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The Prevalence of Neonatal Sepsis and Associated Factors among Neonates Admitted to the Neonatal Intensive Care Unit of Lira Regional Referral Hospital

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ABSTRACT

One of the major causes of morbidity and mortality among newborns worldwide is neonatal sepsis. Limited knowledge of the risk factors for newborn sepsis was accessible in Africa and other underdeveloped nations. Among newborns hospitalized to the neonatal ICU of Lira Regional Referral Hospital, the study's goals were to ascertain the prevalence of neonatal sepsis and related obstetric and neonatal risk factors. Data were collected through a retrospective descriptive research, totaled, and then expressed as frequencies and percentages. Tables and graphs were used to present the data. According to the study, out of the 690 newborns referred to the NICU at Lira Regional Referral Hospital for neonatal intensive care, 242 (or 35.1%) had neonatal sepsis. Limited knowledge of the risk factors for newborn sepsis was accessible in Africa and other underdeveloped nations. Among newborns hospitalized to the neonatal ICU of Lira Regional Referral Hospital, the study's goals were to ascertain the prevalence of neonatal sepsis and related obstetric and neonatal risk factors. Data were collected through a retrospective descriptive research, totaled, and then expressed as frequencies and percentages. Tables and graphs were used to present the data. According to the study, out of the 690 newborns referred to the NICU at Lira Regional Referral Hospital for neonatal intensive care, 242 (or 35.1%) had neonatal sepsis. 60.3% (146) of the newborns with sepsis were boys. 39.7% of the 96 females had EONS, whereas 180 of them had 76.9% and 62 of them (23.1%) had LONS. With 200 (82.7%), PROM was the major obstetric risk that contributed to neonatal sepsis, while 142 out of 150 neonates whose mothers with a history of UTI experienced EONS at a rate of 94.7%. Ninety-nine percent of newborns whose mothers skipped ANC developed LONS. Prematurity 180 (74.4%) was the main newborn risk factor for developing EONS and the biggest neonatal factor causing neonatal sepsis. 77.4% of term infants have LONS. The majority of newborns who experienced EONS had mothers who had both urinary tract infections and alcohol with a bad odor. The majority of neonates with LONS were born to women who skipped prenatal care. The majority of newborns with gestational ages under 37 weeks. People with EONS with an APGAR score of fewer than 7 weeks or a birth weight greater than 2.5 pounds suffered from LONS. Urinary tract infections should be identified early and treated quickly. Encourage hospital deliveries and prenatal care. Preventive measures like giving pregnant women insider and insecticide-treated mosquito nets, routine blood pressure checks in women with pre-eclampsia, prompt treatment of maternal genital infections, cervical cerclage for mothers with incompetent cervixes, and tocolysis when indicated should be put in place to prevent premature delivery.

Keywords; Neonatal sepsis, Morbidity and mortality, Risk factors, Newborns

INTRODUCTION

Currently, there was no consensus definition for neonatal sepsis, it was commonly referred to as a clinical syndrome that includes pneumonia and meningitis and is characterized by a bacterial infection in the firstmonth of life [1].

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According to pediatric sepsis consensus conference of 2005, neonatal sepsis is defined as a systemic inflammatory response syndrome in presence of suspected or proven infection in a neonate. It could be bacterial, viral, fungal or rickettsial [2]. It encompasses various systemic infections of the newborn such as septicemia, meningitis, pneumonia, arthritis, osteomyelitis etc. [3]. It is characterized by systemic manifestations that result from bacterial invasion and multiplication in the bloodstream [4]. Neonatal sepsis (NS) is a serious blood bacterial infection in neonatesat the age equal to or less than 28 days of life which is manifested by systemic signs and symptoms of infection $\lceil 5 \rceil$. Globally neonatal sepsis is one of the most significant causes of morbidity and mortality among neonates. The main causes of neonatal deaths were preterm birth complications (35%), intrapartum-related complications (24%), and sepsis (15 %) globally [6]. The prevalence of neonatal sepsis was more common in developing countries than that of developed countries. A study conducted in Japan indicated that the incidence of neonatal sepsis was 0.74% and outof these 0.13% was EONS [7]. Similarly, in Ethiopia a study conducted in Gondar University Hospital in an intensive care unit indicated thatout of 181 neonates 67.4% were EONS and 32.6% LONS based on clinical parameters [4]. A study in Sudan showed a 37.8% culture-positive neonatal septicemia out of 119 neonates in thestudy and all were cases of early-onset neonatal sepsis. [8]. Another study in Egypt showed that the incidence of suspected neonatal sepsis among the admitted neonates at the neonatal intensive care units of the three included hospitals during the study period was 45.9% (357/778). Among the studied neonates, sepsis was recognized as EONS in 152 (44.2%) cases and as LOS in 192 (55.8%) cases according to infant age at the onset of symptoms. 33.9% (65/192) of LOS were due to nosocomial infection [9]. Neonatal sepsis can be differentiated into early and late-onset neonatal sepsis according to peripartumpathogenesis because both have different sources of infection, onset of disease occurrence, mode of transmission, management and risk factors [9], which include; socio-demographic, maternal, neonatal and medical factors were associated with the development of neonatal sepsis [11]. In Africa, and other developing countries, a small number of data were available on risk factors associated with neonatal sepsis. Blood culture is a definitive diagnostic tool for neonatal sepsis. However, this 'gold standard' testing method is timeconsuming and may result in false positive results as well as falsenegative results, which can be attributed to the difficulties in discriminating a true CONS infection from sample contamination [12]. In addition to this neonatal sepsis is diagnosed based on a combination of clinical appearance and the useof positive septic screening parameters such as TLC < 5000/mm, band to total polymorph nuclear cells ratio of >0.2, C-reactive protein (CRP) >1mg/dl and micro ESR > 10 mm-first [13]. Neonatal sepsis is associated with increased medical costs, prolonged hospital stays and potentially poor long-term neurodevelopmental outcomes. Surviving infants approximately a quarter of the neonates, have significant neurological sequelae as a consequence of central nervous system involvement, septic shock or hypoxemia secondary to severe parenchyma lung disease despite prompt instigation of antibiotictherapy [14].

