.4%), dehydration 9(2.3%), enlarged liver 10(2.6%), ascites 4(1.0%), joint swelling 1(0.3%) and splenomegaly 1(0.3%). Most of the respondents according to the final diagnosis had dengue fever 157(40.8%), dengue fever with warning sign 200(51.9%) and severe dengue 28(7.3%), among them dengue shock syndrome 16(4.2%), expanded dengue syndrome 9(2.3%) and dengue hemorrhagic fever 3(0.8%).

Conclusion: To reduce mortality and morbidity, health care providers must remain alert of the changing pattern of presentation. This challenge requires proper public health interventions to reduce the morbidity and mortality due to severe dengue infection. The outcomes of this study will help to identify potential areas for improvement.

Keywords: Dengue, outcome, mortality.

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Introduction

Dengue has become a global problem since the second world war and is common in more than 120 countries, mainly in Southeast Asia, South Asia and South America.¹⁻³ About 390 million people are infected per year, about half a million require hospital admission,⁴ and approximately 40,000 die.⁵ In 2013 it caused about 60 million symptomatic infections worldwide, with 18% admitted to hospital and about 13,600 deaths.⁶ The worldwide cost of dengue case is estimated US\$9 billion.⁶ For the decade of the 2000s, 12 countries in Southeast Asia were estimated to have about 3 million infections and 6,000 deaths annually.⁷ In 2019, a significant increase in the number of cases was seen.⁸ It is classified as a neglected tropical disease.⁹ It is one of the most common vector-borne diseases worldwide.¹⁰ In Bangladesh, South Asia, dengue fever was first reported in 1964 but became a disease of public health significance from 2000 onwards.^{11,12} Bangladesh has a lower dengue prevalence than most Southeast Asian states,¹³ but recently has sustained an upsurge in dengue outbreaks; from 2769 cases in 2017 to 10148 cases in 2018. In 2019, the Directorate General of Health Services (DGHS)¹⁴ recorded 87953 cases with 81 deaths, a 9-fold increase in the incidence rate of dengue from the previous year.¹⁵ Previous studies indicate that the number of dengue cases and deaths are highest in the warmer months from July to November, and that men were twice as likely to become infected than women.¹⁶ Many cases of dengue are misclassified because of the wide spectrum of disease signs and symptoms and lack of effective case definitions.¹⁷ Over 100,000 people were hospitalized and 129 deaths were recorded in 2019, the most extensive and deadliest outbreak of dengue in the history of Bangladesh.¹⁸ The unofficial number of cases and deaths might be higher as the health reporting system is poor in the country. High incidence of dengue shock syndrome (DSS) and secondary dengue infections were suspected to be associated with high mortality.¹⁹ Dengue virus has four different serotypes (DENV-1 to 4). Infection with one serotype provides long-term immunity to that serotype only but not to the other serotypes, sequential infections with a different serotype put people at greater risk for severe disease by a mechanism called antibody dependent enhancement (ADE).²⁰ Many dengue virus infections produce only mild flu-like illness and over 80% of cases are asymptomatic. Among isolated four serotypes in Bangladesh with a predominance of DENV-3 till 2002.^{21,22} After 2002, DENV-1 and DENV-2 were the prevalent serotypes, which increased the

susceptibility of severe secondary infection by other serotypes.²³ DENV-2 serotype was predominant cause of sharp rise of dengue cases till 2018.²⁴ Thereafter, the 2019 dengue outbreak was predominantly caused by the DENV-3 serotype.²⁵ Among children, nearly 95% of dengue cases are aged less than 15 years.²⁶ Owing to their immature hemodynamic system, children and particularly infants, tend to develop severe dengue disease.²⁷ National surveillance data from Asian countries show that infants under 1 year of age and children aged 4-9 have consistently been at the highest risk for severe dengue disease.²⁸ Shubhankar Mishra et al²⁹ founds 13.40% severe dengue cases among 97 children's where the mean age of admission was 8.7 years. The most common presenting symptom was fever seen in 100% and hepatomegaly (43.8%), the most common physical finding. Gastrointestinal bleeding was markedly seen in severe dengue (76.9%). Elevation in aspartate transaminase (SGOT) was found in 47.42% and thrombocytopenia in 27.5%. The correlation between hepatomegaly and elevated SGOT was significant (P value 0.0346). Case fatality rate (CFR) was 1.03%. The mean duration of hospitalization was 3.8 days. Most people with dengue have mild flu like symptoms or no symptoms and will get better in few days. Symptoms may include high fever (40°C/104°F), severe headache, pain behind the eyes, muscle and joint pains, nausea, vomiting, swollen glands and rash. Severe dengue symptoms may include severe abdominal pain, persistent vomiting, bleeding gums or nose, blood in vomit or stool, being very thirsty, pale, and cold skin. Early diagnosis and effective management can reduce the severity of dengue disease. Over the last 10-15 years, dengue fever (DF) and dengue hemorrhagic fever (DHF) have become one of the leading causes of hospitalization and deaths among both children and adults in South-East Asian regions. So, early evaluation of cases is crucial in management of dengue to reduce the complications and mortality. Although children are the main group affected by dengue, little published data are available regarding dengue infections in children living in South Asia and data in Bangladesh is even more scarce.³⁰ Therefore, the objectives of this study were to see the clinical and laboratory profile and the hospital outcome of the children admitted in this Hospital.

Materials and Methods

A prospective observational study was conducted at Bangladesh Shishu Hospital & Institute from 1st August 2022 to 31st January 2023. Bangladesh Shishu Hospital & Institute was established in 1972 and situated in Sher-e-Bangla Nagar, Dhaka, with

around 700 beds including all facilities. Data were collected from the inpatient department of Bangladesh Shishu Hospital & Institute. A total of 385 confirmed dengue cases were finally enrolled. All the children below 18 years of age have clinical features of dengue and confirmed by IgM or NS1 and clinically by a consultant with a positive IgG report. Children with other diseases were excluded from the study. Informed consent was taken from parents. Detailed history and examination findings of each patient were recorded. The dengue patient's age, gender, weight, signs, symptom severity grading, and final diagnosis were recorded on a standard questionnaire. Ethical Review Committee (ERC) of Bangladesh Shishu Hospital & Institute examined and approved this study protocol. Data were assessed for completeness and were finally analyzed by using SPSS (Statistical Packages for Social Science) version 26.

Results

Table I shows the distribution of the study subjects according to their age, among them below one year 45(11.7%), one years to five years 140(36.4%), five years to ten years 141(36.6%) and more than ten years 59(15.3%). Mean age of the study subjects were 6.09(±4.74) years.

| Age (years) | Frequency | Percentage |
|-------------|-----------|------------|
| <1 | 45 | 11.7 |
| 1-5 | 140 | 36.4 |
| 5-10 | 141 | 36.6 |
| >10 | 59 | 15.3 |
| Total | 385 | 100.0 |

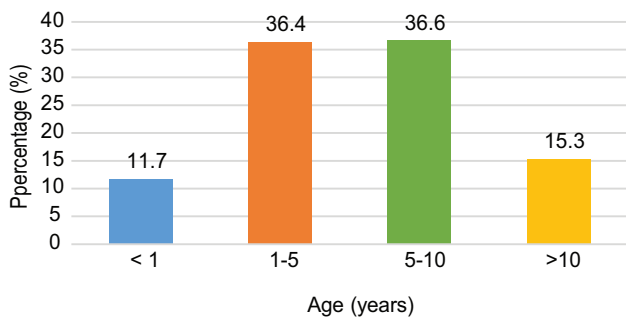


Fig.-1 Distribution of the study subjects according to age

Table II shows that most of the patients suffering from dengue were male 227 (59%) and female 158(41%).

| Gender | Frequency | Percentage |
|--------|-----------|------------|
| Male | 227 | 59.0 |
| Female | 158 | 41.0 |
| Total | 385 | 100.0 |

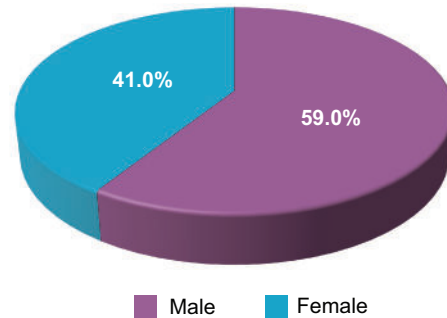


Fig.-2 Distribution of the study subjects according to gender

Table III shows the distribution of the study subjects according to their BMI, among them - underweight 254(66%), normal weight 97(25.2%), overweight 24(6.2%) and obese 10(2.6%).

| BMI (kg/m ²) | Frequency | Percentage |
|---------------------------|-----------|------------|
| Under weight (<18.5) | 254 | 66.0 |
| Normal weight (18.5-24.9) | 97 | 25.2 |
| Overweight (25.0-30.0) | 24 | 6.2 |
| Obese (>30.0) | 10 | 2.6 |
| Total | 385 | 100.0 |

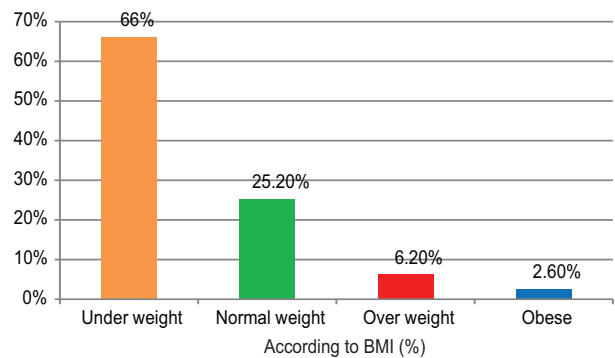


Fig.-3 Distribution of the study subjects according to BMI

Table IV*Distribution of the respondents according to the association of BMI with age (N=385)*

| BMI (kg/m ²) | Age (years) | | | | p value |
|-----------------------------|-------------|-------------|--------------|-------------|------------|
| | <1 n(%) | 1-5 n(%) | 5-10 n(%) | >10 n(%) | |
| Under weight (<18.5) | 28(62.2) | 106(75.7) | 91(64.5) | 29(49.1) | 0.058 |
| Normal weight (18.5-24.9) | 14(31.1) | 23(16.4) | 38(27.0) | 22(37.3) | |
| Overweight (25.0 - 30.0) | 3(6.7) | 7(5.0) | 8(5.7) | 6(10.2) | |
| Obese (>30.0) | 0(0.0) | 4(2.9) | 4(2.8) | 2(3.4) | |

Table IV shows the distribution of the study subjects according to the association of BMI with age. most underweight patients age group were 1-5 years age 106(75.7%), 5-10 years age 91(64.5%), <1 years age 28(62%) and >10 years age 29(49.1%); considering p=0.058.

Table V shows the distribution of the respondents according to the diagnostic confirmation test, most of the patients were NS1 positive 296(76.9%), IgM positive 65(16.9%), IgG positive 21(5.5%), NS1 & IgM both positive 2(0.5%) and NS1 & IgG positive 1(0.2%)

Table V*Distribution of the respondents according to the diagnostic confirmation test (N=385)*

| Diagnostic features | Frequency | Percentage |
|---------------------|-----------|------------|
| NS1 Positive | 296 | 76.9 |
| IgM Positive | 65 | 16.9 |
| IgG Positive | 21 | 5.5 |
| NS1 & IgM | 2 | 0.5 |
| NS1 & IgG | 1 | 0.2 |

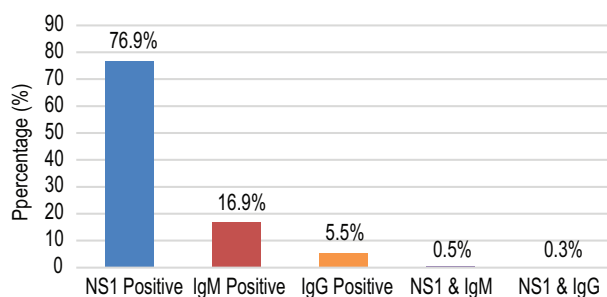


Fig.-4 *Distribution of the respondents according to the Diagnostic confirmation test (N=385)*

Table VI shows the distribution of the respondents according to their symptoms, among them fever 383(99.5%), less urine output 359(93.2%), anorexia 225(58.4%), abdominal pain 136(35.3%), nausea/

vomits 126(32.7%), headache 94(24.4%), cough 86(22.3%), joint pain 54(14.0%), rash 44(11.4%), retro orbital pain 34(8.8%), diarrhea 31(8.1%), back pain 30(7.8%), chill 26(6.8%), others 33(8.6%), neck pain 21(5.5%), cold skin 16(4.2%), respiratory distress 13(3.4%), sore throat 12(3.1%), convulsion 8(2.1%), eye redness 7(1.8%), jaundice 6(1.6%), pallor 3(0.8%), coughing blood 2(0.5%), nasal bleeding 2(0.5%), vaginal bleeding 2(0.5%) and hematuria 2(0.3%).

Table VI*Distribution of the respondents according to symptoms (N=385)*

| Symptoms* | Frequency | Percentage |
|----------------------|-----------|------------|
| Fever | 383 | 99.5 |
| Urine output | 359 | 93.2 |
| Anorexia | 225 | 58.4 |
| Abdominal pain | 136 | 35.3 |
| Nausea/Vomits | 126 | 32.7 |
| Headache | 94 | 24.4 |
| Cough | 86 | 22.3 |
| Joint pain | 54 | 14.0 |
| Rash | 44 | 11.4 |
| Retro orbital | 34 | 8.8 |
| Others | 33 | 8.6 |
| Diarrhea | 31 | 8.1 |
| Back pain | 30 | 7.8 |
| Chill | 26 | 6.8 |
| Neck pain | 21 | 5.5 |
| Cold skin | 16 | 4.2 |
| Respiratory distress | 13 | 3.4 |
| Sore Throat | 12 | 3.1 |
| Convulsion | 8 | 2.1 |
| Eye redness | 7 | 1.8 |
| Jaundice | 6 | 1.6 |
| Pallor | 3 | 0.8 |
| Coughing blood | 2 | 0.5 |
| Nasal bleeding | 2 | 0.5 |
| Vaginal bleeding | 2 | 0.5 |
| Hematuria | 1 | 0.3 |

*Multiple responses

Table VII shows the distribution of the respondents according to their to sign, among them mean (\pm sd) systolic bp 94.36 (\pm 9.76), mean (\pm sd) diastolic bp 61.10 (\pm 8.06), mean (\pm sd) respiratory rate 26.75 (\pm 4.73), mean (\pm sd) temperature 98.81 (\pm 1.30), enlarged lymph node 40(10.4%), dehydration 9 (2.3%), enlarged liver 10(2.6%), ascites 4(1.0%), joint swelling 1(0.3%) and splenomegaly 1(0.3%).

| Sign | Mean \pm SD | Min - max |
|---------------------|------------------|------------|
| Systolic BP | 94.36 \pm 9.76 | 70-140 |
| Diastolic BP | 61.10 \pm 8.06 | 40-90 |
| Respiratory rate | 26.75 \pm 4.73 | 18-50 |
| Temperature | 98.81 \pm 1.30 | 97-104 |
| | Frequency | Percentage |
| Enlarged Lymph node | 40 | 10.4 |
| Dehydration | 9 | 2.3 |
| Enlarged Liver | 10 | 2.6 |
| Ascites | 4 | 1.0 |
| Joint swelling | 1 | 0.3 |
| Splenomegaly | 1 | 0.3 |

Table VIII shows the distribution of the respondents according to the final diagnosis among them dengue fever 157(40.8%), dengue fever with warning sign 200(51.9%) and among severe dengue 28(7.3%) - dengue shock syndrome 16(4.2%), expanded dengue syndrome 9(2.3%) and dengue hemorrhagic fever 3(0.8%).

| Final Diagnosis | Frequency | Percentage |
|--------------------------------|-----------|------------|
| Dengue Fever | 157 | 40.8 |
| Dengue Fever with warning sign | 200 | 51.9 |
| Severe Dengue- | | |
| Dengue Shock Syndrome | 16 | 4.2 |
| Expanded Dengue Syndrome | 9 | 2.3 |
| Dengue Hemorrhagic Fever | 3 | .8 |
| Total | 385 | 100.0 |

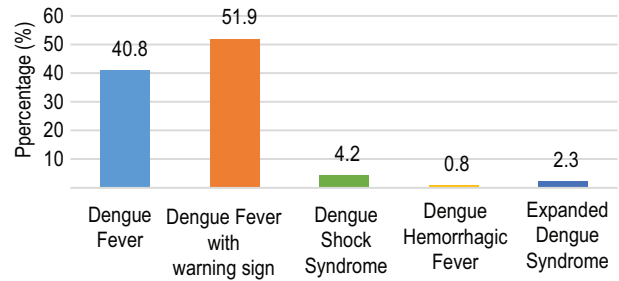


Fig.-5 *Distribution of severity of the dengue*

Discussion

In this observational study we have found that according to the respondent's age, below one year's 45(11.7%), One years to five years 140(36.4%), Five years to ten years 141(36.6%) and more than ten years 59(15.3%). The mean age found was 6.09 (\pm 4.74) years, like the previous studies by Faridi et al³¹ and Wichmann et al³² and similarly Khan et al³³ found 5.6 (\pm 3.8) years. The commonest age group was 5-10 years, similar result observed by Palaniappan.³⁴⁻³⁶ However, Kale et al³⁷ and Rasul et al³⁸ showed that the age group most affected was 11-15 years and 10-14 years, respectively.

Most of the patients suffering from dengue were male 227 (59%) and female 158(41%), male to female ratio was 1: 0.7. this study found that male patients predominated female patients by their number, similarly predominance found by Anker et al³⁹ but this finding was opposite to the finding by Sultana et al⁴⁰ and Afroze et al.⁴¹

According to the BMI, most of the respondents were Underweight 254(66%), Normal weight 97(25.2%), Overweight 24(6.2%) and Obese 10(2.6%). This study found BMI had no significant relationship with the final diagnosis. Although Zulkpli et al⁴² found Obese children with DHF, had been previously found to have an increased risk to develop shock. According to the association of BMI with age group among dengue patients, most sufferer were underweight patients having age group were 1-5 years age 106(75.7%), 5-10 years age 91(64.5%), <1 Years age 28(62%) and >10 years age 29(49.1%); considering p value .058. Kamruzzaman et al⁴³ showed that around 31% of the total study children (2–10 years) were considered underweight (low weight-for-age), approximately 15% were severely underweight. The percentage of underweight and low BMI-for-age (wasted) children was higher at all age categories (25 to 35%) and was found extremely high compared to the BDHS report, where the

prevalence of stunting, underweight, and wasting in Bangladesh was 31, 22, and 8% respectively.⁴⁴

To identify dengue cases, the main targets include the specific serotype detection, the cross reactivity of antibody responses (immunoglobulin M or IgM) and detecting the viral nonstructural protein 1 (NS1 antigen through ELISA), the so-called principal infection marker.^{45,46} According to the diagnostic confirmation test, dengue patients were having NS1 positive 296(76.9%), IgM positive 65(16.9%), IgG positive 21(5.5%), NS1 & IgM both positive 2(0.5%) and NS1 & IgG positive 1(0.2%). The usefulness of the NS1 antigen rapid test for dengue diagnosis has been widely documented.⁴⁷⁻⁵⁰ In this study respondents had symptoms like: fever 383(99.48%), less urine output 359(93.2%), anorexia 225(58.4%), abdominal pain 136(35.3%), nausea/vomits 126(32.7%), headache 94(24.4%), cough 86(22.3%), joint pain 54(14.0%), rash 44(11.4%), retro orbital pain 34(8.8%), diarrhoea 31(8.1%), back pain 30(7.8%), chill 26(6.8%), others 33(8.6%), neck pain 21(5.5%), cold skin 16(4.2%), respiratory distress 13(3.4%), sore throat 12(3.1%), convulsion 8(2.1%), eye redness 7(1.8%), jaundice 6(1.6%) and pallor 3(0.8%). pothapregada et al⁵¹ found similar findings like fever in 94.6% cases, headache (75.1%), retro-orbital pain (51.3%), joint pain (28.7%) and rash (17.2%). Khan, et al³³ found, All the dengue patients had fever, vomiting was present in 40%, ascites and skin rash in 21%, pleural effusion 20%, abdominal pain 14% and 12.2% came with shock. Thrombocytopenia, raised HCT, raised liver enzymes and abnormal coagulation profile were more common in dengue hemorrhagic fever when compared to patients with dengue fever.

