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*Editorial*

# Hospital Oxygen Delivery Systems- Present and Future Trend for Bangladesh

Tarek Ahmed

Oxygen therapy is a core component of hospital standard of care systems for more than 100 years. It is designated an essential drug by the WHO because it is the fundamental component in a health-care system, a critical element for human life existence.

WHO wrote that "safe and effective provision of oxygen is a challenge for doctors, hospital administrators, and government officials globally." The timely availability of oxygen is a decider of life and death for in most of the critically ill patient. As management of critically ill patient continues to improve, referral linkages from primary to secondary and tertiary care strengthen, so health systems going to treat more patients seeking advanced care where oxygen is increasingly important commodity in the treatment of a wide range of indications. Increasing access to oxygen can lead to improve health outcomes across many disease areas. So, requirement of oxygen is accounting a larger burden on disease management at present than a decade ago. Unfortunately, sustainable and affordable supply of oxygen to hospitals has long been neglected in health services in our country. Delivering oxygen therapy and titration of its flow rate in lower-middle income countries like Bangladesh is a challenging job. In our country access to oxygen therapy is limited in many low-resource settings, where many hypoxemic patients do not receive proper oxygen, resulting in an increased risk of death. To provide oxygen therapy, we need a reliable supply system, prompt identification of hypoxic patients and appropriate administration of oxygen by skilled health care worker.

Oxygen can be supplied to hospitals through a variety of methods, such compressed gas cylinders, oxygen concentrators, on-site pressure swing adsorption (PSA) plants, and tanks of compressed liquid oxygen. The appropriate choice of oxygen source for a hospital depends up on multiple factors like the amount of oxygen needed at that health facility, available infrastructure, cost, supply chain, reliability of electricity, access to maintenance services and spare parts, etc.

Cylinder gas supply system requires frequent refilling, long refilling time, transportation, logistics required from hospitals to the refilling centers, constant monitoring by health workers to ensure the stock. All these factors increase the price per volume of gas used. There is an additional challenge of this system is pushed up prices of this life - saving item when demand is increased. The cylinder can be delivered oxygen at a maximum rate of six liters per minute only which sometimes inadequate for patients need. This type of oxygen supply system is unreliable for our secondary and tertiary level hospital where large volume gas consumed and some of the patient needs more oxygen in each minute. Unfortunately, most of our hospitals with huge patient load depends up on this inappropriate system.

On-site pressure swing adsorption plants commonly known as PSA plants can produce oxygen that is then piped through the hospital. Bedside oxygen concentrators are self-contained units that provide up to 97% pure oxygen. But both of these systems rely on a combination of strong and dependable electricity and expert personnel. Our power supply system is intermittent or unreliable. Both the oxygen concentrators and on-site pressure swing adsorption (PSA) plants are not efficient, low-cost system for oxygen production and distribution for our hospitals. These types of oxygen supply systems are should not be considered as ideal for our hospitals.

The oxygen supply system consists of tanks of compressed liquid oxygen requires a more complex and expensive process where bulk liquid oxygen generated off-site, stored in a large tank and self-vaporization gas supplied throughout a health facility via a central pipeline system facility. Tank requires refilling by liquid oxygen supplier. This system can be used to supply large volume of gas and can provide even 40 liters of oxygen per minute to any patient. It is effective in facilities where power supply is intermittent or unreliable like our hospitals. This system allows to storage of more oxygen in the small space in comparison to gaseous oxygen, so it is for more efficient system for transportation and store more oxygen for hospitals. The initial investment for this type of installation is usually high, with similarly high complexity in instal¬lation and maintenance which is important disadvantage.

Our hospitals have a demand of 100-120 tons of oxygen under normal circumstances. World is quite literally gripped by the outbreak of Covid-19 and oxygen market is on a great challenge globally which raised a question to us whether Bangladesh be worried? We must be address this situation properly to prevent any gasping for oxygen in our health facilities. Unfortunately, most of our hospitals have an inconsistent and non-existent oxygen supply resulting in unnecessary patient deaths and huge bills. We need a system to provide oxygen from production industry up to patient at an optimum rate throughout the year. To overcome any crisis all our secondary and tertiary hospitals should be provided with a system consists tanks of compressed liquid oxygen with central pipeline up to bedsides. Our hospital staff should be properly trained in the operation and maintenance of all equipment. We should pay our attention to build adequate infrastructure to deliver oxygen in a systematic manner.

**Prof. Dr. Tarek Ahmed**
Professor of Medicine
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*Original Article*

# Clinical profile and outcome of poisoning in children

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Iqbal Hossain[5] , Najnin Akhter[6], M Azizul Hossain[7]

**Abstract:**
**Background:** Acute poisoning is a common medical emergency in pediatrics unit. The majority of poisonings are accidental, especially in the under-5 age group, although intentional overdoses of substance are seen in older children. Poisoning from medications can happen for a variety of reasons. **Methods:** This is a prospective observational study. **Results:** In the present study out of 50 patients with acute poisoning regarding age mean ±SD and range were 3.79 ± 3.14 and 9 months to 12 years respectively. Thirty nine (78.0%) were male and 11 (22.0%) were female. The types of poison were insecticide (42.0%), drugs (14.0%) and kerosene (38.0%). Other type of poisons were household product, hydrocarbon and turpentine oil one in each. Common physical findings were absent abdominal sound (84.0%), respiratory distress (32.0%), cyanosis (14.0%), sweating (14.0%), and crackles (16.0%). Other physical findings were abnormal jerks, urinary retention and abdominal distension 4.0% in each. Among the 50 patients, 40 (80.0%) were improved, 6 (12.0%) were referred to other hospital and 4 (8.0%) died. **Conclusion:** In the present study insecticide and kerosene oil were found to be the common causes of poisoning in the pediatrics patients. Most of material were stored in unsafe place and stored in attractive bottle. Eighty percent of the patients recovered and 8.0% died.

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**Introduction:**
Acute poisoning is a common medical emergency in pediatrics unit. Poisoning in children less than 5 years of age is accidental[1]. Suspected poisoning in children results in about 40,000 annual emergency department attendances in England and Wales, with approximately half of these admitted for observation or treatment[2]. In the United States, several million episodes of poisoning are reported each year, causing significant morbidity and mortality rates and nearly one half of all poisonings reported in the United States are attributed to acute medication poisonings[3].

The common nature of poisoning in Bangladesh is suicidal, homicidal and accidental. The method of poisoning varies from country to country and a single country in different locations. Eastimated case load of poisoning in hospital of Bangladesh is around 7% of total admission and among them 90 % are due to OPC[4]. The majority of poisonings are accidental, especially in the under-5 age group, although intentional overdoses and substance are seen in older children. Poisoning from medications can happen for a variety of reasons, including intentional overdose, inadvertently taking an extra dose, dispensing or measuring errors, and exposure through breast milk. The most common medication poisoning in children include analgesics; topical preparations; cough and cold preparations; vitamins; antihistamines; gastrointestinal preparations; antimicrobials; hormones and hormone antagonists; electrolytes and minerals; cardiovascular drugs; dietary supplements, herbal medications, and homeopathic medications; asthma therapies; antidepressants; and sedatives, hypnotics, and antipsychotics[3].

Poisoning events involving pesticides account for about 4 percent of all poisoning events reported[5]. Acute pesticide poisoning is an unusual and potentially fatal reason for visiting a family physician in the outpatient or emergency department setting. Most poisonings from pesticides do not have a specific antidote, making decontamination the most important intervention.

The present study was conducted to find out the causes, clinical profile and outcome of poisoning in pediatrics patients admitted with acute poisoning in the department of pediatrics Comilla Medical College Hospital. The study will enrich our knowledge about the causes, clinical profile and outcome of poisoning in pediatrics patients of Bangladeshi population and the findings may help the policymaker when they will revise existing the poisoning guideline.

**Methods:**

This prospective study was conducted in the department of pediatrics Comilla Medical College Hospital, Cumilla between the period of January 2019 to December 2019. Patients with acute poisoning admitted in the department of Pediatrics Comilla Medical College Hospital, Cumilla were the study population. A total 50 children who were admitted in pediatrics ward with acute poisoning were included after taking informed consent from parents.Patients with food poisoning and snake bite,chronic poisoning like arsenic and lead poisoning, iatrogenic poisoning like atropine poisoning in the treatment of OPC poisoning were excluded. After admission attendants of the patients were interviewed face to face using a predesigned questionnaire. The poisoning cases demonstrating on the basis of patients statements, statements of the witness, smell of the poisonous agents and characteristics features of poisoning were recorded in the data sheet form.Patients were treated accordingly and regular follow up were given upto discharge.

All the data were checked and edited. Then the data were entered into computer and statistical analysis of the results were obtained by using window based computer software devised with Statistical Packages for Social Sciences (SPSS-13) (SPSS Inc, Chicago, IL, USA). The results were presented in tables and figures. The statistical terms included in this study were mean, standard deviation, percentage.

**Results:**

Out of 50 patients with acute poisoning 40 (80.0%) were in the age group of less than 5 years followed by 7 (14.0%) were in the age group of 5-10 years and 3 (6.0%) were in the age group of 11-15 years. Mean ±SD and range were 3.79 ± 3.14 and 9 months to 12.00 years respectively (Table-I). Out of 50 patients 39 (78.0%) were male and 11 (22.0%) were female (Figure 1)

**Table-I: Age of patients**

| Age (years) | Frequency | percentage |
|---|---|---|
| <5 | 40 | 80.0 |
| 5 -10 | 07 | 14.0 |
| 11 - 15 | 03 | 06.0 |
| **Total** | **50** | **100.0** |
| Mean ±SD (Range) | 3.79 ± 3.14 (0.75-12.00) | |

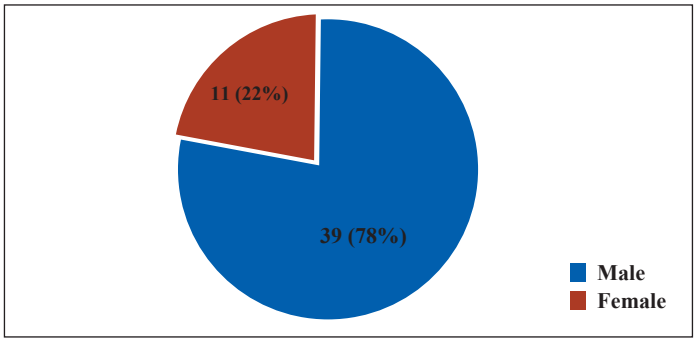


**Figure 1: Sexdistribution of thepatients**

Regarding the residence of the patients, out of 50 patients 45 (90.0%) were from rural area rest 5 (10.0%) were from urban area.Care giver of all patients except one were mother. Grandmother was the care giver of one patient. The distribution of educational level of mother of the patients more than half (56.0%) of mothers had primary education followed by illiterate (26.0%) and secondary (18.0%). Educational level of father of the patients more than half (54.0%) of fathers had primary education followed by illiterate (20.0%) and secondary (20.0%) & occupations were 14 (28.0%)service holders, 18 (36.0%) businessmen, 6 (12.0%)labour and 12 (24.0%) farmer (Table-II).

**Table-II: Occupation of guardian of the respondents**

| Occupation | Frequency | percentage |
|---|---|---|
| Service | 14 | 28.0 |
| Business | 18 | 36.0 |
| Labour | 06 | 12.0 |
| Farmer | 12 | 24.0 |
| **Total** | **50** | **100.0** |

Out of 50 patients 21 (42.0%) had the history of taking insecticide (OPC, endrin, carbamates), 7 (14.0%) had the history of taking medicine (Paracetamol, sedatives, antidepressant), 19 (38.0%) had the history of kerosene intake. Other type of poisons were household product, petrol and turpentine oil one in each (Table-III).

**Table-III: Type of poison**

| Type of poison | Frequency | percentage |
|---|---|---|
| Insecticide (OPC, endrin, carbamates) | 21 | 42.0 |
| Medicine (Paracetamol, sedatives, antidepressant) | 07 | 14 .0 |
| Kerosene | 19 | 38.0 |
| Household product | 01 | 02.0 |
| Petrol | 01 | 02.0 |
| Turpentine | 01 | 02.0 |
| **Total** | **50** | **100.0** |

Figure 2 shows more than three fourth (76.0%) poisons were easily available and rest 12 (24.0%) poisons were not easily available.

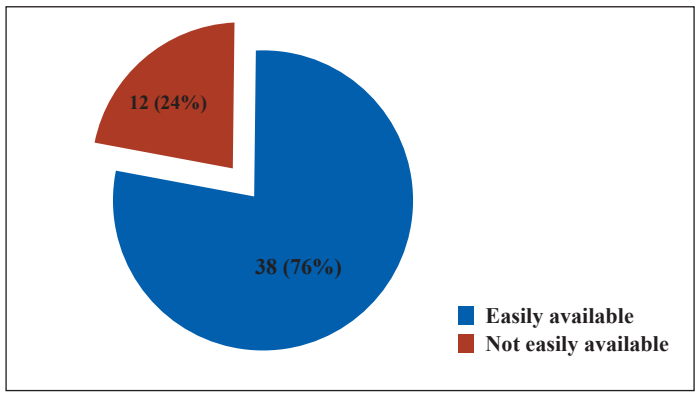


**Figure 2: Availability of poison**

#Easy availability: Easy accessible to the children

*Not easy availability: Not easy accessible to the children

Out of 50, 9 (18.0%) were stored in safe place, 31 (62.0%) were stored in unsafe place and 10 (20.0%) were stored in attractive bottle (Table-IV). Forty eight (96.0%) incidence occurred at home and rest 2 (4.0%) occurred outside the home.

**Table-IV: Storage of poison**

| Storage of poison | Frequency | percentage |
|---|---|---|
| Safe | 09 | 18.0 |
| Unsafe | 31 | 62.0 |
| Stored in attractive bottle | 10 | 20.0 |
| **Total** | **50** | **100.0** |

*Safe: Storage in sealed bottle

# Unsafe: Storage in unsealed bottle

Common physical findings were: absence of abdominal sound, respiratory distress, cyanosis, sweating, crackles and were 84.0%, 32.0%, 14.0%, 14.0% and 16.0% respectively. Other physical findings were abnormal jerks, urinary retention and abdominal distention 4.0% in each category (Table-V).

**Table-V: Physical findings of the patients**

| Physical findings | Frequency | percentage |
|---|---|---|
| Respiratory distress | 16 | 32.0 |
| Cyanosis | 07 | 14.0 |
| Sweating | 07 | 14.0 |
| Wheeze | 05 | 10.0 |
| Crackles | 08 | 16.0 |
| Abnormal jerks | 02 | 04.0 |
| Urinary retention | 02 | 04.0 |
| Abdominal distention | 02 | 04.0 |
| Absent bowel sound | 42 | 84.0 |

Out of 50 patients, 40 (80.0%) improved, 6 (12.0%) were referred to other hospitals and 4 (8.0%) died (Figure 3).

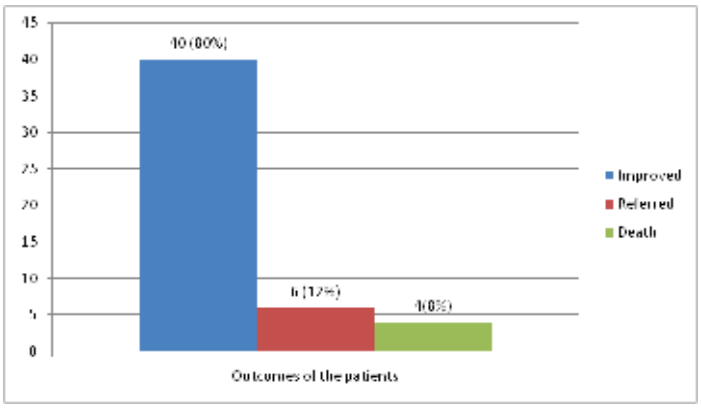


Figure 3: Outcome of the patients

**Discussion:**

Acute poisoning in children is also a major public health problem, and represents a frequent cause of admission in emergency departments[6]. In the present study out of 50 patients with acute poisoning regarding age mean ± SD and range were 3.79 ± 3.14 and 9 months to 12 years respectively. Thirty nine (78.0%) were male and 11 (22.0%) were female. The types of poison were insecticide (42.0%), drugs (14.0%) and kerosene (38.0%). Other type of poisons were household product, hydrocarbon and turpentine oil one in each. Common physical findings were absent abdominal sound (84.0%), respiratory distress (32.0%), cyanosis (14.0%), sweating (14.0%), and crackles (16.0%). Other physical findings were abnormal jerks, urinary retention and abdominal distension 4.0% in each. Among

the 50 patients, 40 (80.0%) were improved, 6 (12.0%) were referred to other hospital and 4 (8.0%) died.

Out of 50 patients with acute poisoning 40 (80.0%) were in the age group of less than 5 years, 7 (14.0%) were in the age group of 5-10 years and 3 (6.0%) were in the age group of 10-15 years. Mean ± SD and range were 3.79 ± 3.14 and 9 months to 12 years respectively. Among 50 patients 39 (78.0%) were male and 11 (22.0%) were female. Male female ratio was 3.5:1. In a retrospective cross-sectional study evaluated all infants and children who were hospitalized due to acute poisoning and they evaluated one hundred forty three cases, 71% 0f poisonings occurred in the age age range of 1-5 years[8]. In Singh et al. studied two hundred and ter cases of poisoning during a 2- year study period accounting 1.2 percent of all children hospitalized for medical disorders and found that about 80% of children were less than 5 years of age[9]. A descriptive case series study conducted by Aqeel et al. to determine different agents involved in acute poisoning in children, determine time interval between ingestion of agent and report at the hospital and document its hospital outcome[10]. In their study majority of patients were below six years of age, 69% were male while 31% were female. Rani et al. studied to analyse acute poisoning in children and found poisoning among children accounted for 1.33% (678) of all the pediatrics admissions. In their study children aged one to three years accounted for 74.7% of all the poisoning admissions[8]. In the present study out of 50 patients 45(90.0%) were from rural area and rest 5(10.0%) were from urban area. In Aqeel et al. found that fifty three percent of cases belonged to urban while forty seven percent belonged to rural area[10] Care giver of all patients except one was mother. Grandmother was the care giver of one patient. About 90.0% (45) had adequate supervision and rest 10.0% (05) had inadequate. In Rani et al. found that lack of appropriate supervision and health awareness in the community are significant contributory factors to the burden of acute poisoning in pediatrics age groups[8].

More than half (56.0%) of mothers had primary education followed by illiterate (26.0%) and secondary (18.0%). More than half (54.0%) of fathers had primary education followed by illiterate (20.0%) and secondary (20.0%). Fathers of three (06.0%) patients had educational level graduate and above. In occupation all mothers of the patient were housewives and among the father of the patients, 14 (28.0%) were service holder, 18 (36.0%) were businessmen, 6(12.0%) were labour and 12 (24.0%) were farmer.

