Welcome to Presentation of Thesis Proposal

Title

Bacterial profile of neonatal septicemia and Antibiotic susceptibility pattern of neonate admitted at special care newborn unit of Rajshahi medical College hospital

Submitted by

Dr. Md. Hasan Ali Molla
MBBS, MD student (3rd part)
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Department of Paediatrics
Rajshahi Medical College, Rajshahi.

Name of the Guide

Professor Dr. Shahida Yeasmin
Professor & Head
Department of Paediatrics
Rajshahi Medical College Hospital, Rajshahi

INTRODUCTION

Introduction

- Neonatal septicemia (NS) is a clinical syndrome of systemic illness associated with bacteremia in the first 28 days of life (Glaser et al., 2021).
- Multiple risk factors are associated with neonatal infection including low birth weight, maternal history of urinary tract infection, formula feeding, cesarean section, pre-term birth, home delivery, prolonged labor and premature rupture of membranes, antenatal urinary tract infection and intrapartum fever.
- Neonates with bacteremia may be asymptomatic so, laboratory testing is crucial for diagnosis.

Introduction Cont..

- In cases of suspected sepsis in a neonate, a blood culture should be promptly obtained (Raymond et al., 2017).
- Empiric antibiotic treatment should be started when sepsis is clinically suspected, even without confirmatory lab data.
- The antimicrobial resistance patterns of prevalent bacteria in the neonatal critical care unit guide the first selection of drugs (Polin, 2012).
- Increasing antibiotic resistance is a concern for neonatal sepsis. It is essential to stop unjustified prolonged use of antibiotics.

Introduction Cont..

- Antimicrobial sensitivity pattern differs in different places, different studies, as well as at different times in the same hospital.
- Indiscriminate use of antibiotics leads to emergence of resistant strains of pathogens.
- Still now proper antibiotic regimen is not adopted in our country, high resistance observed due to excessive and irrational use of antibiotics at primary health facilities from where neonates are referred to our tertiary centers.
- The study will be done to evaluate the causative pathogens and their drug sensitivity pattern which will certainly help in the choice of specific antibiotic during treatment of septicemic neonates.

RATIONALE

Rationale

- Despite considerable advancements in the latest techniques for early detection and introduction of novel antibiotics, still now it continues to be the predominant cause of neonatal mortality accounting for 30-50% of total neonatal deaths.
- It varies from one country to another due to differences in hygiene practices, antibiotic use patterns, detection technique and broader epidemiological factors.
- Accurately identifying bacterial pathogens causing neonatal sepsis and their antibiotic susceptibility patterns is crucial for effective patient management.

Rationale Cont..

- The spectrum of species responsible for neonatal septicemia changes over time and varies with region and diagnosed center.
- Understanding the bacterial profiles and drug susceptibility patterns causing neonatal sepsis is critical for guiding proper therapy, improving patient outcomes and preventing the emergence of antibiotic resistance.
- Epidemiological data from developing countries reveal significant disparities in bacterial patterns from developed countries.

Rationale Cont..

- Alarming finding is that high proportion of organism are becoming resistant to commonly used antibiotics over the last few years.
- In poor and underdeveloped countries, *Klebsiella pneumoniae, E. coli* and *Enterobacter* are the prevalent gram-negative pathogens whereas *Staphylococcus aureus* and *coagulase-negative staphylococci* are the leading gram-positive pathogens.
- This study will be conducted to ascertain the bacteriological profile of newborn septicemia and associated antibiotic susceptibility patterns.

Research Questions

i) What is the bacteriological profile of neonatal septicemia in Special Care Newborn Unit (SCANU) of Rajshahi Medical College Hospital?

ii) What is the antibiotic susceptibility pattern of the isolated bacteria in neonatal septicemia?

OBJECTIVES

General Objective

- To determine the microbiological profile of neonatal septicemia along with the antibiotic susceptibility pattern of the isolates from neonates admitting in Special Care Newborn Unit (SCANU) of Rajshahi Medical College Hospital.

Specific objectives

- To isolate and identify bacterial agents from the patients of neonatal septicemia by microscopy and culture.
- To find out antimicrobial susceptibility pattern of isolated bacteria by modified Kirby Bauer disc diffusion method.
- To find out the sociodemographic characteristics of the neonates.
- To see the relationship of antibiotic susceptibility pattern of neonates with sociodemographic variables.

METHODS AND MATERIALS

- **Study design:** The study will be a cross-sectional type of descriptive study.