The most common hemorrhagic manifestations in this study were coughing blood 2(0.5%), nasal bleeding 2(0.5%), vaginal bleeding 2(0.5%) and haematuria 2 (0.3%), much lower to the previous studies by Rachel et al⁵² The probable mechanism for myositis is the release of myotoxic cytokines, particularly TNF- α thereby injuring the affected muscle.⁵³ In this study we have recorded sign like mean (\pm SD) systolic BP 94.36 (\pm 9.76), mean (\pm SD) diastolic BP 61.10 (\pm 8.06), mean (\pm SD) respiratory rate 26.75 (\pm 4.73), mean (\pm SD) temperature 98.81 (\pm 1.30), enlarged lymph node 40(10.4%), dehydration 9(2.3%), enlarged liver 10(2.6%), ascites 4(1.0%), joint swelling 1(0.3%) and splenomegaly 1(0.3%).

splenomegaly was in 20.7% of cases in our study and is an unusual manifestation of dengue fever. Faridi et al, in their study similarly showed a high percentage (32.4%) of splenomegaly in children with dengue.^{54,55}

In this study we have found that the respondents were finally diagnosed as Dengue Fever 157(40.8%), Dengue Fever with warning sign 200(51.9%) and Severe Dengue 28(7.3%) - Dengue Shock Syndrome 16(4.2%), Expanded Dengue Syndrome 9(2.3%) and Dengue Hemorrhagic Fever 3(0.8%). It was observed that 71.1% of children had non-severe dengue disease and 28.9% had severe dengue disease, according to Khan et al.⁵⁶ Ratageri et al⁵⁷ and Aggarwal et al⁵⁸ reported that shock was the most common presentation in severe dengue infection in 22% and 33% of cases, respectively. There was a much lower rate of Dengue Hemorrhagic Fever 3(0.8%) found in this study compared to other studies.⁵⁹⁻⁶¹ The authors of this study found that children have 3% expanded dengue syndrome, which is like the results of Kumar et al.⁶²

Conclusion

Dengue fever has resurfaced with a different pattern of presentation in recent epidemics. To reduce mortality and morbidity associated with severe dengue infection, clinical vigilance and awareness are essential.

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ORIGINAL ARTICLE

Use of CRIB II (Clinical Risk Index for Babies) Score for Prediction of Mortality in Premature Babies Admitted in A Tertiary Care Hospital

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Abstract

Background: Neonatal mortality accounts for about two-thirds of all infant deaths. The major causes of neonatal mortality are prematurity/low birth weight (LBW) and congenital anomalies. Application of severity scores in this condition may be useful for prognostication. Clinical risk index for babies (CRIB II) score is a tool to predict initial risk of mortality amongst preterm low birth weight babies, the utility of which is scarce in many developing countries.

Objective: To assess the ability of the CRIB II score to predict mortality of preterm babies before hospital discharge.

Methods: This was a cross-sectional study, carried out at Department of Neonatal Medicine, Dhaka Shishu Hospital from August 2013 to January 2014. Preterm newborns of 28-32 weeks, birth weight between 750-1500 gm and admitted within 12 hours of age were purposively included in this study and babies having lethal congenital malformations were excluded. The demographic data including age, sex, birth weight, temperature and after doing arterial blood gas analysis base excess were recorded in the questionnaire. CRIB II score was determined and recorded. Receiver operating characteristic (ROC) analysis and the area under the receiver operating characteristic curve (AUC) was calculated for the predictive performance of CRIB II score.

Results: One hundred and thirty two neonates met the inclusion criteria. Approximately half (51.5%) neonates belonged to age ≤ 6 hours and more than half (56.1%) neonates were male. The mean gestational age was 29.7 ± 1.6 week with 60.6% were of ≤ 30 weeks. The CRIB II score was ranged from 2 to 15 with mean 8.7 ± 3.3 . Among the enrolled neonates mortality was 37.1%. Mortality was significantly ($p < 0.05$) higher in neonates belonged to lower gestational age, birth weight, admission temperature and whose ABG revealed higher base excess. The mean CRIB II score was significantly higher in death group ($p < 0.05$) and a progressive increase in mortality was found with increasing CRIB II score level ($p < 0.05$). The receiver operating characteristics (ROC) analysis revealed the predictive performance of CRIB II score was very good (AUC=0.88, $p < 0.0001$) with a cut off value of CRIB II score ≥ 9.0 having 87.2% sensitivity and 76.2% specificity. Its predictive performance was also better than gestational age (AUC 0.799) or birth weight (AUC 0.734) alone.

Conclusion: This study found the predictive performance of CRIB II score was very good. This would be a tool to assess mortality of hospitalized ≤ 32 weeks preterm very low birth weight neonates.

Keywords: CRIB score, neonatal mortality, very low birth weight.

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Introduction

Among the health care indicators of a country, neonatal mortality plays an important role as it represents health status of its population as well as the degree of development of a country. It results from a complex chain of determinants such as biological, socioeconomic and health factors.¹ Almost all (99%) of neonatal deaths occur in low and middle-income countries,² in Bangladesh neonatal mortality (32/1000 in 2011) accounts for about three-fourth of all infant deaths (deaths before 1 year of age).³ Worldwide prematurity, birth asphyxia and severe neonatal infections are the leading causes of neonatal mortality.^{4,5}

Mortality due to prematurity and its complication responsible for roughly 29% of neonatal deaths globally and pre-term birth acts both as a risk factor as well as a direct cause of mortality.⁶ For a long time, gestational age and birth weight were important univariate predictors of neonatal mortality.⁷ Survival of premature infants depends on birth weight and gestational age but also other perinatal factors and physiological conditions of the individual neonate, in particular disease severity in the first hours of life.⁸ If mortality can be predicted in early period of life, more attention can be given to these premature babies for reduction of mortality rate.

In this context, assessment of severity of illness and mortality prediction could be done through the development of probabilistic models predicting mortality risk.⁹ Scoring systems for the assessment of severity of neonatal illness were increasingly utilized for mortality prediction and to compare the quality of care at different centers. Implementation of severity scores in this condition may be beneficial for prognostication and evaluation of the effectiveness of therapeutic protocols in the neonatal intensive care units (NICUs).¹⁰ The aim of developing illness severity score were to quantify the clinically obvious fact that infants of the same gestational age and birth weight differ in their risk of dying.¹¹

To improve predictability of mortality of these newborns, few scoring systems are available.¹² Four scoring systems for assessment of neonatal mortality risk were introduced during 1993 as follow: the national institutes of health neonatal network model, SNAP (Score for Neonatal acute physiology) SNAP-PE (Score for Neonatal acute physiology-

Perinatal Extension) and CRIB (Clinical risk index for babies).¹³ But those systems are cumbersome and difficult to use in all situations.

CRIB score was created to predict mortality for infants born at less than 32 week gestation and based upon 6 variables for predicting mortality. But the appropriateness of CRIB score has been questioned because it needs up to 12 hours after admission thus introducing a factor of early treatment bias. It also needs to measure FiO_2 which is not a true physiological measurement because it is determined by the care team.¹⁴

CRIB II score, an improved version of CRIB, was developed to solve those questions.¹⁵ CRIB II provides a simplified and recalibrated scoring system that avoids the potential problems of early treatment bias. The score is meant to improve predictors for smaller, very premature infants and to exclude variables that could be influenced by care given to the infants.^{16,17}

CRIB II score is a rational method for assessing initial mortality risk and illness severity within one hour of admission that has only five variables. It is non-subjective and simple to calculate.¹⁷ It is a beneficial and practical tool for identifying high-risk neonates, auditing of neonatal units and also provides a standardized mortality rate for performance comparison among neonatal units.¹⁶ In a setup of low resource and facility this CRIB II can be used as it is easy and a simplified scoring system. This study was designed to assess the ability of the CRIB II score to predict mortality in preterm babies before hospital discharge.

Materials and Methods

This was a cross-sectional study, carried out in the Department of Neonatal Medicine, Dhaka Shishu Hospital from August 2013 to January 2014. Preterm newborns between 28 weeks to 32 weeks of gestation and birth weight between 750 gm to 1500 gm, admitted within 12 hour of age, was purposively enrolled in this study. Neonates having lethal congenital malformations were excluded from this study. The demographic data including age, sex, birth weight, temperature was recorded in the questionnaire immediate after admission. Gestational age was calculated from the first day of last menstrual period (LMP). New Ballard score was used to assess gestational age of every neonate. Weight was recorded for each baby as soon as after

enrollment by using an electronic scale having a sensitivity of 10 gm. Temperature was recorded by using a digital thermometer. After doing arterial blood gas analysis base excess was recorded in the questionnaire. All these parameters of the baby were assigned according to the CRIB II score. The final CRIB II score was obtained by the arithmetic sum of the individual score assigned. The CRIB II score was divided into 4 subgroups: 0-5, 6-10, 11-15, and >15. The primary outcome measure was mortality before hospital discharge.

Written informed consent was taken from parents before enrolment in the study. The protocol was approved by the Ethical Review Committee of Bangladesh Institute of Child Health.

All statistical analysis was done using SPSS version 20 for windows. The mean values were calculated for continuous variables. The quantitative observations were indicated by frequencies and percentages. Unpaired t-test used to compare continuous variables between death and alive neonates. Chi-Square test was used to analyze the categorical variables. Receiver operating characteristic (ROC) curve was constructed and the area under the receiver operating characteristic curve (AUC) was calculated for the predictive performance of CRIB II score. P values <0.05 was considered as statistically significant.

Results

One hundred and thirty two neonates were enrolled in this study. Among the enrolled cases about half (51.5%) neonates belonged to age ≤ 6 hours. The mean age was 6.8 ± 3.2 hours with ranged from 1 to 12 hours. More than half (56.1%) neonates were male. The mean gestational age was 29.7 ± 1.6 weeks with ranged from 28 to 32 weeks. Almost two third patients belonged to gestational age ≤ 30 weeks. The mean birth weight was 1153.1 ± 228.6 gm with ranged from 780 gm to 1480 gm. Mean admission temperature was $35.1^\circ\text{C} \pm 1.5^\circ\text{C}$ with ranged from 32°C to 38°C . The ABG revealed mean base excess was -13.4 ± 7.42 with ranged from -26 to 5 (Table I). Regarding outcome we found that 62.9% (two third) neonates were alive and 37.1% were expired. The mean CRIB II score was 8.7 ± 3.3 , ranged from 2 to 15 and almost half (49.2%) neonates had Level II (6-10) score (Table I).

There was no significant difference ($p > 0.05$) of age and sex between survived and expired neonates. But mortality was significantly ($p < 0.05$) higher in neonates belonged to lower gestational age, birth weight, admission temperature and whose ABG revealed higher base excess (Table II).

Table I
Demographic data of studied neonates (N=132)

| Variables | Number | Percentage |
|----------------------------------|----------|--------------------|
| Age (hrs) | | |
| ≤ 6 | 68 | 51.5 |
| > 6 | 64 | 48.5 |
| Range, Mean \pm SD | 1-12 | 6.8 ± 3.2 |
| Sex | | |
| Male | 74 | 56.1 |
| Female | 58 | 43.9 |
| Gestational age (weeks) | | |
| ≤ 30 | 80 | 60.6 |
| > 30 | 52 | 39.4 |
| Range, Mean \pm SD | 28-32 | 29.7 ± 1.6 |
| Weight (gm) | | |
| Range, Mean \pm SD | 780-1480 | 1153.1 ± 228.6 |
| Temperature ($^\circ\text{C}$) | | |
| Range, Mean \pm SD | 32-38 | 35.1 ± 1.5 |
| Base Excess | | |
| Range, Mean \pm SD | 5-(-26) | -13.4 ± 7.42 |
| Outcome | | |
| Alive | 83 | 62.9 |
| Death | 49 | 37.1 |
| CRIB II score | | |
| Range, Mean \pm SD | 2-15 | 8.7 ± 3.3 |
| CRIB score levels | | |
| Level I (1 - 5) | 26 | 19.7 |
| Level II (6 - 10) | 65 | 49.2 |
| Level III (11 - 15) | 41 | 31.1 |
| Level IV (> 15) | 0 | 0.0 |

Table II
Comparison between general information with outcome (N=132)

| Variables | Death n (%) | Alive n (%) | p value |
|-------------------------|----------------|----------------|------------|
| Age (hrs) | | | |
| ≤6 | 29 (22.0) | 39 (29.5) | 0.175* |
| >6 | 20 (15.1) | 44 (33.4) | |
| Range | 2-11 | 1-12 | |
| Mean±SD | 6.6±3.1 | 6.8±3.2 | 0.726# |
| Sex | | | |
| Male | 30 (22.7) | 44 (33.3) | 0.358* |
| Female | 19 (14.4) | 39 (29.6) | |
| Gestational age (weeks) | | | |
| ≤30 | 37 (28) | 43 (32.6) | 0.007* |
| >30 | 12 (9.1) | 40 (30.3) | |
| Range | 28-32 | 28-32 | |
| Mean ± SD | 30.2±1.5 | 29.4±1.6 | 0.005# |
| Weight (gm) | | | |
| Range | 780-1480 | 780-1480 | |
| Mean ± SD | 1097.0±231.0 | 1248.3±194.6 | 0.0001# |
| Temperature (°C) | | | |
| Range | 32-37 | 34-38 | |
| Mean ± SD | 34.8±1.5 | 35.8±1.5 | 0.008# |
| Base Excess | | | |
| Range | - 26 - (+5) | - 22.3 - (-1) | |
| Mean ± SD | - 16.1±6.95 | - 8.82±5.8 | 0.006# |

* Chi-square test; # Unpaired t test

Comparison of CRIB II score with outcome of the study patients, it was found that a progressive increase in mortality with increasing CRIB II score level; mortality was 8(6.1%), 19(14.3%), 22 (16.7%) and 0(0%) in level I, II, III of CRIB II score respectively and it was statistically significant (p

<0.05). The mean CRIB II score was significantly higher in expired group (p<0.05) (Table III). ROC curve analysis revealed that the most suitable cut-off points of CRIB II score in predicting mortality was ≥9 and there was significantly higher mortality (p <0.05) in this group (Table IV).

Table III
Comparison between CRIB II score with outcome (N=132)

| CRIB II score | Outcome | | | | p value |
|-------------------|--------------|------|--------------|------|------------|
| | Death (n=49) | | Alive (n=83) | | |
| | n | % | n | % | |
| Level I (1-5) | 8 | 6.1 | 18 | 13.6 | |
| Level II (6-10) | 19 | 14.3 | 46 | 34.9 | 0.03* |
| Level III (11-15) | 22 | 16.7 | 19 | 14.4 | |
| Level IV (>15) | 0 | 0.0 | 0 | 0.0 | |
| Mean±SD | 8.1±4.1 | | 6.0±3.9 | | 0.001# |
| Range (min, max) | 2, 15 | | 4, 15 | | |

* Chi-square test; #Unpaired 't' test

Table IV

Comparison between best cutoff level of CRIB II score with outcome (N=132)

| CRIB II score | Outcome | | | | p value |
|---------------|---------|------|-------|------|---------|
| | Death | | Alive | | |
| | n | % | n | % | |
| < 9 | 19 | 15 | 50 | 37.9 | 0.017* |
| ≥9 | 30 | 22.1 | 33 | 25 | |

* Chi-square test

The receiver operating characteristics (ROC) analysis showed that the predictive performance of CRIB II score was very good (AUC=0.88, $p<0.0001$) with a cut off value of CRIB II score ≥ 9.0 having 87.2% sensitivity and 76.2% specificity. Its predictive performance was also better than gestational age (AUC 0.799) or birth weight (AUC 0.734) alone (Fig.-1, Table V).

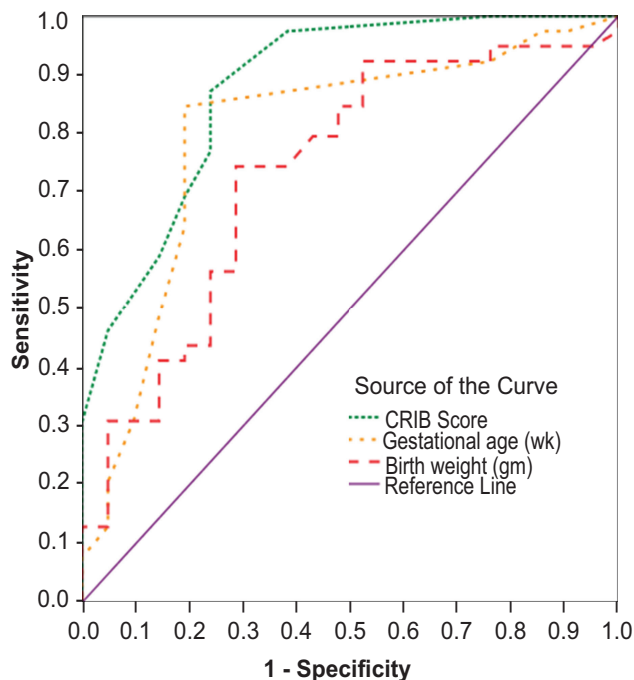


Fig.-1 ROC curve of mortality in hospital by CRIB II score, gestational age and birth weight

Table V

Predictive abilities of CRIB II score, gestational age and birth weight

| | Cut off value | Sensitivity | Specificity | AUC | 95% Confidence interval (CI) | | p value |
|----------------------|---------------|-------------|-------------|-------|------------------------------|-------------|---------|
| | | | | | Lower bound | Upper bound | |
| | | | | | CRIB II Score | ≥ 9.0 | |
| Gestational age (wk) | ≤ 30.0 | 84.6 | 81.0 | 0.799 | 0.672 | 0.926 | <0.0001 |
| Birth weight (gm) | ≤ 1032.0 | 79.5 | 57.1 | 0.734 | 0.599 | 0.87 | <0.005 |

Discussion

In the present study, it was observed that more than half (51.5%) neonates belonged to age ≤ 6 hours and all recruited within 12 hours of age. EZZ-Eldin et al¹² enrolled 113 neonates, during their first 24 hours of birth. In this study, among the enrolled neonates 56.1% were male. Similarly, EZZ-Eldin et al,¹² Marete et al¹⁶ and Mohkam et al¹³ found 51.3%, 53% and 52.6% were male respectively. In this study, we observed that 60.6% neonates belonged to ≤ 30 weeks of gestation with mean 29.7 ± 1.6 weeks and ranged from 28-32 weeks. When comparing our results with those of EZZ-Eldin et al¹² and Fernandez-Carrocera et al¹⁸ we found that the range

of gestational age was similar to their findings (28-32 weeks). Similar observations regarding the gestational age were also reported by Brito et al,⁷ Marete et al¹⁶ and Rastogi et al.¹⁵ This study observed that the mean weight was 1153.1 ± 228.6 gm with ranged from 780 to 1480 gm. Similarly, EZZ-Eldin et al¹² and Rastogi et al¹⁵ found the birth weight were 1134.5 ± 202 gm and 1228 ± 398 grams respectively. Comparable birth weight was also reported by Sundaram et al¹⁰, Brito et al⁷ and Sarquis et al.¹⁹ This study found that mean admission temperature was $35.1 \pm 1.5^\circ\text{C}$ with ranged from 32 to 38°C . Similarly, EZZ-Eldin et al¹² found the temperature ranged from 31°C - 37°C with mean

34.6±1.4°C, Marete et al¹⁶ observed the temperature ranged from 33.4°C-38.40°C and Fernandez-Carrocerca et al¹⁸ found the temperature was <36°C, which were comparable with the current study. In this study, mean base excess was -13.4±7.42 with ranged from -26 to 5. EZZ-Eldin et al¹² and Marete et al¹⁶ found the base excess ranged from -24 to -2.1 (mmol/l), which coincide with our finding.