In the present study out of 50 patients 21 (42.0%) had the history of insecticide, 7(14.0%) had the history of taking medicine, 19 (38.0%) had the history of kerosene. Other type of poisons were household product, hydrocarbon and turpentine one in each. In Aqeel et al. found that Pharmaceutical agents and kerosene oil poisoning were the leading cause constituting 29% each followed by opiate and organophosphours constituting 17% and 15 % respectively[10]. In Rani et al. found that kerosene ingestion was still seen in 23.1% and 52.5% children were poisoned by drugs. Analgesics were implicated as the commonest medicinal causative agents[8]. In Singh et al. (2007) in a study showed that poisoning due to various therapeutic agents was commonest (67.1%) followed by chemical agents (10%), petrol (8.6%), plants (6.7%), food (5.7%) and carbon monoxide gas (2.4%)[8]. Over dosage due to wrong advice of the physician or ignorance of mother was responsible for drug poisoning in 46.8 per cent of all poisonings due to medications. In Rashid et al. showed that kerosene was the commonest from of ingredient used[11].

More than three fourth (76.0%) poisons were easily available and rest 12 (24.0%) poisons were not easily available. Ten (20.0%) were stored in attractive bottle. Forty eight (96.0%) incidence occurred at home and rest 2 (4.0%) occurred outside the home. Rani et al. (2008) studied to analyse acute poisoning in children, to identify risk factors and to demonstrate their spectrum and found that the majority of poisonings occurred accidentally at homes[8].

Common physical findings were absent abdominal sound, respiratory distress, cyanosis, sweating, crackels and these were 84.0%, 32.0%, 14.0%, 14.0% and 16.0% respectively. Other physical findings were abnormal jerks, urinary retention and abdominal distention 4.0% in each. Poisoning is a common preventable cause of morbidity in children. Most of the poisoning in children less than 5 years of age is accidental[11].

In the present study out of 50 patients, 40(80.0%) were improved, 6(12.0%) were referred to other hospitals as the attendants of the patients wishes and 4 (8.0%) died. In Singh et al. showed that the mortality rate was 3.3 percent and all deaths were apparently due to home made or proprietary drug formulations[9]. In Budhathoki et al. found that the overall, the outcome is good with 87.4% survival in hospital[11]. The time gap between the poisoning and presentation to hospital and presence of coma predict mortality. Acute poisoning is a common medical emergency in pediatric unit. In Rashid showed that the overall mortality rate was 4.66%[11]. In Singh et al. showed that the mortality rate was 3.3 percent[9].

**Conclusion:**

In the present study insecticide and kerosene oil were found to be the common causes of poisoning in the pediatrics

patients. Most of material were stored in unsafe place and stored in attractive bottle. Eighty percent of the patients were completely recovered and 8.0%were died.

**Limitation of the Study:**

The study had some limitations. The study was conducted in a single center. Some patients were referred to others hospital so the actual outcome did not reflect in the study. Small sample size is also a limitation.

**Recommendation:**

This study was a small, single center one, so large scale multicenter studies are required to validate the results further.

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*Original Article*

# Validity of the Laboratory Risk Indicator for Necrotizing Fasciitis Score: A Tool for Distinguishing Necrotizing Fasciitis From Other Soft Tissue Infections and Its Severity

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**Abstract:**

**Background:**

This cross-sectional study was carried out in Department of General Surgery, Cumilla Medical College Hospital, Cumilla between August 2012 to July 2013 to determine the validity of Laboratory Risk Indicator for Necrotizing Fasciitis (LRINEC) score based on routinely performed laboratory tests for the evaluation of severe soft tissue infections. **Objectives:** The specific objectives of the study were 1) to construct LRINEC score by routine laboratory tests, 2) to evaluate the sensitivity, specificity, positive and negative predictive values of the score in differentiating necrotizing fascitis from other soft tissue infections and 3) to determine the diagnostic accuracy of the LRINEC score in distinguishing necrotizing fasciitis from other soft tissue infection. **Methods:** Patients of necrotizing fasciitis were consecutively included in the study as case, while the controls were selected based on 1) clinical impression of severe soft tissue infection with use of parenteral antibiotics for ≥ 48 hrs and 2) abscesses (when present) needing surgical debridement. Based on these criteria, 64 cases and 65 controls were selected.To construct a diagnostic scoring system, factors were entered as categorical variables. The LRINEC score of each patient was calculated by combining the scores of each independent variable. **Results:** The proportion of older patients (> 50 years) were significantly higher in the case group than that in the control group (p = 0.027). Male patients were predominant in both groups. Of the co-morbidities, diabetes and peripheral vascular disease were much higher in the former group (p < 0.001 and p = 0.005 respectively). While the older subjects (> 50 years) carry 3.5-fold (95% CI = 1.1-11.8) higher risk of acquiring necrotizing fasciitis, neither sex carry any added risk of developing the disease (p = 0.249). All the haematological variables like total count of white blood cells (WBC), haemoglobin, erythrocyte sedimentation rate (ESR) and platelet count were found to be predictive of necrotizing fasciitis with risks of having the condition in patients with leukocytosis, anemia, raised erythrocyte sedimentation rate (ESR) and thrombocytopenia were 2.8(95% CI = 1.4-5.9), 6.2(95% CI = 2.9-13.8), 2.2(95% CI=1.1-4.5) and 11.8(95% CI=1.5-95.5) times higher than those who had these values within normal range (p=0.007, p < 0.001, p=0.026 and p = 0.004). The risk of developing hyperglycemia, hyponatremia and low chlorine in case group were also much higher with odds of having these conditions estimated to be 6.9(95% CI = 2.2-21.7), 5.2(95% CI = 1.4-19.5) and 8.7(95% CI = 2.4-31.3) times higher respectively than those in their control counterparts. The blood urea and serum creatinine were staggeringly higher in the former group with odds ratios being 10.1(95% CI = 2.2-46.1) and 13.2(95% CI = 3.7-46.8) respectively. Nearly three-quarters (73.4%) of the necrotizing fasciitis cases were correctly diagnosed using a LRINEC score of ≥ 8, but its specificity was extremely low (3.1%) Using this cut-off value, 57.3% of the other soft tissue infections were falsely diagnosed as having necrotizing fasciitis (false positive), while 89.5% of the cases were wrongly diagnosed as severe cellulitis or abscess (false negative) when they actually had necrotizing fasciitis. As the cut-off value is decreased to ≥ 6 the sensitivity increases, but at the cost of specificity which becomes completely '0' (zero). Of the 13 predictor variables, 10 were found to be significantly

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associated with necrotizing fasciitis in univariate analysis. As these 10 predictor variables were entered into binary logistic regression model, all but total count of white blood cells (WBC) were emerged as predictors of the necrotizing fasciitis. Of the factors, raised serum creatinine and urea were highly predictive of the disease with Odds Ratios being 16.5(95% CI = 2.8 – 95.3) and 29.5(95% CI = 1.7 – 503.4) respectively. **Conclusion:** Although LRINEC score is an indicator of the severity of sepsis, it measures nonspecific biochemical and inflammatory changes triggered by systemic inflammatory response syndrome and sepsis. It can be helpful in stratifying patients into risk categories of possibility of necrotizing fasciitis aiding in the early recognition of necrotizing fasciitis. But its over diagnosis, should also be borne in mind. The score, therefore, needs to be prospectively validated before routine use in the evaluation of soft tissue infections can be recommended.

**Key words:** Necrotizing fasciitis, LRINEC score, soft tissue infection

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**Introduction:**

Necrotizing fasciitis is a rare, rapidly progressive infection primarily involving the fascia and subcutaneous tissue. It is perhaps the most severe form of soft tissue infection and is potentially limb and life threatening. Early recognition and aggressive debridement of all necrotic fascia and subcutaneous tissue are major prognostic determinants, and delay in operative debridement has been shown to increase mortality rate.[1-8] The differentiation of necrotizing fasciitis from other soft tissue infections is, therefore, critically important. However, early clinical recognition of necrotizing fasciitis is difficult, as the disease is often indistinguishable from cellulites or abscesses early in its evolution.

Since Meleney's[8] time, the mortality rate of this condition has remained high with a reported cumulative mortality rate of 34% (range, 6–76%).[8,9] Although modalities such computed tomography, magnetic resonance imaging (MRI), and frozen section biopsy have been shown to be useful in the early recognition of necrotizing fasciitis, routine application of theses modalities in the evaluation of soft tissue infections has been limited by cost and availability.[10-14]

A novel, simple and less costly diagnostic tool is, therefore, needed for early diagnosis of the condition. The tool must be highly sensitive and specific and can be constructed by routine laboratory investigations readily available at most centres that can help distinguish necrotizing fasciitis from other soft tissue infections. Wong et al about a decade ago conducted a study in Singapore, where they constructed a scoring system (LRINEC score) using 13 Laboratory Risk Indicators, known as LR and claimed that the tool can diagnose necrotizing fasciitis with fair degree of accuracy. They also validated the tool in another hospital of Singapore on a cohort of 56 patients diagnosed with necrotizing fasciitis and 84 patients of severe cellulitis or abscesses (control cohort) and found reliable with an area under the receiver operating characteristic curve of 0.976. The present study was intended to determine the validity of Laboratory Risk Indicator for Necrotizing Fasciitis (LRINEC) score based on routinely performed laboratory tests for the evaluation of severe soft tissue infections.

**Methods:**

This cross-sectional study was conducted in the Comilla Medical College Hospital, Cumilla between August 2012 to July 2013. Patients of necrotizing fasciitis (based on International Classification of Diseases – 9th Revision) attended at the above-mentioned hospital were consecutively included in the study as case. The following characteristics at operative exploration were used for definitive diagnosis: 1) the presence of grayish necrotic fascia, 2) demonstration of a lack of resistance of normally adherent muscular fascia on blunt dissection, 3) lack of bleeding of the fascia during dissection, and 4) the presence of foul-smelling "dishwater" pus. Finally, histopathologic histopathologic tissue examination was used to confirm the diagnosis if available. The controls were selected based on 1) clinical impression of severe soft tissue infection, 2) the use of parenteral antibiotics for ≥ 48 hrs, and 3) abscesses (when present) needing surgical debridement. Patients with a length of stay of < 48 hrs and were managed with oral antibiotics only were excluded as these patients were considered to have minor soft tissue infections. Based on the above enrollment criteria, 64 cases and 65 controls were consecutively recruited.

Demographic characteristics (age and gender), co-morbidities (diabetes, peripheral vascular disease, drug abuse) and clinical data (temperature, hypotension, multiple organ-failure) and outcome of our cases and controls were recorded on a semistructured questionnaire. The first biochemical and hematologic tests done on admission were analyzed. Variables analyzed were total white cell count, hemoglobin, erythrocyte sedimentation rate and platelet count, serum sodium, potassium, chloride, blood glucose, urea, serum creatinine and C-reactive protein (CRP). Statistical analyses were performed using the SPSS statistical software (version 11.5, SPSS, Chicago, IL). To construct a diagnostic scoring system, factors were entered as categorical variables. For patients' age, an age of 50 was taken as a cutoff. For all other laboratory variables,

the cutoff points to predict for the presence of necrotizing fasciitis were set as suggested by Wong et al1. However, in case of assigning score all variables were equally weighted. The variables that were found to be significantly associated with necrotizing fasciitis in univariate analysis were directly entered into binary regression analysis to find how many of them emerge as independent predictors. The Hosmer-Lemeshow goodness-of-fit test was performed to see whether the model was fit to predict what it intended to predict. The LRINEC score of each patient was calculated by totaling the scores of each independent variable (The scoring system of the thirteen variables is presented in table III). To convert the values of glucose to mmol/L, urea to mmol/L and creatinine to μmol/L they were divided by 18.015, 2.801 and 0.01131 respectively. The maximum score was 13; a score of ≥ 6 was considered suggestive of necrotizing fasciitis and a score of ≥ 8 was taken as strongly predictive of necrotizing fasciitis. The level of significance was set at 0.05 and $p < 0.05$ was considered significant.The present study was intended to determine the accuracy of LRINEC score in diagnosing necrotizing fasciitis. Therefore, the components of accuracy test like sensitivity, specificity, positive and negative predictive values (PPVs and NPVs), percentage of false positive and false negatives were used to evaluate the accuracy of LRINEC score.

**Results :**

**Demographic and clinical characteristics:**

The proportion of older patients (> 50 years) were significantly higher in the case group than that in the control group ($p = 0.027$). Male patients were predominant in both groups with no significant intergroup difference ($p = 0.249$). Of the co-morbidities, diabetes and peripheral vascular disease were much higher in the former group than those in the latter group ($p < 0.001$ and $p = 0.005$ respectively). Drug abuse was not found to be significantly associated with necrotizing fasciitis ($p = 0.119$). While there was no significant difference between the groups in terms raised temperature (> 380C), hypotension and multiple-organ failure demonstrated their significant presence in the case group ($p = 0.028$ and $p = 0.003$ respectively) (Table I).

**Table I. Comparison of demographic and clinical characteristics between groups**

| Demographic and clinical characteristics | Group | | p-value |
|---|---|---|---|
| | Case (n = 64) | Control (n = 65) | |
| **Age(yrs)** | | | |
| >50 | 12(19.0) | 4(6.2) | 0.025 |
| ≤50 | 52(81.0) | 61(93.8) | |
| Mean ± SD | 40.5 ± 12.3 | 30.0 ± 10.9 | |
| **Gender** | | | |
| Male | 56(87.5) | 52(80.0) | 0.249 |
| Female | 8(12.5) | 13(20.0) | |
| **Co-morbidity** | | | |
| Diabetes mellitus | 27(42.2) | 9(13.8) | <0.001 |
| Peripheral vascular diseases | 17(26.6) | 5(7.7) | 0.005 |
| Drug addiction /abuse | 20(34.4) | 14(21.5) | 0.119 |
| **Clinical variables** | | | |
| Temperature>38 $^0$C | 14(21.9) | 9(13.8) | 0.258 |
| Hypotension | 5(7.8) | 0(0.0) | 0.028 |
| Multiple-organ failure at admission | 8(12.5) | 0(0.0) | 0.003 |

Figures in the parentheses indicate corresponding %;

*** Chi-squared Test ($\chi^2$)** was done to analyzed the data.
# Data were analyzed using **Unpaired t-Test** and were presented as **mean ± SD.**

**Distribution of laboratory risk indicators:**

The distribution of laboratory risk indicators show that total count of WBC and ESR were increased and level of haemoglobin and platelet count decreased in the case group compared to those in the control group ($p = 0.006$, $p < 0.001$, $p = 0.003$ and $p = 0.018$ respectively).

Glucose and CRP were also observed to be raised in significant proportion in the former group ($p < 0.001$ and $p < 0.001$ respectively) (Table II). Electrolyte imbalance was also observed with low sodium and chloride and high potassium in the case group (p 0.006, $p < 0.001$ and $p < 0.001$ respectively). Serum urea and creatinine were also significantly higher in the case group than those in the latter group ($p < 0.001$ and $p = 0.001$respectively) (Table II).

**Table II. Comparison of distribution of laboratory risk indicators between groups**

| Laboratory risk indicators | Group | | p-value |
|---|---|---|---|
| | Case (n = 64) | Control (n = 65) | |
| Total Count of White Blood Cells (/mm$^3$) | 12013 ± 1437 | 11275 ± 1560 | 0.006 |
| Hemoglobin (g/dL) | 9.9 ± 1.3 | 11.2 ± 1.5 | < 0.001 |
| Erythrocyte Sedimentation Rate (ESR) (mm/hr) | 64.1 ± 19.7 | 53.6 ± 19.7 | 0.003 |
| Platelet (/mm$^3$) | 187015 ± 54134 | 207723 ± 43044 | 0.018 |
| Glucose (mg/dL) | 162.1 ± 83.6 | 120.9 ± 31.2 | <0.001 |
| C-Reactive Protein (CRP) (mg/L) | 112.7 ± 46.1 | 46.4 ± 27.1 | <0.001 |
| Sodium (Na) (mmol/L) | 137.6 ± 3.6 | 139.3 ± 3.3 | 0.006 |
| Potassium (K) (mmol/L) | 4.3 ± 0.8 | 3.8 ± 0.3 | <0.001 |
| Chloride (Cl) (mmol/L) | 99.3 ± 5.0 | 103.1 ± 3.7 | <0.001 |
| Urea(mg/dL) | 42.4 ± 25.2 | 27.0 ± 4.8 | <0.001 |
| Creatinine (μmol/L) | 1.8 ± 1.3 | 1.1 ± 1.0 | 0.001 |

* Chi-squared Test ($\chi^2$) was done to analyse the data.
# Data were analyzed using Unpaired t-Test and were presented as mean ± SD.

**Risk estimation for necrotizing fasciitis:**

All the haematological variables like total count of WBC, haemoglobin, ESR and platelet count were found to be predictive of necrotizing fasciitis with risks of having the condition in patients with leukocytosis (>11000 /cu-mm), anemia (<11.0 g/dL), raised ESR (> 50 mm/hr) and thrombocytopenia (< 144000/cu-mm) were 2.8(95% CI = 1.4-5.9), 6.2(95% CI = 2.9-13.8), 2.2(95% CI = 1.1-4.5) and 11.8 (95% CI = 1.5-95.5) times higher than those who had these values within normal range ($p = 0.007$, $p < 0.001$, $p = 0.026$ and $p = 0.004$). The risk of developing hyperglycemia (plasma glucose > 10 mmol/L), hyponatremia (< 135 mmol/L) and low chlorine (< 96 mmol/L) in case group were also much higher with odds of having these conditions estimated to be 6.9(95% CI = 2.2-21.7), 5.2(95% CI = 1.4-19.5) and 8.7(95% CI = 2.4-31.3) times higher respectively than those in their control counterparts. The blood urea and serum creatinine were staggeringly higher in the former group with odds ratios being 10.1(95% CI = 2.2-46.1) and 13.2(95% CI = 3.7-46.8) respectively. While the older subjects (> 50 years) carry 3.5-fold (95% CI = 1.1-11.8) higher risk of acquiring necrotizing fasciitis, neither sex carry any added risk of developing the disease ($p = 0.249$) (Table III).

