Prevalence of neonatal sepsis and associated factors among neonates admitted in the neonatal intensive care unit at Lira regional referral hospital, northern Uganda

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Abstract

BACKGROUND: Sepsis is one of the leading causes of mortality and morbidity among neonates. Neonatal sepsis (NS) contributes to 44% of 5.4 million under-5 mortalities globally, and 12% of neonatal deaths in Uganda in 2020 were attributed to NS. Early risk factor identification and improved obstetric care are proven to reduce deaths due to NS, yet there is scanty literature for the Lango sub-region. We, therefore, determined the prevalence of NS, and identified the factors associated with NS in the Lango sub-region of northern Uganda.

METHODS: A hospital-based, quantitative, cross-sectional study with a retrospective chart review was conducted in the neonatal intensive care unit (NICU) at Lira regional referral hospital (LRRH), in northern Uganda, among 194 records of neonates admitted to the NICU from September 2022 to February 2023. The participant records were selected by systematic sampling technique and a structured data extraction tool was used to collect data. Using SPSS version 25 data entry and analysis were done. The univariate analysis gave a general description of the data. Using logistic regression analysis associations were measured and the statistical significance was declared at a P value of 0.05 after multivariate analysis.

RESULTS: Among a total of 194 neonates whose charts were reviewed, 80% of these had neonatal sepsis, giving a prevalence of 41.2%. Age in days of the neonate (AOR=4.212[1.627-10.903]) for neonates of 1-3days of age, sex where males (AOR=2.09[1.123-3.887]), an APGAR score of 1-4 at birth (AOR= 0.309, 95% CI: [0.115-0.831]) and weight at birth <2500g (AOR=2.543[1.381-4.683]) were significantly related to NS.

CONCLUSIONS AND RECOMMENDATIONS: The prevalence of NS among neonates admitted to the NICU of LRRH was high at 41.2% and the neonates of 1-3 days of age, male sex, a birth weight of <2500g, and an Apgar score of 1-4 at birth were significantly related to NS. Therefore, Caregivers ensure safe newborn care, early infection detection, and prophylactic antibiotics during procedures, especially for neonates with low birth weight, and low Apgar score males during the first 3 days of life are recommended to reduce the risk of developing NS. Further research is to be conducted on the major causative agents and outcomes of NS.

BACKGROUND

A neonate refers to a baby from birth to 28 days of life(1). Neonatal sepsis (NS) “refers to the systemic response to infection in newborns within the first four weeks following delivery”(2). “Sepsis is one of the leading causes of mortality and morbidity among neonates…”(3). Of 5.4 million under 5 mortality cases that occur every year globally, NS accounts for 44% (4). Most (99%) of the global neonatal mortality occurs in Low- and middle-income countries (LMIC) with neonatal sepsis being the primary cause (5). Uganda registered stagnated neonatal mortality of 27 deaths per 1000 live births (6) with 12% attributed to neonatal sepsis (NS) as of 2019/2020 (6). Furthermore, NS causes an annual economic burden ranging from $10 billion to $469 billion in sub-Saharan countries where Uganda is located (7). Neonatal sepsis and subsequent long-term morbidities such as respiratory failure, pulmonary hypertension, cardiac failure, shock, renal failure, liver function, and cerebral edema were blamed for the loss of 5.3–8.7 million disability-adjusted life years in sub-Saharan Africa alone in 2014 (8, 9).

Neonatal sepsis is categorized into two, that is, Early Onset sepsis (EOS) which is “disease among neonates aged 72 hours and below” and Late onset sepsis (LOS) which “occurs from 4 to 28 days” (10). Neonatal sepsis

may develop in utero, through the mother's genitalia normally EOS, or from the surroundings in a community or hospital which is usually LOS (3, 10). It has clinical features such as fever, hypothermia, tachycardia, failure to thrive, lethargy, irritability, and listlessness (9). Furthermore, neonates with sepsis may fail to feed, have convulsions, have fast breathing, severe lower chest indrawing, fever and hypothermia as the presenting signs (10). Neonatal sepsis can exhibit mild symptoms at first, but it can quickly advance to meningitis and multisystem organ failure, which are linked to significant mortality and morbidity (11).