Preterm birth is the major direct cause of neonatal death, responsible for about 35% of the world.⁴ This study enrolled 28-32 week preterm neonates and we found 37.1% of them were expired. Heljic et al⁵ reported similar outcome pattern of preterm infants in their study. On the other hand, Draper et al²⁰ had highlighted the variation across Europe in outcomes of very preterm infants. Premature births are outnumbered by males with higher susceptibility of mortality.²¹ In this study though male is more than female but we found no difference of gender between survived and dead neonates.

The present study observed that the mean CRIB II score was 8.7±3.3 with ranged from 2 to 15. Marete et al¹⁶ found mean CRIB II score 12.9±8.1 with ranged from 0 to 27, similarly Sarquis et al¹⁹ reported mean CRIB scores 14.3±7.9 with ranged from 0 to 27. Both the study found higher mean CRIB II score than that of the current study. In this study, we found significantly higher CRIB II score in the expired group (8.1±4.1 vs 6.0±3.9, p 0.001). EZZ-Eldin et al¹² reported that CRIB II score was significantly higher in non-survivors (14.1 ± 2.1) than survivors (7.7 ± 2.9), which support our finding. Mohkam et al¹³ found the mean CRIB score in death neonates was 8.43±4.66 and in survived neonates was 2.57±3.66 (p<0.05), which was closely resembled with the present study.

Comparative analysis between the four levels of CRIB II score, present study found hospital mortality showed a progressive increase with increasing CRIB II score level; mortality was 8(6.1%), 19(14.3%), 22 (16.7%) in level I, II, III of CRIB II score respectively. Our findings coincide with the study findings of Marete et al¹⁶ and Sarquis et al.¹⁹ Though EZZ-Eldin et al¹² reported similar observations but they found 9 neonates graded in level IV with 100% mortality, Marete et al¹⁶ and this study found no neonate graded in level IV.

This present study use CRIB II score as a tool to predict neonatal mortality, quantified by using area

under ROC curve, observed that CRIB II score predict morality positively and showed better performance than gestational age and birth weight (AUC 0.88, 0.799, 0.734), which means that CRIB II score was the best discriminate parameter for neonatal mortality. This finding is in agreement with other studies.^{7,12,16,18,22} However, the accuracy was found to be lower than the study that originated it (0.91 for CRIB II).¹⁴ This study found CRIB II score had sensitivity 87.2%, specificity 76.2% and cut off value ≥9.0. Similar finding was reported by Marete et al¹⁶ with a cutoff value of 4 and they also showed lower sensitivity (32%) by using a cutoff point of 10. EZZ-Eldin et al¹² showed higher sensitivity and specificity and a higher cutoff point of CRIB II score than this study findings. In this study, sensitivity and specificity of CRIB II score was higher than that of gestational age (84.6% and 81.0%) and birth weight (79.5% and 57.1%). Similar findings were reported by EZZ-Eldin et al¹² and Marete et al.¹⁶ From this study and other reports^{12,16,18,22} the sensitivity, specificity and AUC for CRIB II score were found to be better than any of the traditional models separately and the area under the ROC curve for predicting death was greater for CRIB II score than for birth weight or gestational age alone. It was reported that CRIB II score had greater ability to predict mortality in comparison to CRIB and SNAPPE-II.¹¹

Conclusion

This study found progressive increase in mortality with increasing CRIB II score. This study also found the predictive performance of CRIB II score was very good and its predictive performance was better than birth weight or gestational age. So, CRIB II score would be a tool in predicting neonatal mortality before hospital discharge.

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ORIGINAL ARTICLE

Immediate Outcome of Balloon Pulmonary Valvuloplasty in Children: Experience at Bangladesh Shishu Hospital & Institute

Md. Abu Sayed Munsif¹, Maher Akther², Nibedita Paul³

Abstract

Introduction: Isolated pulmonary valve stenosis is a common heart defect (6-9%). Percutaneous balloon pulmonary valvuloplasty (BPV) has become the treatment of choice for the relief of severe valvular pulmonary stenosis (PS).

Objective: To assess the immediate outcome of BPV in children with congenital PS at Bangladesh Shishu Hospital & Institute, Dhaka, Bangladesh.

Methods: A retrospective longitudinal cohort study was carried out in Bangladesh Shishu Hospital & Institute, Dhaka, Bangladesh from January 2021 to December 2022. Thirty three patients (23 male and 10 female) with severe PS who underwent balloon pulmonary valvuloplasty were included in the study. The gradient across pulmonary valve measured pre and immediate post valvuloplasty at catheterization and by transthoracic echo was compared.

Results: A total of 33 patients underwent balloon pulmonary valvuloplasty procedure. Mean age was 2.5 ± 1.2 years while male 23 and female 10 with male female ratio was 2.3:1. Mean weight of the patient was 9.112 ± 4.50 Kg. Majority of the patients ($n=22$, 66.6 %) were symptomatic and dyspnea on exertion was the dominant symptom ($n=18$, 54.5%) and 4 (12.1%) patient presented with cyanosis. All of the patients had doming pulmonary valve ($n=33$, 100%). Mean size of pulmonary valve by transthoracic echo was 10.23 mm and mean size of balloon was 12.6 with balloon to pulmonary valve annulus ratio was 1.22:1. The procedure was successful in 32 ($n=32$, 97%) as significant reductions in the right ventricular pressure from 80.36 ± 16.45 mm Hg (pre valvuloplasty) to 23.85 ± 8.47 mm Hg by transthoracic echo ($p=0.000$) and peak-to-peak systolic pressure gradient across the pulmonary valve decreased from 84.03 ± 26.3 mm Hg (pre valvuloplasty) to 22.76 ± 10.42 mm Hg ($p<0.001$) (post valvuloplasty). One patient developed cardiac arrest during valvuloplasty that patient required CPR. One patient died on 2nd day of valvuloplasty due to severe right ventricular dysfunction. On post procedure echocardiography, 14 (42.4%) patient developed mild PR. Mean Fluoroscopy time was 21.66 ± 18.22 minute and mean total procedure time was 40.50 ± 20.29 minute.

Conclusions: Outcome of balloon pulmonary valvuloplasty in infant and children is a very safe procedure with high success but very low complications rate.

Keywords: Pulmonary stenosis, balloon pulmonary valvuloplasty, TTE, catheterization.

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Introduction

Isolated pulmonary valve stenosis (PVS) is detected in 0.33/1000 newborns and makes up 6-9% of all congenital heart defects among children.¹ Percutaneous trans-catheter balloon pulmonary valvuloplasty (BPV) is the treatment of choice for pulmonary valve stenosis since the introduction of this procedure in 1982 by Kan.² BPV has totally replaced the surgical pulmonary valvotomy and is the treatment of choice for moderate to severe valvular pulmonary stenosis in all age groups.³ It effectively reduces right ventricle-pulmonary artery systolic pressure gradient.² It should be considered as the treatment of choice for children with PS based on its excellent outcome, lesser trauma and fewer complications.^{4,5} It is generally recommended that the procedure be performed for peak-to-peak gradient in excess of 50 mmHg.⁶

BPV has excellent results because of least trauma to patients with limited clinical presentation.⁷ Complications during and immediately after balloon valvuloplasty are usually minimal. Infant and children patients behave differently to balloon pulmonary valvuloplasty ranging from suicidal right ventricle (RV) physiology, reduction in gradients across pulmonary valve and re stenosis. During valvuloplasty transient bradycardia, premature beats and a fall in systemic pressure on balloon inflation are usually noted which return to normal after deflation of balloon. Transient blood loss, complete right bundle branch block, transient or permanent heart block, cerebrovascular accident, loss of consciousness, cardiac arrest, convulsions, balloon rupture at high balloon inflation pressures, rupture of tricuspid valve papillary muscle, and pulmonary artery tears, though rare have been reported.⁶ So this study was undertaken to evaluate the immediate results of BPV in children.

Materials and Methods

This was a retrospective longitudinal cohort study of 33 patients who were less than 18 years old with severe valvular (peak gradient ≥ 64 mm of Hg) PS and underwent BPV with Tyshak balloon catheter at Bangladesh Shishu Hospital & Institute, Dhaka, Bangladesh over a period of 2 years from January 2021 to December 2022. All 33 patients who had systolic doming of pulmonary valve with severe valvular PS and underwent balloon pulmonary valvuloplasty were included in the study. Patients

having dysplastic pulmonary valve with infundibular and supra-valvular PS were excluded from the study. The gradient was measured before and immediately after valvuloplasty. It is a routine of the institute to get informed written consent at time of admission and before start of every procedure. We retrieved the data of the patients from hospital database, including demographic profile and clinical data of the patients, age, gender (male/ female), weight in kilograms (Kg) or symptoms at presentation. Pre procedural findings of trans-thoracic echocardiography (TTE) including valve morphology (doming/ dysplastic), valve annulus, RV systolic function, color flow mapping, presence or absence of tricuspid valve regurgitation (TR), peak pressure gradient across pulmonary valve in millimeter of mercury (mmHg) was also retrieved.

After careful history, clinical examination and informed written consent cardiac catheterization was performed through femoral venous access under general anesthesia in all the enrolled patients. NIH catheter was taken through the venous sheath to RV and then RV angiogram performed in full lateral projection (90^0) to confirm the valvular stenosis, morphology of valve and annulus. Hemodynamic data was assessed. A soft profile low pressure balloon (Tyshak II in all 33 cases), 20% greater in diameter than valve annulus, was selected and inflated across pulmonary valve over an extra stiff exchange length guide wire which already was anchored in a branch pulmonary artery by using a multipurpose catheter. One to three inflations were given in each case depending upon disappearance of waste and the inflation was not more than 30 seconds. Post-procedure pulmonary artery to right ventricular outflow tract (RVOT) pull back gradient that is peak to peak pressure gradient (PPG) across pulmonary valve was measured using an end-hole catheter, carefully excluding any right ventricular outflow obstruction gradient. We define BPV a success if peak-to peak pressure gradient by pull back pressure tracing post BPV was ≤ 35 mm of Hg immediately after the procedure. All patients were given heparin in a dose of 100 units per kg during the procedure. The patient usually stayed in hospital for one day after the procedure, received intravenous antibiotics and was discharged after performing 2D-Echo Doppler evaluation. Procedural complications like syncope, arrhythmias, pericardial effusion, local bleeding / hematoma from femoral

sheath site were recorded. Findings of post procedural echocardiography done on day one were also retrieved for pulmonary valve instantaneous gradient and RV function, RVOT obstruction, pericardial effusion, TR (mild, moderate, severe) and Pulmonary regurgitation (mild, moderate, severe). The clinical stability of patients regarding blood pressure, pulse, temperature, local puncture site wound condition for inflammation and total hospital stay was noted.

All data were expressed as mean \pm SD or median with range. Paired t- test was used to compare the Pressure gradient across PV before and after procedure by TTE and peak to peak pressure gradient across the pulmonary valve before and after the procedure. A P value less than 0.05, was considered significant.

Results

Mean age was 2.5 \pm 1.2 years while male 23 and female 10 with male female ratio was 2.3:1. Majority of patient below one year of age (Table I).

| Character | Frequency | Percentage |
|---------------|---------------|------------|
| Sex | | |
| Male | 23 | 69.7 |
| Female | 10 | 30.3 |
| Age (year) | | |
| ≤ 1 | 14 | 42.4 |
| $>1-<5$ | 13 | 39.4 |
| ≥ 5 | 6 | 18.2 |
| Mean \pm SD | 2.5 \pm 1.2 | |

Most of the patient was below 1 year of age. Mean weight was 9.112 \pm 4.509Kg (Table II).

| Age (year) | Weight (kg) Mean \pm SD | |
|-----------------|------------------------------|--------|
| ≤ 1 (n=14) | 5.671 | 2.0480 |
| $>1-<5$ (n=13) | 9.969 | 2.5313 |
| ≥ 5 (n=6) | 15.283 | 4.8077 |

Majority of the patients (n=22, 66.6 %) were symptomatic and shortness of breath on exertion was the dominant symptom (n=18, 54.5%) and 4(12.1%) patients presented with cyanosis (Table III).

| Symptoms | Frequency | Percentage |
|---------------------------------|-----------|------------|
| Incidental detection of murmur | 11 | 33.3 |
| Shortness of breath on exertion | 18 | 54.5 |
| Cyanosis | 4 | 12.2 |

After BPV, there was a significant reduction in pressure gradient across pulmonary valve from 80.36 \pm 16.45 mm Hg to 23.85 \pm 8.47mm Hg (p=0.000) (Table IV).

After BPV, there was a significant reduction in peak to peak pressure gradient across pulmonary valve from 84.03 \pm 26.31 mm Hg to 22.76 \pm 10.42 mm of Hg (p=0.000) (Table V).

| | Mean \pm SD | p value |
|---|-------------------|---------|
| Pressure gradient across PV before procedure by TTE | 80.36 \pm 16.45 | 0.000 |
| Pressure gradient across PV after procedure by TTE | 23.85 \pm 8.47 | |

Significance p = $<$ 0.05

| Pressure gradient | Mean \pm SD | p value |
|---|-------------------|---------|
| Peak to peak pressure across pulmonary valve before BPV | 84.03 \pm 26.31 | 0.000 |
| Peak to peak pressure across pulmonary valve after BPV | 22.76 \pm 10.42 | |

Significance p= $<$ 0.05

Mean size of PV was 10.239 and mean size of Tyshak II balloon used in this study was 12.5. balloon to annulus ratio was 1.22 (Table VI).

| Mean size of Tyshak II balloon | Mean size of PV by TTE | Ratio |
|--------------------------------|------------------------|-------|
| 12.5 | 10.239 | 1.22 |

Mean Fluoroscopy time was 21.66±18.22 minute and mean total procedure time was 40.50±20.29 minute. Fluoroscopy time and total procedure time was comparatively more in infant (Table VII).

| Age (year) | Fluoroscopy time (min) ± SD | Total Procedure time (min) ± SD |
|--------------|-----------------------------|---------------------------------|
| ≤1 (n=14) | 23.97±20.01 | 47.07±22.73 |
| >1-<5 (n=13) | 20.14±15.29 | 44.08±17.29 |
| ≥5 (n=6) | 19.53 ± 22.28 | 40.50 ± 20.29 |
| Total (n=33) | 21.66 ± 18.22 | 44.70 ± 19.81 |

One patient developed cardiac arrest during procedure that patient required cardio-pulmonary resuscitation, 14 (42.4%) patient develop mild PR and one patient died on 2nd day of procedure (Table VIII).

| Complication | Frequency | Percentage |
|----------------|-----------|------------|
| Cardiac arrest | 1 | 3.0 |
| Mild PR | 14 | 42.4 |
| Died | 1 | 3.0 |

Discussion

Pulmonary stenosis is one of the common congenital heart diseases.⁷ The traditional method of treatment was surgical valvotomy until 1982, when Kan et al² introduced the technique of percutaneous balloon

valvuloplasty. Since then, it has replaced the surgical option.^{3,8} This study showed mean age was 2.5±1.2 years while male 23 and female 10 with male female ratio was 2.3:1. Majority of patient below one year of age which is differing from other study.⁹ This study confirms the safety and effectiveness of BPV in children with PS. After BPV, there was a significant reduction in pressure gradient across pulmonary valve from 80.36±16.45 mm Hg to 23.85±8.47mm Hg (p=0.000) by TTE and significant reduction in peak to peak pressure gradient across pulmonary valve from 84.03±26.31 mm Hg to 22.76±10.42 mm of Hg (p=0.000) which is comparable to studies from other countries.^{10,11}

Majority of the patients (n=22, 66.6 %) were symptomatic and shortness of breath on exertion was the dominant symptom (n=18, 54.5%) and 4 (12.1%) patient presented with cyanosis which was comparable with other study.¹²

Good outcome defined as a residual catheter gradient <36 mm Hg, was achieved in 97.0% of patient in this study. One study from Iran found 77% of their patient has residual catheter gradient <36 mm Hg.¹³ But when the residual pressure gradient (PG) after BPV <25 mmHg is considered successful in Sri Lankan study.¹⁴ This study showed 97% success rate which is higher than their study (60%).¹⁴ In This study, no procedure failure was found but one patient died on 2nd day of procedure due to right ventricular dysfunction. In general, after BPV, there is a decrease of RV pressure ranging from 39 to 71% and peak pressure gradient across pulmonary valve ranging from 45 to 93%.¹⁵ Mean Fluoroscopy time was 21.66±18.22 minute and mean total procedure time was 40.50±20.29 minute. Fluoroscopy time and total procedure time was depends on age of the child. Infant required more fluoroscopy time and procedure time. One patient developed cardiac arrest during procedure that patient required cardio-pulmonary resuscitation, 14 patients develop mild PR and one patient died on 2nd day of procedure. Complications are common when balloon to annulus ratio exceeds 30%. However, in our study we used a balloon to annulus ratio exceeds 22%.

Conclusions

The immediate outcomes of balloon pulmonary valvuloplasty in children are excellent. BPV is a safe, effective and reliable treatment for patients with PS and is the treatment of choice in patients with symptomatic pulmonary stenosis.

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ORIGINAL ARTICLE

Evaluation of Outcome and the Influencing Factors on the Improvement of Renal Function after Anderson-Hynes Pyeloplasty in Children

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Abstract

Background: Pelvi-ureteric junction (PUJ) obstruction is one of the most common causes of Hydronephrosis in pediatric population. Anderson-Hynes (A-H) pyeloplasty is the standard surgical treatment of PUJ obstruction. The pyeloplasty is considered as successful when there is decrease in APD of renal pelvis in USG and improved SRF in DTPA renogram after pyeloplasty. There are many factors that may affect the SRF. These are the age of pyeloplasty, anteroposterior diameter (APD) of renal pelvis and baseline SRF.

Objective: The aim of our study was to observe the functional outcome after pyeloplasty in our setting and to find out the effect of the factors (age, APD, baseline SRF) on the postoperative SRF.

Methods: This quasi-experimental study was conducted at Pediatric urology department, Bangladesh Shishu Hospital and Institute, Dhaka among the children having A-H pyeloplasty for unilateral PUJ obstruction from September 2020 to December 2021. Patients associated with other anomalies, solitary kidney and redopyeloplasty cases were excluded. Changes in APD of renal pelvis and split renal function (SRF) of the obstructed kidneys were compared with the preoperative value to evaluate the outcome of pyeloplasty at 6 month after surgery. Patients were divided into Group 1: patient with improved renal function (postoperative SRF increased >5%), Group 2: patients with stable renal function (no change or <5% change in SRF), Group 3: patients with deteriorated renal function (decreased 5% or more in postoperative SRF). The groups were compared in terms of age, APD and base line SRF. The mean follows up time of the respondents was 12 months.