Statement of Problem

Neonatal sepsis caused 15% of neonatal deaths globally in 2018 and this impacts negatively on the attainment of the Sustainable Development Goal to end preventable child deaths. There are approximately 1.3 millioncases of neonatal sepsis annually, the bulk of which were in low-income countries especially those in Africa. Global data indicate a 3.5 times higher incidence in low-income countries and a 1.8 times higher incidence in middle-income countries compared to high-income countries [15]. The incidence of neonatal bacterial sepsis varies from 1 to 4 cases per 1,000 live births in developed countries, with great differences over time and geographic location [10]. The risk of neonatal death becomes 6 times higher in developing countries compared to that of developed countries [16]. According to a 2011 UNICEF report, neonatal deaths accounted for 52% of all under-five childmortality in South Asia, 53% in Latin America and the Caribbean and 34% in sub-Saharan Africa [14]. In Africa, and other developing countries, a small number of data were available on risk factors associated with neonatal sepsis. Few pieces of evidence showed that both obstetric and neonatal factors play important roles in early-onset sepsis, as they do in resourcerich countries [17], [18]. A study in Gambia, West Africa, one of the developing sub-Saharan African countries showed that the prevalence of neonatal sepsis was 67% (137 out of 203) among the neonates admitted at neonatal wards of three hospitals in Gambia. [19]. Neonatal conditions which were causing under-five mortality in 2004 have recently increased to 43%. Out of these conditions which cause under five mortalities, neonatal sepsis accounts for 9% [20]. However, the prevalence of neonatal sepsis and its associated factors at Lira Regional Referral Hospital NICU is not known.

Aim

To assess the prevalence and associated factors of neonatal sepsis among neonates admitted to the neonatalICU of Lira Regional Referral Hospital.

Specific objectives

- To determine the prevalence of neonatal sepsis among neonates admitted to the NICU of Lira Regional Referral Hospital.
- To identify the obstetric factors associated with neonatal sepsis among neonates admitted to the NICU of Ewama, 2023.

LiraRegional Referral Hospital.

To identify the neonatal factors associated with neonatal sepsis among neonates admitted to the NICU of LiraRegional Referral Hospital.

Research Questions

- i. What is the prevalence of neonatal sepsis in Lira Regional Referral Hospital?
- ii. What are the obstetric factors associated with neonatal sepsis among neonates admitted to the NICU of LiraRegional Referral Hospital?
- iii. What are neonatal factors associated with neonatal sepsis among neonates admitted to the NICU of Lira Regional Referral Hospital?

METHODOLOGY

Area of Study

The study was carried out at Lira Regional Referral Hospital in Lira NICU, located in Lira Northern Uganda. The hospital serves as a regional referral for districts such as Amolatar, Apac, Dokolo, Lira,Kole, Kwania, Oleptong, Otuke, Abim, Pader, Agago, and Oyam Districts.

Research Design

An institution-based retrospective descriptive study was carried out to determine the factors associated with the prevalence of neonatal sepsis at Lira Regional Referral Hospital NICU between January 1st andDecember 31 2021.

Study population

The study was done by reviewing the records of all neonates in the study population who were admitted to the Neonatal Intensive Care Unit of Lira Regional Referral Hospital between 1st January2021 and 31st December 2021.