- **Place and period of study:** This study will be conducted in the SCANU, Department of Paediatrics, Rajshahi Medical College Hospital, Rajshahi over a period of one and half years from January 2025 to June 2026.

- **Data collection place:** Data will be collected from the SCANU of Department of Paediatrics at Rajshahi Medical College Hospital, Rajshahi.

- **Study population:** All neonates (age ≤ 28 days) admitted with clinical features of septicemia in SCANU of Rajshahi Medical College Hospital irrespective of gestational age & birth weight will be included in the study.

ELIGIBILITY CRITERIA

Inclusion criteria

Neonates with following conditions will be included:

- Neonate with clinical features of septicemia.
- Both inborn and outborn babies admitted in this hospital.
- Age less than 28 days.
- Any gestational age (preterm, term, post-term).
- Any birth weight.

Exclusion criteria

i) Presence of any serious illness other than neonatal septicemia.

ii) Babies who will have any major congenital anomalies (dysmorphism, TORCH infection, imperforated anus, inborn error of metabolism).

iii) Head trauma causing intracranial hemorrhage.

iv) Meconium aspiration syndrome.

Exclusion criteria Cont..

v) Evidence of antepartum asphyxia such as a history of an antepartum episode of loss of fetal movements lasting for 24 hours or more and oligohydramnios.

vi) Coagulopathy with active bleeding.

vii) Mother or father of neonate who will not give consent to participate in the study.

Sample size determination

Sample size is determined using single proportion estimate formula Haque, (2021) as follows:

It is expected from the findings of a previous study "Bacterial Profile of Neonatal Septicemia and Antibiotic Susceptibility Pattern of the Isolates in Tertiary Care Hospital, Dhaka, Bangladesh" by Islam et al., (2019) that Gram-negative isolates were responsible for septicemia in 22 (70.97%) neonates. So, the minimum sample size at 5% level of significance was calculated using the following formula,

$$n = \frac{Z^2 \text{ x } p \text{ x } q}{d^2}$$

Sample size determination cont..

n=The desired sample size

Z=Standard normal deviate for Z distribution which corresponds to 95% confidence interval in normal distribution = 1.96

p= Anticipated prevalence of Gram-negative isolates in neonatal septicemia =70.97% = 0.7097 = 0.71 (Islam et al., 2019).

q=1-0.71=0.29

d=Allowable error of anticipated prevalence =10% of the anticipated 'p'=0.071

Therefore, the desired sample size

$$n = \frac{(1.96)^2 \text{ x } 0.71 \text{ x } 0.29}{(0.071)^2} = 162$$

The calculated sample size of this study is 162. So, 162 neonates will be

Sampling technique

- Purposive sampling technique will be employed to include the required number of septicemic neonates.

Variables will be used in the study

Independent variables

- Age of neonate
- Gender
- Educational status of father and mother
- Occupational status of father and mother
- Birth-status
- Mode of delivery
- Place of delivery
- Birth weight
- APGAR score
- Neonate with septicemia

Dependent variables

- Causative agents of neonatal septicemia.
- Antibiotic susceptibility pattern of the isolates.

OPERATIONAL DEFINITIONS

Operational definitions

- **Neonatal sepsis:** Neonatal sepsis is a type of neonatal infection, particularly bacteremia, diagnosed by the presence of microorganisms in blood via microbiological culture tests during the first 4 weeks of birth.

- **Sign symptoms of neonatal septicemia:** Reluctant to feed, lethargy, temperature instability, abdominal distension, vomiting, diarrhea & jaundice. Clinical feature appeared in the first 3 days of life will be considered as early onset sepsis (EOS) and when the disease appeared after 72 hours to 28 days of life will be considered as late onset sepsis (LOS).

Operational definitions cont..

- **Antimicrobial susceptibility pattern:** The response of specific bacterial isolates to various antibiotics, categorized as resistant, intermediate or susceptible based on inhibition zone diameters. Both “resistant” and “intermediate” patterns will be considered as resistant.

Operational definitions cont..

- The antibiotics will be following in the study for Gram positive organism are Cefoxitin Screen, Benzylpenicillin, Oxacillin, Gentamicin High level (Synergy), Gentamicin, Ciprofloxacin, levofloxacin, Inducible Clindamycin Resistance, Erythromycin, Clindamycin, Linezolid, Daptomycin, Teicoplanin, Vancomycin, Tetracycline, Tigecycline, Nitrofurantoin, Rifampicin, Trimethoprim/Sulfamethoxazole.