A complete entity of sepsis was estimated at 2,824 cases of neonatal sepsis with 2,469 cases of EONS per 100,000 live births and 946 cases of LONS per 100,000 live births world-wide. With the high occurrence of infectious illnesses and limited access to medical facilities that are sufficiently manned and staffed, neonatal mortality is on the rise in low-and-middle-income countries (LMICs). Numerous variables influenced neonatal sepsis of which birth weight, size at birth, mode of delivery, maturity, Apgar score and gestational age were found to be the neonatal individual factors; the length of rupture of membranes, maternal age, parity, maternal infection, complications of pregnancy, number of pregnancies and number of antenatal attendances were maternal factors. Sepsis is a life-threatening illness which can cause lots of morbidities and sequelae even in the survivors. A half of the victims recover completely, a third of them die within a year a half of which is due to the acute episodes, a sixth of the victims retain functional inability to bathe, and dress independently. They also suffer moderate to severe cognitive impairment, and decreased mental health disorders. The post discharge sepsis complications are related to infection severity, quality of hospital care and pre-illness health status.

To combat the rising neonatal mortality due to NS, strategies such as early risk factor identification and improved obstetric care have been implemented. This is done by keeping the area around births clean, and using intrapartum antibiotic prophylaxis, which has been shown to lower the EOS(11). However, there is a rise in LOS linked to longer hospital stays for preterm infants and higher survival rates (11). A combined approach to mother and baby care during pregnancy, including instruction on NS causes, warning signs, and preventative measures improves newborn outcomes (11). Furthermore, delivery and effective care after birth improves newborn outcomes, staff training and education about infection prevention is a crucial step to prevent nosocomial infections (12). Despite the efforts, NS remains a significant problem in Northern Uganda where by 22.2 neonates per 1000 live births suffered sepsis in 2020 (6) which is higher as compared to other parts of the country like eastern Uganda with 8.9–15 neonates per 1000 live births (13). The paucity of information about the prevalence of NS in Lango subregion justified the need for a study to identify prevalence and factors associated to neonatal sepsis in the region. In this region many people had low standards of living and marked disparities in access to quality health care. This study was conducted in LRRH because it is the main point of contact of neonates born in Lango subregion. The findings from this study filled the literature gap and brought awareness of the prevalence and factors associated to neonatal sepsis, and these will direct policy makers about which particular measures to be taken to improve neonatal health.

METHODS AND MATERIALS

Study area and period.

The study was carried out from March 2023 to July 2023 in Lira regional referral hospital in Lango subregion, northern Uganda. Lira Regional Referral Hospital, which is located in Lira city, serves a population of about 2.2 million people from its mandated catchment districts of the central north which are Amolatar, Apac, Dokolo,

Lira, Lira city, Oyam, Kwania, Otuke, Kole, and Alebtong and has a total of 254 beds. LRRH is one of the 13 regional referrals in Uganda, it serves both outpatient and inpatient which includes general and specialized services such as surgery, gynaecology and obstetrics care, medicine, dentistry, orthopaedics, pediatrics and outpatient services such as immunization, HIV counselling and testing, elimination of mother to child transmission (EMTCT) and antenatal care services. The study was carried out in the neonatal intensive care unit which is a subunit under the pediatrics department. It handles babies with abnormal conditions from time of birth to 28days after birth, among which is neonatal sepsis.

Study design and population.

This was a hospital-based retrospective chart review cross-sectional study design. The study used records for neonates admitted to Neonatal Intensive Care Unit (NICU) of Lira Regional Referral Hospital (LRRH) from September 2022 to February 2023.