**Table III. Comparison of demographic and laboratory risk indicators between groups**

| Risk indicators | LRINEC Score | Group | | p-value | Odds Ratio (95% CI) |
|---|---|---|---|---|---|
| | | Case (n = 64) | Control (n = 65) | | |
| **Total Count of White Blood Cells (/mm$^3$)** | | | | | |
| >11000 | 1 | 47(73.4) | 32(49.2) | 0.007 | 2.8(1.4-5.9) |
| <11000 | 0 | 17(26.6) | 33(50.8) | | |
| **Hemoglobin (g/dL)** | | | | | |
| <11.0 | 1 | 51(79.7) | 25(38.5) | <0.001 | 6.2(2.9-13.8) |
| ≥11.0 | 0 | 13(20.3) | 40(61.5) | | |
| **Erythrocyte Sedimentation Rate (ESR) (mm/hr)** | | | | | |
| >50 | 1 | 42(65.6) | 30(46.2) | 0.026 | 2.2(1.1-4.5) |
| ≤50 | 0 | 22(34.4) | 35(53.8) | | |
| **Platelet (/mm$^3$)** | | | | | |
| <144000 | 1 | 10(15.6) | 1(1.5) | 0.004 | 11.8(1.5-95.5) |
| ≥144000 | 0 | 54(84.4) | 64(98.5) | | |
| **Glucose (mmol/L)** | | | | | |
| >10 | 1 | 20(31.3) | 4(6.2) | <0.001 | 6.9(2.2-21.7) |
| ≤10 | 0 | 44(68.8) | 61(93.8) | | |
| **C-Reactive Protein (CRP) (mg/L)** | | | | | |
| ≥150 | 1 | 5(7.8) | 0(0.0) | 0.028 | Not applicable |
| <150 | 0 | 59(92.2) | 65(100.0) | | |
| **Sodium (Na)(mmol/L )** | | | | | |
| <135 | 1 | 13(20.3) | 3(4.6) | 0.007 | 5.2(1.4-19.5) |
| ≥135 | 0 | 51(79.7) | 62(95.4) | | |
| **Potassium (K) (mmol/L)** | | | | | |
| >4.9 | 1 | 12(18.8) | 0(0.0) | <0.001 | Not applicable |
| ≤4.9 | 0 | 52(81.3) | 65(100.0) | | |
| **Chloride (CL) (mmol/L)** | | | | | |
| <96 | 1 | 19(29.7) | 3(4.6) | <0.001 | 8.7(2.4-31.3) |
| ≥96 | 0 | 45(70.3) | 62(95.4) | | |
| **Urea(mmol/L)** | | | | | |
| >7.7 | 1 | 62(96.9) | 49(75.4) | <0.001 | 10.1(2.2-46.1) |
| ≤7.7 | 0 | 2(3.1) | 16(24.6) | | |
| **Creatinine(µmol/L)** | | | | | |
| >141 | 1 | 25(39.1) | 3(4.6) | <0.001 | 13.2(3.7-46.8) |
| ≤141 | 0 | 39(60.9) | 62(95.4) | | |
| **Age (yrs)** | | | | | |
| > 50 | 1 | 12(19.0) | 4(6.2) | 0.025 | 3.6(1.1-11.8) |
| ≤ 50 | 0 | 51(81.0) | 61(93.8) | | |
| **Gender** | | | | | |
| Male | 1 | 56(87.5) | 52(80.0) | 0.249 | Not applicable |
| Female | 0 | 8(12.5) | 13(20.0) | | |

Figures in the parentheses indicate corresponding %; Chi-squared Test ($\chi^2$) was done to analyse the data.

**Accuracy of LRINEC score in predicting Necrotizing Fasciitis:**

Fasciitis is The accuracy of LRINEC score (at cut-off value of 8) in diagnosing Necrotizing shown in table IV. The sensitivity and specificity of the test in diagnosing and ruling out necrotizing fasciitis is 73.4% and 3.1% respectively. Likewise the positive and negative predictive values of the test are 42.7% and 10.5% respectively, while the percentages of false positives and false negatives are 57.3% and 89.5% respectively. The accuracy of LRINEC score (at cut-off value of 6) in diagnosing necrotizing fasciitis is shown in table V. The sensitivity of the test in differentiating the condition is 92.2% and the specificity of the test in correctly detecting those who do not have the condition is 0%. The positive and negative predictive values of the test are 47.6% and 0% respectively, while the percentages of false positive and false negatives are 52.4% and 100.0% respectively.

**Table IV. Accuracy of LRINEC score in predicting Necrotizing Fasciitis**

| LRINEC score | Diagnosis | | Total |
|---|---|---|---|
| | Necrotizing Fasciitis | Others (cellulits or abscess) | |
| ≥ 8 | 47 | 63 | **110** |
| < 8 | 17 | 02 | **19** |
| **Total** | **64** | **65** | **129** |

**Table V. Accuracy of LRINEC score in predicting Necrotizing Fasciitis**

| LRINEC score | Diagnosis | | Total |
|---|---|---|---|
| | Necrotizing Fasciitis | Others (cellulits or abscess) | |
| ≥ 6 | 59 | 65 | **124** |
| < 6 | 05 | 0.0 | **05** |
| **Total** | **64** | **65** | **129** |

**Binary logistic regression analysis:**

**Model Fit:**
Of the 13 predictor variables, 10 were significantly associated with necrotizing fasciitis in univariate analysis. These 10 predictor variables were directly entered into binary logistic regression model and Hosmer and Lemeshow goodness-of-fit test found that the model was a good fit model which could predict 76.6% of the Necrotizing Fasciitis correctly (p = 0.881).

**Multivariate analysis:**
Table VI demonstrates the binary logistic regression analysis of Odds Ratios for characteristics of the subjects likely to have necrotizing fasciitis. All the 10 variables, except total count of WBC emerged as predictors of the necrotizing fasciitis. Of the factors, raised serum creatinine and urea were highly predictive of the disease with Odds Ratios being 16.5(95% CI = 2.8 – 95.3) and 29.5(95% CI = 1.7 – 503.4) respectively.

**Table VI. Predictors of necrotizing fasciitis by univariate and multivariate analysis**

| Variables of interest | Univariate analysis (p-value) | Multivariate analysis | |
|---|---|---|---|
| | | Odds Ratio or β (95% CI of OR) | p-value |
| Age (yrs) | 0.025 | 3.0(0.4 – 20.5) | 0.260 |
| Erythrocyte Sedimentation Rate (ESR) | 0.026 | 1.9(0.6 – 5.6) | 0.255 |
| Chloride(Cl) | < 0.001 | 3.9 (0.5 –27.3) | 0.172 |
| Hemoglobin | < 0.001 | 2.3(0.8 – 6.6) | 0.125 |
| Creatinine | < 0.001 | 16.5(2.8- 95.3) | 0.002 |
| Glucose | < 0.001 | 4.3(0.8 – 22.3) | 0.082 |
| Sodium(Na) | 0.007 | 2.2(0.2 – 26.9) | 0.542 |
| Urea | < 0.001 | 29.5(1.7 – 503.4) | 0.019 |
| Total Count of White Blood Cells | 0.007 | 0.3(0.1 – 0.9) | 0.042 |
| Platelet | 0.004 | 1.3(0.1–16.3) | 0.829 |

**Discussion :**
The LRINEC score is sensitive to diagnose early cases of necrotizing fasciitis among patients with severe soft tissue infections. Nearly three-quarters (73.4%) of the necrotizing fasciitis cases were correctly diagnosed using a LRINEC score of ≥ 8, but its specificity is extremely low (3.1%) meaning that a negligible portion of the severe soft tissue infection other than necrotizing fasciitis could be excluded with LRINEC score of ≥ 8. Using this cut-off value, 57.3% of the other soft tissue infections were falsely diagnosed as having necrotizing fasciitis (false positive) when they actually did not have the disease, while 89.5% of the cases were wrongly diagnosed as severe cellulitis or abscess (false negative) when they actually had necrotizing fasciitis. As the cut-off value is decreased to ≥ 6 the sensitivity is increased, but at the cost of specificity which becomes completely '0' (zero). Wong et al1 however, demonstrated that a LRINEC score of ≥ 6 should raise the suspicion of necrotizing fasciitis, and a score of ≥ 8 is strongly predictive of this disease. At a cutoff value of LRINEC score 6, they showed positive and negative predictive values to be 92% and 96% respectively with areas under the receiver operating characteristic curve were 0.980 and 0.976 in the developmental and validation cohorts respectively. In contrast, the present study showed that at a cut-off value of '6' the LRINEC score had a much lower positive predictive value (47.6%) and completely '0' (zero) negative predictive value. In the Wong's study of the 89 patients in the developmental cohort, only 13(14.6%) patients had a diagnosis or suspicion of necrotizing fasciitis on admission. A majority were therefore initially missed, resulting in delayed operative debridement. In contrast, 80(89.9%) of these patients had a LRINEC score of ≥ 6.1

The biochemical and hematological changes in necrotizing fasciitis develop early in the evolution of the disease, and the LRINEC score can stratify patients into high- and moderate-risk categories even when the clinical picture is still equivocal. Used in the right context (patients with soft tissue infections with no other septic foci), the LRINEC

score can significantly decrease the time to diagnosis by stratifying patients into risk categories for necrotizing soft tissue infections warranting immediate further evaluation. In the present study blood urea and serum creatinine were found to be independently predictive of necrotizing fasciitis, but in the Wong's study total white cell count, hemoglobin, sodium, glucose, serum creatinine, and C-reactive protein were emerged as independent predictors of the condition.

Clinical variables alone are often nonspecific early in the course of the disease and can potentially lead to fatal delay in operative treatment.[1,6,7] A diagnostic score that includes clinical as well as laboratory variables would inevitably favor advance cases of necrotizing fasciitis (where clinical recognition is usually not a problem) and risk of missing early cases of necrotizing fasciitis (where early diagnosis would profoundly affect outcome). The LRINEC score therefore acts an objective diagnostic adjunct, based on laboratory variables alone to assess for the possibility of necrotizing soft tissue infections.

Necrotizing fasciitis is associated with severe sepsis.[1-9] Sepsis and the associated systemic inflammatory response syndrome cause changes in the biochemical and hematological variables in a predictable manner. These biochemical and hematologic disturbances that we observed in our patients with necrotizing fasciitis had also been previously reported by other investigators.[15–19] The LRINEC score is essentially a measure of these changes and predicts the probability of the presence of necrotizing fasciitis based on the severity of sepsis. Other soft tissue infections such as cellulites and abscesses rarely cause an inflammatory state severe enough to cause such disturbances in the laboratory variables.

Various modality and techniques have been proposed to aid in the early diagnosis of necrotizing fasciitis. Frozen section biopsies and MRI scans of the affected part have been shown to be capable of detecting early cases of necrotizing fasciitis.[10–14] However, it is neither feasible nor logical to subject all patients with the suspicion of necrotizing fasciitis to frozen section biopsies, as the procedure is not without morbidity. Routine MRI scanning for all patients at the first suspicion of necrotizing fasciitis is financially prohibitive.[7] Alternatively, the "finger test" should be considered. This is a bedside procedure where under local anesthesia a 2-cm incision is made down to the deep fascia and a gentle probing maneuver with the index finger is performed at the level of the deep fascia. The lack of bleeding, presence of characteristic "dishwater pus," and lack of tissue resistance to blunt finger dissection are features of a positive finger test for necrotizing fasciitis .[20] The LRINEC score can be used for patient selection and for allocation of resources by stratifying patients with soft tissue infections into high and low-risk categories. Depending on availability, frozen section biopsy, MRI scan, or a bedside finger test should be considered for patients with equivocal clinical findings.

It should be emphasized that the diagnosis of necrotizing soft tissue infections is a clinical diagnosis, and this diagnosis or even suspicion of it warrants immediate operative debridement.[1] The LRINEC score is, however, a very useful diagnostic adjunct in the management of soft tissue infections to stratify these patients into low-, moderate-, and high-risk categories for necrotizing fasciitis for further evaluation.

**The potential applications and advantages of the LRINEC score are as follows:**

1. It is based on routine laboratory investigations done on admission for evaluation of all severe soft tissue infections: complete blood count, serum electrolytes (U/E/Cr), and CRP. These investigations are cheap and readily available.
2. It can stratify patients into high-, moderate-, and low-risk categories for serious soft tissue infections warranting admission, intravenous antibiotics, and immediate further evaluation.
3. To achieve early diagnosis, operative debridement, and ultimately better survival in necrotizing fasciitis, patients in the moderate- and especially the high-risk categories should be evaluated urgently to exclude necrotizing fasciitis

Some potential pitfalls and weaknesses of the LRINEC score should be borne in mind when using this scoring system. Serial LRINEC score monitoring is helpful, and in many cases an increasing score despite broad-spectrum antibiotics is a valuable diagnostic clue. However, in patients with multiple comorbidities, the inflammatory response may be blunted and the score should be interpreted with caution. Of note, neutropenia is a poor prognostics marker in sepsis and, in patients with a total white count of $< 4 \times 10^3$ per $mm^3$, should alert the physician of the possibility of leukopenic sepsis.[21] Finally, this is an adjunct in the management of soft tissue infections. Clinical presentation remains of paramount

importance, and when the clinical suspicion is high, emergent debridement must be performed regardless of the LRINEC score.

**Conclusion:**

The LRINEC score that described in this study is an indicator of the severity of sepsis. Although it measures nonspecific biochemical and inflammatory changes triggered by systemic inflammatory response syndrome and sepsis, it is believed that when used in the right context, it can be helpful in stratifying patients into risk categories of possibility of necrotizing fasciitis. But its over diagnosis, i.e. low positive and almost '0' negative predictive values should also be borne in mind. The score, therefore, needs to be prospectively validated before routine use in the evaluation of soft tissue infections can be recommended.

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*Original Article*

# Evaluation of Bone Marrow Findings in Cancer Patients: A Tertiary Cancer Centre Study

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**Abstract:**

**Background:** Evaluation of cytopenias and other blood diseases, especially in situations where diagnosis remains cryptic after detailed clinical history, physical examination and peripheral blood analysis, Bone marrow aspiration (BMA) is crucial. BMA is an invasive test, performed by haematologists in the course of evaluating patients with primary or secondary haemopathies. However, there is sparse local data on its clinical utility on cancer patients. This study therefore assessed the common clinical indications, diagnostic findings and associated complications in our locality. **Methods:** A prospective study of 679 cases of BMA procedures among patients managed and co-managed by the Haemato-Oncology unit at National Institute of Cancer Research and Hospital (NICRH), Dhaka was carried out. Clinical data and intra-procedure details were obtained using a structured questionnaire within the time of the procedure during the study period through case file review and patient interview. All patients were followed up for a period of 1 week post-procedure.

**Results:** Majority of the subjects (33%) were 41 to 60 years of age, with a male to female ratio of 1.99:1 and age range was of 2 to 80 years. Most (87.78%) of the BMA cytology were performed at out-patient basis. Posterior iliac crest was the most commonly used site (99.2%). Aspiration yield was adequate in 93.66% of cases. Pain is the common (100%) procedure related complication. Most common indication for BMA in cancer patients in this institution was staging of lymphoma (46.54%), after that ALL (9.42%), AML (8.39%), Acute Leukaemia (4.56%), Round Cell tumour (3.98%), CML(3.24%), organomegaly (3.24%), MM(2.9%) were the other common indications for BMA. Most common bone marrow findings were normal active marrow (45%), acutemyeloid leukaemias (9.72%), acute lymphoblastic leukaemia (7.65%), reactive marrow (6.77%), Lymphoproliferative Disease (3.53%), CML (3.38%), Plasma Cell Dyscrasia (3.0.9%). BMA to see the treatment response was done in 9.28 % of cases.

**Key Words:** LPD, AML, ALL. BMA, MM, MDS, MPD, NICR&H.

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**Conclusion:** BMA cytology is a highly informative/ diagnostic test procedure performed by haematologists in evaluating blood and blood related diseases in our environment. BMA is relatively safe although significant procedure related pain was frequently reported. Efforts should be taken for better analgesia. Patients with unexplained cytopenias and other relevant indications should be referred to haematological consultation and possible BMA.

**Introduction:**

Bone marrow aspiration (BMA) is an invasive procedure where a representative portion of spongy bone marrow is taken through a needle aspiration for diagnostic evaluations especially cytology and stem cell harvest.[1] The history of bone marrow examination begins since 1876 when Mosler aspirated bone marrow particles from a live patient with leukaemia using a regular wood drill.[2] But it was not until the introduction of sternal aspiration in the late 1920s which became an important diagnostic procedure.[3] Bone marrow aspiration can determine the metastatic deposits, degree of cellularity and fibrosis readily. The bone marrow picture may vary depending on the etiology, from normocellular with non-specific changes to hypercellular

being replaced completely by malignant cells.[4] BMA remains a veritable tool in the haematology armamentarium for conducting diagnosis and differentiation of primary and secondary haemopathies. In today's practice, BMA specimens are used in further diagnostic assays including cytochemical/ special staining, immunophenotyping, microbiologic tests, cytogenetic analysis and molecular studies.[1,2,5] Additionally, BMA is a major source of stem cells for haemopoietic stem cell transplantation.[6] Often, a trephine biopsy is carried out as part of the same procedure.[7]

The BMA procedure is performed by a qualified haematologist during clinical evaluation of patients with blood and blood related diseases. Patients for BMA are carefully selected. Often, patients with suspected marrow diseases whose diagnosis remains inconclusive after examination of the peripheral blood with complete blood count (CBC), peripheral blood film (PBF) and ancillary tests, require BMA. Usually, BMA is done in cases of unexplained cytopenia (anaemia, leucopenia, thrombocytopenia), unexplained splenomegaly and lymphadenopathy, diagnosis of acute leukaemia, megaloblastic anaemia, plasma cell myeloma, myelophthisic anaemia, monitoring of success of cancer chemotherapy, staging of lymphoma and other solid tumors, staining for marrow iron stores and other cytochemistries, chromosomal studies/karyotyping and molecular genetic analysis.[1,2,5,8-10] Before a BMA is performed, clinical history and laboratory tests including CBC, reticulocyte count (some cases) and PBF must be evaluated. Pre-procedure evaluation of the patient includes establishing clear indications, screening for HBsAg, HCVand HIV, assessment of the patient's haemostatic status, patient education about the procedure and proper consent. Once the marrow blood is harvested under aseptic protocols, the smear is made, remaining specimen is stored in EDTA anticoagulant bottle and further processing is carried out in the haematology laboratory.[1] Well prepared marrow smears are viewed and reported by the haematologists. Reports are subsequently translated to patient care or dispatched to requesting clinicians.

Despite being a highly informative test procedure in diagnostic evaluation of blood and blood related diseases and cancers, there is sparse local literature on its indications, diagnostic findings and complications of BMA in both pediatric and adult group of cancer patients in Bangladesh. This study therefore evaluated and reports on the spectrum of common indications, bone marrow diagnosis and observed complications of the BMA among 724 patients seen at dept. of Haematology, NICRH, Bangladesh. This would also serve for possible comparison with findings from other parts of Bangladesh and beyond.

**Methods:**

This is a prospective study conducted at dept. of Haematology,National Institute of Cancer Research and Hospital, a referral tertiary cancer care institution located at Mohakhali, Dhaka. The haematology dept. is concerned with management of blood and blood related cancers, laboratory services and clinical interpretation of laboratory tests.Bone marrow is one of the important test done frequently in this department for diagnosis, staging and to see treatment response in cancer patients. Though we perform bone marrow study frequently there is no study related with bone marrow findings of cancer patients. The main objective of this study was to evaluate the indications and findings of bone marrow aspiration procedures.Other objectives were to see the characteristics, viral status and complication of marrow aspiration procedure of patients. The study was carried out from January, 2019 toDecember,2019.Patients were profiled using a structured, intervieweradministered questionnaire. Relevant clinical data of the patient, laboratory tests, intra and post-procedure details were recorded. BMA were done using a standard unit protocol as adapted from ICSH guidelines and other authorities.1,5 Patients were followed up for a minimum period of one week for post-procedure complications. Patients with known coagulopathies or thrombocyte counts less than 10,000/ul were deferred from the procedure until adequate blood component supports were given. Similarly, patients on anti-platelet medications were deferred for a few days. All BMA were performed after detailed explanation of the procedure to the patients and or parents and proper consent obtained.

After collection editing and compilation of all data was done. All data were inputted and analyzed manually and using window based software devised with Statistical Package for Social Sciences (SPSS) 16. Findings are presented in frequencies and tables.

**Results:**

A total of 724 cases of BMA were profiled during the study period. Among them 679 was total sample size with an age range of 2 to 80 years.Majority of the subjects (33%) were aged 41 to 60 years, with a male to female ratio of 1.99:1. Most BMA procedures (87.78%) were done on outpatientbasis, the remaining were performed during admission. Screening was done for HbsAg, HCV and HIV to all patient and 1.18% were HbsAg and 15% were HCV positive.Table-1 shows the patients characteristics and viral status.

