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RISK FACTORS FOR NEONATAL SEPSIS IN IBN SINA HOSPITAL

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ABSTRACT

Background: Newborn sepsis is a potentially fatal systemic infection that occurs within the first 28 days of life and continues to be a primary cause of newborn mortality and morbidity in low-resource settings. Neonatal sepsis is caused by bacterial, viral, or fungal infections entering the circulation, either vertically from the mother or horizontally from the hospital environment, and the non-specific clinical presentation makes early identification difficult. **Objectives:** Is to identify antenatal and perinatal variables that contribute to early or late sepsis in newborns at Ibn Sina Teaching Hospital in Mosul, Iraq. **Methods:** The study is an observational, descriptive, case control study. It was conducted between the 10th of April 2025 to the end of November 2025 at Ibn Sina Teaching Hospital in Mosul city. The study included 100 patients divided into two groups (50 patients and 50 controls). The questionnaire was composed from three tools. The first tool for maternal risk factor assessment sheet. The second Tool for neonatal risk factors and the third tool for neonatal intensive care unit related factors. **Results:** The mean age ± standard deviation of the study participants is 8.53 ± 3.83 days. Male: Female ratio was 1.041:1. Comparison between cases and controls regarding showed statistically significant difference regarding parity (P value = 0.043), positive history of PROM (P value < 0.001), UTI (P value <0.001), and antenatal antibiotic use (P value = 0.042). Moreover, statistically significant difference between them regarding their birth weight (P value <0.001), gestational age (P value <0.001), Low APGAR score (P value <0.001), birth asphyxia (P value <0.001), need for resuscitation (P value <0.001), congenital anomalies (P value = 0.046) and breast-feeding history (P value <0.001). Lastly, statistically significant difference between them regarding use of venous catheter (P value = 0.039), mechanical ventilation (P value <0.001) and prolonged hospitalization (P value <0.001). **Conclusion:** This study established that both maternal, neonatal and hospital factors contributed to the risk of neonatal sepsis. According to the current study's findings, universal screening for rectovaginal GBS colonization of all pregnant women at 35-37 weeks gestation is recommended to give prophylaxis antibiotic for indicated ladies.

KEYWORDS: Factors, Iraq, Newborn, Risky, Septicemia, Mosul.

1. INTRODUCTION

Newborn sepsis is a potentially fatal systemic infection that occurs within the first 28 days of life and continues to be a primary cause of newborn mortality and morbidity in low-resource settings.[1] Sepsis can occur early (before 72 hours after birth) or late (beyond 72 hours), with different risk factor profiles and transmission mechanisms.[2] Neonatal sepsis is caused by bacterial, viral, or fungal infections entering the circulation, either vertically from the mother or horizontally from the hospital environment, and the non-specific clinical presentation makes early identification difficult.[3-4] Group B streptococcus and E. coli cause approximately 70% of early-onset neonatal sepsis. Gram-positive organisms cause 70% of late-onset infections, with coagulase-negative staphylococci, Listeria monocytogenes, and Salmonella accounting for approximately 48%.[5]

Neonatal sepsis is estimated to cause over 3.1 million deaths per year.[6] In recent years, the employment of invasive procedures and the creation of resistant

organisms may have contributed to an increase in neonatal sepsis incidence.[7] Criteria for NS include fever (rectal >38°C), hypothermia (rectal <36°C), metabolic acidosis, WBC count ≥30,000/mm or <5,000/mm, or >25% immature cells, hypotension, and lung symptoms.[8-9] Diagnostic tests include blood, urine, and CSF cultures, leukocyte profile, platelet count, ESR, C-reactive protein, latex agglutination, counter immune electrophoresis, and polymerase chain reaction (PCR).[10]

Neonatal sepsis continues to be a major cause of infant mortality in underdeveloped nations, due to insufficient prenatal care, maternal infections, and infection control preventive measures in maternity and neonatal facilities.[11] Maternal risk factors (for example, prolonged membrane rupture, maternal fever or infections, and hypertensive disorders during pregnancy) and neonatal risk factors (for example, prematurity, low birth weight, mode of delivery, and need for resuscitation at birth) are frequently identified risk factor in similar settings.[12] Although regional studies in Iraq have looked at risk factors for newborn sepsis at tertiary hospitals, there has been little targeted study at Ibn Sina Hospital/Mosul, where healthcare services are provided to a high number of neonates. Identifying context-specific maternal and neonatal variables is critical for developing treatment protocols and preventative interventions based on Mosul's local demographics and healthcare utilization pattern. This study aims to identify antenatal and perinatal variables that contribute to early or late sepsis in newborns at Ibn Sina Teaching Hospital in Mosul, Iraq.