Operational definitions Cont..

- The antibiotics will be following in the study for Gram negative organism are Amoxicillin /Clavulanic acid, Piperacillin/Tazobactam, Cefuroxime, Cefuroxime Axetil, Ceftriaxone, Cefoperazone/Sulbactam, Cefepime, Ertapenem, Imipenem, Meropenem, Amikacin, Gentamicin, Ciprofloxacin, Tigecycline, Fosfomycin, Colistin and Trimethoprim/Sulfamethoxazole.

Operational definitions Cont..

- **Multidrug resistance**: The ability of a bacterial strain to resist three or more antimicrobial agents from different classes (Alam et al., 2011).

Detailed study procedure

- This study will be a cross-sectional type of descriptive study. It will be conducted in the Department of SCANU, Rajshahi Medical College Hospital, Rajshahi during the period January 2025 to June 2026.

- 162 admitted neonates with clinical symptoms of septicemia will be enrolled in this study on the basis of inclusion and exclusion criteria.

Detailed study procedure cont..

- Blood samples from 162 clinically suspected neonatal septicaemia cases will be collected and processed in the microbiology laboratory of RMC.

- The growths will be identified by standard microbiological protocol and their antimicrobial sensitivity pattern will be determined.

- Ethical clearance will be duly taken from the concern authority of the Rajshahi Medical College, Rajshahi.

Detailed study procedure cont..

- A thorough physical examination will be carried out after taking detailed and careful history of each case.

- Patient's attendants will be interviewed and only those babies will be enrolled where the guardians will give permission for collection of samples.

Detailed study procedure cont..

- All those babies presenting with clinical sepsis will be thoroughly investigated for any evidence of bacterial sepsis and all laboratory investigations will be sent within 24 hours of admission.

- The babies will have clinical features of neonatal sepsis and two or more laboratory criteria or culture positive will be included in the study.

Isolation of bacteria and antimicrobial susceptibility testing cont..

- As a sample, 1-2 ml of blood will be withdrawn by a sterile disposable syringe with butterfly needle from a peripheral vein after cleaning the site with povidone iodine and chlorhexidane.

- The blood culture medium will be aseptically inoculated and aerobically incubated at 37ºC (20ml of Trypticase Soya Broth will be used) for bacterial growth.

Isolation of bacteria and antimicrobial susceptibility testing

- The isolates will be identified by studying colony morphology, gram staining and conventional biochemical methods.
- Antibiotic sensitivity testing will be performed on Muller-Hinton (MHA) plates by Kirby-Bauer disc diffusion method.
- All of the investigations will be done in the department of intensive care unit, Rajshahi Medical College Hospital, Rajshahi.

Data collection tools

- Data will be collected using a semi-structured questionnaire (research instrument) containing all the variables of interest and a good laboratory settings.

Statistical analysis

- All data will be analyzed by using the ‘Statistical Package for the Social Sciences (SPSS)’ software, 26-version.

- Categorical variables will be summarized by using numbers and percentages while continuous variables will be summarized by means ± standard deviation (SD) and median.

Statistical analysis cont..

- An independent t-test will be used to compare continuous variables with two categories.

- A chi-square test will be used to compare categorical variables with two categories. A p-value < 0.05 will be considered statistically significant.

Utilization of the study

i) The data generated from the study might be useful for the pediatricians, neonatologists and physicians in general for their day-to-day management of neonatal septicemia effectively and safely.

ii) It will be helpful for policy makers for establishment of SCANU and supplementation of proper antibiotic in every secondary and tertiary level hospital.

Ethical Implications

- Prior permission will be taken from the Institutional Review Board (IRB) of Rajshahi Medical College (RMC), Rajshahi. Keeping compliance with Helsinki Declaration for Medical Research Involving Human Subjects 1964, revised in 2013, all the study subjects will be informed verbally about the study design, the purpose of the study and potential benefits derived and risks involved from the study. They will also be assured that they will have full rights to withdraw themselves from the study at any time for any reasons what-so-ever. Patients who will give informed consent to participate in the study will be included as study sample.

References

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Polin, R.A., 2012. Management of neonates with suspected or proven early-onset bacterial sepsis. Pediatrics 129, 1006–1015.

Raymond, S.L., Stortz, J.A., Mira, J.C., Larson, S.D., Wynn, J.L., Moldawer, L.L., 2017. Immunological defects in neonatal sepsis and potential therapeutic approaches. Front. Pediatr. 5, 14.


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