**Table-I: Patients Characteristics and viral status**

| Characteristics | | Frequency(n) | Percentage(%) |
|---|---|---|---|
| Age in years | 1 to 15 | 136 | 20.03 |
| | 16 to 25 | 95 | 13.99 |
| | 26 to 40 | 150 | 22.09 |
| | 41 to 60 | 224 | 33.00 |
| | 61 to 80 | 71 | 10.46 |
| | >80 | 3 | 0.44 |
| | Total | 679 | |
| | | | |
| Sex | Male | 452 | 66.57 |
| | Female | 227 | 33.43 |
| Male:Female:1.99:1 | | | |
| Location | In- Patient | 83 | 12.22 |
| | Out-Patient | 596 | 87.78 |
| Screening with positive result | HBs Ag | 8 | 1.18 |
| | HCV | 1 | 0.15 |
| | HIV | 0 | 0.00 |

**Table-II: Intra Procedure Details**

| Variables | | Frequency (n) | Percentage(%) |
|---|---|---|---|
| Anaesthesia/Sedative | Lidocaine | 679 | 100 |
| | Midazolam | 53 | 7.80 |
| | | | |
| Aspiration sites | Anterior ilium | 2 | 0.30 |
| | Posterior ilium | 674 | 99.2 |
| | Sternum | 1 | 0.15 |
| | Femur | 2 | 0.30 |
| Number of | Single | 636 | 93.67 |
| aspiration sites | Multiple | 47 | 7 |
| Aspiration yield | Adequate | 636 | 93.66 |
| | Not adequate | 33 | 4.86 |
| | Dry Tap | 10 | 1.47 |
| Trephine Biopsy | Yes | 9 | 1.32 |
| | No | 670 | 98.67 |
| Indication of Trephine Biopsy | Assessment of overall cellularity/suspected AA | 3 | |
| | Dry tap/inadequate particle | 6 | |

Local anaesthesia with 2% lidocaine was used in all patients. A few (7.8%) of the patients aged less than 5 years were sedated with midazolam in order to achieve better analgesia and patient cooperation. Most of the aspirates (99.2%) were taken from the posterior iliac crest, the rest were taken from anterior iliac bone, sternum and femur (in children less than 2 years). Multiple aspirations were performed in about 7% of the subjects.About 9(1.32%) of the subjects had concurrent bone marrow aspiration and trephine biopsy, while the remaining had solely a BMA procedure. Indications for concurrent BM trephine included evaluation of marrow cellularity in suspected aplastic anaemia cases, dry tap/inadequate marrow yield to enable imprints and others.

The frequent indications for initiation of BMA studies were staging of Lymphoma 316(46.54%), suspected Acute Lymphoblastic Leukaemia 64(9.42%) and monitoring of chemotherapy success in treated cases 59(8.70%), suspected Acute Myeloid Leukaemia 57(8.39%), suspected Acute Leulaemia 31(4.56%), Round Cell Tumour 27(3.98%), unexplained lymphadenopathy or hepato-spleenomegaly 22(3.24%), suspected CML 22 (3.24%) and Multiple Myeloma 20(2.9%).

**Table-III: Indications of BMA**

| BMA Indications | Frequency(n) | Percentage(%) |
|---|---|---|
| Staging of Lymphoma | 316 | 46.54 |
| Suspected AML | 57 | 8.39 |
| Suspected APL | 3 | 0.44 |
| Suspected ALL | 64 | 9.42 |
| Acute leukaemia | 31 | 4.56 |
| Suspected CML | 22 | 3.24 |
| Multiple Myeloma | 20 | 2.9 |
| Plasmacytoma | 6 | 0.88 |
| Plasma cell Leukaemia | 1 | 0.15 |
| Round Cell Tumour | 27 | 3.98 |
| Lymphadenopathy/hepato-spleenomegaly | 22 | 3.24 |
| Pancytopenia | 8 | 1.17 |
| Bicytopenia | 4 | 0.59 |
| Anaemia under evaluation | 4 | 0.59 |
| Thrombocytopenia | 3 | 0.44 |
| Acute ITP | 1 | 0.15 |
| CLL | 7 | 1.03 |
| Suspected MDS | 4 | 0.59 |
| Suspected MPN | 1 | 0.15 |
| Langerhan Cells Histeocytosis | 1 | 0.15 |
| Monitoring therapy | 59 | 8.70 |
| Non Haematological malignancy/mets | 11 | 1.62 |
| Others | 4 | 0.59 |
| Repeat Collection | 3 | 0.44 |
| Total | 679 | |

Mild non-opioid analgesia with paracetamol was commonly prescribed post-procedure in all 588 (88.2%) of the subjects. The common marrow diagnosis (in order of decreasing frequencies) were normal active marrow 306 (45%), acute myeloid leukaemia 66(9.72%), acute lymphoblastic leukaemia 52(7.65%), reactive marrow 46(6.77%), lympho-proliferative disease 24(3.53%), chronic myeloid leukaemia 23(3.38%), plasma cell dyscrasia 21 (3.09%), ALL in remission 21 (3.09%), myeloid hyperplasia 20(3%), MM in remission 18(2.65%), erythroid hyperplasia 12(1.76%), acute leucaemia 9(1.32%), hypocellular marrow consistent with Aplastic

Anaemia 6(0.88%), AML in remission 6(0.88%), secondary metastasis 4(0.59%),progressive marrow failure and MDS was found 3(0.44) in each group.MDS/MPD and MPD is diagnosed 1(.15%) in each case. Repeat collection were advised in 5(0.73%) of the cases. The most frequently reported post-procedure complications were local pain at the site of the procedure (100%) and local sepsis (0.44%).

**Table-IV: Post Procedure Findings**

| Variables | | Frequency(N) | Percentage(%) |
|---|---|---|---|
| Analgesia | Nil | none | |
| | Mild non-opioid/Paracetamol | 599 | 88.2 |
| | NSAID | 13 | 1.91 |
| | Opioid | 67 | 9.86 |
| Diagnostic Findings | Normal Active Marrow | 306 | 45 |
| | Reactive Marrow | 46 | 6.77 |
| | Myeloid Hyperplasia | 20 | 3 |
| | Erythroid Hyperplasia | 12 | 1.76 |
| | Lymphoproliferative Disease | 24 | 3.53 |
| | CML | 23 | 3.38 |
| | Panmyeloid Hyperplasia | 1 | 0.15 |
| | Megakaryocytic Hyperplasia | 1 | 0.15 |
| | Plasma Cell Dyscrasia | 21 | 3.09 |
| | AML | 66 | 9.72 |
| | APL | 2 | 0.3 |
| | ALL | 52 | 7.65 |
| | Acute Leukaemia | 9 | 1.32 |
| | Hypocellular marrow consistent with AA | 6 | 0.88 |
| | Secondary mets | 4 | 0.59 |
| | Hypocellular Marrow(radiotherapy induced) | 1 | 0.15 |
| | Progressive Marrow Failure | 3 | 0.44 |
| | MDS | 3 | 0.44 |
| | MDS/MPD | 1 | 0.15 |
| | MPD | 1 | 0.15 |
| | Repeat collection | 5 | 0.73 |
| | Trephine Biopsy | 9 | 1.32 |
| Treatment response | AML in remission | 6 | 0.88 |
| | APL in remission | 1 | 0.15 |
| | AML not in remission | 1 | 0.15 |
| | ALL in remission | 21 | 3.09 |
| | ALL not in remission | 1 | 0.15 |
| | CML in CP | 3 | 0.44 |
| | CML in AP | 2 | 0.3 |
| | CML with hypocellular Marrow | 2 | 0.3 |
| | MM in remission | 18 | 2.65 |
| | MM in Partial remission | 4 | 0.58 |
| | MM not in remission | 3 | 0.44 |
| | MCL not in remission | 1 | |
| | Total | 679 | 100 |
| | | | |
| Procedure related Complication | Local pain | 679 | 100 |
| | Local sepsis | 3 | |
| | Haematoma | none | |
| | Vascular injury | none | |
| | Needle brake | none | |
| | | | |

**Discussion:**

Most cases of Bone marrow aspiration were done on outpatient basis. For management of procedural complications hospital admission is not necessary. Most of the aspirate specimens were taken from the posterior iliac crest, anterior ilium was less favoured (onlydone on the patients with postural difficulties). The sternum was totally avoided because of the possible fatal damage to the great vessel.[10,11]The tibia is the preferred site in children aged less than 24 months.[2,8,10] Bone marrow aspiration and biopsy are the obligatory tools, for the assessment of bone marrow cellularity[3], fibrosis, metastatic deposits and architectural patterns of histological diagnostic procedures.[12] Most times, if the cause is not found peripherally, there is need for examination of the bone marrow, the site of haematopoiesis. BMA specimens are also relevant for additional investigations including cytogenetic, molecular studies, flow cytometry / Immunophenotyping, cytochemistry, microbiological studies and others.[1,2,7] This study however provides useful information about the indications and findings of BM aspirations of both children and adult cancer patients in this locality.

Most common bone marrow findings was normal active marrow, observed in 306(45%) of cases. This is not unexpected as the most common indications were lymphoma and bone marrow involvement in B-Cell and T-cell lymphoma is 31% and 32%.[13] This study findings are similar to The WHO prediction, the commonest type of Haematological Malignancy (HM) was NHL, which was followed by leukemias, HL and multiple myeloma. In Pakistan, NHL is the most prevalent type of HM.[14] In US, NHL is the commonest cancer among HM, which is 1.5 times that of all leukemias.[15] In contrast maximum 49 (27.69%) were Acute Myeloid Leukemia (AML) found in a Bangladeshi study[16] and another multi-centered hospital-based data presented a different picture: the leukemias constituted approximately two thirds of (64.3%) all HM cases, while NHL accounted for 16.9%, followed by MM (10.5%) and HL (3.9%).[17] A same percentage of leukemias, NHL and multiple myeloma is observed in India.But similar to this study other Asian countries including Japan, Korea and Singapore, NHL is the most frequent hematological malignancies.[14,18]

In this study 2nd, 3rd, 4th, and other most common indications for BMA were suspected ALL 64(9.42%),monitoring therapy 59(8.70%) (To see the treatment response), suspected AML57 (8.39%), Acute Leukaemia 31(4.56%), Round cell Tumour 27(3.98%),suspected CML 22(3.24%), organomegaly 22(3.24%), MM 20(2.9%),non haematological malignancy/metastasis 12(1.62%).

Other common findings after Normal Active marrow were AML 66(9.72%), ALL 52%(7.65%), Reactive marrow 46(6.77%), LPD 24(3.53%), CML 23(3.38%), Plasma cell dyscratia 21 (3.09%), Myeloid hyperplasia 20(3%), Erythroid hyperplasia 12(1.76%), Acute Leukaemia 9(1.32%), hypocellular marrow consistent with Aplastic Anaemia 6(.88%), secondary metastasis 4(0.59%), progressive marrow failure and MDS were same in number 3 (0.44%), MDS/MPD and MPD was diagnosed in only 1(0.15%) patients indicating their rarity in diagnosis.

The age range of our study subjects were 2 years to 80 years and the mean ages of the patients were 49.7 years. Mean age found by in Gandapur ASK et al[15], Pudasaini S. et al[16], Atla Bl et al[17], Kibria SG et al[18], Mahfuz H, et al[19] were 40, 37.9, 32.4, 27.05, 28.2 years in their respective studies. Most patients belongs to the age in between 41 to 60 years 224 (33%),Unlike Western countries, the hematological malignancies in Bangladesh seem to afflict younger population as is indicated by the overall median age at diagnosis was 42 years[17]. May be related to the underreporting cases of older individuals due to of several socioeconomic and cultural reasons.In this study men were more involved than women, with an overall male to female ratio of 1.99:1. Men often get priority while seeking medical attention. But also higher prevalence of HM in males might be the result of increased exposure to environmental and occupational risk factors, smoking, alcohol consumption as well as different hormonal and genetic background of males and females. [19-22]

Repeat collection was advised in 5(0.73)patients due to inadequate particle or dry tap and trephine biopsy (TB) was done in 9 (1.32%) cases. TB allows for preparation of imprints and better assessment of overall cellularity, marrow architecture or infiltrations.[1,2,5] Pain was a main complication of BMA in this study and poor pain control may discourage patients in event of a need for repeat procedures. All of the patient-cases received post-procedure analgesia, most of the analgesia (88.2%) was conducted with mild non-opioid (Paracetamol). Due to the propensity for platelet dysfunction or thrombocytopenia NSAIDS were less frequently used. Severity may be related to patient factors such as individual pain thresholds, anxiety and apprehensiveness, skills and expertise of the operator or the differing quality of the anaesthetic agent. Local sepsis occurred in a very few patients. No other procedure related complication is noted. In a large series of over 50,000 cases, haemorhage and local infection were very rare. Fourteen cases had serious haemorhage with one death and six required transfusion.[23]

**Conclusion:**

BMA should be done after initial evaluation of the peripheral blood and other ancillary test and be performed by a qualified haematologist. BMA should not be a first line investigation, it'sinterpretation is complicated and needs to take into account the patient's clinical history, examination and laboratory results. This study revealed most common indication for BMA in cancer patients in this institute is Lymphoma ,after that ALL, AML, Acute Leukaemia, Round Cell tumour, CML, MM are the other common indications for BMA. To reduce fear/anxiety and procedure related pain, it is recommended that patients/attendants for bone marrow studies should be properly educated about the procedure, its indication and potential risks. Informed consent should be documented. Local anaesthesia should be allowed the minimum time of onset to take effect before the procedure.This study of a 679 number of cancer patients is a step in understanding the patterns and distribution of bone marrow aspiration findings in as a whole cancer patients of Bangladesh.

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*Original Article*

# Effects of Oral Vitamin C Supplementation on Lipid Profile in Patients with Type 2 Diabetes Mellitus

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**Abstract:**

**Background:** Diabetes mellitus is a metabolic disorder that causes micro-vascular and macro-vascular complications. As because vitamin C is beneficial in improving serum lipid, it can be supplemented to control components of lipid profile and thus reducingthe risk of micro-vascularand macro-vascular complications. **Objective:** To observe the effects of vitamin C supplementation on lipid profile in patients with type 2 diabetes mellitus. **Method:** This was a prospective interventional study carried out in the Department of Physiology, Dhaka Medical College, Dhaka from July 2015 to June 2016. In this study, 33 diagnosed type 2 diabetic patients were enrolled. Among them, 17 patients were supplementedwith vitamin C (1000 mg/day) for 6 weeks (Study group). Another 16 age matched patients were not supplementedwith vitamin C (Control group).All of them were studied at the time of enrolment (base line) and after 6 weeks of the study period.

**Result:** The meanTotal Cholesterol (TC), Triglyceride (TG), High Density Lipoprotein (HDL) andLow Density Lipoprotein (LDL) levels were almost similar in both groups at the beginning of study (baseline). After 6 weeks,meanTC, TG and LDL levels were significantly ($p<0.05$) reducedand meanHDL level was significantly ($p<0.05$) increasedin study group in comparison to those of control group. Again,mean TC, TG andLDL levels were significantly ($p<0.001$) reducedand mean HDL level was significantly ($p<0.00l$) increasedin study group than those of their base line value but no significant changes wereobservedin mean TC, TG, LDL and HDL levelsin control group than those of their base line value after 6 weeks. **Conclusion:** Supplementation of vitamin C is effective in improvinglipid profile.

**Keywords:** Vitamin C, Lipid profile and diabetes mellitus

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## Introduction:

Diabetes mellitus is a metabolic disorder characterized by chronic hyperglycemia with disturbances of carbohydrate, fat and protein metabolism resulting from defects in insulin secretion and/or insulin action.[1]

Diabetes is one of the largest global health emergencies of the 21st century. About 415 million people of age groups between 20 to 79 years were suffering from diabetes mellitus with a prevalence of 8.8%. This number will rise to 642 million by the year 2040 with a prevalence of 10.4 %. The highest regional prevalence of DM was reported for North America 12.9% and in South East Asia, it was about 8.5%.[2] The prevalence of diabetes mellitus was about 7.4% in Bangladesh.[3]

In type 2 DM, defects in insulin action and hyperglycemia cause lipid abnormalities. It includes increased total cholesterol (TC), triglyceride (TG), low-density lipoprotein (LDL) concentrations and decreased high-density lipoprotein (HDL) concentration.[4] Oxidation of LDL leads to atherosclerosis which is the main cause of cardiovascular disease (CVD). About 75% of all CVD related deaths occur due to this atherosclerosis. Antioxidants can reduce the risk of atherosclerosis in people with diabetes by reducing oxidation of LDL. [5,6]

Vitamin C is an essential micronutrient and acts as a cofactor for some enzymes that are involved in the biosynthesis of collagen, carnitine and neurotransmitters.[7] It is also an important antioxidant in human, capable of scavenging oxygen derived free radicals and plays an important role in the prevention of oxidative damage to DNA, lipids and proteins.[8]

Supplementation of vitamin C significantly reduces serum TG, TC and LDL[9] and significantly increases in serum HDL levels in patients with type 2 DM.[10]
A little is known about the role of vitamin C on lipid profile in Bangladeshi type 2 DM patients. So, the present study was intended to assess the effects of oral supplementation of vitamin C on lipid profile in Bangladeshi type 2 DM patients.

**Method:**
This prospective interventional study was conducted in the Department of Physiology, Dhaka Medical College, Dhakafrom July 2015 to June 2016. Control and study subjects were randomly selected from Outpatient Department of Endocrinology, Dhaka Medical College Hospital, Dhaka. At the beginning of the study, 40 diagnosed type 2 diabetic patients (Fasting blood glucose level > 7.0mmol/1 or HbAlc> 6.5% [ADA, 2015]),aged 40-55 years of both sexes, suffering ≥3 years, having oral hypoglycemic drugs and not having antioxidant supplements in the last 4 weeks were selected and were divided into two groups equally. Participants who were pregnant, on insulin therapy, history of renal stone and renal failure, taking drugs which interact with vitamin C metabolism such as anticoagulant, barbiturates were excluded from the study. After 6 weeks of study period, 4 patients from control and 3 patients from study groups were lost to follow up. Finally, 16 subjects in control group (Control group)and 17 subjects in study group (Study group)were studied.

After selection of the subjects, informed written consent was taken from the participants. Study groupwere advised to take vitamin C supplement 1000 mg/day for 6 weeks.Both control and study groups were asked to maintain former food habit, physical activities and type and doses of medicine during the course of the study. Regular telephonic contact was made to ensure compliance with intervention.Detailed family and medical history were taken andanthropometric measurement of the subjects was done and blood pressure was measured. All the information was recorded in a prefixed questionnaire. Lipid profile were studied 2 times in all subjects of control and study group, i.e, at the beginning of study (base line) and after 6 weeks of study period. All the parameters were expressed as mean ± SD (standard deviation). Paired Student's't' test and unpaired Student's't' test were done to find the level of significance. p value < 0.05 was considered as level of significance. Statistical analyses were performed by using a computer based statistical program SPSS (Statistical package for social science) version 22.0.