Sample size estimation

The sample population was determined using the Yamane's formula of 1973 used for calculating sample size for known populations. Taking the known population size of neonates admitted in the NICU of LRRH from September 2022 to February 2023 from the records of the hospital as follows:

$n = N/1+Ne^2$

Where n is the sample size needed, N is the population size (498 records) as shown in table 1 below, and e is the margin of error (5%) at 95% confidence level.

$n = 498 /1+498(0.05^2)$

n = 222 sample records.

Therefore, the sample size considered was 222 patient records.

Sampling technique and procedure

The study employed systematic random sampling. The list of neonates that were admitted from September 2022 to February 2023 to NICU. Though the records for all admissions were 498, only 396 were presented with full records. A skip interval (X^{th}) was calculated from the total population (N) and the required sample (n) as shown below

$X^{th} = N/n$

$X^{th} = 396/222 \sim 2$

Two papers were folded and lottery method used to select one for starting the recruitment. Thereafter, an interval of 2 was used on the generated list of records until 198 respondent records were obtained However, 4 had missing information. Therefore, a total of 194 responses were obtained.

Operational definitions

Neonate is a baby who is from time of birth to 28 days after birth.

Neonatal mortality this is the death of a baby within the first 28 days of life.

Neonatal sepsis is clinical syndrome of systemic illness accompanied by bacteraemia occurring in the first 28 days of life.

Early onset neonatal sepsis is the sepsis that occurs within the period from birth to 72 hours after birth.

Late onset neonatal sepsis is the sepsis that occurs from 4-28 days after birth.

Apgar score Is a score used in "evaluation of a newborn's physical status by assigning numeric values (0 to 2) to each of the 5 criteria: 1) heart rate, 2) respiratory effort, 3) muscle tone, 4) response to stimulation and 5) skin colour. A score of 8 to 10 indicates the best possible condition"(14).

Expectant mother refers to a pregnant woman.

Nosocomial infections are hospital acquired infections.

Parity is the number of times a woman has given birth in life.

Prolonged rupture of membranes is considered when amniotic membranes ruptured more than 18 hours prior to delivery.

Data collection tool and quality control

Data collection was done using a structured data extraction tool adopted from the Uganda pediatric association publication indicating the diagnoses that fall under NS (15). The factors that were to be studied were adapted from different studies (9, 12, 16-24). The structured data collection tool had three sections. Section one contained the diagnosis, where the different diagnoses that fall under the umbrella of neonatal sepsis were listed according to the UPA and with which any of them present was a positive diagnosis of neonatal sepsis. The other part contained the provision to tick the diagnosis which was either Neonatal sepsis or other illnesses. Section 2 contained the maternal factor extraction tool which included the parameters: neonate's ID to identify whose mother is being assessed, maternal age, parity, and number of antenatal attendances. Section 3 contained the neonatal individual factors extraction tool including neonate's ID, neonate's age in days, neonate's gestational age at birth, neonate's sex, whether there was resuscitation at birth, the mode by which the neonate was delivered, and birth weight. To ensure quality control, the data collection tool which was used was adapted from previous studies about prevalence and associated factors of neonatal sepsis which were published in international peer reviewed journals. The designed data extraction tool was submitted to the supervisor and the Lira University Research Ethics Committee as well as a pediatrician for review and correction to ensure it covers all aspects of the research objectives. The tool was reviewed 2 weeks after designing to confirm it contained the required questions then was run through the Cronbach alpha to determine its reliability. Internal consistency was ensured by using the same data extraction tool for all patient charts.

The structured data collection tool had clearly defined parameters of the phenomenon under scrutiny and simple words that are easy to understand were used throughout. Data was collected from patient charts of all

neonates admitted in NICU at LRRH from September 2022 to February 2023 that were picked up using the systematic sampling technique and met the inclusion criteria. Data was collected for 8 days.