Results: Total 30 patients included in our study. The mean postoperative APD of renal pelvis was decreased 12.80 mm and postoperative renal SRF was increased 6.04% than preoperative SRF value. Both were statistically highly significant. 56.7% of patients had significant improvement of renal function and only 10% of them had deterioration of renal function. Remaining 33% patients had stable renal function. The relation between age category and APD of renal pelvis of the patients and postoperative renal function status was statistically not significant ($p > .05$). Patients who belongs to preoperative SRF <20% and >20% -40% category had statistically significant mean changes in their SRF after surgical intervention.

Conclusion: Our study reflected that APD and SRF can be used for predicting success after pediatric pyeloplasty for unilateral PUJ obstruction. The factor that may affect the outcome was low baseline SRF.

Keywords: PUJ, A-H Pyeloplasty, APD, SRF.

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Introduction

The pelvi-ureteric junction is the most common site of obstruction within the urinary tract in children.¹ The indication of surgery is to improve symptoms like pain and urinary tract infection, to improve renal drainage and preserve renal function. Anderson Hynes (A-H) pyeloplasty is the standard surgical treatment for PUJ obstruction. Ultrasonography (USG) and dynamic renal scan (DTPA) are commonly used for diagnosis and postoperative functional assessment. The pyeloplasty is considered as successful when the USG at postoperative period finds the improvement of the degree of hydronephrosis by the decreased anteroposterior diameter (APD) of renal pelvis,^{2,3} and in DTPA renal scan shows improvement in Split renal function (SRF).^{3,4} But all kidneys do not show improvement in split renal function (SRF) after pyeloplasty. There are many factors that may affect the postoperative SRF. These are the age of the patient, symptoms at presentation, anteroposterior diameter (APD) of renal pelvis, baseline/preoperative SRF.^{5,6} But there are lots of controversies. Some authors mention that pyeloplasty before 1 year of age showed greater improvement.⁵ But other studies reveal that the age of pyeloplasty is not a significant factor.⁶ Preoperative SRF in DTPA is reported to be important by some author.^{5,6} But this has been questioned in other studies.⁴ The aim of our study was to observe the changes of preoperative APD and SRF after pyeloplasty and the effect of the factors (age, APD, baseline SRF) on the postoperative SRF in our context.

Materials and Methods

This quasi-experimental study was conducted at Paediatric Urology Department, Bangladesh Shishu Hospital and Institute among the children, who underwent pyeloplasty for PUJ obstruction during September 2020 to December 2021. Patients with unilateral PUJ obstruction and normal contralateral kidney were included in this study. Patients of PUJ obstruction associated with other anomalies, solitary kidney and redopyeloplasty cases were excluded from the study. All patients were preoperatively evaluated by Ultrasonography and DTPA renogram. Significant Hydronephrosis in USG and obstruction in DTPA was usually the indication for surgery. In case of equivocal DTPA renogram, patients were operated if they were symptomatic or the hydronephrosis became progressive with an increase

in APD or decrease in cortical thickness (CT) in consecutive USG. Open Anderson- Hynes pyeloplasty with double J stent was performed in all patients. The stent was removed 6-8 weeks after operation. Postoperative follow up included USG and DTPA renogram at 6 months after surgery. Changes in APD of renal pelvis and split renal function (SRF) of the obstructed kidneys were compared with the preoperative value to evaluate the outcome of pyeloplasty. On the basis of changes of postoperative SRF from preoperative SRF, patients were divided into 3 groups. Group 1 included patients with improved renal function (postoperative SRF increased more than 5% from preoperative SRF). Group 2 included patients with stable renal function (no change or less than 5% change in SRF). Group 3 included the patients with deteriorated renal function (postoperative SRF decreased 5% or more than preoperative SRF). The groups were compared in terms of age, APD and base line SRF. The mean follows up time of the respondents was 12 months. Data were collected by semi structured questionnaire on variables of interests and analyzed by using Statistical Package for the Social Sciences (SPSS, version 25.0, Chicago, IL) software. Qualitative variables were described by frequency distribution, while quantitative variables were described by the mean and standard deviation. Chi-square test was applied for categorical data. Difference of means between or among the groups had tested by paired 't' test and Kruskal-Wallis H test respectively. The statistical significance was evaluated as appropriate probability level $p < 0.05$ or < 0.001 for all tests.

Results

From September 2020 to December 2021 total 30 patients were underwent Anderson-Hynes pyeloplasty for their unilateral PUJ obstruction in Pediatric Urology Department, Bangladesh Shishu Hospital and Institute. In this study, 77% patients had left sided hydronephrosis and remaining 23% patients had right sided hydronephrosis. Among all, 80% were male and only 20% were female. The mean (\pm SD) age of the respondents during the time of surgery was 25.80 (\pm 22.27) months and minimum and maximum age of the patients were 3 months & 7 years 5 months respectively. About 33.3% of the patients were belongs to below 1 year old , 60% were in between 1 year to 5 years and 6.7% were more than 5 years old (Table I).

Table I
Demographic variables and hydronephrosis affected side of the respondents (N=30)

| Demographic variables | | Frequency | Percent |
|------------------------------|------------|-----------|---------|
| Age (year) | <1 | 10 | 33.3 |
| | 1-5 | 18 | 60.0 |
| | >5 | 2 | 6.7 |
| | Total | 30 | 100.0 |
| Gender | Boy | 24 | 80.0 |
| | Girl | 6 | 20.0 |
| | Total | 30 | 100.0 |
| Hydronephrosis affected side | Right side | 7 | 23.0 |
| | Left side | 23 | 77.0 |
| | Total | 30 | 100.0 |

Outcome of the pyeloplasty was assumed by the comparison of mean changes of APD of renal pelvis and SRF after surgery (N=30). Paired samples t-test with p of <0.05 were used to compare the mean preoperative and postoperative APD of renal pelvis and SRF. Mean postoperative APD of renal pelvis was decreased 12.80 mm which was statistically highly significant (p<0.001). The comparison of mean changes of split renal function (SRF) after surgery among the respondents (N=30) revealed that on average, postoperative renal SRF was increased 6.04% ($\pm 7.39\%$) than preoperative SRF value among

the unilateral PUJ obstructed children which was also statistically highly significant (p <0.001) (Table II).

The patients were categorized into 3 groups according to postoperative renal functional status on the basis of postoperative SRF changes from baseline SRF level (n= 30) It revealed that more than half (56.7%) of them had significant improvement of renal function and only some (10%) of them had deterioration of renal function. Remaining 1/3rd (33%) patients had stable renal function (Table III).

Table II
Comparison of mean changes of outcome variables like anterior posterior diameter (APD) of renal pelvis and split renal function (SRF) before & after surgical intervention (N=30)

| Outcome variables | N | Mean | Std. Deviation | p | |
|-------------------|-------------------------|------|----------------|-------|--------|
| APD | Preoperative APD in mm | 30 | 44.03 | 14.88 | <0.001 |
| | Postoperative APD in mm | 30 | 31.23 | 8.32 | |
| SRF | Preoperative SRF in % | 30 | 33.38 | 11.65 | <0.001 |
| | Postoperative SRF in % | 30 | 39.42 | 8.14 | |

t (30) = 7.39, 95% CI (9.26, 16.34), p =.000 for comparison of pre & postoperative APD

t (30) = 4.48, 95% CI (3.28, 8.80), p =.000 for comparison of pre & postoperative SRF

Table III
Distribution of the patients according to postoperative renal function status on the basis of postoperative SRF changes from baseline SRF level (N=30)

| Postoperative renal function status according SRF changes from base line SRF level | Frequency | Percent |
|---|-----------|---------|
| Stable renal function (Changes of SRF within 5%) | 10 | 33.3 |
| Significant improvement of renal function (Postoperative SRF increase > 5% of preoperative level) | 17 | 56.7 |
| Deterioration of renal function (>5% decrease SRF from preoperative level) | 3 | 10.0 |
| Total | 30 | 100.0 |

Table IV explained the relation between age category of the patients and postoperative renal functional status. It revealed that about 66.7 % of the patients who were in between 1 year to 5 years and 50 % of the patients who were below 1 year had improvement in renal function after pyeloplasty. Again, 27.8% of the patients who were in between 1 year to 5 years old and 40 % of the patients who were below 1 year old had stable renal function after pyeloplasty. Among the patients who were above 5 years old, 50% of them had stable renal function and 50% had deterioration of renal function. Data were analyzed by Chi-square test and revealed that the relation between age category of the respondents and postoperative renal function status was statistically not significant ($p > .05$) (Table IV).

Table V showed the relation between preoperative anterior posterior diameter of renal pelvis and

different postoperative renal function status category among the respondents (N=30). Data were analyzed by Kruskal Wallis test and it revealed that there was no statistically significant difference in preoperative APD of renal pelvis among the different postoperative renal function status category.

Table VI showed comparison of mean changes of SRF after pyeloplasty from preoperative level among the three categories patient according to their baseline SRF function (n=30). It revealed that patients who belongs to preoperative SRF <20% and >20% -40% category had statistically significant ($p = <.05$ & $<.001$ respectively) mean changes in their SRF after surgical intervention. But among the patients (n=10) who belongs to more than 40% baseline SRF had no statistically significant ($p = >.05$) mean changes after pyeloplasty.

Table IV

Relation between age category of the patients and postoperative renal function status (N=30)

| Age | Postoperative renal function status | | | Total |
|-------------------|-------------------------------------|-----------|---------------|------------|
| | Stable | Improved | Deterioration | |
| Below 1 year | 4(40%) | 5(50.0%) | 1(10%) | 10(100.0%) |
| 1 year to 5 years | 5(27.8%) | 12(66.7%) | 1(5.6%) | 18(100.0%) |
| Above 5 years | 1(50.0%) | 0(0.0%) | 1(50.0%) | 2(100.0%) |
| Total | 10(33.3%) | 17(56.7%) | 3(10.0%) | 30(100.0%) |

$$\chi^2 = 5.55 \text{ df} = 4, p = .235$$

Table V

Relation between preoperative anterior posterior diameter of renal pelvis and different postoperative renal function status category among the respondents (N=30)

| Ranks | | | |
|--|--|----|-----------|
| | Postoperative renal function status category | N | Mean Rank |
| Preoperative anterior posterior diameter of renal pelvis | Stable renal function | 10 | 17.60 |
| | Improved renal function | 17 | 15.76 |
| | Deterioration of renal function | 3 | 7.00 |
| | Total | 30 | |

$$\chi^2 = 3.453, p = 0.178$$

Table VI

Comparison of mean changes of SRF from preoperative level after pyeloplasty among the three categories patient according to their baseline SRF function (N= 30)

| Category of the patients according to baseline SRF | SRF before & after Surgery | N | Mean | Std. Deviation | p* |
|--|----------------------------|----|-------|----------------|-------|
| Patients with Preoperative SRF \leq 20% | Preoperative SRF (%) | 4 | 12.98 | 3.58 | <.05 |
| | Postoperative SRF (%) | 4 | 27.13 | 3.33 | |
| Patients with Preoperative SRF >20%-40% | Preoperative SRF (%) | 16 | 30.61 | 5.60 | <.001 |
| | Postoperative SRF (%) | 16 | 38.13 | 4.83 | |
| Patients with Preoperative SRF > 40% | Preoperative SRF (%) | 10 | 45.96 | 2.54 | >.05 |
| | Postoperative SRF (%) | 10 | 46.40 | 6.83 | |

*paired 't' test

Discussion

PUJ obstruction is one of the common causes of hydronephrosis among the children.⁵ Anderson-Hynes Pyeloplasty is usually done to relieve obstruction and to improve the renal function. Traditionally, after pyeloplasty, repeat USG together with dynamic renal scans are the method of choice to confirm successful correction of obstruction. Successful pyeloplasty is assumed when there is decrease in APD in USG and/ or improvement of SRF in diuretic renography.³

This study demonstrated highly significant ($p < 0.001$) mean changes of preoperative and postoperative APD and SRF after 6 month of operation on postoperative follow up. In a prospective study conducted in the Department of Urology, outpatient clinic, Zagazig University Hospital in Egypt from September 2018 to September 2019 where a total of 30 children <18 years with unilateral UPJO were enrolled, among the patients, statistically significant changes occurred in between mean preoperative and postoperative APD and SRF after 6 months of pyeloplasty.³ Again, in another prospective, nonrandomized study where 68 patients were enrolled and underwent pyeloplasty between May 2010 to March 2012 in Egypt had similar findings of significant mean preoperative and postoperative APD changes. There was improvement in the mean DRF from preoperative to postoperative level but the difference had no statistical significance.⁷ Both of these study findings were similar to the present study findings.

According to postoperative SRF changes from baseline SRF value, in this study we grouped the patients into three categories. We found that 1/3rd patient had stable renal function and more than half had improved renal function after surgery but only 10% of patient had deterioration of their renal function. A study conducted among 52 consecutive patients at a tertiary care center in India between September 2009 to January 2011, where improvement in DRF were 30.8%, no change or stable renal function in 59.6% and deterioration of renal function in 9.6% patients.⁸

We analyzed the relation between the age category and preoperative anteroposterior diameter with postoperative renal function. The relation between age category of the patients and postoperative renal function status revealed, no statistical significance. Similar finding was mentioned by McAleer et al⁴.

They mentioned that renal functional differences did not depend on patient's age at the time of surgery. In contrast, another study found improvement in DRF in almost all patients who had antenatal diagnosis of PUJ obstruction and surgically treated during their first year of life.⁹ But they did not mention how many cases were improved by >5% in DRF. Although due to the widespread use of routine antenatal USG, the prenatal detection of hydronephrosis is common in developed country. But in our country prenatal detection is not very common. In this study, among the 30 patients, no one was prenatally diagnosed.

In our study, the relation of preoperative APD with postoperative SRF found not significant. But Koff et al¹⁰ reported that the beneficial effects of hydronephrosis in 2003. Though the increased APD of renal pelvis is a sign of obstruction but he showed that hydronephrosis may be a compensatory mechanism to protect the kidney from high pressure and renal damage. Another author also mentioned that large APD is one of three independent factors which predict the improvement in renal function of >5% in their 85 cases.¹¹ Chipde et al⁸ prospectively studied among 52 patients and also found that APD and pelvis cortical ratio were the most important predictors of improvement after pyeloplasty. In our study, the small sample size might be the cause of non-significance.

In this study we compared the mean changes of SRF after surgery among the patients according to different level of preoperative SRF function. We found that patients who belongs to preoperative SRF $\leq 20\%$ ($p = < 0.05$) and $>20\% - 40\%$ ($p = < 0.001$) category had statistically significant improvement in their SRF after surgical intervention. But among the patients, who belongs to $>40\%$ baseline or preoperative SRF, had no statistically significant ($p = > 0.05$) changes in postoperative SRF. These findings were consistent with other study.⁵ They found that kidneys with low baseline SRF (below 30%) demonstrated improved renal function after pyeloplasty. On the other hand, the kidneys with initial SRF close to 40% did not improve after pyeloplasty. It happened because the kidneys with low preoperative SRF had more room to improve and so demonstrated more improvement when obstruction was relieved by pyeloplasty. The low baseline DRF was shown to be a predictor of improvement in other studies.^{6,11,12} But in contrast McAleer et al⁴ described that the renal function did

not improve after pyeloplasty regardless of initial level of renal function.

Follow up period in our study was short. But there is no well accepted duration and follow up protocol for the patients with PUJ obstruction after surgical intervention. In this study though most of the patients were followed up to 1 year or more but some patients did not come after 6 month of operation for follow up. Ikari et al¹³ studied about the length of follow-up in patients underwent pyeloplasty. They concluded that, satisfactory diuretic renogram at 3 or 6 months after pyeloplasty with maintained renal function and stable hydronephrosis suggests no need of further follow up. But long duration follow up can find out the changes of renal functional status after 1-2 years of pyeloplasty.

The limitations of our study were small sample size and the accuracy of results of SRF in DTPA renogram were not consistent as all of them were not done in same center.

Conclusion

USG parameter such as APD and SRF in DTPA renogram can be used for predicting success after pediatric pyeloplasty for unilateral PUJ obstruction. In the study it has been found that the recoverability of renal function in affected renal unit after pyeloplasty can be predicted in patients with the preoperative low DRF.

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ORIGINAL ARTICLE

Laparotomy for Ingested Foreign Body in Children: Nine Years Experience in A Tertiary Care Hospital

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Abstract

Background: Ingestion of foreign bodies in children is a common occurrence and can affect from harmless to life-threatening situations. While laparotomy for ingested foreign body, in children is generally safe and effective, it is more important to take steps to prevent foreign body ingestion in the first place.

Objective: The aim of this study was to evaluate the cases that underwent laparotomy for foreign body ingestion and the management of any complications.

Methods: This retrospective study was conducted in the Division of Paediatric Surgery, Bangladesh Shishu Hospital & Institute, Dhaka, Bangladesh from January 2013 to December 2022. Total 83 patients were admitted for ingestion of foreign body of which 32 foreign bodies were removed endoscopically and 40 patients expelled foreign bodies with defecation without any intervention. For the remaining 11 patients, laparotomy was performed and associated complications were managed accordingly.

Results: In this study, the average age of the children were 38.7 months, of which majority were male (81.8%). Common presenting symptoms were dysphagia, (18.2%), abdominal pain (45.5%), vomiting (27.3%), and fever (27.3%). Whereas, 36.4% were asymptomatic. The time interval between ingestion and treatment were about 56.5 hours. The primary indication for laparotomy was perforation (45.5%) and failed endoscopic removal (36.4%). Most ingested objects were magnets (36.4%), predominantly found in the jejunum and ileum (45.5%). The commonest per operative complication (81.8%) was intestinal obstruction. The average operation time was 68.4 minutes. Post-operative hospital stay was 7.5 days on average, with a 4.2-month follow-up. There were incidents of postoperative complications, with 18.2% experiencing postoperative ileus.

Conclusion: Careful follow up of children with Ingested foreign bodies specially sharp and pointed objects, is warranted for its occasional requirement of surgical intervention, predominantly due to failure of endoscopic removal or spontaneous passage. Multiple ingestion of magnets or a single button battery ingestion can lead to life threatening complications, requiring surgical intervention.

Keywords: Laparotomy, ingested foreign body, children.

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Introduction

Due to lack of oral orientation beyond the age of six months, young toddlers frequently put unfamiliar objects in their mouths.¹ Children, especially under the age of six, are more prone to FB injuries because of the lack of molar teeth, they tend to have a propensity for oral exploration, as to play when they eat, with poor swallowing coordination.² According to their eating patterns and societal traits, FB differs from country to country. Coins, batteries, and fish bones were the most frequent FB, according to the European Study on Foreign Bodies Injuries (ESFBI) research.² In a Bangladeshi study conducted by Alam et al³, the commonest foreign bodies were needles, nails, coins, button batteries, safety pins, hijab pins and etc. In another study by Chowdhury et al⁴, coin, pins, nails, and batteries were the commonest foreign bodies ingested by children. Males are more commonly affected than females. Although, it might vary depending on sociocultural factors, early intervention is necessary when metal (such as coins, paper clips, batteries, and needles) and non-metal (such as wooden and plastic toy pieces) objects are ingested.⁵⁻⁸ Patients might appear with no symptoms or serious issues such as erosions, ulcers, or perforations that require immediate medical management.⁹ Foreign bodies may also be accidentally discovered during radiological assessment done for unrelated conditions, such as dysphagia, wheezing, pneumonia, or asthma.^{5,7} Although it has been reported that between 80% and 90% of foreign bodies that are ingested pass through the gastrointestinal canal on their own without any complications, in 10-20% of cases, the foreign body may remain in anatomically restricted areas, primarily the upper esophageal region, the pylorus, the ileocecal valve, and the rectosigmoid colon, necessitating endoscopic removal; in 1% of cases, surgical removal may become a necessity.⁵⁻⁸ Although most foreign bodies may spontaneously pass along the GI system, a few may require endoscopic or surgical removal is necessary. Yet, there is still debate regarding the circumstances which require the need for operative intervention. Admittedly, >90% of esophageal FBs pass naturally without causing problems; nevertheless, a small number of FBs can't readily pass via the pylorus, stomach, duodenum, ileocecal valve, Meckel's diverticulum, and/or anus, thus 10% of swallowed FBs may remain in the GI tract.¹⁰⁻¹² The key to

minimize any harmful repercussions is early diagnosis and effective care. The choice of the method of management for an ingested foreign body typically depends on the doctor's experience, other various factors, such as the patient's age, the nature and location of the foreign body, the time that has passed since ingestion, the patient's prior medical and surgical history, and the availability of medical techniques like endoscopy, should be also be taken into consideration.¹³ This present study was conducted to evaluate the cases of ingested foreign body in children who underwent laparotomy for removal and the management of complications. So this study was undertaken to evaluate the cases of ingested foreign body in children who underwent laparotomy for foreign body removal and to manage the associated complications.