2. PATIENTS AND METHODS

The study is an observational, descriptive, case control study. It was conducted between the 10th of April 2025 to the end of November 2025 at Ibn Sina Teaching Hospital in Mosul city. The study included 100 patients divided into two groups (50 patients and 50 controls).

The investigators conducted direct interviews with parents to complete self-administered questionnaires. The questionnaire was composed from three tools. The first tool for maternal risk factor assessment sheet; including maternal age, parity, premature rupture of membrane, maternal infection history (chorioamnionitis, urinary tract infection), history of antenatal antibiotic use, mode of delivery, complications associated with delivery, history of poor antenatal care and gestational diseases. The second Tool for neonatal risk factors; including, gender, birth weight, gestational age, APGAR score, meconium-stained amniotic fluid, birth asphyxia, need for resuscitation, congenital anomalies, type of feeding. The third tool for neonatal intensive care unit related factors, including the use of central venous catheter, mechanical ventilation, parenteral nutrition and prolonged hospitalization.

The information gathered was processed, categorized, and evaluated using relevant statistical significance tests. Statistical analysis was conducted using SPSS version 30.0 (SPSS Inc., Chicago, USA). Quantitative data were presented as mean ± standard deviation. Qualitative data were presented as frequency and percentages. A p value of <0.05 was considered statistically significant.

RESULTS

The study includes 100 children, of them 50 patients with neonatal sepsis matched according to the age with 50 normal children. The mean age ± standard deviation of the study participants is 8.53 ± 3.83 days. Male: Female ratio was 1.041:1.

Table 3.1 shows comparison between cases and controls regarding their maternal factors. Statistically significant difference between them regarding parity (P value = 0.043), positive history of PROM (P value < 0.001), UTI (P value <0.001), and antenatal antibiotic use (P value = 0.042).

Table 3.1: Comparison between cases and controls regarding their maternal factors (number=100).

Variable	Cases = 50 (%)	Controls = 50 (%)	P value
Maternal age, mean ± standard deviation	32.28 ± 7.29	30.89 ± 9.83	0.492
Parity, median (IQR)	1 (1-3)	2 (1-5)	**0.043**
Positive history of PROM for more than 18 hours	15 (30%)	3 (6%)	**<0.001**
Positive history of chorioamnionitis	12 (24%)	2 (4%)	**<0.001**
Positive history of urinary tract infection	27 (54%)	11 (22%)	**<0.001**
Positive history of antenatal antibiotic use	9 (18%)	2 (4%)	**0.042**
Cesarean section	9 (18%)	8 (16%)	0.293
Positive history of poor antenatal care	10 (20%)	11 (22%)	0.839
Positive history of gestational disease	6 (12%)	4 (8%)	0.139

Table 3.2 shows comparison between cases and controls their neonatal factors. Statistically significant difference between them regarding their birth weight (P value <0.001), gestational age (P value <0.001), Low APGAR score (P value <0.001), birth asphyxia (P value <0.001), need for resuscitation (P value <0.001), congenital anomalies (P value = 0.046) and breast-feeding history (P value <0.001).

Table 3.2: Comparison between cases and controls regarding their neonatal factors (number=100).

Variable	Cases = 50 (%)	Controls = 50 (%)	P value
Male gender	26 (52%)	25 (50%)	0.820
Birth weight, mean ± standard deviation	2.47 ± 0.37	3.21 ± 0.41	**<0.001**
Gestational age, Median (IQR)	35 (33-39)	39 (37-41)	**<0.001**
Low APGAR score	21 (42%)	6 (12%)	**<0.001**
Birth asphyxia	19 (38%)	3 (6%)	**<0.001**
Need for resuscitation	19 (38%)	4 (8%)	**<0.001**
Congenital anomalies	6 (12%)	1 (2%)	**0.046**
Breast feeding	30 (60%)	47 (94%)	**<0.001**

Table 3.3 shows comparison between cases and controls regarding their neonatal intensive care unit related factors. Statistically significant difference between them regarding use of venous catheter (P value = 0.039), mechanical ventilation (P value <0.001) and prolonged hospitalization (P value <0.001).