Data processing and analysis

Data editing and cleaning was performed during data collection, every day after collection, and after entry. Cleaning involved checking for entry errors, missing data and coding responses. Data entry and post entry cleaning were performed in Microsoft Excel (2013). Data analysis was performed using the Statistical Product and Service Solutions (SPSS) version 25.0 software. Data analysis was done at univariate, bivariate and multivariate levels. Univariate analysis was done to summarize all data as frequencies and proportions for categorical variables, and mean with standard deviation or median with interquartile range for discrete and continuous variables. Bivariate analysis was performed using univariate logistic regression to determine associations between NS and each independent variable, including maternal factors, and neonatal individual factors. Crude odds ratio with corresponding 95% confidence interval were reported with p values. All variables with $p<0.2$ at bivariate analysis with all other plausible variables from literature were considered for multivariate logistic regression analysis. The backward elimination method was performed, where all variables were entered into the equation and those that are not statistically significant ($p>0.05$) dropped one at a time. Confounding and interactions were assessed before making the final model. Adjusted odds ratios with corresponding 95% confidence interval and p values were reported and presented using tables and texts.

RESULTS

In this study, the proposed sample size was 222 records of neonates admitted in LRRH NICU from September 2022 to February 2023. 389 files were present at hand and on 194 files were sampled out to be considered in the review. This resolved with a response rate of 87.4% as shown in the table below (Table 2). The study included 194 medical charts of neonates admitted to NICU of LRRH from September 2022 to February 2023. Among 194 reviewed charts of neonate's charts of neonates admitted to NICU of LRRH from September 2022 to February 2023 which were involved in the study, 80 neonates (41%) had sepsis, and 114 neonates (59%) had no sepsis (figure 1).

FACTORS ASSOCIATED WITH NEONATAL SEPSIS AMONG NEONATES ADMITTED AT LRRH FROM SEPTEMBER 2022 TO FEBRUARY 2023

MATERNAL FACTORS

Table 3 shows that majority of the mothers (n=87, 44.8%) to the neonates whose charts were involved in the study were para 2-4, majority and almost a half (n=91, 46.9%) were 20-25 years of age, and more than a half (n=113, 58.2%), had attended ANC >4 times. All of the maternal factors are summarized in the table below.

NEONATAL FACTORS

Table 4 indicates that more than a third of the neonates (n=169, 87.1%) were in a range of 1-3 days of age, a half (50.5%) were born before 37 completed weeks of gestation, a half (n=99, 51%) were males, more than a half (n=112, 57.7%) had been resuscitated at birth, almost three quarters (n=130, 67%) were born vaginally,

slightly more than a half (n=105, 54.1%) had a birth weight of <2500g, and 53.1% (n=103) had an Apgar score of 8-10.

BIVARIATE LOGISTIC REGRESSION RESULTS OF FACTORS ASSOCIATED WITH NEONATAL SEPSIS

Table 6 shows that age in days was significantly associated with neonatal sepsis in that those of 1-3days were 3.575 times more like to suffer NS, which implied that neonates who are 1-3days of age would be most likely to suffer from NS in comparison with those of 4-28 days of age (COR 3.575[1.459-8.762], P value 0.05). Furthermore, gestational age at birth was positively related to neonatal sepsis in that a neonate born at <37 weeks of gestation was 2.062 times more likely to develop NS as compared to those born at a gestation age of >=37weeks (COR 2.062[1.153-3.690], P value 0.015). The logistic regression showed that NS was significantly related to birthweight with neonates born with <2500grams having 2.442 odds of suffering NS in comparison with those born with >=2500grams (COR 2.442 [1.359-4.385], P value 0.003. Apgar score too showed significance when it was logistically compared to NS in that those neonates who had an APGAR score of 1-4 at birth had 0.257 odds of suffering from NS compared with the others (COR O.257 [0.100-0.660], P value 0.005). The other results of binary logistic regression between individual factors and NS are shown in table 5.