Materials and Methods

This retrospective study was conducted in the Division of Paediatric Surgery, Bangladesh Shishu Hospital & Institute, Dhaka, Bangladesh, from January 2013 to December 2022. Total 83 patient admitted within this period for ingestion of foreign body of which 32 foreign bodies were removed endoscopically and 40 patients expelled the foreign bodies with defecation. For the remaining 11 patients, laparotomy were performed for removal of foreign bodes. Plain x-ray of abdomen were advocated in all cases. Patients aged between 2 months to 60 months undergone laparotomy for ingested foreign body were included in this study.

Results

Table-I presents the baseline characteristics of the study cases. The average age of the children was 38.7 months (about 3.2 years) with a standard deviation of 11.2 months. The ages ranged from as young as 2 months to as old as 12 years. The majority of the study subjects were male, accounting for 81.8% of the total 11 study cases, while there were only 2 female, representing 18.2% of the total. The most common symptom was abdominal pain, experienced by 5 children (45.5% of subjects). This was followed by vomiting and fever, each of which were experienced by 3 children (27.3% of subjects). Dysphagia was a symptom in 2 cases (18.2% of subjects) and interestingly, 4 children (35.4%) were asymptomatic, showing no overt signs of having ingested a foreign body. On average, the time from ingestion to the detection and treatment of the

foreign body was approximately 56.5 hours, with a standard deviation of 17.2 hours. Figure 1 provides reasons for performing laparotomy in children who swallowed foreign bodies.

The most common reason for laparotomy was perforation, accounting for 45.5% of the cases. This was closely followed by failed endoscopic removal, which was the reason in 36.4% of the cases. Failure of progression contributed to 18.2% of the laparotomy indications, while peritonitis was the least common indication, representing 9.1% of the cases. Table-II describes the characteristics of the foreign bodies ingested by the children in the study. The most commonly ingested foreign body was magnet, which accounted for 36.4% of the cases. The second most common was button battery, representing 27.2% of the cases. Hijab pins were ingested in 18.2% of the cases, while both broken metallic rings and food objects were found in 9.1% of the cases for each type. The foreign bodies were located in various parts of the digestive system and peritoneal cavity. The jejunum ileum was the most common location, holding 45.4 of the foreign bodies. Both the cecum and large bowel and the peritoneal cavity each accounted for 18.2% of the locations. The stomach and duodenum each had 9.1% of the foreign bodies located within them. Table-III summarizes the Surgical observation and outcome in the study subjects. The most frequently observed per operative

finding was intestinal obstruction, which was present in 81.8% of the patients. Following this, gastrointestinal fistulae were identified in 63.6% of the cases.

The finding of bleeding was observed in 18.2% of the patients, and the presence of foreign bodies impacted within the lumen was noted in 27.3% of the cases. The average operation time was 68.4 minutes with a standard deviation of 10.6 minutes. Patients stayed in the hospital for an average of 7.5 (± 2.7) days post-surgery and were followed up for an average of 4.2 (± 1.5) months. The table also includes post-surgery complications. Out of 11, 2 patients (18.2%) experienced postoperative ileus. Surgical site infection, occurred in 1 case (9.1% each). Figure 2 shows the foreign body in CT scan of the abdomen. Figure 3 demonstrates the laparotomy performed on the children. Lastly, figure 4 shows example of some foreign body found after operation.

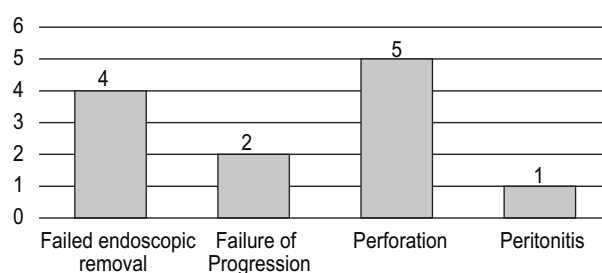


Fig.-1 Indications of laparotomy

Table I
Baseline characteristics of the study subjects (N=11)

| Characteristics | n | % |
|--|----------------|-------------------|
| Age (Month) | Mean \pm SD | 38.7 \pm 11.2 |
| | Range | 2 months-12 years |
| Sex | Male | 9 |
| | Female | 2 |
| Symptoms | Dysphagia | 2 |
| | Vomiting | 3 |
| | Abdominal pain | 5 |
| | Fever | 3 |
| | Asymptomatic | 4 |
| Time of ingestion to presentation (Hour) | Mean \pm SD | 56.5 \pm 17.2 |

Table II
Types of foreign bodies and their locations (N=11)

| Characteristics | | n | % |
|---------------------------------|-----------------------|---|------|
| Type of foreign bodies ingested | Broken metallic ring | 1 | 9.1 |
| | Button battery | 3 | 27.2 |
| | Hijab pin | 2 | 18.2 |
| | Magnet | 4 | 36.4 |
| | Food object | 1 | 9.1 |
| Location of foreign body | Stomach | 1 | 9.1 |
| | Duodenum | 1 | 9.1 |
| | Jejunum ileum | 5 | 45.4 |
| | Cecum and large bowel | 2 | 18.2 |
| | Peritoneal cavity | 2 | 18.2 |

Table III
Surgical observation and outcome (N=11)

| Outcome | | n | % |
|-------------------------------|---------------------------|-----------------|------|
| Per operative findings | Bleeding | 2 | 18.2 |
| | Gastrointestinal fistula | 7 | 63.6 |
| | Intestinal obstruction | 9 | 81.8 |
| | Impacted within the lumen | 3 | 27.3 |
| Operation time | Mean \pm SD | 68.4 \pm 10.6 | |
| Length of hospital stay (Day) | Mean \pm SD | 7.5 \pm 2.7 | |
| Follow up (Month) | Mean \pm SD | 4.2 \pm 1.5 | |
| Post-operative complication | Postoperative ileus | 2 | 18.2 |
| | Surgical site infection | 1 | 9.1 |

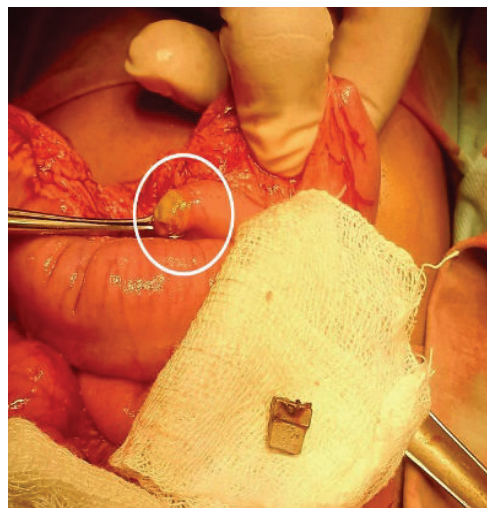


Fig.-2 Multiple magnates ingestion. 2 pieces removed endoscopically. 3 pieces removed from laser sac after laparotomy

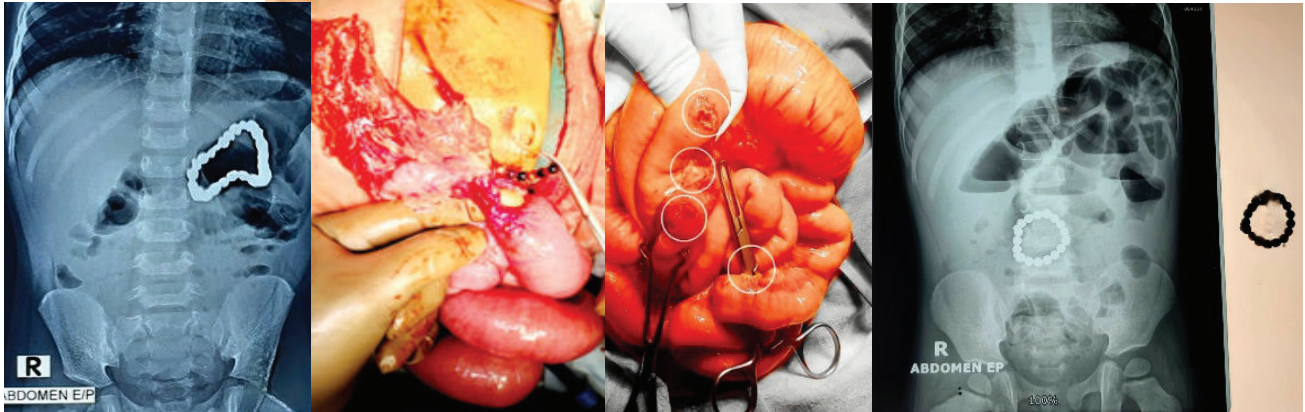


Fig.-3 Multiple magnates (17) ingestion. Gut perforation in multiple site

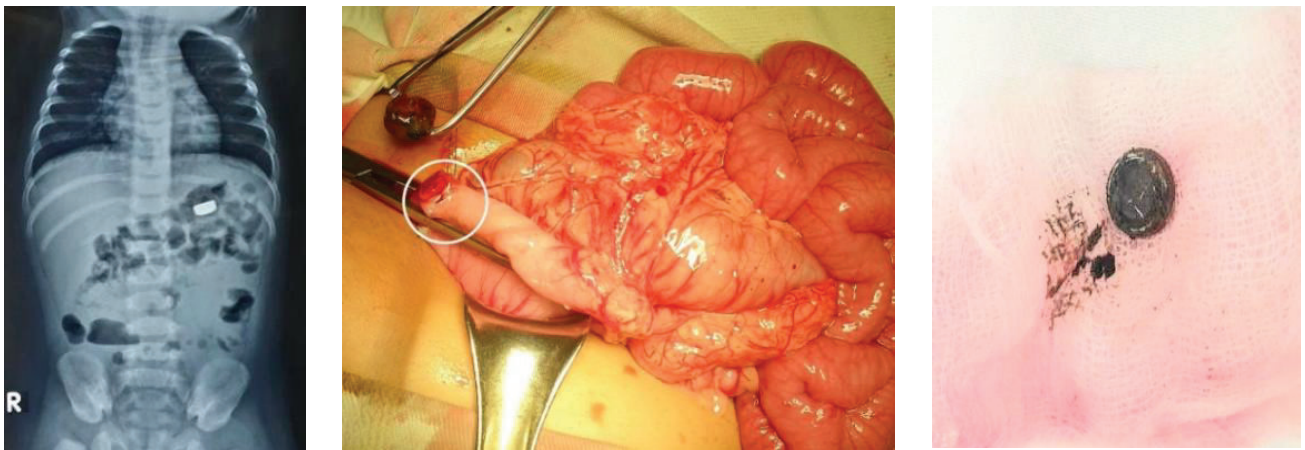


Fig.-4 Button battery ingestion



Fig.-5 Multiple button battery and Impacted foreign body in the small intestine, Caecum and transverse colon

Discussion

This study has shed light on the prevalence and management of ingested foreign bodies in children, a problem that frequently arises in pediatric care. The average age of children in this study was 38.7 months, echoing previous research that showed children around the age of three to be most at risk of foreign body ingestion due to their exploratory behavior and lack of mastication skills.¹⁴ With a male preponderance (81.8%), our findings concur with past literature suggesting that boys are more likely to ingest foreign bodies than girls.¹⁵ The presenting symptoms, included dysphagia, vomiting, abdominal pain, and fever, align with those reported in previous studies, emphasizing the potential severity of foreign body ingestion.¹⁶ It is noteworthy that 36.4% of our study subjects were asymptomatic, reinforcing the challenges clinicians face in diagnosing this condition, as children often fail to report or recall the ingestion.¹⁷ The predominance of magnets (36.4%) in this study, present a significant risk, particularly when multiple magnets are ingested and attract through the intestinal walls.¹⁸ In this study, multiple magnet ingestion caused fistula in the study subject, as they stuck together by magnetic force. Button batteries were found in 27.3% among the ingested foreign bodies in our study, is also concerning due to their potential to cause serious complications, such as burns and perforations.¹⁹ Button batteries which are able to pass duodenum caused perforation in our study patients. The less common items, including hijab pins, broken metallic ring, and food object, are consistent with objects reported in other studies.²⁰ In this study, common location of foreign body lodgment, was for the small bowel, which aligns with the existing literature emphasizing the small bowel, and specifically, the ileocecal valve, as a common site of impaction.²¹ The most common indication for laparotomy was failed endoscopic removal, which is consistent with practice guidelines that recommend endoscopic removal as the first-line treatment for ingested foreign bodies that fail to pass spontaneously.²² However, failure to progress, perforation, and peritonitis also necessitated surgical intervention, emphasizing the potential severity of these cases. For per operative findings, intestinal obstruction was the predominant

complication, present in a significant 81.8% of cases. This high rate aligns with previous studies which have documented the intestines as the most common location for foreign body impaction, due to the narrowing and tortuosity of the gastrointestinal tract.²³ Gastrointestinal fistulae were observed in 63.6% of cases. The formation of fistulae due to foreign bodies has been previously reported, suggesting that sharp or pointed objects are particularly predisposed to creating such traumatic perforations.²⁴ The foreign bodies may migrate and erode through the walls of the gastrointestinal tract, leading to fistula formation. While bleeding was a relatively less common finding in this study, occurring in 18.2% of cases, it remains clinically significant. The risk of bleeding is compounded when sharp objects cause direct injury or when corrosive agents produce mucosal erosions.²⁵ The average operation time and length of hospital stay in this study were within the ranges reported in other studies on pediatric foreign body ingestion, which may vary depending on the complexity of the case and the child's overall health.²⁶ This suggests that although the procedure requires precision, it is fairly straightforward for seasoned surgeons. An average post-operative hospital stay of 7.5 days, with a follow-up of 4.2 months, indicates the critical nature of ingested foreign bodies and the meticulous post-operative care they demand. Complications following surgery, such as postoperative ileus and surgical site infection, underscore the risk associated with foreign body ingestion and the need for prompt, effective treatment. These findings are similar to other studies.^{27,28}

Conclusion

Careful follow up of children with Ingested foreign bodies specially sharp and pointed objects, is warranted for its occasional requirement of surgical intervention, predominantly due to failure of endoscopic removal or spontaneous passage. Multiple ingestion of magnets or a single button battery ingestion can lead to life threatening complications, requiring surgical intervention. Steps to raise awareness of parents regarding, the dangers of handling small magnets and button battery by children, should be taken to prevent any future adversity.

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ORIGINAL ARTICLE

Spectrum of Biochemical Abnormalities in Neonatal Seizures: A Cross-sectional Study in A Tertiary Care Paediatric Hospital

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Abstract

Background: Neonatal seizure by itself is not a diagnosis but is a manifestation of an underlying disease of central nervous system which may result due to systemic and biochemical abnormalities. Biochemical disturbances are transient and rapidly correctable. This study aims to assess biochemical abnormalities in neonatal seizure.

Objective: Aims of the study were to describe biochemical abnormalities in neonatal seizure.

Methods: This cross-sectional study has been conducted in the Department of Paediatrics, Bangladesh Shishu Hospital & Institute from January to July 2020. Neonates admitted with history of convulsion or who developed convulsion during hospitalization were included and neonates having congenital malformation of brain, syndromic baby were excluded from this study. Baseline characteristics of neonates including sex, gestational age, weight, head circumference, details of seizure including age at onset, duration, number, and type were recorded. Blood glucose, serum calcium, sodium, potassium, and magnesium level were done immediate after admission before instituting any specific treatment. Informed verbal consent from caregiver was taken before enrolment.

Results: Total 60 neonates presenting with seizure were enrolled in the study. About two-third neonates presented with generalized tonic clonic seizure (43/71.7%). Majority (51/85%) of the neonates had seizure within 72 hours, rest of them after 72 hours. Out of 60, 32(53.3%) neonates had biochemical abnormalities of which 28(87.5%) were non-metabolic and 4(12.5%) were primary metabolic seizures. Hypoglycaemia and hypocalcaemia were equally found in primary metabolic seizure. Non-metabolic seizures were associated with perinatal asphyxia, meningitis, sepsis, and intracranial haemorrhage. Hypoglycaemia (67.8%) was commonest abnormality among secondary causes, followed by hyponatremia (21.4%) and hypocalcaemia (10.7%). Among 32 cases, 66.67% hypoglycaemia and 50% hyponatremia were found in perinatal asphyxia cases, which was higher than other cases.

Conclusion: This study showed hypoglycaemia was commonest abnormality among biochemical changes in neonatal seizure. Hypoglycaemia and hyponatremia occur with higher frequency in case of perinatal asphyxia.

Keywords: Neonatal seizure, hypoglycaemia, hyponatremia, hypocalcaemia.

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Introduction

Seizure is the most common and distinct sign of neurological dysfunction in neonates. Neonatal seizures are abnormal electrical discharge in the central nervous system of neonates, usually manifesting as stereotyped muscular activity or automatic changes.¹ Seizures occur when a large group of neurons undergo excessive synchronized depolarization, which can result from excitatory amino acid release or deficient inhibitory neurotransmitter. Another potential cause is disruption of ATP dependent resting membrane potentials, which causes a flow of sodium into the neurons and potassium out of the neurons.² It may manifest as impairment or loss of consciousness, abnormal motor activity, behavioural abnormalities, sensory disturbances, or autonomic dysfunction.³

Neonatal seizures are clinically significant as they may be symptomatic of an underlying disorder or primary epileptic condition. The occurrence of seizure may be the first indication of neurological disorder and the time of onset of seizure has relationship with the aetiology of seizure and prognosis.⁴ Neonatal seizure may arise as a result of diverse aetiologies and can have varied presentation.⁵ The major causes of neonatal seizures are perinatal asphyxia, metabolic abnormalities (hypoglycaemia, hypocalcaemia, hypomagnesaemia, pyridoxine dependency and deficiency, hyponatremia and hypernatremia, amino aciduria and kernicterus), infection (sepsis, meningitis and encephalitis), bleeding (subarachnoid, subdural, thrombosis and intraventricular haemorrhage), developmental anomalies (cerebral dysgenesis, incontinentia pigmenti) and other causes (drug withdrawal), hyperthermia, benign familial neonatal seizure, benign idiopathic neonatal seizures and benign sleep myoclonus.⁶⁻⁸ Among various aetiologies perinatal asphyxia, sepsis, neonatal meningitis and metabolic abnormalities are commonest aetiologies of neonatal seizures.³

Biochemical disturbances occur frequently in neonatal seizure either as an underlying cause or as associated abnormalities. In their presence it is difficult to control seizure and there is a risk of further brain damage.^{4,9} So early recognition and treatment of those aetiologies are essential for optimal management and satisfactory long-term outcome.⁹ Aims of the study were to describe clinical presentation, time of onset of seizure and to

determine biochemical abnormalities in neonatal seizure.