Table 3.3: Comparison between cases and controls regarding neonatal intensive care unit related factors (number=100).

Variable	Cases = 50 (%)	Controls = 50 (%)	P value
Use of central venous catheter	13 (26%)	4 (8%)	**0.039**
Mechanical ventilation	19 (38%)	4 (8%)	**<0.001**
Parenteral nutrition	2 (4%)	0 (0%)	0.201

4. DISCUSSION

The study addressed maternal, neonatal and NICU factors associated with neonatal sepsis. Regarding maternal risk factors, the study found low parity is significant factor for neonatal sepsis. The greater risk in first-time mothers is frequently related to the longer labor time that occurs during first births, which increases the time the newborn is exposed to possible pathogens in the birth canal. Similar findings obtained from several studies.[13-14] In same way positive history of PROM found in this study to be significant factor, which runs with other studies.[15-16] As a result antibiotics is recommended as a prophylaxis measures. Moreover, the study found neonatal sepsis is higher among mothers with chorioamnionitis in comparison to control mothers, which might due to direct transmission of infection to neonate. Randis et al[17] and Beck et al[18] showed similar findings. This connection highlights the importance of treating of chorioamnionitis and urinary tract infection promptly during pregnancy. The same with urinary tract infection, comparable findings obtained form Noor et al.[19] Additionally, the study found mothers of patients with neonatal sepsis reported more antibiotic use than mother of control patients. While antibiotics are frequently used to treat maternal illnesses, which are risk factors for sepsis, the medicine can also affect the infant's health outcomes. Lee et al had similar findings.[20]

Regrading neonatal risk factors, the study shows neonatal sepsis is significantly higher in babies with low birth weight, which might occur because they have immature immune systems, fragile skin barriers, and often require invasive medical procedures, all of which increase their susceptibility to infection. Similar findings were obtained from Pereira et al.[21] Similarly, neonate with neonatal sepsis found to had significant lower gestational age and APGAR score than controls. Immature immune systems (such as poor neutrophil storage and immunoglobulin levels) and a greater need for invasive medical procedures such as intubation or catheterization all contribute to an increased risk of nosocomial infections, which consistent to other study findings.[22-23] Furthermore, the study found neonatal sepsis were significantly higher among neonate with birth asphyxia and among those who need resuscitation. Asphyxia causes a systemic inflammatory response that increases cytokines like IL-1β and IL-6, similar to those observed in sepsis.[24] This can worsen organ damage and multisystem dysfunction. While the resuscitation technique, includes endotracheal intubation, central venous catheterization, and oxygen delivery, might serve as an entrance point for infection, increasing the neonate's susceptibility to sepsis.[24] Gebremeskel et al showed parallel findings.[25] Neonatal sepsis patients found in the present study to have more congenital anomalies than control neonate, acting as an independent risk factor for both infection and increased mortality. Which in agreement with Linhart et al study results.[26] Additionally, neonatal sepsis patients found to had significantly less dependent on breast feeding than controls. Xiong et al had consistent findings.[27]

Regarding hospital condition, the study found patients with neonatal sepsis were significantly use more invasive central catheter or mechanical ventilation, as these procedures are associated with increased manipulation and portals for bacterial entry. Krajčinović had similar findings.[28]

The limitations of the current study should be considered when interpreting the results. First, because of the limited sample size, the results might not be as readily generalizable to other populations. Second, the study was

conducted at single hospital setting, which may have reduced the external validity of the results.

5. CONCLUSIONS AND RECOMMENDATIONS

This study established that both maternal, neonatal and hospital factors contributed to the risk of neonatal sepsis. According to the current study's findings, universal screening for rectovaginal GBS colonization of all pregnant women at 35-37 weeks gestation is recommended to give prophylaxis antibiotic for indicated ladies.

CONFLICT OF INTEREST

The authors of this study report no conflicts of interest.

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