**Results:**
**Table 1: General characteristics of the subjects in both groups (n=33)**

| Parameters | Control group (n=16) | Study group (n=17) | p value |
|---|---|---|---|
| Age (years) | 47.50±4.42 (40-55) | 49.29±4.95 (40-55) | $0.282^{ns}$ |
| Sex | | | |
| Male | 6 (37.5) | 8 (47.1) | 0.841 |
| Female | 10 (62.5) | 9 (52.9) | |
| BMI ($kg/m^2$) | 25.79±2.53 (18.03-28.17) | 24.32±2.79 (20.55-30.36) | 0.125 |
| Duration of DM (years) | 4.68±1.88 (3-10) | 5.00±2.57 (3-10) | 0.685 |
| Systolic BP (mmHg) | 125.00±6.32 | 127.05±8.48 | 0.436 |
| Diastolic BP (mmHg) | 80.00±7.07 | 80.58±9.33 | 0.841 |

There were no significant differences in age, sex, BMI, duration of DM and blood pressure between two groups.

**Table 2: Lipid profiles of the subjects in both groups (n=33)**

| Parameters | | Control group (n=16) | Study group (n=17) | p value |
|---|---|---|---|---|
| TC (mg/dl) | At baseline | 202.18±26.79 | 200.11±24.93 | $0.820^{ns}$ |
| | After 6 weeks | 202.81±26.13 | 184.91±24.02 | 0.049* |
| | p value | $0.137^{ns}$ | <0.001*** | |
| TG (mg/dl) | At baseline | 160.62±27.84 | 164.41±25.77 | $0.688^{ns}$ |
| | After 6 weeks | 160.82±28.04 | 142.35±21.73 | 0.042* |
| | p value | $0.068^{ns}$ | <0.001*** | |
| HDL (mg/dl) | At baseline | 36.43±5.11 | 37.47±7.87 | $0.660^{ns}$ |
| | After 6 weeks | 36.31±5.08 | 41.47±8.17 | 0.039* |
| | p value | $0.071^{ns}$ | <0.001*** | |
| LDL (mg/dl) | At baseline | 135.25±13.05 | 130.00±26.65 | $0.482^{ns}$ |
| | After 6 weeks | 135.51±13.36 | 119.79±26.93 | 0.044* |
| | p value | $0.060^{ns}$ | <0.001*** | |

Serum TC, TG and LDL were reduced and HDL was increased significantly in study group.

**Discussion**
The present study was carried out to find out the effects of vitamin C supplementation on lipid profile in diabetic patients. Lipid profiles were compared between two groups at the time of enrolment and after 6 weeks of intervention. Lipid profiles were also compared with in groups.

In the present study, mean TC, TG, HDL and LDL levels were almost similar and differences were not statistically significant between the control and the study group at the beginning of the study (baseline). Almost similar findings were described by the various investigators from different countries.[9-13]

Age and BMI of all the subjects in both the control and the study groups were almost similar and statistically no significant differences were observed between them. The mean systolic and diastolic blood pressure and duration of disease were almost similar in both groups in this study.

After 6 weeks,mean TC, TG and LDL levels were significantly ($p<0.05$) reducedand mean HDL level was significantly ($p<0.05$) increasedin study group in comparison to those of control group. Again,meanTC, TG and LDL levels were significantly ($p<0.001$) reducedand mean HDL level was significantly ($p<0.00l$) increasedin study group than those of their base line value but no significant change was observed in mean TC, TG, LDL and HDL levels in control group than those of their base line value after 6 weeks.Almost similar types of results were described by different researchers of different countries.[9,10,14] On the contrary, Mazloom et al. [12] found no significant difference in lipid profile in patients after supplementation of vitamin C.

**Study limitations:**

Although optimal care had been tried by the researcher in every steps of the study, but there were some limitations.Sample size was small.The study was conducted in a selected hospital. So, the study population might not represent the whole community. The sample was taken purposively. So there may be chance of bias which can influence the results. Measurement of vitamin C and other plasma antioxidant levels were not assessed due to time and financialconstrains.

**Conclusion:**

According to this study finding it can be concluded that vitamin C supplementation in recommended dose may decrease TC, TG & LDL levels and increase HDL level in type 2 DM patients.

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*Original Article*

# Pattern and Outcome of Respiratory Illness in Children Admitted to Pediatric Pulmonology Unit, Combined Military Hospital, Dhaka: A 2-Year Study.

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**Abstract:**

**Background:** Respiratory illness is one of the leading causes of childhood morbidity and mortality worldwide. There is paucity of data on pattern and outcome of respiratory illness in children in our country. This study conducted to explore the pattern and outcome of respiratory illness in hospitalized children in pediatric pulmonology unit in a tertiary level hospital of Bangladesh. This will form an epidemiological database for further studies.

**Objective:** To determine the pattern and outcome of respiratory illness in children admitted to pediatric pulmonology unit, Combined Military Hospital, Dhaka.

**Methodology:** This is a retrospective cross-sectional study. The children who were admitted with only acute respiratory illness aged 1 month to 12 years from January 2019 to December 2020 in pediatric pulmonology unit was included in this study. Children having co-morbidities were not included in this study. Data were collected through data collection sheet from register of pediatric pulmonology unit and case record sheets from archive after taking permission from the institutional ethical committee. Data analysis was done by using the MINITABTM and MS XL programs.

**Results:** Total 9928 patients were admitted in pediatric department from January 2019 to December 2020. Among them, 836 patients (8.4%) were admitted with only respiratory illness in pulmonology unit, of which 534 (63.8%) were male and 302 (36.2%) were female. The mean hospital stay was 5.01(±0.129) days. The mean age was 31.60 (± 1.20) months. Among the admitted children, higher percentage had pneumonia with the 244 (29%) cases, 151 (18%) patients had bronchiolitis, 113 (14%) patients had bronchial asthma, 99 (12%) patients had common cold, 48 (6%) patients had pharyngitis, 43 (5%) patients had tonsillitis and 36 (4%) patients had croup. The other respiratory illness (sinusitis, laryngitis, tuberculosis, pneumothorax, foreign body aspiration, reactive airway disease etc.) were recorded for 102 (12%) patients. In most of the diseases higher percentage of boys were affected. Among the most common respiratory illness children of under five years of age (<60m) had more hospital stay. Outof 836 patients, 719 (86%) were discharged with medical advice and 110 (13.16%) were referred to the Pediatric Intensive Care Unit (PICU) in which 7 patients (0.84%) were died from pneumonia. Among died patients, most (86%) cases were under 5 years of age. Among all pneumonia patients, 237 (97.13%) were discharged with medical advice. Out of all pneumonia cases, 68 (27.87%) patients required PICU care. Of 151 bronchiolitis 11 (7.28%) patients and of 113 asthma patients 15 (13.27%) cases required PICU care. Among Other 229 cases, only 16 patients (6.99 %) required PICU care. Remaining 213(93.01%) patients were discharged with medical advice from ward.

**Conclusion:** Respiratory illness is one of the common causes of hospital admission. Among them pneumonia, bronchiolitis, bronchial asthma and common cold are the leading cause. Pneumonia and common cold are more prevalent under 12 months of age; bronchiolitis is common under 24 months of age. Whereas bronchial asthma is more common in over 60 months of age. Hospital stay is also more in younger age group (< 60months of age) in major respiratory illness. Pneumonia is the commonest cause of morbidity and mortality. Mortality is higher in under five years of age.

**Key words:**
Respiratory illness, pattern, pulmonology unit, outcome.

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**Introduction:**

A major cause of morbidity and mortality in children especially under 5 years of age is respiratory illness[1]. Among respiratory illnesses, acute respiratory illness (ARI), in particularly pneumonia and bronchiolitis are the leading causes of death of children in the developing countries[2]. In developing countries, ARI results in the death

of an estimated 4 to 5 million children each year[3]. An important indication for hospital admission in pediatric patients is respiratory illness. Respiratory symptoms comprises 27.5% of pediatric emergency department visits[4]. Other than pneumonia, children may suffer from a variety of respiratory illnesses including common cold, pharyngitis, laryngitis, sinusitis, bronchiolitis, tonsillitis, asthma, tuberculosis and foreign body aspiration. Some of these cases may require hospital admission based on its severity. In Bangladesh, ARI alone is responsible for 38.8% of total pediatric hospital admissions. Among 182,936 respiratory illness cases, ARI remains a major cause of morbidity and mortality in children, especially under 5 years of age[5,6]. Bronchiolitis and community-acquired pneumonia are the most common causes of ARI in children below 2 years of age. Prevalence of childhood asthma is substantial and asthma has often been treated as pneumonia while it is under-diagnosed in the developing countries including Bangladesh [7]. Most of the deaths among the children are related to pneumonia. Respiratory tract infection etiology is complex and diverse. In the developed countries, the major causes of ARI in children and adults are influenza A and B viruses (INF A, INF B), parainfluenza virus type 1 (PIV1), PIV2, PIV3, respiratory syncytial virus (RSV), adenovirus (ADV) and rhinovirus[8, 9]. Bronchial obstructive syndrome and pneumonia are the common causes of child visits to primary care, and emergency and specialized services. The children can be in serious conditions and require hospitalization, which can lead to consumption of significant resources and predispose the child to life-long or nearly life-long chronic obstructive diseases and, in some cases, may cause death. The importance of these conditions has led the medical specialists to unify criteria in order to prevent, diagnose, and treat all respiratory diseases. These respiratory diseases affect children, especially in the first 5 years of life, due to susceptibility and immaturity of the respiratory tract in this age group[10]. More often, the studies on respiratory diseases are on the specific illnesses that cause morbidity and mortality while the combined pattern of the respiratory diseases is ignored. The importance of data on respiratory diseases is that it enhances knowledge on the types and burden of the categories of diseases that affect the respiratory system. This will help in developing intervention measures both at the institutional and national levels[11]. The pattern of different respiratory illness in several parts of the world have been reported. Most of the data gathered from different geographical regions. There is paucity of data on pattern and outcome of respiratory illness in children in our country. The present study intended to explore the pattern and outcome of respiratory illness in hospitalized children in pediatric pulmonology unit in a tertiary level hospital of Bangladesh. This will form an epidemiological database for further studies.

**Methodology:**

This study is a retrospective cross sectional study. The children who were admitted with only acute respiratory illness aged 1 month to 12 years from January 2019 to December 2020 in pediatric pulmonology unit was included in this study. Children having co-morbidities e.g congenital heart disease, hematological problem, gastrointestinal problem or endocrine problem were not included in this study. Data were collected by data collection sheet from register of pediatric pulmonology unit and case record sheets from archive after taking permission from the institutional ethical committee. Data analysis was one by using the MINITABTM and MS XL programs.

**Results:**

From January 2019 to December 2020, total 9928 patients were admitted to the pediatric department at CMH, Dhaka. Among them, 836 were respiratory patients (Table-I), which was 8.4% of total hospital admissions. In 2020, the hospital admissions were less due to Covid-19 pandemic but respiratory cases were higher (10.07%) than previous year (7.81%).

**Table-I: Yearly admission data in pulmonology unit of CMH**

| Year | Total admission | Respiratory cases | Percentage |
|---|---|---|---|
| 2019 | 7268 | 568 | 7.81 |
| 2020 | 2660 | 268 | 10.07 |
| Total | 9928 | 836 | 8.4 |

Total 836 patients, who were admitted only with acute respiratory illness were studied. Among them, 534 (63.8%) were boys and 302 (36.2%) were girls (Figure 1).

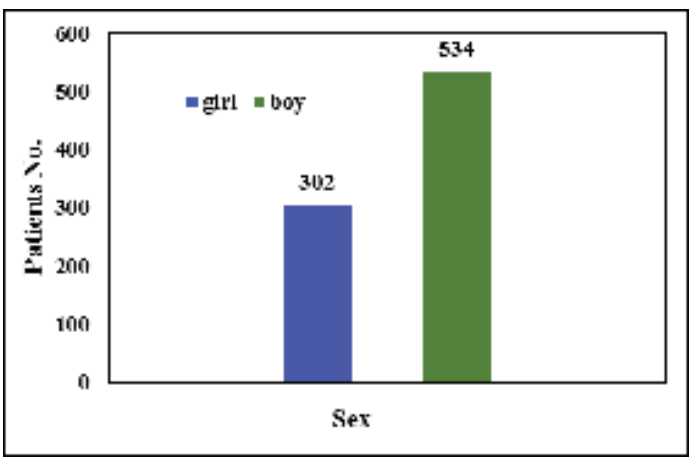


**Figure-1: Distribution of sex**

The mean age was 31.60 (± 1.20) months. The boys had the mean age of 30.95 (±1.54) months and the girls had the mean age of 32.77 (±1.92) months (Figure 2).

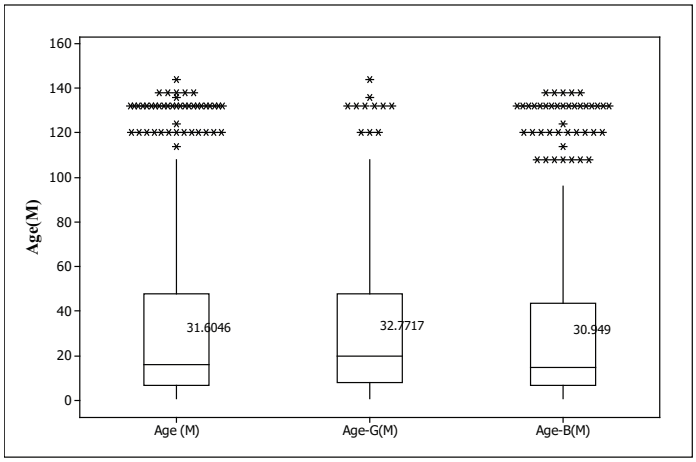


**Fig.-2. Age of the patients admitted with respiratory illness**

The mean hospital stay was 5.01 (±0.129) days. Of them boys stayed at hospital for 5.2 (±0.17) days and the girls stayed for 4.57 (±0.18) days (Figure 3).

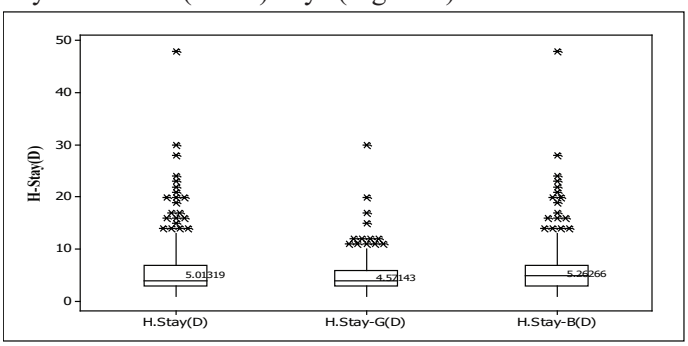


Figure-3: Duration of hospital stay

Among all the studied children, most of the patients suffered from pneumonia. Total 244 (29%) cases were pneumonia. Of them, 168 (69%) were boys and 76 (31%) were girls. Total 151(18%) patients had bronchiolitis, and 97 (64%) of them were boys and 54 (36%) were girls. Bronchial asthma comprised about 113 (14%) patients, where 79 (70%) were boys and 34 (30%) were girls. 99 (12%) patients had common cold and of them 55 (55.5%) were boys and 44 (44.4%) were girls. 48 (6%) patients had pharyngitis, in which 23 (48%) were boys and 25 (52%) were girls (Table-2). Most of the illnesses were observed among the boys. 43 (5%) patients had tonsillitis and 36 (4%) patients had croup while the other respiratory diseases (sinusitis, laryngitis, tuberculosis, pneumothorax, foreign body aspiration, reactive airway disease etc.) were in 102 (12%) patients. (Figure-4).

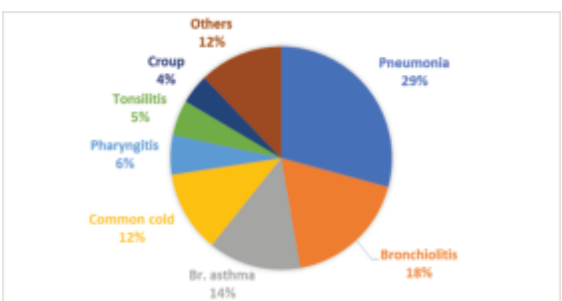


**Figure- 4: Distribution of respiratory illness**

The data showed that the occurrences of pneumonia were highest (244) followed by bronchiolitis (151), bronchial asthma (113) and common cold (99).

**Table-II: Distribution of respiratory illness among girls and boys.**

| Respiratory illness | Girl (n=302) | Boy ( n=534) | Total (n=836 |
|---|---|---|---|
| Pneumonia | 76 | 168 | 244 |
| Bronchiolitis | 54 | 97 | 151 |
| Br. Asthma | 34 | 79 | 113 |
| Common cold | 44 | 55 | 99 |
| Pharyngitis | 25 | 23 | 48 |
| Tonsillitis | 26 | 17 | 43 |
| Croup | 13 | 23 | 36 |
| Sinusitis | 11 | 18 | 29 |
| Laryngitis | 5 | 16 | 21 |
| Reactive Airway Disease | 4 | 15 | 19 |
| Others | 7 | 11 | 18 |
| TB | 3 | 12 | 15 |

The age group-based admission of the patients and their hospital stay were analyzed. Table 3-6 shows the number of patients and their hospitals stay for different age group. In this study, pneumonia, bronchiolitis and common cold patients were highest for the age group 1-24 months while bronchial asthma were highest among the 61+ months age group. Average hospital stay was more (7.6±4 days) in 25-60 months age group in case of pneumonia. Whereas average hospital stay was more in <24 months age in bronchiolitis (4.32±2.34 days) and bronchial asthma (5.2±4.82 days) children. Patients had common cold in 1-12 months age group required more hospital stay (3.63±1.8 days) than other age group.

**Table-III: Distribution of Pneumonia according to age and hospital stay**

| Age (month) | Total patient | Average Hospital Stay (days) | Min (days) | Max (days) | Standard Deviation |
|---|---|---|---|---|---|
| 1-12 | 127 | 7 | 2 | 48 | 5 |
| 13-24 | 54 | 6.4 | 1 | 24 | 4 |
| 25-60 | 43 | 7.6 | 1 | 20 | 4 |
| 61+ | 20 | 6.7 | 1 | 11 | 3.1 |

**Table-IV: Distribution of Bronchiolitis according to age and hospital stay**

| Age (month) | Total patient | Average Hospital Stay (days) | Min (days) | Max (days) | Standard Deviation |
|---|---|---|---|---|---|
| 1-24 | 137 | 4.32 | 1 | 13 | 2.34 |
| 25-60 | 14 | 3.92 | 2 | 8 | 1.66 |

**Table-V: Distribution of Br. Asthma according to age and hospital stay**

| Age (month) | Total patient | Average Hospital Stay (days) | Min (days) | Max (days) | Standard Deviation |
|---|---|---|---|---|---|
| 13-24 | 32 | 5.2 | 2 | 30 | 4.82 |
| 25-60 | 31 | 4.61 | 1 | 14 | 2.73 |
| 61+ | 50 | 3.7 | 1 | 13 | 2.31 |

**Table-VI: Distribution of Common cold according to age and hospital stay**

| Age (month) | Total patient | Average Hospital Stay (days) | Min (days) | Max (days) | Standard Deviation |
|---|---|---|---|---|---|
| 1-12 | 48 | 3.63 | 1 | 9 | 1.8 |
| 13-24 | 15 | 3 | 1 | 7 | 1.92 |
| 25-60 | 22 | 3.18 | 1 | 7 | 1.47 |
| 61+ | 14 | 3.1 | 1 | 10 | 2.64 |

Out of 836 patients, 719 (86%) were discharged with medical advice and 110 (13.16%) were referred to the Pediatric ICU (PICU) as their health conditions were not improving, so they required ICU care. Among the referred patients in the PICU, 7 patients (0.84%) died from pneumonia in PICU (Figure -5).