MULTIVARIATE LOGISTIC REGRESSION RESULTS OF FACTORS ASSOCIATED WITH NEONATAL SEPSIS

The variables with a P-value of less than 0.2 at bivariate analysis were considered for multivariate logistic analysis. In this study neonates with 1-3days of age were 4.159(AOR=4.159, 95% CI: [1.583-10.925]) more likely to develop NS than those older that is 4-28 days of age. The possibility of developing NS was 1.894 times (AOR =1.894, 95% CI [1.009-3.553]) more in male neonates than in the females. The odds of developing NS among neonates born with <2500g of weight was 1.758 times higher than that of those born with >=2500g. In regards to APGAR score, neonates who had Apgar scores from 1-4 were at odds 0.309 of developing NS (AOR= 0.309, 95% CI: [0.115-0.831]) and those with APGAR scores from 5-7 had 0.643 (AOR=0.643, 95% CI: [0.329-1.256]) odds of developing NS as compared to those with APGAR score from 8-10 (Table 6). Therefore, the analysis proved that neonates age in days, neonate's sex, birth weight and APGAR score had significant relationship with neonatal sepsis.

DISCUSSION

The prevalence of neonatal sepsis among neonates admitted to NICU of LRRH from September 2022 to January 2023 is 41.2%. The results are similar to those of studies conducted in north and east Ethiopia (45%) as well as the global prevalence of 48% (12). However, this prevalence is higher than that of Northern Uganda (17.7%) (6), Kenya (23.9%), Nigeria (18.2%), Tanzania (31.4%), India (7.6%), and Iran(15.98%) (12, 23, 25); and lower than that of southern Ethiopia (78.3%) (12). The difference could be due to differences in socio-demographics in study areas and the way the results in regards to the diagnosis was obtained. While some of the studies were conducted in regions, others covered the whole country and others were global. This study was conducted specifically at a central regional referral of the Lango subregion. Different studies considered confirmed blood cultures for the diagnosis of NS while this study considered the umbrella diagnoses and clinical judgement for the diagnosis of NS (15) because the culture test were not used as diagnostic tool with in the health facility. The difference in prevalence in the same area maybe due to the difference in time of

conducting the study as the former was of 2021.(6) and also the former study was considering the whole northern Uganda while this considered only Lango subregion.

The results that low birth weight was significantly related to NS build on the existing evidence of the positive relationship between neonatal sepsis and low birth weight in that neonates who are born with low birth weight are more likely to develop NS as compared to those born with normal birthweight. This finding is similar to those of a study conducted in Ethiopia as a whole and eastern Ethiopia singly (12, 22). This maybe because low birth weight babies have low subcutaneous fat which predisposes them to hypothermia due to high surface area to volume ratio (weight ratio) and have a compromised immune system which predisposes them to NS because of low immunity.

In this study, age of neonates in days was significantly associated with neonatal sepsis which similar to a systematic review and meta-analysis study conducted in Ethiopia which reported that neonatal sepsis is more among neonates in less than 7 days of life(26). This may be because neonates are at a higher risk of infection since they are developmentally weak and have immature immune systems.

These findings show that there is a positive association between lower than 7 APGAR score and neonatal sepsis and this is similar to the findings of studies conducted in Eastern Ethiopia and in all public hospitals in Ethiopia (12, 22). This maybe because the neonates of low APGAR score are believed to have been exposed to infection-causing microbes at birth. This is through unsterile resuscitation equipment such as bulb syringes which may introduce microorganisms to the lungs and an unsafe environment as they intend to save life (17). This then predisposes the neonates born with very low Apgar score a risk of infections like neonatal sepsis as compared to the neonates functioning well at birth.