Sampling technique

A consecutive sampling technique was used to select the files. Files were checked for consistency and only those with complete information were considered.

Sample size

The sample size was determined by Keish and Leslie's (1965) formula as belowN=

Z^2PQ/D^2

Where N= sample size required

Z = Standard normal deviate (1.96 for 95% confidence interval)

P = Proportion of neonates with sepsis 19%

Q = 1-P

D = the level of precision desired (0.05)

The estimated prevalence of neonates with sepsis in northern Uganda is 19 % according to a study by Agenda, Wilfred et al Therefore the estimated sample is 240.

Data collection procedure

Using a checklist, the records department was approached and the files for neonates treated for neonatal sepsis were requested, sorted, and organized and only those that met the criteria were used to obtain data.

Data management

Data was collected using a checklist, tallied then using Microsoft Excel 2007 the data was presented using tables and graphs.

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Inclusion Criteria

All neonates diagnosed with sepsis were admitted to the NICU of Lira Regional Referral Hospitalbetween January 1st and December 1st 2021.

Exclusion criteria

Neonates files with incomplete patient chart information. Neonates with a diagnosis other than sepsis.

Neonatal sepsis

Independent Variables

Dependent variables

Obstetric Risk Factors Neonatal risk factors

Research instrument

Data was collected using a checklist that was structured to obtain the data able to fulfil the studyobjectives. A sample of the checklist is included in the appendix of the dissertation.

Ethical consideration

Approval was sought from the Institutional Review Board and Ethics Committee of KIU. Permission to carryout the research was obtained from the hospital Executive Director before data was collected. Initials were used to provide privacy and confidentiality of the patient's data. Before data collection, the objectives of the study were fully explained to the records manager in order to obtain her permission which was granted.

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RESULTS

The study found out that of the 690 neonates who were admitted to neonatal Intensive care of LiraRegional Referral Hospital, 242 had neonatal sepsis which is 35.1% prevalence.



Figure 1: SOCIO DEMOGRAPHIC CHARACTERISTICS

Of the 242 neonates in this study with sepsis, 60.3% (146) were males and 39.7% (96) were females, 78.5% (190) had EONS and 21.4 % (56) had LONS. Majority of the mothers were below 20 years 43.5. % (114), 87 (33.2%) were between 20 and 35 years and 61 (23.3%) were above 35 years of age.

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Table 1: socio-demographic characteristics of mothers and neonates

PARAMETER		NUMBER	
Sex Of Neonate	Male	146(60.3%)	Page 6
	Female	96(39.7%)	
Age Of Neonate	0-7 Days	190(78.5%)	
	8-28 Days	52(21.5%)	
Maternal Age	<20	100(41.3%)	
	20-35	75(31.0%)	
	>35	67(27.7%)	

Obstetric Risk Factors

Below is a graphical and tabular representation of the different factors expected to contribute to the prevalence of sepsis according to the existing literature. 82.7% of neonates their mothers had a history of PROM, while 77.7% of neonates their mothers had foul-smelling liquor, 62.0% of neonates whose mothers had a history of UTI had sepsis, 19.8% of the neonates who had sepsis were delivered from home, 77.3% of the neonates who had sepsis were delivered vaginally and only 25.6% of the neonates with sepsis were of mothers who had not attended ANC.

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Table 2: obstetric risk factors

VARIABLES		SEPSIS		
		EONS	LONS	TOTAL
Maternal history of UTI	Yes	142(94.7%)	8(5.3%)	150(62.0%)
	No	55(59.8%)	37(40.2%)	92(38.0%)
Attendance of antenatal clinic	Yes	134(74.4%)	46(25.6%)	180(74.4%)
	No	52(83.9%)	10(16.1%)	62(25.6%)
Foul smelling liquor	Yes	155(82.4%)	33(17.6%)	188(77.7%)
	No	31(57.4%)	23(42.6%)	54(22.3%)

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History of premature rupture of membranes	Yes	174(87.0%)	26(13.0%)	200(82.7%)
	No	25(59.5%)	17(40.5%)	42(17.3%)
Place of delivery	Home	34(70.8%)	14(29.2%)	48(19.8%)
	Hospital	172(88.7%)	22(11.3%)	194(80.2%)
Mode of delivery	Vaginally	151(80.7%)	36(19.3%)	187(77.3%)
	Caeserean section	35(63.6%)	20(36.4%)	55(22.7%)

The majority of the neonates 94.7%, whose mothers had a history of UTI had EONS and only 5.3% of mothers who had UTI had LONS. For most of the neonates, 83.9% of neonates whose mothers didn't attendANC had LONS while only 16.1% did. Of the neonates delivered by vaginal birth, 80.7% developed EONS while 19.3% had LONS. Of neonates delivered at home, 70.8% had EONS while 29.2% developed LONS. Most neonates 87.0%, whose mothers had a history of PROM had EONS while 13.0% had LONS. The majority of the neonates 82.4%, whose mothers had foul-smelling liquor had EONS as only 17.6% had LONS.