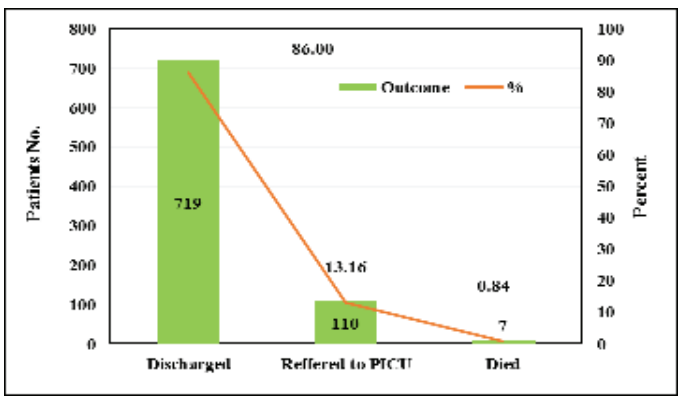


**Figure-5: Outcome of respiratory cases**

Among died patients, most (86%) were <60 months (< 5 years) of age (Fig-6) and the cause of death of all patients was pneumonia.

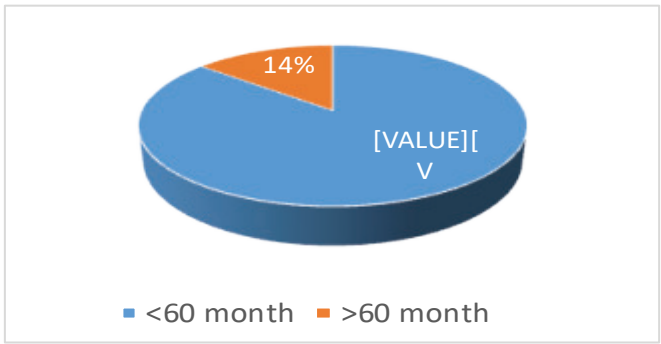


**Figure-6: Distribution of age of died patients**

Among total 244 pneumonia patients 237(97.13%) patients were discharged with medical advice, and 7 (2.86%) patients were died. Out all pneumonia cases, 68 (27.87%) patients required PICU care. Out of 151 bronchiolitis patients, 11 patients (7.28%) and out of 113 asthma patients 15 patients (13.27%) required PICU care. Among Other 229 cases, only 16 patients (6.99 %) required PICU care. Remaining 213(93.01%) patients were discharged with medical advice from ward. Out of 110 referred patients in PICU, 7 cases (6.36%) died in pneumonia and rest of the patients were shifted to ward and discharged with medical advice later on (figure-7).

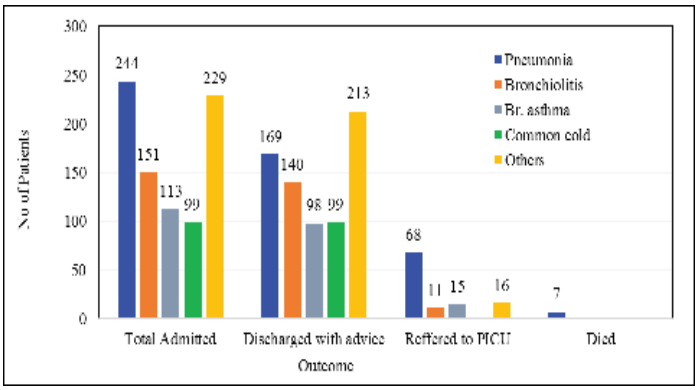


**Figure-7: Outcome of respiratory illness according to disease pattern**

**Discussion:**

Respiratory illness is one of the major causes of hospital admission among the children worldwide. In this study, approximately 8.4% of the children admitted of the hospital were suffering from respiratory illness. T. K. P. Nguyen et al. reported that the acute respiratory infections accounted for 27.9% (37,436/134,061) of all pediatric admissions, which is fairly corresponds to this study[12].

In this study, the mean age was 31.60 (± 1.20) months, which is similar to the study of Oguonu et al. which showed the mean age, was 39.6 (±3.9) months[13].

In this study, the mean length of hospital stay was 5.01 (±0.129) days. L Y Tsung et al. showed that the mean length of hospital stay was 3 days[14]. This is also similar to this study.

Pneumonia (29%), bronchiolitis (18%) and bronchial asthma (14%) accounted for the majority of respiratory illness among the hospitalized patients in this study. Begum et al. showed that pneumonia (71.2%), acute bronchiolitis (20.1%), bronchial asthma (4.2%) and TB (2.7%) were commonest15 and Kabir et al. also found Common cold, bronchiolitis, pneumonia, and asthma. Pneumonia (29%), bronchiolitis (18%) and bronchial asthma (14%) accounted for the majority of respiratory illness among the hospitalized patients in this study. Begum et al. showed that pneumonia (71.2%), acute bronchiolitis (20.1%), bronchial asthma (4.2%) and TB (2.7%) were commonest[15] and Kabir et al. also found Common cold, bronchiolitis, pneumonia, and asthma were 1659 (48%), 744 (21%), 402 (11.5%), and 277 (8%); respectively which is very much similar to our study[16].

Other respiratory illness included common cold (12%), pharyngitis (6%), tonsillitis (5%), croups (4%) etc. Simoes et al. shows that among respiratory tract infections pharyngitis, laryngitis, tonsillitis, epiglottitis are the very common upper respiratory tract infections[17].

In this study, higher percentage of boys (63.8%) were infected than the girls (36.2%), which is similar to Oguonu et al. study which shows 61% patients were boy[13].

In this study, pneumonia, bronchiolitis and common cold patients were highest for the age group <60 months (5yrs) while bronchial asthma were highest among the 61+ months (>5 yrs.) age group. Oguonu et al. showed that of all admitted children with respiratory diseases 75.2% were less than five years old, 23.5 % were > 5 years old13. Begum J A et al. also found that Pneumonia and bronchiolitis were common among under five children and less common after 5 years15. As under five children has less mature immune systems as well as less lung compliance, this increases their susceptibility to respiratory tract infections and illness resulting in relatively increased morbidity, hospital admissions and mortality.

In this study, average hospital stay was more (7.6±4 days) in 25-60 months age group in case of pneumonia. Whereas average hospital stay was more in <24 months age in bronchiolitis (4.32±2.34 days) and in bronchial asthma (5.2±4.82 days). Patients had Common cold in 1-12 months age group required more hospital stay (3.63±1.8 days) than other age group. These findings reveal that, in most of the diseases, children < 60 months (< 5 years) require more hospital stay. Oguonu T et al. showed that children less than five years required more hospital stay than the other age groups[13]. These findings are very much similar to this study.

In this study, out of 836 patients, 719 (86%) were discharged with medical advice and 110 (13.16%) were referred to the PICU in which 7 patients (0.84%) died from pneumonia. Oguonu et al.18 found that majority, 91.9% of cases admitted were discharged home and 7.6% were transferred to inpatient wards while death was recorded in 0.5% (11/2214) of the children, which is similar to this study.

According to pattern of illness, among 244 pneumonia patients, 237(97.13%) patients were discharged with medical advice, and 7 (2.86%) patients were died. Of all pneumonia cases, 68 (27.87%) patients required PICU care. Out of 151 bronchiolitis patients 11 (7.28%) patients and out of 113 asthma patients 15 (13.27%) patients required PICU care. Among Other 229 cases only 16 (6.99 %) patients required PICU care. Out of 110 patients in PICU, 7 (6.36%) cases died in pneumonia. Begum et al. found that majority of pneumonia patients (96.1%) were discharged and 3.9% cases died. Among acute bronchiolitis cases, discharge with advice was 98.5% and all the asthma patients were discharged with advised [15]. This is similar to this study. Rakshit et al. reported also same type of findings[18], which is consistent to this study.

In this study, mortality is higher in under five years of age. Among the died patients, 86% of the patients were <60 months and 14% patients were >60 months. According to various other studies e.g. Akbar et al, Black et al, Oguonu et al. and Kabir et al. [5,6,13,19], respiratory illnesses are the most common causes of morbidity and mortality for the children under five years of age. These scenarios corresponds to this study.

**Conclusion:**

Respiratory illness is one of the common causes of hospital admission in children in a tertiary care hospital. Pneumonia, bronchiolitis, bronchial asthma and common cold are the leading causes of respiratory illness. They are more prevalent in under 24 months of age except bronchial asthma which is more common in above 5 years of age. Hospital stay is also more common in younger age group (< 5 years of age). Pneumonia is the leading cause of morbidity and mortality. Mortality is higher in under five years of age. Further large-scale, multicenter study will depict a clearer scenario in this aspect.

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*Original Article*

# Antimicrobial Sensitivity Pattern of Uropathogens in Children in Comilla Medical College Hospital, Cumilla

Pinki Saha[1], Sujit Kumar Saha[2], M Mahabubul Alam[3], M Nazmul Hasan[4]

**Abstract:**

**Background:** Urinary tract infection is a common bacterial illness in children. Knowledge of the antimicrobial susceptibility patterns of common uropathogens in children according to epidemiology is the essential for providing clinically appropriate, cost effective therapy for UTI. Antibiotic resistance of urinary tract pathogens has increased worldwide. **Objective:** The purpose of the study is to identify the uropathogens responsible for the infection and their antibiotic susceptibility. **Methods:** This cross-sectional study was carried out in Microbiology department of Cumilla Medical College from October-2018 to September-2019. Hundred (100) culture positive urine samples from children were enrolled in this study. The specimens were cultured and the isolates were identified using standard microbiological technique. The antibiotic susceptibilities of the isolates were also determined. **Result:** Based on urine culture, significant growths were showed in 100 cases and male female ratio was 1:2.03. Fifteen children were less than 1 year old. Escherichia coli were most prominent 84% followed by Klebsiella 6%, Proteus spp 4%, Pseudomonas spp 2%, Enterobactor spp 1%, staphylococcus aurius 3%. Escherichia coli were 100% sensitive againist lmipenem, Meropenem. Majority isolated were sensitive to Amikacin, lmipenem, Meropenem, Nitrofurantoin, Netilmyicin and Gentamycin. All isolates were fully resistant to Ampicillin. **Conclusion:** Attention should be paid to restriction of antibiotic abuse in the community to retard development of further drug resistance. It is also recommended to monitor continuously the pattern of urinary pathogens from the community and their resistance patterns to guide the empirical treatment of patients in the future.

**Key words:** Urinary tract infection, Antibiotic susceptibility, Children.

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## Introduction:

Urinary tract infection is the common problem in children[1]. The incidence varies with age, race and sex of children[2,3]. Urinary tract infection is 3 to 5% girl and 1% in boy[4]. It affects male children more than female in the first year of life and female after 1 year of age[5]. There is a trend of increasing antibiotic resistance in pathogens causing urinary tract infection. The effective management needs the knowledge of various organism and there antibiotic sensitivity pattern. The aim of this study was to assess common organism causing urinary tract infection in the community and antimicrobial susceptibility pattern of these isolates.

## Methods:

This cross-sectional study was carried out in Microbiology department of Cumilla Medical College from October-2018 to September-2019. The samples were collected from children under the age of 12 years by aseptic procedure in sterile plastic disposable containers and transported to the laboratory. The urine samples were inoculated on blood agar media, Mac conkey's agar media were incubated at 37ºC for 24 hours. Colony count greater than $10^5$ colony forming unit (CFU)/ml of urine of a single microorganism or mixed flora with a predominant species was considered significant and defined as positive urine culture.

Identification of growth was done using gram staining and standard biochemical methods. Antibiotics susceptibility test was carried out on Muller Hinton agar media by disc diffusion method. Antibiotic susceptibility is determined by measuring the diameter of the zones of bacterial inhibition around the antibiotics disk and comparing the diameter with disk diffusion interpretive criteria updated annually by CLSI. On the basis of zone of inhibition, results were reported as sensitive, intermediate and resistance. The antibiotic susceptibility of Gram negative bacteria was evaluated against a panel of antibiotic including Amikacin, Ampicillin, Cefepime, Cetazidime, Cefoxitin, Ciprofloxacin, Gentamycin, Imepenem, Meropenem, Nitrofurantoin.

**Result:**

**Table-I: Age and sex**

| Age group (year) | Male | Percent | Female | Percent | Total | Percent |
|---|---|---|---|---|---|---|
| <1 | 09 | 60 | 06 | 40 | 15 | 15 |
| 1-5 | 13 | 24 | 43 | 76 | 55 | 55 |
| 6-10 | 06 | 40 | 09 | 60 | 15 | 15 |
| 11-15 | 05 | 40 | 09 | 60 | 15 | 15 |

**Table-II: Sex Distribution**

| | Number | Percentage |
|---|---|---|
| Male | 33 | 33% |
| Female | 67 | 67% |

**Table-III: Isolation of Organism**

| Name of Organism | Number | Percentage |
|---|---|---|
| Escherichia coli | 84 | 84% |
| Klebsiella spp | 06 | 06% |
| Proteus spp | 04 | 04% |
| Pseudomonas spp | 02 | 02% |
| Staphylococcus aurius | 03 | 03% |
| Enterobactor | 01 | 01% |

**Table-4: Antimicrobial Sensitivity Pattern of isolates**

| Antimicrobial Agent | Sensitivity Pattern | E.Coli | Klebsiella | Proteus | Pseudo monas | Staphylo coccus aurius | Enterobactor |
|---|---|---|---|---|---|---|---|
| Amikacin | S | 91.6% | 66.66% | 100% | 100% | 66.66% | 00% |
| | R | 8.3% | 33.34% | 00% | 00% | 33.34% | 100% |
| Cefepime | S | 44.4% | 50% | 25% | 00% | 66.66% | 00% |
| | R | 55.95% | 50% | 75% | 100% | 33.34% | 100% |
| Ceftriaxone | S | 67.71% | 66.66% | 75% | 50% | 33.34% | 00% |
| | R | 39.28% | 33.34% | 25% | 50% | 66.66% | 100% |
| Cefixime | S | 38.09% | 50% | 50% | 00% | 66.66% | 00% |
| | R | 61.90% | 50% | 50% | 100% | 33.34% | 100% |
| Ceftazidime | S | 26.19% | 33.34% | 25% | 00% | 66.66% | 00% |
| | R | 73.80% | 66.66% | 75% | 100% | 33.34% | 100% |
| Imipenem | S | 100% | 100% | 100% | 100% | 100% | 00% |
| | R | 00% | 00% | 00% | 00% | 00% | 100% |
| Nitrofurantoin | S | 88.9% | 50% | 75% | 00% | 66.66% | 00% |
| | R | 11.90% | 50% | 25% | 100% | 33.34% | 100% |
| Co-trimoxazole | S | 36.90% | 66.66% | 00% | 00% | 33.34% | 00% |
| | R | 63.09% | 33.34% | 100% | 100% | 66.66% | 100% |
| Nalidixic Acid | S | 26.19% | 66.66% | 00% | 00% | 00% | 100% |
| | R | 73.80% | 33.34% | 100% | 100% | 100% | 00% |
| Ampicillin | S | 00% | 00% | 00% | 00% | 00% | 00% |
| | R | 100% | 100% | 100% | 100% | 100% | 100% |
| Ciprofloxacin | S | 52.38% | 77.73% | 75% | 00% | 66.66% | 100% |
| | R | 47.61% | 32.27% | 25% | 100% | 33.34% | 00% |
| Gentamycin | S | 69.04% | 50% | 100% | 100% | 33.34% | 100% |
| | R | 30.92% | 50% | 00% | 00% | 66.66% | 00% |
| Meropenem | S | 100% | 100% | 100% | 100% | 100% | 100% |
| | R | 00% | 00% | 00% | 00% | 00% | 00% |
| Netilmycin | S | 90.48% | 66.66% | 100% | 100% | 100% | 100% |
| | R | 9.52% | 33.34% | 00% | 00% | 00% | 00% |

The antimicrobial susceptibility of the isolates is shown in Table-4. Escherichia coli were 100% sensitive against Imipenem, Meropenem and around 90% sensitive to Nitrofurantoin, Netilmycine, Amikacin followed by Ciprofloxacin 77.73%, Cefixime 50%, Gentamycin50% and Ceftriaxone 60.76%. Ampicillin, Co-trimoxazole, Ceftazidime and Nalidixic acid exhibiting resistance to E-coli of 100%, 63%, 73.8% and 73.8%. Klebsiella were 100% sensitive against Imipenem and Meropenem and sensitive to Co-trimoxazole, Nalidixic acid, Ciprofloxacin, Amikacin, Netilmycine, Cefixime, Gentamicin, Ceftriaxone were respectively 66.66%, 66.66% 73.73%, 66.66%, 66.66%, 50%, 50% and 50% Ampicillin, Ceftazidime, Nitrofurantoin were the least effective agents, with 100%, 66%,50% 0f Klebsiella isolates exhabiting resistance. Proteus was 100% sensitive against Imipenem, Meropenem, Gentamicin, Amikacin and Netilmicine. Sensitive to Ceftriaxone, Ciprofloxacin and Nitrofurantion were 75% respectively. Proteus isolates exhibiting 100% resistance to Ampicillin, Co-trimoxazole and Nalidixic acid. Pseudomonas was 100% sensitive to Amikacin, Imipenem, Meropenem, Netilmicine, Gentamicin and exhibiting 100% resistance to Ampicillin, Co-trimoxazole and Nalidixic acid. Enterobactor were 100% sensitive against Imipenem, Meropenem, Nitrofurantone and Netilmicine and exhibiting 100% resistance to Ampicillin, Co-trimoxazole, Ceftriaxone, Ciprofloxacin, Gentamicin, Amikacin and Nalidixic Acid. Staphylococcus aurius were 100% sensitive against Imipenem, Meropenem, and Nitilmicin and exhibiting 100% resistance to Ampicillin, Co-trimoxazole. Staphylococcus aurius were sensitive against Ceftriaxone, Ciprofloxacin, Gentamicin, Amikacin and Nanidixic Acid around 66%.