Materials and Methods

This was a cross-sectional study, conducted in the Department of Paediatrics at Bangladesh Shishu Hospital & Institute, Sher-e-Bangla Nagar, Dhaka-1207, from January to July 2020. Neonates (0-28 days) admitted in Department of Paediatrics with history of convulsion or who developed convulsion during hospitalization were included and neonates having congenital malformation of brain, syndromic baby, whose caregiver did not give consent were excluded from this study. Informed verbal consent from caregiver was taken before enrolment. Data was collected by structured questionnaire with maintaining proper ethical issues.

Baseline characteristics of patient, clinical details of seizure including age of onset of seizure, duration, frequency, type of seizure were recorded. Before instituting treatment, 2ml blood drawn from median cubital vein for blood sugar, serum calcium, sodium, potassium, chloride, magnesium and was sent to Biochemistry department for analysis. Report was collected from patients hospital record. Criteria for diagnosing biochemical abnormalities are - Hypoglycaemia: Blood glucose level <40mg /dl (2.2 mmol/L), Hypocalcaemia: Total serum calcium <7 mg / dl (1.75 mmol/L) or ionized calcium <4 mg/dl (1 mmol /L), Hypomagnesaemia: Serum magnesium level <1.5 mg/dl, Hyponatremia: Serum sodium level <130 meq/dl, Hypernatremia: Serum sodium level >150 meq/dl. Data were processed and analysed by using SPSS (statistical package for social sciences) version-23. Data was described as percentage.

Results

Out of 60 neonates, 41 (68.3%) were males and 19 (31.7%) females; male to female ratio of 2.16:1. Forty-four neonates were full-term (90%), 6 were preterm (10%). Fifty-two cases (86.7%) were appropriate for gestational age (AGA) and 8 (13.3%) were small for gestational age (SGA) (Table I).

In present study 85% (51/60) neonates had seizure within 72 hours of life, among them 36.7% (22/60) neonates had seizure on first day, 38.3% (23/60) on second day and 10% (6/60) on day 3; and after 72 hours of life, 15% (9/60) neonates had seizure (Fig.-1). Generalized tonic seizure was the commonest type of seizure (43, 71.7%); followed by focal (10, 16.6%),

subtle (5, 8.3%), myoclonic (1, 1.7%) and partial (1, 1.7%) seizure (Table II). Perinatal asphyxia (60%) was most common cause of neonatal seizure; followed by meningitis (16.7%), sepsis (15%), primary metabolic causes (6.7%) and intracranial haemorrhage (1.6%) (Fig.-2). Perinatal asphyxia (68.6%) was most common cause of seizure within 72 hours and after 72 hours meningitis was the predominant cause.

In present study, biochemical abnormalities were seen in 32 (53.3%) cases of which 28 (87.5%) were non-metabolic and 4(12.5%) were metabolic seizures. The most common type of biochemical abnormality was hypoglycaemia (65.6%) followed by hyponatremia (18.7%) and hypocalcaemia (15.6%). Among non-metabolic seizures (28, 87.5%), hypoglycaemia (19, 67.8%) was commonest abnormality; followed by hyponatremia (6, 21.4%) and hypocalcaemia (3, 10.7%). One or more abnormalities co-existed in non-metabolic seizure, those were hypoglycaemia and hyponatremia (2, 7%) and hyponatremia and hypocalcaemia (1, 3.6%). Among metabolic seizure (4), 2 cases were hypoglycaemia and 2 cases hypocalcaemia (Table III). One case of hypoglycaemia was IDM and both hypocalcaemia cases had early onset seizure; and one case was SGA and one IDM. Non-metabolic abnormalities were due to perinatal asphyxia, meningitis, sepsis, and intracranial haemorrhage, among them perinatal asphyxia was highest (18/28, 64.3%) (Table IV). Among 32 cases, 66.67% hypoglycaemia and 50% hyponatremia were found in perinatal asphyxia cases, which was higher than other cases.

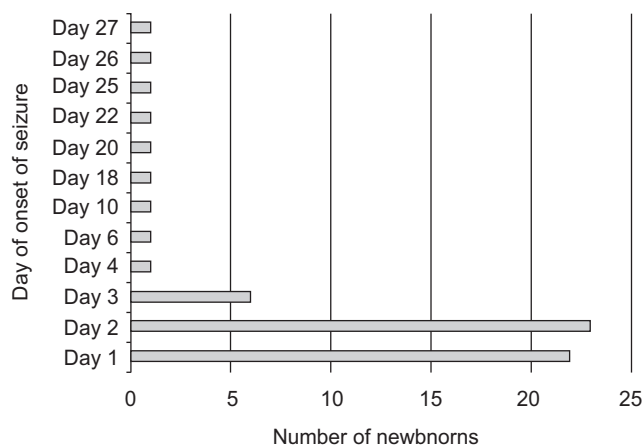


Fig.-1 Age of onset of seizure

| Seizure type | Number | Percentage |
|-------------------|-----------|------------|
| Generalized tonic | 43 | 71.7 |
| Focal | 10 | 16.6 |
| Subtle | 5 | 8.3 |
| Myoclonic | 1 | 1.7 |
| Partial | 1 | 1.7 |
| Total | 60 | 100 |

| Characteristics | Number | Percentage |
|----------------------------|---------|------------|
| Gender | Male | 41 68.3 |
| | Female | 19 31.7 |
| Gestational age | Term | 54 90.0 |
| | Preterm | 6 10.0 |
| Weight for gestational age | AGA | 52 86.7 |
| | SGA | 8 13.3 |

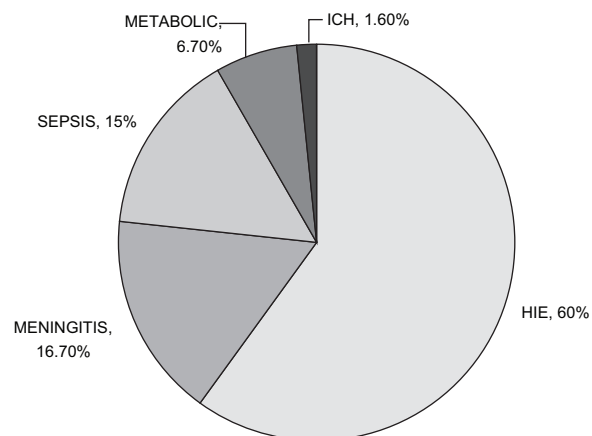


Fig.-2 Distribution of aetiology of neonatal seizure

Table III
Overall biochemical profile in patients with neonatal seizure (N=32)

| | Number (percentage) | Hypo- glycaemia | Hypo- natraemia | Hypo- calcaemia | Hypo- magnesaemia | Hypoglycaemia+ hyponatraemia | Hyponatremia+ hypocalcaemia |
|-------------------|------------------------|--------------------|--------------------|--------------------|----------------------|---------------------------------|--------------------------------|
| Non-metabolic | 28(87.5) | 19(67.8) | 6(21.4) | 3(10.7) | 0 | 2(7.1) | 1(3.6) |
| Primary metabolic | 4(12.4) | 2(50) | 0 | 2(50) | 0 | 0 | 0 |
| Total | 32(53.3) | 21(65.6) | 6(18.7) | 5(15.6) | 0 | 2(6.2) | 1(3.1) |

Table IV
Distribution of patient of non-metabolic seizure in accordance with Biochemical profile

| Etiology | Number having abnormality | Hypogly caemia | Hypo Na+ | Hypo Ca++ | Hypo Mg++ | Hypoglycaemia and Hypo Na+ | Hypo Ca++ and Hypo Na+ |
|------------------------------|---------------------------------|-------------------|-------------|--------------|--------------|----------------------------------|------------------------------|
| Perinatal asphyxia (36) | 18 | 14 | 3 | 1 | 0 | | 1 |
| Meningitis (10) | 6 | 4 | 1 | 1 | 0 | 1 | |
| Sepsis (9) | 3 | 1 | 1 | 1 | 0 | 1 | |
| Intracranial haemorrhage (1) | 1 | 0 | 1 | 0 | 0 | | |
| Total | 28 | 19 | 6 | 3 | 0 | 2 | 1 |

Discussion

Neonatal seizures have always been a topic of interest because of their universal occurrence. The presence of a seizure does not constitute a diagnosis, but it is a symptom of underlying CNS disorder due to systemic or biochemical disturbances.¹⁰

In present study out of 60 neonates 41 (68.3%) were male and 19 (31.7%) were female. Male to female ratio was 2.16:1, which is similar to the study conducted by Arunkumar et al¹¹ (1.4:1). Mishra et al¹² also showed male predominance (1.8:1). Male predominance may be due to health care seeking behaviour for male babies in our society.

This study showed 86.7% neonate having seizure were appropriate for gestational age and 13.33% constituted low birth weight, which is similar to the study done by Das et al⁴, showed AGA (81.7%), SGA (9.6%). More number of neonatal seizures having birth weight ≥ 2500 gm may be due to perinatal asphyxia is more common in these neonates.

In this study term babies were 90% while preterm babies were 10% of all new-born's having seizure. The majorities of neonates who developed seizure were full term (90%) which is similar to the findings of Marzoki et al² (95.4%) and Das et al⁴ (91.3%).

In our study 85% neonates had seizure within 72 hours which is similar to the study conducted by Aziz et al⁵ (83%), Das et al⁴ (71.3%). But Marzoki et al² found most of seizure occur after 72 hours. This difference may be due to aetiology. In our study perinatal asphyxia was the main cause of seizure but in the study of Marzoki et al² metabolic abnormalities (47.7%) were most common cause of seizure.

Generalized tonic seizure (71.7%) was predominant seizure in the present study, but Aziz et al⁵ found focal clonic seizure (30%) and Das et al⁴ showed subtle seizure (49%) as the commonest seizure type.

The results of the present study showed biochemical abnormalities in 53.3% of neonates with seizure which corroborated with the findings published by Aziz et al⁵. On the other hand, Arunkumar et al¹¹ and Kumar et al¹³ found biochemical abnormalities in 82% and 62.8% neonates respectively, which was higher than our study.

We found hypoglycaemia was the principal cause of seizure (65.6%) in neonates, similarly Kumar et al¹³, Arunkumar et al¹¹ and Aziz et al⁵ found hypoglycaemia (50%, 53.6% and 50% respectively) in neonates with seizure.

In present study hyponatremia was the second most common abnormality (18.7%, 6/32) of neonates with seizure which was similar to the study conducted by Aziz et al⁵ (18.5%, 10/54), Sood et al¹⁴ (17.2% 5/29) but was lower compared to the study conducted by Kumar et al¹³ (45.4%, 10/22).

This study found perinatal asphyxia accounted for 50% (3/6) of case with hyponatremia which was similar to the findings of Arunkumar et al¹¹ (12/24), The most probable explanation for occurrence of hyponatremia might be due to fluid overload as a result of renal compromise or due to syndrome of inappropriate secretion of antidiuretic hormone.

Hypocalcaemia was seen in 15.6% (5/32) cases in the present study, which was lower in contrary to the study conducted by Aziz et al¹⁵ (48.1%), Sood et al¹⁴ (48.3%), and Kumar et al¹³ (31.8%).

We found primary metabolic abnormalities in 12.4% neonates due to hypoglycaemia and hypocalcaemia. Aziz et al¹⁵ and Sood et al¹⁴ described higher percentage (31.8%, 34.4% respectively) of primary metabolic seizure in contrary to our study. This study found primary metabolic seizure due to hypoglycaemia and hypocalcaemia, similarly found by Sood et al¹⁴ but Aziz et al¹⁵ found primary metabolic seizures due to hypocalcaemia, hypomagnesemia and hyperphosphatemia.

Conclusion

Among biochemical abnormalities hypoglycaemia was commonest abnormality. Hypoglycaemia and hypocalcaemia were equally observed among primary metabolic cases. Hypoglycaemia and hyponatremia occur with higher frequency in case of perinatal asphyxia. So, if biochemical correction is possible in time, we would be able to control seizure promptly.

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REVIEW ARTICLE

Flexible Bronchoscopy in Children: An Overview

Sarabon Tahura

Abstract

Bronchoscopy is a dynamic diagnostic tool that has continually advanced alongside the rapid progression of medical technology. It offers a comprehensive evaluation of the upper and lower airways, catering to a wide range of respiratory concerns. Over the course of numerous decades, bronchoscopy has played a pivotal role in the field of pediatric pulmonology, providing invaluable diagnostic and therapeutic options that extend well beyond the boundaries of this specialized medical domain. The purpose of this article is to consolidate the existing knowledge and explore the diverse interdisciplinary facets of pediatric bronchoscopy, with the ultimate goal of establishing a consensus on the safe and effective technical execution of this procedure. The intension is to create a standardized foundation for its practical application.

Introduction

Bronchoscopy offers a comprehensive evaluation of the upper and lower airways, catering to a wide range of respiratory concerns.¹ The clinical application of bronchoscopy dates back to 1897 when Killian removed a pork bone from the right main bronchus in a farmer.² Bronchoscopy stands as a versatile tool, providing invaluable insights and therapeutic interventions that enable clinicians to perform a various procedure, significantly enhancing the capacity for precise diagnosis and treatment of respiratory conditions. Thus, bronchoscopy assumes a pivotal role in evaluation of airway anatomy, assessment of airway dynamics, obtaining biological samples and therapeutic interventions.

Types of Bronchoscope

There are two types of bronchoscope - Rigid and flexible (Fig.-1). Both types of bronchoscope exhibit numerous differences offering advantages and disadvantages that vary depending on factors such

as the clinical scenario of patient, the intended task and the interventional context (Table I). Frequently, employing both of these instruments in conjunction proves to be most effective in gaining a comprehensive understanding of airway and lung pathology.

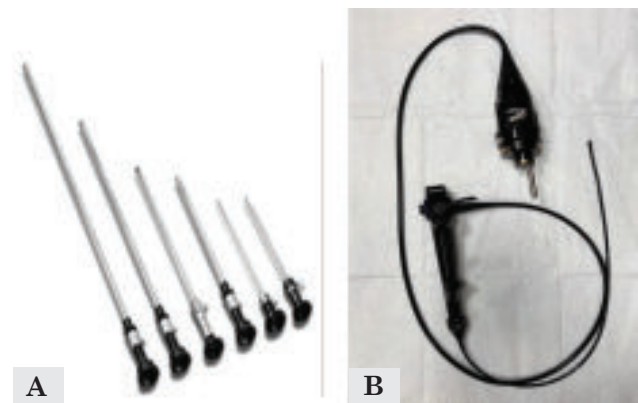


Fig.-1 Types of bronchoscope. A - Rigid bronchoscope, B - Flexible bronchoscope

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Table I
Comparison of flexible and rigid paediatric bronchoscopy³

| Rigid bronchoscopy | Flexible bronchoscopy |
|--|--|
| Advantages | |
| <p>Airway anatomy</p> <ul style="list-style-type: none"> • Superior optical quality <p>Airway dynamics</p> <ul style="list-style-type: none"> • Evaluation of the upper and lower airway structures during spontaneous ventilation • With a ventilating bronchoscope, can determine the amount of pressure needed to overcome airway malacia • Visualization and instrumentation of an occult tracheoesophageal fistula can be performed <p>Obtain clinical samples</p> <ul style="list-style-type: none"> • Easy to obtain tissue biopsies using optical forceps • Direct suctioning of secretions <p>Therapeutic intervention</p> <ul style="list-style-type: none"> • Diagnosis and treatment of many conditions during the same procedure • Multitude of associated instruments to perform many intra-airway procedures • Innumerable functions including biopsy, foreign body removal, excision of masses/lesions, airway dilation, treatment of airway stenosis, and more | <p>Airway anatomy</p> <ul style="list-style-type: none"> • Visualization of more distal airways • Not typically patient position dependent, so can be used in patients with anatomic constraints • Can be performed via nasal passage, LMA or endotracheal/tracheostomy tube <p>Airway dynamics</p> <ul style="list-style-type: none"> • Upper airway anatomy is best viewed in an awake patient with a flexible scope • Upper airway endoscopy during simulated sleep can be performed • Less likely to deform or stent the airway during dynamic evaluation <p>Obtain clinical samples</p> <ul style="list-style-type: none"> • Better option is to obtain clinical samples from the distal airways • Flexible scope can be “wedged” into the airway to administer and collect BAL fluid <p>Therapeutic intervention</p> <ul style="list-style-type: none"> • Suctioning and clearance of secretions or mucus plugs from the small/distal airways • Targeted instillation of medications |
| Drawbacks | |
| <p>Airway anatomy</p> <ul style="list-style-type: none"> • Cannot access/visualize smaller airways • Requires collaboration with anesthesiologist for concurrent patient ventilation • Patient anatomy may make access difficult <p>Airway dynamics</p> <ul style="list-style-type: none"> • Rigid scopes may alter airway anatomy <p>Obtain clinical samples</p> <ul style="list-style-type: none"> • Difficult to “wedge” bronchoscope for BAL collection <p>Therapeutic intervention</p> <ul style="list-style-type: none"> • Difficult to reach right upper lobe or distal bronchi in some patients | <p>Airway anatomy</p> <ul style="list-style-type: none"> • Poorer optical quality <p>Airway dynamics</p> <ul style="list-style-type: none"> • When using LMA or endotracheal tube, dynamics may be altered • Bronchoscope in ETT contributes to PEEP during the procedure and may alter the airway assessment <p>Obtain clinical samples</p> <ul style="list-style-type: none"> • More difficult to obtain biopsies in younger patients due to the small size of the scope and instruments <p>Therapeutic intervention</p> <ul style="list-style-type: none"> • Limited use due to small size of scope and instruments |

Flexible Bronchoscopy

In the early 1970s, fiber-optic bronchoscopes were introduced, marking a significant advancement in medical technology. In 1978, the first report detailing diagnostic flexible bronchoscopy in children was published.⁴ Since then, bronchoscopy has grown into an increasingly vital tool for managing acute and chronic lung conditions in pediatric patients. In 2003, a task force from the European Respiratory Society (ERS) released their findings regarding flexible endoscopy of pediatric airways, ultimately affirming its safety as long as proper preparation is undertaken and the procedure is conducted by proficient and well-trained medical personnel.¹ Concurrently with advancements in adult bronchoscopy, pediatric airway endoscopy has progressed from primarily serving diagnostic purposes to encompassing therapeutic or interventional, bronchoscopy.

Now-a-days, the exception of the 2.2-mm neonatal-size bronchoscope, these instruments are equipped with a suction/working channel, which varies in diameter from 1.2 to 2.8 mm. This working channel facilitates a range of functions, including suctioning of secretions, collection of bronchoalveolar lavage samples, instillation of fluids, oxygen insufflation, and the passage of small instruments like cytology brushes, laser probes, cryoprobes, and biopsy forceps.⁵ The different parts of a flexible bronchoscope are: angulation control lever, angulation lock, working channel, suction connector, insertion tube: at the distal end has objective lens, light guides and instrument/working channel and has a bending section at the tip of the bronchoscope and universal cord which connects to the light guide connector section (Fig.-2).