Abbreviations

NS - Neonatal Sepsis

WHO - World Health Organization

EOS – Early Onset Sepsis

LOS – Late Onset Sepsis

LRRH- Lira Regional Referral Hospital

NICU - Neonatal Intensive Care Unit

UN – United Nations

PROM - Premature Rupture of Membranes

ANC – Antenatal Care

UNICEF – United Nations International Children’s Emergency Fund

Ubos – Uganda Bureau of Standards

SDG 3 - Sustainable Development Goal 3

UHDS – Uganda Demographics Survey

OR – Odds Ratio

CI – Confidence Interval

COR- Crude Odds Ratio

AOR – Adjusted Odds Ratio

Declarations

ETHICS APPROVAL AND CONSENT TO PARTICIPATE

The research proposal was submitted to the Lira University Research Ethics Committee (LUREC) and approval to conduct the study was granted under number LUREC-2023-13. A waiver of consent was granted by LUREC since the study intended to use participants' health information without actually obtaining consent from the individuals, for the reason that the study was a retrospective chart review. The administrative clearance to collect data was obtained from the hospital director of LRRH. To do this, the ethical approval from LUREC, a waiver of consent, and the study protocol were presented to LRRH director, and permission to conduct the study within the NICU was granted. A signed and stamped letter was provided as permission for data collection from the records of neonates who had been admitted to the NICU of the hospital from September 2022 to February 2023 and these were required for the study. Verbal consent was sought from the in-charge NICU at LRRH to use the records with the approval and permission letters presented.

CONSENT FOR PUBLICATION

Not applicable

AVAILABILITY OF DATA AND MATERIALS.

The data that supports the findings of the study are available from the author but restrictions apply to the availability of these data, so they are not publicly available but are available upon reasonable request of permission.

COMPETING INTERESTS

The authors declare they have no competing interests regarding publication of this paper.

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AUTHORS CONTRIBUTIONS

BK. Proposed, wrote, and conducted the study. Did data collection, cleaning, entry and analysis as well as wrote the manuscript.

DAN. Research supervisor. Reviewed, and guided all the processes of the study, and guided the writing of all of sections of the paper.

JBM. Guided the writing of all of sections of the paper and contributed to the development of the data collection tool.

NO. Contributed to the development of the data extraction tool

EK. Participated in data analysis

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Tables

Table 1 Population of neonates admitted in NICU, LRRH from September 2022 to February 2023

Month	Year	Admission
September	2022	81
October	2022	88
November	2022	96
December	2022	88
January	2023	60
February	2023	85
TOTAL		**498**

Table 2:Response rate in the study

Variable	Frequency	Percentage
Available	198	89.2
Cleaned	4	1.8
Considered	194	87.4
Missed	24	10.8
Proposed total	222	100

Table 3: Frequencies of the maternal factors associated with neonatal sepsis among neonates admitted at NICU of LRRH at univariate analysis.

variable	frequency	Percentage
Mother's parity		
1	86	44.3
2-4	87	44.8
>/=5	21	10.8
Maternal age		
<20	44	22.7
20-25	91	46.9
26-35	49	25.3
>35	10	5.2
Number of ANC attendances		
1-4	81	41.8
>4	113	58.2

Table 4 is available in the Supplementary Files section.

Table 5: Bivariate logistic regression results of factors associated with neonatal sepsis among neonates admitted in NICU of LRRH, lira city, Northern Uganda from September 2022 to February 2023.

Variable	Outcome n (%)		P-value	COR (95% CI)
	Sepsis	No sepsis		
Maternal parity				
1	35(40.7)	51(59.1)	0.309	0.583(0.206-1.649)
02-Apr	39(44.8)	48(55.2)	0.18	0.492(0.115-1.388)
>=5	6(28.6)	15(71.4)		
Maternal age				
<20 years	17(38.6)	27(61.4)	0.611	0.681(0.155-2.997)
20-25 years	42(46.2)	49(53.8)	0.337	0.500(0.122-2.056)
26-35 years	18(36.7)	31(63.3)	0.686	0.738(0.169-3.216)
>35years	3(30.0)	7(70.0)		
ANC attendance				
1-4 times	32(39.5)	49(60.5)	0.678	1.131(0.632-2.022)
>4 times	48(42.5)	65(57.5)		
Age in days				
1-3 days	63(37.3)	106(62.7)	0.005	3.575(1.459-8.762)
4-28 days	17(68)	8(32)		
Gestational age at birth				
<37 weeks	32(32.7)	66(67.3)	0.015	2.062(1.153-3.690)
>=37 weeks	48(50)	48(50)		
Sex				
Male	34(35.4)	64(64.6)	0.062	1.732(0.972-3.085)
Female	46(47.4)	50(52.6)		
Resuscitation at birth				
Yes	50(44.6)	62(55.4)	0.261	0.715(0.399-1.282)
No	30(36.6)	52(63.4)		
Mode of delivery				
Vaginal	54(41.5)	76(58.5)	0.808	0.925(0.492-1.739)
Assisted vaginal	3(50)	3(50)	0.625	0.657(0.122-3.542)
Caesarean section	23(39.7)	35(60.3)		
Birth weight at birth				

