

Prevalence and factors associated with neonatal sepsis among hospitalized newborns at Ruvuma, southern Tanzania

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Abstract

Introduction: Neonatal sepsis is one of the most common causes of neonatal morbidity and mortality in developing countries.

Objective: This study aimed to determine the prevalence and factors associated with neonatal sepsis among hospitalized new-borns at Ruvuma, southern Tanzania.

Methods: A facility-based retrospective study was conducted at Songea Regional Referral hospital in Ruvuma, during August-October, 2018. A standardized questionnaire was used to collect demographic, obstetric and clinical information from medical case files of patients. Neonatal sepsis was diagnosed clinically. Data were analysed using SPSS version 24.0. Chi square test was used to assess relationship between outcome and exposure variables. Multivariate logistic regression was used to measure association after controlling for confounders, and P-values of <0.05 were statistically significant.

Results: Medical case files of 263 neonates were reviewed. Of these, 131(49.8%) had sepsis. Factors associated with neonatal sepsis were prematurity (AOR=2.2; 95%CI. 1.3 – 3.6, p=0.002), age of more than a week (AOR=2.2; 95%CI. 1.0 – 4.6, p=0.04), intravenous cannulation after birth (AOR=6.3; 95%CI. 2.1 – 19.0, p=0.002), and resuscitation with nasal oxygen prongs (AOR=1.7; 95%CI. 1.1 – 2.9, p=0.02).

Conclusions: Neonatal sepsis is relatively common among neonates in Ruvuma and is associated with maternal and health services related factors. The findings underscore the importance of routine assessment and close monitoring of neonates.

Key words: neonatal sepsis, prevalence, risk factors

Introduction

Neonatal sepsis is one of the most common causes of neonatal morbidity and mortality accounting for about 26% of neonatal deaths in developing countries.^[1] In some developing countries the mortality rate due to neonatal sepsis is as high as 50% in untreated infants, leading to many clinicians to treat infants based on the history and risk factors alone.^[2] Locally, the prevalence of neonatal sepsis was reported to be as high as 31.4%^[3] in Dar es Salaam, eastern Tanzania and 38.9% in Mwanza, west of Tanzania.^[4]

The condition may be classified as early onset neonatal sepsis, which is mostly associated with acquisition of the infection from the mother, and late onset neonatal sepsis, which is associated with acquisition of infection from the environment.^[2] One meta-analysis estimated that the prevalence of early onset neonatal lab-confirmed infection among newborns of mothers with lab-confirmed infection was 17.2%^[5] while another hospital-based study in Ethiopia reported a 35.3% prevalence of late onset neonatal sepsis.^[6]

Neonatal sepsis is associated with prematurity, hospitalization, invasive procedures, and poor caregiving environment. One previous study showed a

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Table 1. Characteristics of neonates, n=263

Variable	n (%)	Status of neonatal sepsis	
		Sepsis n (%)	No sepsis n (%)
Total population	263 (100.0)	131 (49.8)	132 (50.2)
Gender			
Male	134 (51.0)	61 (45.5)	73 (54.5)
Female	129 (49.0)	70 (54.3)	59 (45.7)
Age (days)			
0 – 7	227 (86.4)	119 (52.4)	108 (47.6)
8 – 28	36 (13.6)	12 (33.3)	24 (66.7)
Gestation age			
Pre-term	113 (43.0)	69 (61.1)	44 (38.9)
Term	150 (57.0)	62 (41.3)	88 (58.7)
Birth weight (kgs)			
≤1.5	10 (3.8)	8 (80.0)	2 (20.0)
1.6 – 2.4	53 (20.2)	41 (77.4)	12 (22.6)
2.5 – 3.9	183 (69.6)	76 (41.5)	107 (58.5)
≥ 4.0	17 (6.4)	6 (35.3)	11 (64.7)
APGAR score			
<7	127 (48.3)	67 (52.8)	60 (47.2)
≥7	136 (51.7)	64 (47.1)	72 (52.9)
Had IV cannulation			
Yes	237 (90.1)	127 (53.6)	110 (46.4)
No	26 (9.9)	4 (15.4)	22 (84.6)
Given oxygen via machine			
Yes	120 (45.6)	69 (57.5)	51 (42.5)
No	143 (54.4)	62 (43.4)	81 (56.6)

significant association between maternal urinary tract infections (UTI) and history of meconium aspiration.^[6] Another multicentre surveillance study showed that neonatal sepsis was associated with maternal intrapartum fever, and frequent vaginal examinations, preterm delivery, or premature rupture of membranes.^[7]

The aim of this study was to determine the prevalence and factors associated with neonatal sepsis among hospitalized new-borns at Ruvuma, southern Tanzania.

Method

This was a retrospective descriptive cross-sectional study conducted between August and October 2018 at Songea Regional Referral Hospital, Ruvuma, Tanzania. The

sample size was 263 newborns. Inclusion criteria were all newborns less than 28 days of life delivered at or admitted to the hospital. Neonates with congenital malformations were excluded.