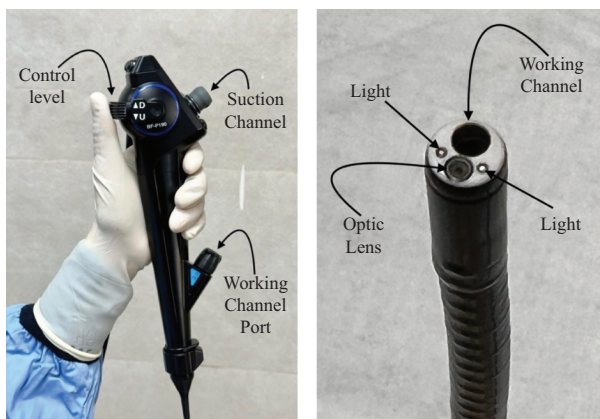


Fig.-2 Parts of flexible bronchoscope

Table II
Indications of flexible bronchoscopy^{1,3}

| | |
|-----------------------|---|
| Diagnostic | Need for information within the lungs or airways: <ul style="list-style-type: none"> • Upper airway obstruction • Chronic cough • Lower airway cultures needed • Abnormal imaging • Localization of bleeding • Severe persistent asthma, difficult to treat • Extubation failure • Biopsies-transbronchial, endobronchial |
| Therapeutic | Need to relieve obstruction in the airways: <ul style="list-style-type: none"> • Improve atelectasis due to mucus plugging • Removal of foreign body Advanced interventions : <ul style="list-style-type: none"> • Cryotherapy • Tracheo-oesophageal fistula repair • Balloon dilation and occlusion • Laser-assisted procedures • Airway stents |
| Intubation assistance | <ul style="list-style-type: none"> • Elective, nasotracheal intubation • Difficult view • Spinal issues |

Equipment and instrument (Fig.-3)

Minimum equipment for setting a bronchoscopy suit/operating room (equipment and quantity may vary depending on hospital setting) are as follows-

- Video processor
- Video monitor
- Video recording system
- Bronchoscope
- The light source, video processor, video monitor, and video recording system can be mounted in the operating room or suite or to a portable cart
- For the procedure include
 - 10 ml syringes (filling with normal saline for bronchoalveolar lavage [BAL])
 - Suction tube
 - Suction catheter kit
 - Specimen trap (for BAL specimen collection)
 - Bottle of sodium chloride (for BAL and mucus clearance)
 - Oxygen tubing (for airway insufflation to relieve obstruction)



Fig.-3 Portable cart having video processor, video monitor & video recording system and bronchoscope

- Suction valve for scope ventilator bronchoscope elbow (connects to ventilator, for ventilation during procedure)
- Specimen bags (for transport of clinical samples to Pathology and Microbiology)

Advantages of flexible bronchoscopy over rigid bronchoscopy

Flexibility of flexible bronchoscope give the following advantages⁴:

- Access and evaluate more peripheral smaller airways.
- Visualize and evaluate the bronchi of the lung apices, particularly the right upper lobe bronchus, which is challenging to access with rigid bronchoscope.

- Assess the airway using the nasal route, tracheostomy tube, and endotracheal tube.
- Evaluate airways in patients facing challenges with the passage of a rigid bronchoscope, including those with mandibular hypoplasia, cervical or temporomandibular ankyloses, severe kyphoscoliosis, and patients with an unstable cervical spine
- Evaluate airway dynamics without causing distortion of the anatomy which would be affected by the rigid bronchoscope
- If necessary, bronchoscopy can be done under sedation without general anesthesia.

Preparation for a flexible bronchoscopy

The ideal setting for bronchoscopic procedures is either a bronchoscopy suite (Fig.-4) or an operating room equipped with continuous cardiopulmonary monitoring, ensuring readiness to manage any foreseeable emergencies, including pulmonary hemorrhage or cardiac arrest. Alternatively, in emergency situations, bronchoscopic procedures can be performed at the bedside in intensive care units (ICU) with the appropriate support (fig.-5) from ICU staff.^{6,7}

Ensuring the safety and comfort of the patient during bronchoscopic procedures is paramount. It is strongly recommended to administer sedation, either conscious sedation or general anesthesia, to minimize the risk of physical or psychological harm. Sedation and monitoring throughout the procedure should be carried out by a trained anesthesiologist and his team.⁸

General Anesthesia

Opting for “anesthesia” rather than “sedation” offers advantages, as it allows for the use of agents such as intravenous (IV) propofol and inhaled sevoflurane, which offer rapid onset and emergence from the sedated state. With an experienced anesthesiologist or anesthetist overseeing the procedure, the depth of anesthesia can be adjusted as needed. Lighter sedation enables spontaneous breathing and assessment of airway dynamics, while deeper sedation can be utilized for procedures in the lower airways, such as bronchoalveolar lavage (BAL) or biopsies.⁹

Sedation and Local Anesthesia

The goals of sedation are to allow the patient to remain comfortable while maintaining adequate ventilation and oxygenation despite the use of bronchoscope in the airway. The medications commonly used for sedation are fentanyl 1-3 mcg/kg/h and midazolam 0.1 mg/kg.^{10,11} Reversal agents (naloxone and flumazenil) may be used in the post-operative period. In adult patients who undergo flexible bronchoscopy under local anesthesia and sedation. The commonest indication for use of reversal agents is for patients who develop respiratory depression. Topical lignocaine in doses up to 8 mg/kg can be used safely, Lignocaine jelly (2%) is applied to the nostril and 2% lignocaine is sprayed on the cords, trachea and bronchial tree through the working channel of the bronchoscope as required.¹²



Fig.-4 Bronchoscopy suit



Fig.-5 Bedside bronchoscopy in intensive care units (ICU)

Steps and technique of performing flexible bronchoscopy^{13,14}

A well-coordinated team is indispensable for the effective execution of a bronchoscopic examination, ensuring both its success and the safety of the patient.

This team typically comprises a physician bronchoscopist, an assistant, an anesthesiologist, as well as additional personnel responsible for various tasks like scheduling, equipment maintenance, coordination, and housekeeping.

- Flexible bronchoscopy is an invasive procedure and need to take informed written consent from patient or parents before starting the procedure.
- The patient should be kept nothing by mouth (NPO) for a minimum of 6-8 hours prior performing bronchoscopy. This practice is designed to minimize the likelihood of aspiration, though it's important to note that specific institutions might have slightly different guidelines regarding these timeframes.
- The patient is positioned supine on the procedure table and gently secured in place until they reach the desired level of sedation or anesthesia.
- bronchoscopist typically stands at the head of the table or bed and adjust the position as needed for optimal access.
- Continuous monitoring of the patient is essential throughout the entire procedure, encompassing continuous pulse oximetry and comprehensive cardiopulmonary monitoring.

Post-bronchoscopy care of the patient

It is crucial to maintain continuous monitoring and observation for every sedated patient until they fully regain consciousness and return to their normal baseline condition. Patients who experience ongoing issues after the procedure, such as hypoxemia, changes in mental status, heightened respiratory effort, or challenges with airway clearance, may require extended observation either in the post-anesthesia care unit or even admission for overnight monitoring. The decision regarding the appropriate level of care upon admission will be based on the patient's clinical condition, any complications during the procedure, and identified risk factors.

Top of Form

Post procedure care of the flexible bronchoscope

Cleaning¹⁵

To maintain cleanliness and functionality, it is important to follow a specific protocol immediately after completing the procedure:

- Initiate suction with water or saline through the suction channel to clear away any substantial blood or secretions.
- Subsequently, introduce a detergent solution through the channel while maintaining suction to ensure thorough cleaning.
- Use damp gauze or a sponge saturated with detergent solution to wipe away any secretions or blood from the exterior of the bronchoscope.
- Ensure all single-use suction valves and adapters are removed and disposed of appropriately to maintain hygiene.

The bronchoscope is transported to the cleaning station in a suitable container.

Leak test¹⁵

When the bronchoscope is ready for further processing, it is imperative to conduct a leak test before commencing the sterilizing procedure. This test involves introducing pressurized air through the ethylene oxide valve of the bronchoscope while submerging the instrument underwater.

If a leak is detected, the bronchoscope should undergo a cleaning procedure using enzymatic detergent. Subsequently, it must be subjected to ethylene oxide gas sterilization before sending it for repair. It is crucial to refrain from using a disinfectant solution or an automatic disinfectant for cleaning in such cases.

Sterilization^{15,16}

Bronchoscopes that are confirmed to be free from any leaks should undergo a thorough cleaning process, both internally and externally, using a specialized brush. Afterward, they should be soaked in enzymatic detergent, followed by a rinsing phase. External rinsing can be accomplished by wiping the scope's exterior and passing a 70% alcohol solution through the channel. To ensure disinfection, the bronchoscope can be either manually immersed in a sterilizing solution like alkaline glutaraldehyde or 0.55% orthophthalaldehyde or processed using an automated cleaning machine. It is of utmost importance to never subject a flexible bronchoscope to an autoclave.

Storage of the bronchoscope

To maintain the cleanliness of the instruments, a recommended practice is to insert the bronchoscope's shaft into a paper sleeve and store it on a shelf, in a drawer, or by hanging it from a bracket (Fig.6). It's

important to note that suction adapters should never be affixed to the bronchoscope during storage, as this could lead to bacterial proliferation in any remaining moisture, posing a potential risk.¹⁶

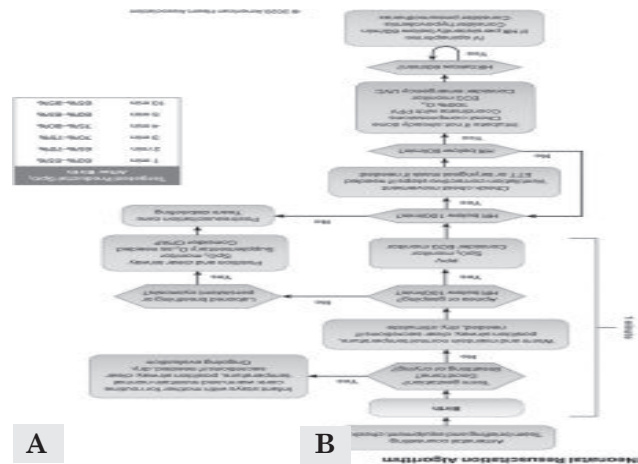


Fig.-6 A- Flexible bronchoscope hanging self, B- suction adapter is separated from bronchoscope during storage

What is needed to know before performing a flexible bronchoscopy

Before proceeding with the procedure, it's imperative to take into account the following factors:

- Assess the indications and potential risk factors that may lead to complications during or after the operation.
- Evaluate the urgency of the procedure in conjunction with the patient's overall clinical condition and stability.
- Ensure the availability of essential staff, consultative services, and a suitable facility for both the procedure and subsequent post-operative care.
- Engage in a discussion with the patient and their family to understand their preferences and expectations, aligning them with the planned course of action.

Risk factors for complications

A critical aspect of the preparation process involves recognizing the factors that may increase the likelihood of complications (Table III) and implementing the requisite measures to avert them. While bronchoscopy does not have any absolute contraindications, it is imperative to meticulously evaluate the potential risks associated with both the procedure itself and the administration of anesthesia for each individual patient.

Table III
Possible complications of flexible bronchoscopy³

| Physiological | Bacteriological | Mechanical | Anesthesia- related | Others |
|-----------------------------------|---|--------------------------------------|----------------------|----------------|
| - Hypoxemia | - Iatrogenic infection | - Pneumothorax | - Insufficient or | Cardiac arrest |
| - Arrhythmia | - Spread of infection to | - Hemorrhage | excessive anesthesia | |
| - Hypercapnia/ hypoventilation | other areas in the lung | - Laryngeal trauma/ Nasal trauma, | - Aspiration | |
| | - Spread of infection to bronchoscopy team | - Mucosal edema | | |
| | | - Epistaxis | | |

Conclusion

A profound comprehension of clinical indications, fundamental principles of pediatric bronchoscopy, and the spectrum of diseases or abnormalities frequently encountered is paramount in the practice of pediatric bronchoscopy. Mastering the art of flexible bronchoscopy is undoubtedly a challenging endeavor, yet it is entirely attainable. Gaining a comprehensive understanding of the potential complications, risk factors, required equipment, techniques, and the indispensable team members is the first step towards acquiring the knowledge necessary for performing the procedure. However, the real key to proficiency, skill refinement, and bolstering confidence lies in diligent practice and hands-on experience under the guidance of experienced mentors.

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CASE REPORT

Limb Girdle Muscular Dystrophy Type 2E (Beta-Sarcoglycanopathy): A Case Report

Shaoli Sarker¹, Tafsira Ferdaus², Asma Hoque³, Mohammed Uddin⁴,
Tamannyat Binte Eshaque⁵, Probir Kumar Sarkar⁶

Introduction

Limb girdle muscular dystrophies (LGMDs) are a diverse collection of progressive, genetically defined illnesses of skeletal muscle.¹ All limb girdle muscular dystrophies (LGMD) are characterized by the gradual development of proximal weakness and tends to deteriorate as time progresses.² The prevalence of LGMD ranges from approximately 1 in 14,500 to 1 in 123,000.² Certain kinds of LGMD exhibit autosomal dominant inheritance patterns, whereas others manifest autosomal recessive inheritance patterns.

Autosomal recessive LGMD results from genetic abnormalities in the sarcoglycan complex. This complex is connected to the intracellular dystrophin protein via dystroglycan. Truncating and missense mutations in the β -sarcoglycan gene located in chromosome 4q12 causes primary β -sarcoglycan deficiency. It is a transmembrane glycoprotein that forms part of the sarcoglycan complex, deficiency of which causes autosomal recessive LGMD type 2E (LGMD 2E).³

Limb-Girdle Muscular Dystrophy (LGMD) favors hip, thigh, shoulder, and upper arm muscles. A typical LGMD Type 2E patient shows calf

hypertrophy and Gower sign.⁴ Other muscular dystrophies, such as X-linked recessive DMD also have these traits. Thus, pedigree analysis is necessary to suspect autosomal recessive limb girdle muscular dystrophies and warrants for further genetic diagnosis, counseling and management. Keeping this in mind, A patient with genetically diagnosed LGMD Type 2E is presented in this case report.

Case Report

A 7 year old girl, 2nd issue of consanguineous parents presented with the complaints of difficulty in standing from sitting position and climbing stairs for 2 years. She was studying in class one with good academic performance. Her bowel and bladder habits were normal. There was no history of cough, dysphagia, nasal voice, drooling. Her birth history was uncomplicated and no significant past history of illness. One paternal cousin, a 20 years old male, died due to same type of illness at the age of 20 yrs. He was suspected of having DMD. His sister had also same type of illness for which she was confined to wheel chair. Their parents also had consanguineous marriage (Fig.1).

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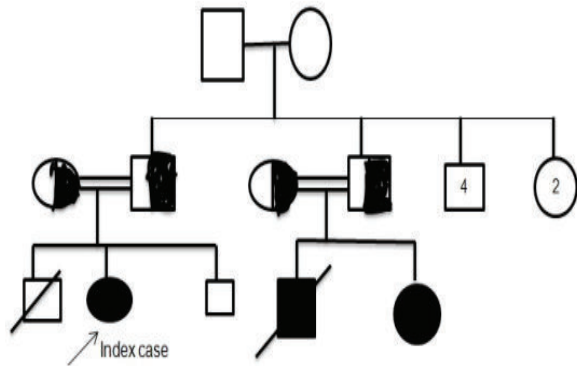


Fig.-1 Three generation pedigree

She had no apparent dysmorphism. Her vitals were normal. Her weight was 21 kg and height was 117 cm and BMI 15.3 (falls just below 50th centile). She was oriented to time, place and person. She had normal naming, repetition and comprehension. Cranial nerve examination revealed normal findings. She had increased bulk of midcalf muscle (calf hypertrophy) (Fig.-2) no wasting of thigh muscle, tone was normal, power 4/5 and normal deep tendon with bilateral plantar flexor responses. Waddling gait was present and Gower sign positive.

Her investigation revealed CPK 8248 U/L, EMG shows early recruitment, small-amplitude narrow duration polyphasic motor unit potential suggestive of muscular dystrophy. Whole exome sequencing shows pathogenic mutation of SGCB gene which is found to be associated with Limb girdle muscular dystrophy type 2E (Table I). Chest X ray, ECG, Echo-cardiography and Spirometry were normal.



Fig.-2 Calf muscle hypertrophy

The history, clinical examination and investigations confirmed limb girdle muscular dystrophy type 2 E. Counseling was done regarding the disease process, prognosis and management options. Genetic counseling was done regarding carrier detection and antenatal diagnostic approach for next pregnancy. Oral Steroid (deflazacort), vitamin D and calcium supplement was prescribed and physical therapy was provided to prevent contracture. We have further planned for autologous stem cell transplantation for this child at BSH&I.

Table I

Whole exome sequencing of the patient

| Gene | Chr | Transcript Id | Variant coordinate (GRCh38) | Variant type Zygoty | Variant Information | Classification As per ACMG Guideline |
|------|-----|---------------|-----------------------------|-----------------------|---------------------|--------------------------------------|
| SGCB | 4 | NM_00232 | 52038225 | Splice donor Variant* | c.33+2DC | Pathogenic |
| | | Exon 1 | Novel | Homozygous | | |

Discussion

Limb-girdle muscular dystrophy (LGMD) refers to non-X-linked, noncongenital muscular dystrophies with varying onset ages.² More than one disorder make up LGMD. From late in the first decade to the fourth decade, both male and female are affected. LGMDs cause weakness and wasting of muscles in legs and arms. Weakness of the diaphragm may cause respiratory insufficiency. Cardiomyopathy may also occur.¹ Unlike Duchenne muscular dystrophy, there appears to be no cognitive involvement in patients with sarcoglycanopathies. Based on inheritance, LGMDs are categorized into autosomal recessive and autosomal dominant, with multiple forms in each category. There are eight (10%) autosomal dominant (AD) and 26 (90%) autosomal recessive types.² Differential diagnosis include adult variant of spinal muscular atrophy (SMA III, Kugelberg-Welander disease), polymyositis, dermatomyositis, other muscular dystrophies e.g., facio-scapulo-humeral, Becker, Duchenne muscular dystrophy, endocrine and acquired metabolic myopathies (e.g., Cushing's disease, hyper-thyroidism, steroid, and statin administration).¹ Reports on LGMDs and their subtypes are very few from Bangladesh.⁵

Sarcoglycan complex genetic abnormalities cause autosomal recessive LGMD muscular dystrophies. This complex is connected to intracellular dystrophin by dystroglycan. Mutation screening reliably detects sarcoglycan gene mutations. Muscle biopsy immunohistochemistry staining patterns may also indicate these mutations. The beta-sarcoglycan gene anomalies caused 62% of muscle biopsies to lack all four sarcoglycans (a-, b-, c-, d-).³ The clinical features of primary α -sarcoglycan deficiency are early onset of proximal weakness, progression with loss of independent ambulation in the second decade, and elevated creatine kinase 3-22 times normal.⁶⁻⁸

Any condition that is associated with proximal muscle weakness involving pelvic girdle or lower extremity, can present with positive Gowers sign. such as Duchenne muscular dystrophy, Limb-girdle and other muscular dystrophies, Proximal ascending pseudomyopathic diseases, Spinal muscular atrophy, Polymyositis, Discitis and Juvenile idiopathic arthritis.⁹ Muscle diseases such as dystrophinopathies, limb-girdle muscular dystrophies, metabolic myopathy, parasite muscle pathologies, amyloid and sarcoid myopathy,

dystrophic and non-dystrophic myotonias, endocrine disorders, and granulomatous myositis are among the causes of pseudohypertrophy.¹⁰ Charcot-Marie-Tooth disease, spinal muscular atrophy, poliomyelitis, and radiculopathy are examples of neurological causes of pseudohypertrophy.¹⁰ In our case, as we see in figure 1, the pedigree shows the male cousin of the patient who died was diagnosed as DMD patient probably due to positive Gower sign and pseudohypertrophy of calf muscle as genetic diagnosis was not established. But if the consanguinity of the parents could be kept in mind, Autosomal recessive LGMD comes as provisional diagnosis.