**Discussion:**

In our study. UTI was more common in female children. Male: Female ratio was 1:2.03 Other such studies also showed male: female ratio: 1:2.6[4.5]. This can be easily attributed to short urethra in female. The E.coli was the most common organism isolated 84% in our study. This was in accrordance with other studies in which E.coli was isolated from 61% to 72.8% [4.7.9-12]. However, Yokel at al and chakupurakal et al reported a very high percentage 87% [13] and 92%[14] of E.coli in this study. Similar findings of Hossin in Bangladesh showing E.coli 74% followed by Klebsiella 17.7 and Pseudomonas 2.5% [19] Another study done in BSMMU, Dhaka by Anis showed, E.coli 92%as the commonest organism responsible for UTI followed by Klebsiella, Pseudomonas, Enterobactor and Proteus[20]. Klebsiella was isolated in 6% our study. A study done in Aliger, India by Akram et al showed 22%[4]. Similar finding was also noted by different studies were klebsiella was isolated in 23.1% [10] and 15.7%15and 16.6% [16] . Proteus was the third isolate in our study occupying 4% of the total

isolate. Different studies have shown the growth of Proteus in urine from 5.8% to 12.4 % [5.10.11]. Pseudomonas spp was 2% in our study, this was comparable to other studies where Pseudomonas was isolated 2.1%[6] and 3.5%[12] respectively. Enterobactor was isolated in 1.0% of cases. Staphylococcus aurius has been isolated in 3% of cases; this is in keeping with the study carried out by other author[16].The frequency of Enterobactor isolation in this study different considerably from that of other similar surveys, isolated Enterobactor from urine cultures in only 2.3% of Iranian children with UTI [21.22]. in our study, E.coli showed sensitivity to Imipenem, Meropenem in 100% and to Amikacin, Netilmicine, Nitrofurantoin the rate around 90%. E.coli was resistance to Ampicillin in 100% and in Co-trimoxazole, Ceftazidime, Nalidixic Acid respectively 63%, 73.8% and 73.8%. A study done in Turkey also reported highest sensitivity of Nitrofurantoin 97.8% against E.coli[13]. Antibiotic susceptibility pattern of our study matched with other study were E.coli was more than 80% sensitive to Amikacin and Nitrofurantoin[7]. Other studies done in Greece and United Kingdom also reported 95.6%[9] and 93%[14] sensitivity of E.coli to Nitrofuratoin respectively. In our study, E.coli was resistant to Ampicillin 100%, Co-trimoxazole 63.6% and Nalidixic Acid 73.6%. one study done in Poland, E.coli was resistant Ampicillin in 56.8% and to Co-trimoxazole in 23.1%[17]. In our study, E.coli was resistant to Nalidixic Acid in 63.6%. Klebsiella showed 100% sensitive against Imipenem and Meropenem and sensitivity to Co-trimoxazole, Nalidixic Acid, Ciprofloxacin, Amikacin, Netilmicin, Cefioxime, Gentamicin and Ceftriaxone were respectively 66.66%, 66.66%, 73.73%, 66.66%, 66.66%, 50%,50% and 50%. In our study, Klebsiella was 100% resistant to Ampicillin. This finding was comparable to the study done in one of the tertiary centers of Eastern Nepal were Klebsiella and Proteus were 96.0% and 92.1% Sensitive to Amikacin[18]. In our study, Proteus was 100.0% sensitive to Amikacin, Imipenem, Meropenem and Gentamicine were as 100% resistant to Co-trimoxazole, Nalidixic Acid, Ampicillin. Sensitivity of Protus to these antibiotics was much lower in one study[18]. Proteus was sensitive to Nitrofurantoin, Ciprofloxacin and Ceftriaxone in 75% respectively. Our study showed Pseudomonas was 100% sensitive to Amikacin, Imipenem, Meropenem, Gentamicine, Netilmicine where as resistant to Ampicillin, Co-trimoxazole, Nalidixic Acid, Ciprofloxacin. This was comparable to other studies where Pseudomonas was isolated in 2.1%[6] and 3.5%[12] respectively. In the present study, Imipenem, Meropenem, Gentamicine, Nitrofurantoin and Netilmicine was the most effective antimicrobial agent against Enterobactor, but Co-trimoxazole , Nalidixic Acid and almost all of the cephalosporin was the least active agents against Enterobactor. Recent studies have showed that most Enterobactor were susceptible to third-generation cephalosporin[23]. Others found that 31% of Enterobactor infections were not susceptible to third-generation Cephalosporine[24]. In addition, a high rate of enterobactor resistance to Fluoroquinolone and Cephalosporine antibiotics has been reported in European countries, South America, Asia and Pacific regions[25].

**Limitations:** Small sample, absence of long-term follow up.

**Conclusion:**

Uropathogens become resistant at an increase rate of commonly used antimicrobials as reveled in this study. So, Regular surveillance of the developing resistance in uropathogen due to inappropriate use of antibiotic is necessary to reduce complication in children with urinary tract infection.

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*Original Article*

# Epidemiologcal and Clinical Profile of Epilepsy in Cerebral Palsy Children

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**Abstract:**

**Background:** Cerebral palsy (CP) describes a group of permanent disorders of development of movement and posture, causing activity limitations, that are attributed to nonprogressive disturbances that occur in developing fetal or infant brain. The motor disorders of cerebral palsy are often accompanied by disturbances of perception, cognition, communication and behavior, by epilepsy and by secondary musculoskeletal problems. CP is a major cause of childhood disability and has been described as one of the most common life-long developmental disability in childhood. It is more prevalent in the more socioeconomically deprived populations of the world. Epilepsy is said to occur in 15-90% of children with CP and this posses additional economic and psychological stress on affected children and their family. **Objectives:** Purpose of this study was to evaluate the epidemiologcal and clinical profile of epilepsy in cerebral palsy children. **Methods:** This cross sectional observational study was conducted among 100 patients of cerebral palsy with (study group: case) or without epilepsy (comparison group: control). Study was conducted over a period of one year from December 2018 to December 2019 in Department of pediatrics, Central Medical College Hospital. Epilepsy in suspected cases of neurometabolic and neurodegenerative disorder, whose presentation is as like as cerebral palsy and epilepsy in progressive neurological disorder were excluded from study. Clinical examination and relevant investigation were done meticulously. Data were collected from the patient's guardian after taking informed written consent. Quantitative data expressed as mean and standard deviation and qualitative data as frequency and percentage. Statistical hypothetical test was done by student t-test, chi-square test. Comparison was done by tabulation and graphical presentation in the form of tables, bar diagrams, histogram & charts etc **Result:** Epilepsy occurred in 37.5% of the studied children. Epilepsy most commonly affected children with spastic quadriplegia (47.5%). GTCS is more common in spastic quadriplegic CP and partial seizure common in spastic hemiplegic CP. On evaluation of motor abnormality, poor neck control was more (36.66%) in group B, but absent sitting was more (40%) in group A.LBW, prematurity, delayed cry, neonatal Jaundice, neonatal Sepsis, neonatal Convulsion and postnatal CNS .infection were significantly found to be related to increased risk of epilepsy in children with CP.

**Key words:** Cerebral Palsy in children, Epilepsy, Neonatal convulsion.

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**Conclusion:** Epilepsy is a frequent problem in children with CP. A history of neonatal convulsion, occurrence of seizure in the first year of life, LBW, prematurity and post-natal CNS infection all warrant a close evaluation and appropriate follow up for early detection of epilepsy in children with CP

**Introduction:**

CP is not a single diagnosis but an umbrella term encompassing a group of non-progressive brain lesions involving motor or postural abnormalities noted during early development. Cerebral palsy describes a group of permanent disorders of development of movement and posture, causing activity limitations that are attributed to nonprogressive disturbances that occur in developing fetal or infant brain. The motor disorders of cerebral palsy are often accompanied by disturbances of sensation, perception, cognition, communication and behavior, by epilepsy and by secondary musculoskeletal problems.[1] Epidemiologic studies of CP have traditionally grouped children with CP into phenotypic sub types based on distribution of limb weakness and type of tone

abnormality- hemiplegic, diplegic, quadriplegic, ataxic, hypotonic, dyskinetic and mixed. A Scandinavian study reported that 33% of CP population was hemiplegic, 44% diplegic and 6% quadriplegic.[2]

Most of the CP patients also have some associated problems like epilepsy, mental retardation and problem related to speech, hearing, vision or behavior. Among them epilepsy one of the commonest associated problem in patients of CP.[3] The diagnosis of CP always involves a motor deficit that the child is not reaching motor milestones at the appropriate chronological age. A medical history establishes that the patient does not have a progressive disease. This history, combined with a neurologic examination establishing that the patient's motor deficit is due to a cerebral abnormality, leads to the diagnosis of the CP. Serial examinations may be necessary to assure the diagnosis of CP, especially when the history is not reliable.[2] Epilepsy is considered to be present when two or more unprovoked seizures occur at an interval greater than 24 hour apart.

On evaluation of risk factors, intrauterine exposure to maternal infection (chorioamnionitis, inflammation of placental membrane cord inflammation, foul smelling amniotic fluid, maternal sepsis, temperature >38$^0$C during labor, UTI) is associated with a significant increase in the risk of CP in normal birth weight infants. Elevated levels inflammatory cytokines are noted in heelstick blood collected at birth from children who later were identified with CP.[4] Low birth weight and short gestation are important risk factor for CP premature influent who are small for their short gestation are specially high risk. CP arising in low birth weight infant constitute a large and increasing sector of total CP because increasing numbers of these high risk infants are surviving.[5] Among low birth weight infant those with congenital malformation and chorionitis are a special risk of CP.

One third of ataxic CP appears to be inherited as autosomal recessive disorders. Inborn errors of amino acids and organic acid metabolism also are at increased risk for developing CP as hyperammonemic come may exhibit spastic quadriplegia[6] and glutamic aciduria type-1 exhibit extra pyramidal CP. The risk recurrence of CP in an affected family is about 10%.[6] Congenital malformation of the brain including neuronal migration defect and cerebral dysgenesis also can manifest as CP most commonly as spastic quadriplegia.[12] Claudine et al. in the study found that most of the CP were associated with severe congenital anomalies but not attributable to birth asphyxia.[7]

Seizure is a common neurological disorder in the pediatric age group and occurs with a frequency 3-6 cases per thousand children.[8] In India incidence is 4-7.8/1000 and prevalence is higher.[9] In Bangladesh there is no national statistics of incidence and prevalence. One study on childhood seizures revealed intracranial infection (36%), febrile seizure (24.97%) and epilepsy (17.33%).[10] It is a common health problem, which carries with it a variety of medical social, psychological and economic burdens. Childhood epilepsy differs from adult epilepsy since the brain is a developing organ. The clinical picture is not static and the pattern of epilepsy may change with age.

In the general childhood population the prevalence of epilepsy is between 3-6 per 1000.[8]Overall epilepsy occurs in between 15-55% of children and adult with CP.[11] Likewise Swaaiman KF5 also observed epilepsy in 25-33% of patients with CP. Epilepsy is more common in some form of CP than in others. It has been observed that seizures in the children tend to have an earlier onset, necessitating the use of more than one antiepileptic drugs.[12,13]Extensive research has been done in this field in the developed world but there are few published data in developing countries like Bangladesh. The present study aims was to observe the prenatal, natal and postnatal factors on development of epilepsy in children with CP.

**Methods:**

The study was a cross sectional observational study among 100 patients of cerebral palsy with (study group: case) or without epilepsy (comparison group: control). Study was conducted over a period of one year from December 2018 to December 2019 in Department of Paediatrics, Central Medical College Hospital, Comilla. Patient who has no responsible attendants for giving history properly, epilepsy in suspected cases of neurometabolic and neurodegenerative disorder, whose presentation is as like as cerebral palsy and epilepsy in progressive neurological disorder were excluded. Diagnosis of cerebral palsy were clinical, based on disorder of posture and movement of cerebral origin with improving developmental trend and findings related to centers controlling posture and movement as would be documented by findings related to pyramidal , extrapyramidal and cerebellar system. Epilepsy is defined as occurrence of two or more unprovoked seizures. Diagnosis of epilepsy based on history from a reliable eye witness or video documentation if available and EEG were done in selected cases. Neuroimaging, EEG and other relevant investigation were done based on the patient status and affordability. Finally all risk factors, clinical profiles were compared between two groups to find out the associated factors epilepsy. The pre-structured Case Record Form (CRF) was filled up by the study physician himself. The case definitions of operational variable were described. Patient data such as age, sex, clinical presentation, etcwere noted. This data was used for collection of information by interviewing parents. All the

collected informations were checked very carefully to identify errors in collecting data. Data processing work consisted of registration of schedules, editing, coding and computerization, preparation of dummy tables, analysis and matching data. The technical matters of editing, encoding and computerization looked by researcher.

**Result:**

In this study total 100 cases of different ages were studied in two groups, children with CP having epilepsy were in group A (40, 40% cases) and children with CP not having epilepsy were in group B (60, 60% cases).

Age distribution (Table I) of the patients shows age range was 0.5-9.5 years and 0.5-10 years in group A and group B respectively. Mean (±SD) age was 2.39±2.07 year in group A and 2.44±1.98 year in group B. Maximum case were in the age group of <2 years 21 (52%) in group A and 33 (54.4%) in group B. Mean age of two group was comparable (p=0.821).

**Table I: Age distribution of patients (n=100)**

| Age in Year | Group A (n=40) | | Group B (n=60) | |
|---|---|---|---|---|
| | n | % | n | % |
| <2 | 21 | 52 | 33 | 55 |
| 2-5 | 17 | 42.5 | 22 | 36 |
| >5 | 2 | 5 | 5 | 9 |
| Mean±SD | 2.39±2.07 | | 2.44±1.98 | |
| Range | (0.50-9.5) | | (0.50-10) | |

Sex distribution revealed that, male cases were 24 (60%) in group A and 34 (56.4%) in group B. Both groups are comparable in relation to sex (p=0.480).(Table-II)

**Table II: Sex distribution of the patients (n=100)**

| **Sex** | **Group A (n=40)** | | **Group B (n=60)** | |
|---|---|---|---|---|
| | **n** | **%** | **N** | **%** |
| Male | 24 | 60 | 34 | 56.67 |
| Female | 16 | 40 | 26 | 43.33 |

Table III demonstrated that Patients came from both urban and rural areas with rural (58 %) preponderance (A and B). Rural dwellers were 23 (57.5%) in group A and 35 (58.33%) in group B, on the other hand Urban dwellerswere 17 (42.5%) in group A and 25 (41.66%) in group B. Both groups are comparable in relation to habitation (p=0.463).

**Table III : Distribution of the patients according to residence (n=100)**

| **Residence** | **Group A (n=40)** | | **Group B (n=60)** | |
|---|---|---|---|---|
| | **n** | **%** | **N** | **%** |
| Urban | 17 | 42.5 | 25 | 41.66 |
| Rural | 23 | 57.5 | 35 | 58.33 |

Table IV shows the result of place and mode of delivery in both group (A and B). In group A home delivery was (10%) more than hospital delivery, but in group B hospital delivery was (3%) more than home delivery. On the other hand normal vaginal delivery (50%) was more than caesarean section in both groups. Both groups are comparable in relation to place (p=0.245) and mode of delivery (p=0.789).

**Table IV : Place and Mode of delivery of patients (n=100)**

| **Sex** | **Group A (n=40)** | | **Group B (n=60)** | |
|---|---|---|---|---|
| | **n** | **%** | **n** | **%** |
| Place of delivery | | | | |
| Home | 22 | 55 | 29 | 48.33 |
| Hospital | 18 | 45 | 31 | 51.67 |
| Mode of delivery | | | | |
| NVD | 30 | 75 | 45 | 75 |
| CS | 10 | 25 | 15 | 25 |

Table V shows the risk factors. LBW was the commonest risk factor in group A (30%) and delayed cry was the commonest in group B (35%). Although when adjusted with other risk factors, delayed cry did not reach statistical significance LBW (p=0.035), neonatal convulsion (p=0.022), postnatal CNS infection (p=0.016) were strong predictors for epilepsy.

**Table V : Risk factors in studied children (n=100)**

| **Risk factors** | **Group A (n=40)** | | **Group B (n=60)** | | **P Value** |
|---|---|---|---|---|---|
| | **n** | **%** | **N** | **%** | |
| ANC (absent) | 4 | 10 | 07 | 11.66 | 0.808 |
| Maternal illness | 4 | 10 | 07 | 11.66 | 0.167 |
| LBW | 12 | 30 | 07 | 11.66 | 0.035 |
| Prematurity | 3 | 7.5 | 05 | 8.33 | 0.367 |
| Delayed Cry | 4 | 10 | 21 | 35 | 0.463 |
| Neonatal Jaundice | 4 | 10 | 4 | 6.66 | 0.064 |
| Neonatal Sepsis | 3 | 7.5 | 3 | 5 | 0.189 |
| Neonatal Convulsion | 3 | 7.5 | 6 | 10 | 0.022 |
| Postnatal CNS infection | 3 | 7.5 | 1 | 1.6 | 0.016 |

Table VI shows type of CP in both groups. Spastic quadriplegia type was commonest in both groups (47.5% and 41.67%).

**Table VI : Type of cerebral palsy in studied children (n=100)**

| **Type of cerebral palsy** | **Group A (n=40)** | | **Group B (n=60)** | |
|---|---|---|---|---|
| | **n** | **%** | **n** | **%** |
| Spastic Quadriplegia | 19 | 47.5 | 25 | 41.67 |
| Spastic Diplegia | 9 | 22.5 | 15 | 25 |
| Spastic Hemiplegia | 4 | 10 | 10 | 16.67 |
| Hypotonic | 2 | 5 | 3 | 5 |
| Dyskinetic | 3 | 7.5 | 4 | 6.6 |
| Mixed | 3 | 7.5 | 3 | 5 |

Table VII shows motor abnormality in both groups. Poor neck control was more (36.66%) in group B, but absent sitting was more (40%) in group A.

**Table VII : Motor abnormality of CP patients (n=100)**

| Motor abnormality | Group A (n=40) | | Group B (n=60) | |
|---|---|---|---|---|
| | n | % | n | % |
| Poor neck control | 15 | 37.5 | 22 | 36.66 |
| Absent sitting | 16 | 40 | 19 | 31.6 |
| Absent standing | 7 | 17.5 | 12 | 20 |
| Absent walking | 2 | 5 | 7 | 11.66 |

Fig-I shows type of epilepsy in children with CP having epilepsy (n=40). GTCS was commonest type of seizure (62%).

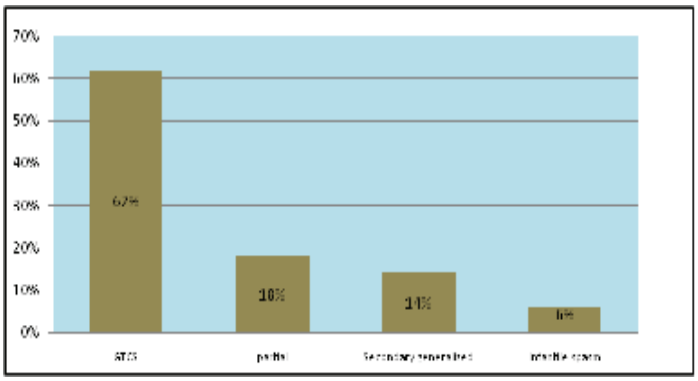


**Fig-2 : Type of epilepsy in children with CP having epilepsy (n=40)**

Table VIII shows onset of first unprovoked seizure in children with CP onset of seizure was significantly ($p<0.05$) earlier. 29 (72.5%) of CP with epilepsy children manifested first seizure before one year of age.

**Table VIII : Age of onset of seizure in CP patients with epilepsy (n=40)**

| Age in month | Group A (n=40) | |
|---|---|---|
| | N | % |
| 0-12 | 29 | 72.5 |
| 13-24 | 6 | 15 |
| 25-36 | 2 | 5 |
| 37-48 | 2 | 5 |
| 49-60 | 1 | 2.5 |
| >60 | 1 | 2.5 |
| Mean±SD | 13.53±13.03 | |
| Range | (3-68) | |

Fig-II shows distribution of the seizure types in children with CP and epilepsy (n=40). GTCS was the commonest type of seizure in spastic quadriplegic CP and partial type in spastic hemiplegic CP.