<2500 grams	33(31.4)	72(68.6)	0.003	2.442(1.359-4.385)
>=2500 grams	47(52.8)	42(47.2)		
Apgar score				
01-Apr	16(66.7)	8(33.3)	0.005	0.257(0.100-0.660)
05-Jul	29(43.3)	38(50.7)	0.222	0.674(0.358-1.269)
08-Oct	35(34)	68(66)		

Table 6: Multivariate logistic regression results of factors associated with neonatal sepsis among neonates admitted in NICU of LRRH, lira city, Northern

Variable	neonatal Sepsis		P value	COR (95% CI)	AOR (95% CI)
	Yes n (%)	No n (%)			
Age in days					
1 to 3	63(78.8)	106(93.0)	0.004	3.575(1.459-8.762)	4.159(1.583-10.925)
4 to 28	17(21.3)	8(7.0)			
Sex					
Male	34(42.5)	64(56.1)	0.047	1.732(0.972-3.085)	1.894(1.009-3.553)
Female	46(57.5)	50(43.9)			
Birth weight in grams					
<2500	33(41.3)	72(63.2)	0.199	2.442(1.359-4.385)	1.758(0.744-4.156)
>2500	47(58.8)	42(36.8)			
Apgar score					
1-4			0.02	0.257(0.100-0.660)	0.309(0.115-0.831)
5-7			0.196	0.674(0.358-1.269)	0.643(0.329-1.256)
8-10					

Figures

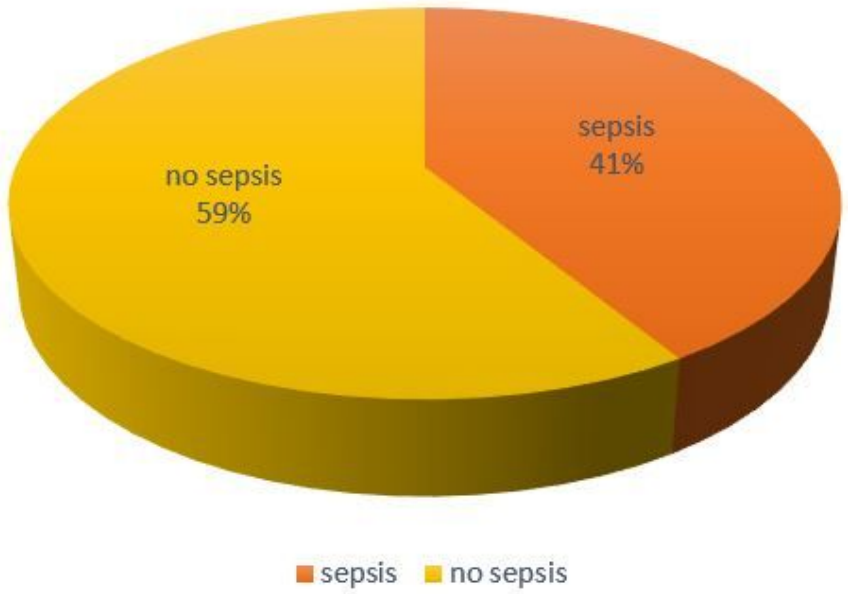

Figure 1

Prevalence of neonatal sepsis

Supplementary Files

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- Table4.docx