Previously when electroclinical and molecular diagnosis was not readily available, Serum CPK and muscle biopsy were the way to diagnose muscular dystrophy in general. Muscular dystrophies begin with CPK levels 50-300 times higher than usual although they decrease as muscle mass declines. Muscle biopsies show scattered necrotic and regenerating fibers and increased endomysial and perimysial connective tissue. But, based just on histological and histochemical evidence, it is challenging to diagnose a specific muscular dystrophy.¹¹ To determine the loss or insufficiency of sarcolemmal membrane-associated proteins, immunohistochemistry (IHC) analysis is necessary for a conclusive diagnosis. At present, when evaluating muscle biopsies from patients with a high clinical suspicion of MD but no genetic mutation has been found, this approach is very crucial.¹²

EMG shows early recruitment and the typical small-amplitude, narrow-duration, polyphasic motor-unit potentials that are seen in muscular diseases. Abnormal spontaneous activity in the form of fibrillations and positive sharp waves is not prominent but has been described in a few cases of LGMD. When present, it should raise the clinician's suspicion for an inflammatory myopathy, such as polymyositis. Our patient shows typical muscular dystrophy pattern.

Whole exome sequencing or Clinical exome sequencing under muscular dystrophy panel plays a crucial role for not only diagnosing but also pin pointing the specific subtype of muscular dystrophy. In a study by Ghaoui et al¹³ pathogenic mutations in known myopathy genes were found in 45% of 60 families that completed full exome

sequencing. Interestingly, half of the genes were not LGMD genes, indicating clinical overlap between LGMD and other myopathies. Collagen, metabolic, and congenital myopathy genes caused phenotypic overlap. So it is better to perform whole exome sequencing to rule out other myopathies and also to identify novel pathogenic mutation.

About 30% of patients with sarcoglycanopathy had aberrant findings on electrocardiography or echocardiography, indicating dilated cardiomyopathy, according to Melacini et al¹⁴ (1999). In addition, Raquel et al¹⁵ showed FVC was low which is predictive of restrictive respiratory insufficiency in 74.2% of patients in their study with 100 patients with sarcoglycanopathies at long term follow up. So cardiac and respiratory evaluation and further follow up is necessary for LGMD type 2E. These investigations turned up normal results for our patient up until this point.

Physical and occupational therapy should be recommended for most patients to prevent contractures and maximize limb usage. Muscle cramps can be treated with baclofen, tizanidine, or gabapentin.^{5,16} Role of steroid has been proven to decrease inflammation and it may influence the repair of weakened muscle cell membranes. An open label, exploratory single center study of once-weekly prednisone at 0.75-1 mg/Kg for 24 weeks showed some improvement in muscle performance and reduced serum CPK level.¹⁷

LGMD Type 2E entail respiratory involvement, particularly in patients with significant peripheral weakness. Pulmonary function tests can detect respiratory weakness. Noninvasive or invasive breathing technologies are beneficial in therapeutic settings. For patients with cardiac involvement (though less frequent in LGMD type 2E) serial ECG and echocardiograms are essential for monitoring heart state. Management of cardiomyopathy requires regular cardiologic follow-up and insertion of intracardiac pacemakers or defibrillators as needed.¹⁶ SRP-9003 (bidri distrogenexeboparvec) is an investigational gene therapy that uses the AAVrh74 vector, which is designed to be systemically and robustly delivered to skeletal, diaphragm and cardiac muscle, making it an ideal candidate to treat peripheral neuromuscular diseases. The 1st patient with LGMD type 2E started getting gene therapy under a phase 1 study since February 17, 2023 provided by Sarepta Therapeutics.¹⁸

With LGMD type 2E, life expectancy reaches adulthood and is dependent on the diagnosis and management of related heart and breathing muscle dysfunction.

Conclusion

Pseudohypertrophy of calf muscle with positive Gower sign are often present in muscular dystrophies other than DMD. Muscle biopsy without biochemical testing will not confirm the type of muscular dystrophy. Paediatricians should construct at least a three generation pedigree to identify the inheritance pattern and opt for making further genetic diagnosis which are vital for diagnosis of such rare disease like LGMD type 2E leading to further counselling and management.

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ABSTRACTS FROM CURRENT LITERATURE

Updates for the Neonatal Resuscitation Program and Resuscitation Guidelines

Gary M. Weiner, Jeanette Zaichkin.

Neoreviews. 2022;23(4):e238-e249.

Although most newborns require no assistance to successfully transition to extrauterine life, the large number of births each year and limited ability to predict which newborns will need assistance means that skilled clinicians must be prepared to respond quickly and efficiently for every birth. A successful outcome is dependent on a rapid response from skilled staff who have mastered the cognitive, technical, and behavioral skills of neonatal resuscitation. Since its release in 1987, over 4.5 million clinicians have been trained by the American Heart Association and American Academy of Pediatrics Neonatal Resuscitation Program®. The guidelines used to develop this program were updated in 2020 and the *Textbook of Neonatal Resuscitation*, 8th edition, was released in June 2021. The updated guidelines have not changed the basic approach to neonatal resuscitation, which emphasizes the importance of anticipation, preparation, teamwork, and effective ventilation. Several practices have changed, including the prebirth questions, initial steps, use of electronic cardiac monitors, the initial dose of epinephrine, the flush volume after intravascular epinephrine, and the duration of resuscitation with an absent heart rate. In addition, the program has enhanced components of the textbook to improve learning, added new course delivery options, and offers 2 course levels to allow learners to study the material that is most relevant to their role during neonatal resuscitation.

Neonatal Resuscitation in Delivery Room: Current Trends and Guidelines in 2022

Fatoumata Kromah.

Current Anesthesiology Reports. 2023;13:67-75.

Purpose of Review

This review article summarizes current trends and provides an updated overview of the 2020 guidelines on neonatal resuscitation in the delivery room.

Neonatal respiratory depression, which accounts for one-third of all neonatal mortality, results in approximately 1 million newborn deaths each year worldwide due to asphyxia at birth.

Recent Findings

Around 10% of all newborns will require some intervention, while less than 1% of all newborns necessitate intensive resuscitation at birth. An increase in heart rate during the first few minutes is the key sign of the newborn's smooth transition from intrauterine to extrauterine life. Efficient and timely resuscitation at birth may improve the outcomes of the resuscitated newborn.

Summary

The neonatal mortality rate due to respiratory depression may be decreased by evidence-based resuscitative efforts that encourage or assist the newborn to initiate and/or sustain breathing. Neonatal resuscitation involves basic interventions such as tactile stimulation, airway clearance, positive pressure ventilation, chest compression, and medication therapy.

Vitamin D Deficiency (VDD) and Susceptibility towards Severe Dengue Fever - A Prospective Cross-Sectional Study of Hospitalized Dengue Fever Patients from Lahore, Pakistan

Somia Iqtadar, Amjad Khan, Sami Ullah Mumtaz, Shona Livingstone, Muhammad Nabeel Akbar Chaudhry, Mehreen Zahra, Sajid Abaidullah.

Trop Med Infect Dis. 2023;8(1):43. DOI: 10.3390/tropicalmed8010043

Abstract

Dengue is a mosquito-borne flaviviral serious febrile illness, most common in the tropical and subtropical regions including Pakistan. Vitamin D is a strong immunomodulator affecting both the innate and adaptive immune responses and plays a pivotal role in pathogen-defense mechanisms. There has been considerable interest in the possible role of vitamin D in dengue viral (DENV) infection. In the present prospective cross-sectional study, we assessed a possible association between serum vitamin D

deficiency (VDD) and susceptibility towards severe dengue fever (DF) illness. Serum vitamin D levels were measured at the time of hospitalization in 97 patients diagnosed with dengue fever (DF), dengue hemorrhagic fever (DHF) or dengue shock syndrome (DSS) at Mayo Hospital, King Edward Medical University, Lahore, PK, from 16 November 2021 to 15 January 2022. In terms of disease severity, 37 (38.1%) patients were DF, 52 (53.6%) were DHF grade 1 and 2, and 8 (8.2%) were DSS. The results revealed that most patients (75 (77.3%)) were vitamin-D-deficient (i.e., serum level < 20 ng/mL), including 27

(73.0%) in DF, 41 (78.8%) in DHF grade 1 and 2, and 7 (87.5%) in DSS. The degree of VDD was somewhat higher in DSS patients as compared to DF and DHF grade 1 and 2 patients. Overall, serum vitamin D levels ranged from 4.2 to 109.7 ng/mL, and the median (IQR) was in the VDD range, i.e., 12.2 (9.1, 17.8) ng/mL. Our results suggest that there may be a possible association between VDD and susceptibility towards severe dengue illness. Hence, maintaining sufficient vitamin D levels in the body either through diet or supplementation may help provide adequate immune protection against severe dengue fever illness. Further research is warranted.

INSTITUTE NEWS

In March 1972, Dhaka Shishu (Children) Hospital was established. The academic wing of Dhaka Shishu (Children) Hospital was Bangladesh Institute of Child Health (BICH) which was established in 30 January 1983.

The name of Dhaka Shishu (Children) Hospital and Bangladesh Institute of Child Health has been changed by Bangladesh Shishu Hospital & Institute act (Act. No. 19 of 2021) which was implemented on 22 September 2021. Now the hospital and institute is a statutory organization and formally recognized as Bangladesh Shishu Hospital & Institute (BSH&I).

The Institute is affiliated with Dhaka University, Bangabandhu Sheikh Mujib Medical University (BSMMU) and Bangladesh College of Physicians and Surgeons (BCPS). Recently the name of BICH has been changed, its new name is Bangladesh Shishu Hospital & Institute. In this Institute different basic science departments were established in the year 2006. It has been conducting different courses e.g. FCPS (in General Paediatrics and also subspeciality like FCPS Neonatology, Paediatric Nephrology, Paediatric Haemato-oncology, Paediatric Neurology and Development, Paediatric Pulmonology,

Paediatric Cardiology under BCPS), MD Residency Course in General Paediatrics and Neonatology and Nephrology under BSMMU, MD Non residency course under Dhaka University and BSMMU, MS (Paediatric Surgery) Residency Course under BSMMU, MS (Paediatric surgery) non residency course under Dhaka University, DCH course under BSMMU. The Institute is also conducting Diploma in Paediatric Nursing course under Bangladesh Nursing Council, BSc in Health Technology course under Dhaka University. It organizes different programme, seminars and symposium on Paediatrics. The Institute conducted its regular classes, academic activities, symposium, seminars etc. during COVID-19 pandemic.

Library facilities Library facilities

The library of the Institute has a rich collection of updated medical texts and reference books and reputed Medical Journals from home and abroad. Institute has introduced Broad Band facilities which are open to all students, teachers/ consultants of hospital. Facilities of library are also improved by HINARI. Students can download 2230 Medical Journals & more than 50 Paediatric Journals.

Postgraduate Courses and Training in Paediatrics at Bangladesh Shishu Hospital & Institute

1. BSH&I has course for FCPS in General Paediatrics (2nd part): Students can be registered twice in a year, in the month of January and July.
2. BSH&I is a recognized center by BCPS for training in FCPS (Paeditric Medicine and Surgery).
3. It is a recognized centre for course and training in different subspeciality of Paediatrics like Neonatology, Paediatric Nephrology, Paediatric Haematology and Oncology, Paediatric Pulmonology, Paediatric Neuroscience and Paeditric Cardiology.
4. There is MD Residency program in General Paediatrics, Neonatology, Paediatric Nephrology and MS Paediatric Surgery. Phase A commences in the month of March every year. There is also MD Paediatrics and MS Paediatric Surgery. Non Residency Courses commences in the month of January and July.
5. DCH course: Once in a year in the month of July.
6. Other courses conducted by BSH&I are
 - Paediatric Nursing.
 - BSc in Health Technology.
 - Training programme on Essential Newborn Care for doctors and nurses, KMC (Kangaroo Mother Care) training, ETAT (Emergency Triage, Assessment and Treatment) training, IMCI (Integrated management of childhood illness), newborn and paediatric standard use of oxygen therapy for hypoxemia management etc. are conducted by BSH&I.

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Students Qualified from Bangladesh Institute of Child Health (At present BSH&I) till July 2023

Student Qualified From BSH&I till July 2023

| Course | Number |
|-------------------------|------------|
| DCH | 388 |
| MD Pediatrics | 130 |
| MS Pediatrics | 113 |
| FCPS Pediatrics | 21 |
| MD Neonatology | 14 |
| MD Pediatric Nephrology | 07 |
| Total | 673 |

Foreign Student qualified from BSH&I till December 2023

| Course of origin | Course | Number |
|------------------|-----------------|-----------|
| Nepal | DCH | 23 |
| | MS (Paeditrics) | 02 |
| | MD (Paeditrics) | 01 |
| India | DCH | 01 |
| Iran | DCH | 01 |
| Iraq | DCH | 01 |
| Somalia | DCH | 01 |
| Sudan | DCH | 01 |
| Total | | 31 |

Present Students (till December 2023) of BSH&I

| Name of Courses | | Number of Students |
|------------------------------|----------|--------------------|
| MD (General Pediatrics) | Phase-A | 32 |
| MD (Neonatology) | Phase-A | 07 |
| MD (Pediatric Nephrology) | Phase-A | 05 |
| MS Pediatric Surgery | Phase-A | 23 |
| FCPS (Pediatrics) | Part-II | 00 |
| MD (Pediatrics) | Part-III | 04 |
| FCPS (Pediatric Cardiology) | | 00 |
| FCPS(Pediatrics Nephrology) | | 01 |
| MS (Pediatric Surgery) | Part-III | 02 |
| DCH | | 28 |
| MD (General Pediatrics) | Phase-B | 34 |
| MD (Neonatology) | Phase-B | 06 |
| MD (Pediatric Nephrology) | Phase-B | 04 |
| MS Pediatric Surgery | Phase-B | 27 |
| Total | | 173 |

INSTRUCTIONS FOR AUTHORS

Dhaka Shishu (Children) Hospital Journal is the official organ of Bangladesh Shishu Hospital & Institute (BSH&I). It is a peer reviewed, open access journal published twice a year since 1984. This journal is recognized by Bangladesh Medical and Dental Council (BMDC) which is the highest body for the recognition of medical journals in Bangladesh. All parts of the journal are indexed/tracked/covered by DOI/CrossRef and BanglaJOL. The present Editorial board has decided that the cover design will be in accordance with the subjects of editorial in each issue. The editor welcomes articles to be published to the journal as leading article, original article, review article, case report, current issues of child health, short report and junior's page where trainee doctors are encouraged to publish their topic of interest.

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- All scientific units should be expressed in System International (SI) units. Authors are referred to Annals of Internal Medicine 1987;106:114-29 for guidance in the use of SI units. All drugs should be mentioned in their generic form.
- Manuscript should be typed in English and on one side of A4 (220 x 210 cm) size 12, with single space.
- There should be one original and two paper copies and one IBM compatible electronic copy. (CD or Pen drive)
- There should be a margin of 2.5 cm at top and bottom, and 1.2 cm left and right.
- Pages should be numbered in English numerical at the upper right hand, consecutively, beginning with the title page.
- Title should not exceed 100 characters (Font size 16, bold).
- Name of authors, e.g. 1. Prof. Saiful Islam, 2. Dr. Nurun Nahar, these two author's name will be written like this; Saiful Islam¹, Nurun Nahar², etc. (Font size 12). Author's designation and name of place of study will be written after the end of the abstract (Font size 10).
- Abstract with a structured format with five sections (about 250 words maximum): Background, Objective, Methods, Results and Conclusion. All these sections will be in Times New Roman, Font size 12, italic and bold. Text will not be bold and after the text there will be Key words (not more than 10). No references are allowed in the abstract.

For review article abstract will be non structured and in case report no need to give abstract.

- Text will also comprises with five sections (Introduction, Materials and Methods, Results, Discussion and Conclusion).
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- References must include: (i) all authors, surnames and initials (if there are 6 authors or fewer) or if there are more than 6 authors, the first six authors followed by et al. (ii) the full title of the paper in sentence case; (iii) the abbreviated or full title of the journal in italic; (iv) the year of publication; (v) the volume No will be bold; (vi) the first and last page numbers followed by full stop. Example: Khan NZ. A study of mentally retarded children: aetiology and associated factors. *Bangladesh Journal of Child Health* 1983; **9**:102-08.
- *References from books include:* (i) authors name, (ii) title of article, (iii) In: editor name/s. (iv) name of the chapter, (v) place of publication, (vi) name of book, (vii) year of publication and page numbers. *Example:* Bazvani I. An approach to inborn errors of metabolism. In: Behrman RE, Kliegman RM, Jenson HB, editors. Nelson textbook of Paediatrics. Philadelphia: Saunders, 2004: p.397-98.
- *Documents in electronic formal must include:* i) title, (ii) authors name, (iii) year of publication (iv) web site address, (v) date of access. Example: United Nations programme on HIV/AIDS Children living in a world with AIDS. Geneva, 1978 (<http://www.....>) accessed on (dd/mm/year).

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Pathology

1. Mythic18 Automated Haematology Analyser having 18 parameters: WBC count with 3 parts differential - RBC count, Haemoglobin percentage, HCT, MCV, MCH, MCHC, RDW, Platelet count, MPV, PDW
2. Haemoglobin Electrophoresis
3. BT, CT, PT, APTT
4. Routine urine exam, including pH, urobilinogen, bilirubin, haemoglobin and morphology of RBC in urine.
5. Routine stool exam, including reducing substances and occult blood test
6. Osmotic Fragility test
7. NESTROFT for screening of beta thalassaemia
8. LE cell Phenomenon
9. Sputum for Eosinophils

Microbiology

1. All types of cultures and sensitivity test of aerobic and anaerobic organisms
2. Serological Test - Widal test, Febrile Antigen, ASO titre, RA Test, VDRL, HbsAg, ICT for Kala-Azar, Malaria, Filaria and Dengue
3. Cytology-
CSF analysis with Latex agglutination test for bacterial antigens
4. Staining - gram stain, AFB stain, KLB stain
5. Skin scrapping for fungus

Biochemistry

1. Full auto biochemistry analyzer (Dade Behring)- Dimension RxL Max with random access test- Bilirubin, SGPT, SGOT, Alkaline Phosphatase, Urea, Creatinine, Calcium, Phosphate, Uric Acids, Protein, Albumin, Glucose, CPK, Serum Electrolytes, Serum Ferritin, CRP, ammonia, lactate
2. Semi Auto Biochemistry analyzer - Routine biochemical tests
3. Electrolyte analyzer - Na, K, Cl, TCO₂
4. Gas analyzer - Blood pH, PCO₂, PO₂, HCO₃, O₂ saturation, Base excess, Oxyhemoglobin, Carboxy hemoglobin, Methemoglobin, Deoxyhemoglobin, Oxygen binding capacity

Blood Bank

1. Blood grouping and cross matching
2. Screening test - HbsAg, HCV, HIV, VDRL, MP
3. Coomb's test - direct and indirect
4. Collection of platelet & concentrate

Histopathology : Histopathology of all surgical specimens

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3. Color Doppler study by SIEMENS Color Doppler Machine (Sonoline - G40), study of abdominal vessels, portal vein, renal artery, cerebral arteries, vascular malformation of neck- upper/lower limbs
4. Portable USG for very sick indoor patients
5. Colour Doppler Echocardiogram

Director
Bangladesh Shishu Hospital & Institute