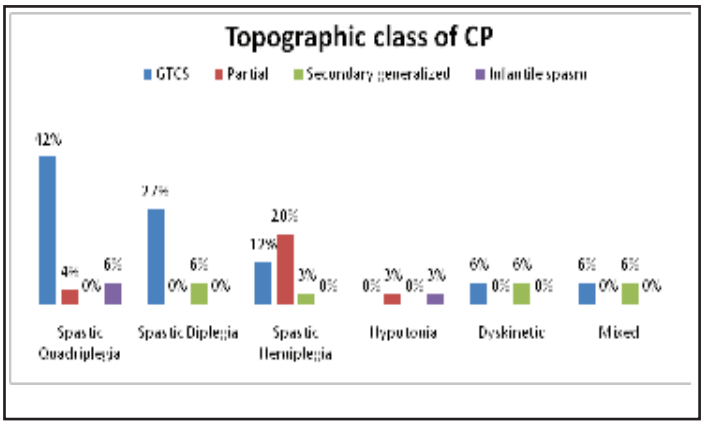


**Fig-3 : Distribution of the seizure types in children with CP and Epilepsy (n=40)**

**Table IX : Type of Epilepsy vs risk factors cross tabulation (n=40)**

| Epilepsy type | Risk factors | | | | | | | | | Total |
|---|---|---|---|---|---|---|---|---|---|---|
| | ANC (absent) | Maternal illness | LBW | Prematurity | Delayed cry | Neonatal Jaundice | Neonatal Sepsis | Neonatal Convulsion | Postnatal CNS infection | |
| GTCS | 2 | 1 | 6 | 2 | 3 | 1 | 1 | 1 | 2 | 19 |
| Partial | 1 | 2 | 3 | 1 | 1 | 1 | 2 | 0 | 0 | 11 |
| Secondary Generalized | 1 | 1 | 1 | 0 | 0 | 1 | 0 | 1 | 1 | 06 |
| Infantile spasm | 0 | 0 | 2 | 0 | 0 | 1 | 0 | 1 | 0 | 04 |
| Total | 04 | 04 | 12 | 03 | 04 | 04 | 03 | 03 | 03 | 40 |

**Table X : Bivariate associations between epilepsy and predictor variables**

| | Number within epilepsy | Chi square | p value |
|---|---|---|---|
| ANC (absent) | 16 | -0.012 | 0.404 |
| Maternal illness | 5 | -0.069 | 0.084 |
| LBW | 19 | 0.105 | 0.018 |
| Prematurity | 7 | -0.045 | 0.184 |
| Delayed Cry | 14 | -0.037 | 0.232 |
| Neonatal Jaundice | 9 | 0.093 | 0.032 |
| Neonatal Sepsis | 8 | 0.066 | 0.095 |
| Neonatal Convulsion | 16 | 0.115 | 0.011 |
| Postnatal CNS infection | 6 | 0.121 | 0.008 |

Table X shows bivariate associations between epilepsy and predictor variables. LBW (p=0.018), neonatal jaundice (p=0.032), neonatal convulsion (p=0.011) and postnatal CNS infection (p=0.008) were statistically significant.

**Discussion:**

Risk factors of epilepsy among children with cerebral palsy (group A, 40 cases) have been described and compared with children with cerebral palsy without epilepsy (group B, 60 cases). Results of these two groups were compared. Epilepsy affected 40% of the children with CP in this study,

which is in accordance with similar studies (Kwong[13], Langunju,[14] Kulak,[15] Carlsson,[16] Hadjipanayis,[17] Zelnik[18]) where frequencies of between 29% and 42% have been reported.

Mean (±SD) age was 2.39±2.07 year ranged from 0.5-9.5 years in group A. Likewise in group B (mean ±SD) age 2.44±1.98 ranged from 0.5-10 years. The majority of the patients were under 2 years of age, in both group A (52%) and group B (54.4%).Regarding sex distribution, there was preponderance of male over female in both groups. Male female ratio was 1.5:1 (group A) and 1.29:1 (group B).Age, sex, mode and place of delivery, associated problems (hearing impairment, vision impairment, speech delay, psychosocial delay, microcephaly) did not differ significantly between these two groups. So these factors have no significance for the development of epilepsy in CP. In this study, in group A home delivery was (10%) more than hospital delivery, but in group B hospital delivery was (03%) more than home delivery. On the other hand normal vaginal delivery (50%) was more than caesarean section in both groups. Lagunju[14] and Kulak[15]show similar result. In this study, LBW was present more frequently (42%) in CP with epilepsy and was significantly associated with an increased risk of epilepsy. Our findings are similar with studies of Kulak[15].

Prematurity was present in 15% in group A and 19.6% in group B in this study and showed significant relation to develop epilepsy in CP by logistic regression analysis but not significant in bivariant associations. No data has found to be supportive to this finding. Neonatal jaundice was present 10.% and 6.6% in group A and group B respectively in this study and showed significant relation to develop epilepsy in CP by bivariant associations but not significant in logistic regression analysis. No data found to be supportive to this finding. This study showed a significant relationship between neonatal convulsion and development of epilepsy but following regression analysis, neonatal convulsion was not found to be a significant predictor of epilepsy in CP. Similar result have been reported by others (Kwong[3], Langunju,[14] Kulak,[15] Carlsson,[16] Hadjipanayis,[17] Zelnik[18]).

Postnatal CNS infection was present 7.5% in group A and 1.6% in group B in this study and showed significant relation to develop epilepsy in CP. Lagunju[14] and carlsson[16] showed similar result.In this study, spastic quadriplegic type of CP was more common in both group followed by spastic diplegia. Kulak[15] and Hadjipanayis[17] showed similar result. The most common forms of seizure found in children with CP in this study were GTCS (62%), partial (18%), secondary generalized (14%) and less common forms seen was infantile spasm (6%). This finding is consistent with reports from previous studies Lagunju[14] showed frequency of epilepsy was highest in children with spastic quadriplegia (40%) and major seizure types were GTCS (53.8%), partial seizure 18.5% and infantile spasm [15].4%. The findings of the present study showed that epilepsy was more likely to have in children with quadriplegic CP. Similar result have been reported by others (Kwong[3], Carlsson,[16] Hadjipanayis,[17]).In this study, average age at onset of epilepsy was 13.53 months with the first seizure occurring during the first year of life in 73.33% of patient of group A which is similar with Kulak.[15]

**Conclusions:**

Epilepsy is a frequent problem in children with CP. The presence of epilepsy is associated with increased risk of cognitive problems and a greater burden of care. Both the diagnosis and management of associated epilepsies require skills additional to those needed for uncomplicated CP. A history of neonatal convulsion, occurrence of seizure in the first year of life, LBW, prematurity and post-natal CNS infection all warrant a close evaluation and appropriate follow up for early detection of epilepsy in children with CP.

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*Original Article*

# Short term Outcome in Patients with Right Ventricular Infarction Associated with Acute Inferior Wall Myocardial Infarction

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**Abstract:**

**Background:** Acute Myocardial Infarction is a major cause of mortality and morbidity in general population. Acute Inferior wall myocardial Infarction when complicated with Right Ventricular Infarct further increases the risk for outcome of the patients. **Method:** A Cross sectional study was done in Department of Cardiology, Comilla Medical College Hospital during July 2019 to June 2020. Total 65 patients with Acute Inferior Wall Myocardial Infarction were enrolled in the study. 20 patients had Right Ventricular Infarction and 45 had no evidence of Right Ventricular Infarct acted as control. All the baseline characteristics, management and outcome were recorded. The variables analyzed in the study will divided into categorical and continuous variables. The categorical variables were described as frequencies and percentages, while continuous variables were presented as medians and interquartile range (IQR) values and means and standard deviations. All statistical analyses were performed using Statistical Package for Social Sciences (IBM SPSS Statistics 26.0)

**Results:** A total of 65 patients were included in this study. Male were 49 (75.38%) and female were 16 (24.62%). 60% of the respondents were belonged to 51 – 70 year age group. Case group, 20 patients had ST elevation > 0.1 mV in lead V4R. All of them got standard treatment. Diuretics and nitrates were avoided in case group. RVI found in 30.8% patients having AIWMI. All but diabetes mellitus were nearly equally distributed in two groups $p>0.05$). Heart failure and cardiogenic shock were observed to be considerably higher in cases (45% and 85%) than those in controls (11.11% and 11.11%) respectively $p<0.05$ and ($p<0.001$). Statistically significant, recurrent angina / MI, arrhythmia and mortality were higher in RVI group. Patients with raised jugular venous pressure (JVP) had significantly worse in-hospital outcome in terms of arrhythmia, cardiogenic shock and mortality compared to AIWMI without raised JVP. **Conclusion:** In this study we found worse outcome in patients with Acute Inferior Wall Myocardial Infarction complicated with Right Ventricular Infarct than those without RV Infarct.

**Key Words:** Acute Inferior wall Myocardial Infarction (AIWMI), Right Ventricular Infarction (RVI), Electrocardiogram (ECG).

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**Introduction:**

Myocardial Infarction (MI) was previously thought to be a disease of mainly in the left ventricle, right ventricular involvement was just a pathological entity.

Acute Inferior Wall Myocardial Infarction (AIWMI) with right ventricular infarction (RVI) was first recognized in a sub+group of patients who developed right ventricular failure with normal left ventricular filling pressure.[1]

The incidence of RVI is varies depending on criteria used for detection.[2,3,6] Autopsy studies suggested that RVI accompanies fatal IWMI in 24 to 34 percent of cases.[4,5] Non-invasive studies suggest that RVI occurs in more than 30 percent of patients with IWMI.[4,5] Acute myocardial infarction (AMI) involving only the RVI is a rare event. RVI in the setting of an acute IMI is much more common.

Its presence defines a high-risk subgroup of patients with acute IMI who should be considered high-priority candidates for reperfusion. Ischemia or infarction of the right ventricle results in decreased RV compliance, reduce filling, and decreased RVEF. In turn, these changes lead to diminished left ventricular filling and drop in cardiac output (CO) that could result in systemic hypotension and shock. Frequent accompaniments may include atrial infarction, sinus bradycardia, atrial fibrillation, and atrioventricular block (A-V block). Hence the presence of RVI should raise a clinical alert for its potential immediate life-threatening consequences[5] .

Anatomic evidence of RVI is more common than expected hemodynamic pattern.[4] RVI in acute IMI can be diagnosed clinically, electrocardiographically (ECG), echocardiographically, radionuclide studies and angiographically. The classic symptoms that are associated with inferior wall infarction: hypotension, raised JVP and clear lung fields are strong indicators of RVI.[7]

Right-sided ECG evaluation of all patients with IMI at the time of presentation is currently the gold standard in the diagnosis of RVI. ST elevation >1mm in right chest lead V4R is 70% sensitive and nearly 100% specific for RVI.[8] The work carried out in this study was to look at the presentation and early outcomes of noninvasive management of RVI complicating IMI in the current era in the setting of a peripheral teaching hospital.

The incidence of RVI in such cases ranges from 10%-50%, depending on the series.[9] Another three studies in abroad showed incidence of RVI were, 54%,[4,12], 37%.[10] In Bangladesh it is found that RVI was 40%[11,12,13]

The principal cause of RVI is atherosclerotic proximal occlusion of the right coronary artery.[14] The etiology and pathogenesis are similar to that of left ventricular infarction.

Clinical recognition of acute RVI is extremely important, as it causes decreased RV compliance, reduced filling and stroke volume followed by diminished LV filling and cardiac output.[15,16] The triad of hypotension, elevated JVP, and clear lung fields has been recognized as marker of RVI in acute inferior wall M1.[17]

Volume loading helps to maintain the CO and BP of the patient.[18] Response to reperfusion depends on the duration of the preceding ischemia. Early reperfusion leads to prompt improvement and subsequent recovery of RV free wall contraction and global RV function without any scar formation.[18]

When IMI is complicated by RVI, however, the in-hospital mortality may be as high as 31 %, as compared with 6% for patients with inferior myocardial infarction.[2,24]There are conflicting data, that right ventricular dysfunction after a myocardial infarction is an independent risk factor for higher long-term mortality .[24.25.26.27]

**Method:**

A Cross sectional study was done in Department of Cardiology, Comilla Medical College Hospital during July 2019 to June 2020. Total 65 patients with Acute Inferior Wall Myocardial Infarction were enrolled in the study. 20 patients had Right Ventricular Infarction and 45 had no evidence of Right Ventricular Infarct acted as control. All the baseline characteristics, management and outcome were recorded. The variables analyzed in the study will divided into categorical and continuous variables. The categorical variables were described as frequencies and percentages, while continuous variables were presented as medians and interquartile range (IQR) values and means and standard deviations. All statistical analyses were performed using Statistical Package for Social Sciences (IBM SPSS Statistics 26.0)

**Result:**

A total number of 65 patients were included in the study. They were divided into two groups. Group-A (AIWMI with RVI) includes 20 cases, group-B (AIWMI without RVI) includes 45 controls. The following results were obtained.

**Table-I: Distribution of respondents by age and sex:**

| Parameters | Frequency | Percentage | Statistics |
|---|---|---|---|
| 30 – 50 year | 20 | 30.8 | Mean = 58.88 yrs Median = 65 yrs SD (± ) = 12.578 yrs Minimum = 30yrs Maximum = 80yrs. |
| 51 – 70 year | 39 | 60.0 | |
| 71 – 80 year | 6 | 9.2 | |
| Male | 49 | 75.38 | |
| Feamle | 16 | 24.62 | |

Table-I: demonstrates that among total 65 patients maximum respondents were in 51-70 years age group [39 (60%)], minimum age 30 years, maximum age 80 years. Among participants male patients were 49 (75.38%), female were patient16 (24.60%).

**Table-II: Distribution of risk factors between the groups (n=65)**

| Risk factors | Groups | | |
|---|---|---|---|
| | Case (n=20) | Control (n= 45) | |
| Smoking | 15 (75%0 | 30 (66%) | NS |
| HTN | 8 (40%) | 16 ( 35%) | <0.05 |
| DM | 9 (45%0 | 10 (22%) | NS |
| Dyslipidaemia | 19 (80%) | 30 (66.66%) | NS |
| Family History of IHD | 3 (15%) | 5 (11%) | NS |

Table-II: demonstrates that risk factors for both groups were similar, statistically not significant, except DM, where RVI were more and statistically significant.

**Table-III: Incidence of Right Ventricular Infarction (RVI) inpatients of Acute Inferior Wall Myocardial Infarction (AIWMI**

| In hospital outcome | Groups | | P - value |
|---|---|---|---|
| | Case (n=20) | Control (n= 45) | |
| Recurrent angina/MI | 9 (45%0 | 7 (15%) | <0.05 |
| Heart Failure (Killip class) | 9 (45%0 | 5 (11.11%) | <0.05 |
| Arrhythmia | 14 (75%) | 5 (11.11%) | <0.05 |
| Cardiogenic shock | 17 (85%0 | 5 (11.11%) | <0.05 |
| Death | 2 (10%) | 0 (0%) | <0.05 |

Table-III: Demonstrates that incidence of right ventricular infarction inpatients of acute inferior wall myocardial infarction was 30.8%

**Table-IV: Comparison of clinical presentation between groups (n=65)**

| Type of infarction in ECG | Frequency | Percentage |
|---|---|---|
| Inferior wall with Right ventricle | 20 | 30.8 |
| Inferior wall. | 45 | 69.2 |
| Total | 65 | 100 |

Table-IV: Demonstrates that comparison of clinical presentations in between groups states chest pain occurred approximately in all patients, which were statistically not significant. Other clinical presentation like dyspnoea, syncope/ presyncope, bradycardia (Heart rate< 60 bpm), hypotension (SBP < 80 mmHg), raised JVP were more in group-I patients which were statistically significant.

**Table-V: In-hospital short outcome in between groups (n-65)**

| Clinical Presentation | Groups | | P - value |
|---|---|---|---|
| | Case (n=20) | Control (n=45) | |
| Chest Pain | 18 (90%) | 40 (88%) | NS |
| Dyspnoea | 10 (50%) | 6 (13%) | <0.05 |
| Syncope/ Presyncope | 14 (70%) | 5 (11%) | 0.001 |
| Heart rate | 9 (45%) | 4 (8.88%) | 0.002 |
| Systolic BP<80 mmHg | 16 (80%) | 5 (11.11%) | <0.01 |
| Raised JVP | 15 (75%) | 5 (11.11%) | 0.001 |

Table-V: In-hospital short outcome in between groups demonstrates that recurrent angina / MI, Heart Failure, Arrhythmias, Cardiogenic shock, mortality were more in group -1 patients, were statistically significant.

**Discussion:**

The right coronary artery (RCA) provides the predominant blood supply to the right ventricle, supplying the lateral wall through the acute marginal branches, in the majority of patients, it also supplies the posterior wall and posterior inter ventricular septum through the posterior descending artery.

Identification of RVI in CCU was based on clinical findings and electrocardiographic changes. Clinically patients have the features of raised JVP, hypotension and clear lung bases. Right sided chest leads are useful for diagnosis. It is now established that ST elevation of > 0.1 mV in V4R is highly specific as well as sensitive.[8]In our study ST elevation of> 1mm in V4R was observed in all cases.

The age, sex, and risk factors of the sampled population were similar with the previous study[21,8,22] except DM. Necropsy series revealed evidence of RVMI were 14% to 60% in deaths from IMI.[21,8] Clinically, RVMI complicates about 50%[10] of acute IMI on the basis of an ST-segment elevation of > 0.1 mV in lead V4R. Bangladeshi showed RVI were 30% to 40% [11,12,13,24] which is very much similar to our present study (30.8%). This incidence also consistent with one study in India,[25] and another study in Pakistan. [27]

Biomarkers were found higher in group-a compared to the group-B, which indicates more myonecrosis in RVI.[3]

The classical triad of hypotension, raised JVP and clear lung fields occurred in majority of these patients of RVI. The diagnosis of RVMI can be made clinically if these features are present in patients with IMI. We followed the standard modality of treatment, most of the patients responded well except two who developed shock, arrhythmia and succumbed to death.

Over three-quarter of the cases had arrhythmia in our study which is almost similar to one previous study in Bangladesh[12] but greater than several other studies.[8,13,22]

Heart failure and cardiogenic shock were found considerably higher in case than those in control group. ( $p<0.05$ and $p<0.01$ respectively) which is higher than three previous studies,[10,15,25,26] which might be due to lack of percutaneous coronary intervention and cardiac pacing.

Occurrence of HF, shock and Arrhythmia in IMI was associated with more mortality in RVI. RVMI significantly increases the risk of major complications and in-hospital

death up to 31%compared to only about 6% in IMI per se[2,27.] In present study the mortality was 10% and 0% respectively, with or without RVI in acute IMI, which is almost similar to previous Bangladeshi studies, as 13%[11,13,23] Other studies in abroad showed the mortality were 16%.[8,22]

**Conclusion:**

In this study we found worse outcome in patients with Acute Inferior Wall Myocardial Infarction complicated with Right Ventricular Infarct than those without RV Infarct. Diabetes mellitus was significantly associated with RVI. Clinical findings and ECG proved sensitive tools for diagnosis of RVI in AIWMI patients.

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