NEONATAL RISK FACTORS

According to existing literature, the factors below are associated with neonatal sepsis and the figure compares the different factors with preterm (prematurity) being the highest with 74.4% (180 out of 242) of the premature babies in this study getting sepsis and then low birth weight 71.1% (172of the 242) neonates in the study developed sepsis then lastly an APGAR score less than 7 where 59.1% (143 of 242neonates.

Table 3: Neonatal factors					
VARIABLES		SEPSIS			
		EONS	LONS	TOTAL	
BIRTH WEIGHT	<2.5Kgs	140(81.4%)	32(18.6%)	172(71.1%)	

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	>2.5Kgs	46(65.7%)	24(34.3%)	70(28.9%)	
GESTATIONAL AGE	<37wks (preterm)	172(95.6%)	8(4%)	180(74.4%)	Page 9
	>37wks (term)	14(22.6%)	48(77.4%)	62(25.6%)	
APGAR SCORE in 5fh minutes after birth	<7	128(89.5%)	15(10.5%)	143(59.1%)	
	>7	58(58.6%)	41(41.4%)	99(40.9%)	

Neonatal Risk Factors (EONS and LONS)

Over 81.4% of EONS had a birth weight <2.5 kgs while 34.3% of the neonates with a birth weight >2.5 kgshad LONS. 95.6% of the preterm neonates had EONS while 77.4% of the term neonates had LONS. 89.5% of the neonates with APGAR < 7 had EONS while 41.4% of those with APGAR >7 had LONS.

DISCUSSION

Prevalence

The prevalence of sepsis at Lira Regional Referral Hospital in 2021 was 35.1% which is higher than what Bua et al found in [21]. This could be due to the fact that Lira is a regional referral that serves alarge catchment population as compared to the Buyende district. This is also slightly lower than the 37.8% obtained by [8]. A similar study in southern Mexico by [22] showed the prevalence of sepsis in that area as 43% much higher than this study finding. In this study, 76.9% had early-onset neonatal sepsis and 23.1% had late-onset neonatal sepsis almostsimilar results were obtained in southern Mexico in 2012 by Yelda et al. where EONS prevalence was 75.3% and LONS 24.7%. [23] found a prevalence of EONS at 81.0% and LONS at 19% which is almost similar to what was found in this study.

Obstetric factors

In this study, neonatal sepsis was not found more in neonates whose mothers didn't attend ANC and thiswas different to the findings that were found by [24]. This is because antenatal careattendance alone cannot be protective however if screening for infections and prompt treatment is done during ANC then that can be preventive for neonatal sepsis. This study showed that vaginal delivery was more associated with sepsis than cesarean delivery which was also observed by [25]. However according to [26] who showed that cesarean delivery was more likely to cause neonatal sepsis. Cesarean section is more likely to cause neonatal sepsis in places where aseptic precautions are not taken into considerationduring the procedure. This study found that neonates of mothers who had foul-smelling liquor and PROM developed neonatalsepsis and the results are similar to studies conducted by [27] and [22].

Neonatal factors

This study found that prematurity and low birth weight neonates were at a higher risk of getting neonatalsepsis. Most of the preterm neonates also had a low birth weight which was also found [27]. It was also found that most term infants were more likely to suffer from LONS than EONS. In this study, neonates with APGAR scores <7 didn't have a higher percentage of sepsis as was seen in a study done in Indonesia by [28]-[31]. Similarly studies by [22], [27] and [26], in this study neonates with APGAR scores less than 7 who developed sepsis were almost equal to those who had APGAR scores of more than 7 who developed sepsis

CONCLUSION

The majority of the neonates who suffered from EONS were mothers who had suffered from Urinary tract infections and also had foul-smelling liquor. Most of the neonates that suffered from LONS were those of mothers who didn't attend antenatal care. Majority of the neonates with gestational age less than 37 weeks and APGAR score less than 7 suffered from EONS while those with birth weight above 2.5 suffered from LONS.

RECOMMENDATIONS

Early diagnosis and prompt treatment of urinary tract infections.

Encourage Antenatal care and hospital delivery.

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Preventive measures should be put in place to prevent premature delivery like cervical cerclage for mothers with incompetent cervix, prompt treatment of maternal genital infections, tocolysis, whereit's indicated, giving Fansidar and insecticide-treated mosquito nets to pregnant women, regular blood pressure assessments in women with pre-eclampsia.

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