We reviewed the case files of newborn babies born or admitted at the hospital between 1st July 2017 and 31st June 2018. The dependant variable was neonatal sepsis, independent variables were demographic characteristics of mother, neonate's age, delivery mode, birth weight, gestation age, and rupture of membranes, intravenous cannula insertion and use of oxygen in delivery room. Neonatal sepsis was diagnosed both clinically and by blood culture. In this study, prevalence of neonatal sepsis means the number of babies in the study affected by neonatal sepsis. Data were collected using a standardized questionnaire, and data analysis was done using SPSS statistical software v24.

Ethical clearance was obtained from the Institutional Review Committee of the Archbishop James University College, Songea and permission to collect data was granted by the regional and hospital authorities. Confidentiality of the newborns' details was ensured.

Results

The sample size was 263 of whom 134 (51.0%) were males and 227 (86.3%) were aged between 0 – 7 days. Ten newborns (3.8%) had a very low birth weight while 20.2% had a low birth weight. About 5.0% were delivered at home. The majority (39.1%) of the mothers were aged 20 to 24 years. Neonatal sepsis was diagnosed in 131(49.8%) while the rest had other neonatal conditions. There was a significant association between age of the neonates ($p=0.03$), gestation age ($p=0.002$), birth weight ($p<0.00001$), cannulated ($p=0.002$) and being kept under oxygen ($p=0.02$) with neonatal sepsis (Table 1).

After controlling for potential confounders through multivariate regression analysis, factors associated with neonatal sepsis were age of less than a week ($AOR=3.05$; 95% CI. 1.4 – 6.4, $p=0.004$), age of more than a week ($AOR=2.2$; 95% CI. 1.0 – 4.6, $p=0.04$), being cannulated after birth ($AOR=6.3$; 95% CI. 2.1 – 19.0, $p=0.002$), and resuscitation at birth with oxygen via mask ($AOR=1.7$; 95% CI. 1.1 – 2.9, $p=0.02$) (Table 2).

Discussion

Prevalence of neonatal sepsis in this study was 49.8%, higher than the 31.4% previously reported by Jabir et al^[3] in Dar es Salaam, and 38.9% in Mwanza, west Tanzania.^[4] Our higher figures are likely to be due to the fact that this study was done in a referral hospital that receives neonates from both rural and urban areas who already have complications.

Our findings showed that neonatal sepsis was associated with invasive procedures such as intravenous cannulation

(AOR=6.3; 95%CI. 2.1 – 19.0, p=0.002) and administration of oxygen via nasal prongs (AOR=1.7; 95%CI. 1.1 – 2.9, p=0.02) soon after birth. Our findings are in line with those reported by Chapman et al that showed that the need for invasive monitoring and supportive care of very low birth weight places the

neonates at a risk of acquiring nosocomial infections.^[8] It is also possible that inadequate knowledge on newborn-resuscitation among health care providers may predispose to sepsis, thus calls for a need to build their capacity. About 43.0% of the newborns were born prematurely and about 24.0% had very low or low birth weights. Low birth

Table 2. Multivariate logistic regression on maternal and neonatal factors associated with neonatal sepsis

Variable	Total, n	With Sepsis n (%)	Adjusted odds ratio 95% CI	P-Value
Age (days)				
0 – 7	227	119 (52.4)	3.05 (1.44 – 6.46)	
8 – 28	36	12 (33.3)	1	0.004
Gestation age				
Pre-term	113	69 (61.1)	2.23 (1.35 – 3.66)	
Term	150	62 (41.3)	1	0.002
Birth weight (kg)				
≤1.5	10	8 (80.0)	5.76 (1.19 – 27.80)	
1.6 – 2.4	53	41 (77.4)	7.38 (3.29 – 16.55)	<0.0001
≥3.9 – 2.5	200	82 (41.5)	1	
APGAR score				
<7	127	67 (52.8)	0.99 (0.61 – 1.61)	
≥7	136	64 (47.1)	1	0.98
Place of delivery				
Home	12	9 (82.5)	3.17(0.84 – 11.99)	
Hospital	251	122 (48.6)	1	0.09
Had cannulation				
Yes	237	127 (53.6)	6.50 (2.12 – 18.99)	
No	26	4 (15.4)	1	0.001
Given Oxygen via mask				
Yes	120	69 (57.5)	1.76 (1.08 – 2.89)	
No	143	62 (43.4)	1	0.02
Maternal age (years)				
<19	57	24 (42.1)	1.62 (0.63 – 4.16)	
20 – 24	103	57 (55.3)	2.75 (1.15 – 6.62)	
25 – 29	74	41 (55.4)	2.76 (1.11 – 6.86)	0.04
≥30	29	9 (30.8)	1	
Rupture of membranes (hours before delivery)				
0 – 2	183	96 (52.5)	0.18 (0.02 – 1.56)	
2- 18	73	29 (39.7)	0.11 (0.01 – 0.96)	0.09
<18	7	6 (85.7)	1	

weight is usually associated with prematurity. Premature newborns have poor host defences and are therefore at risk of sepsis. Our findings show that neonatal sepsis is associated with prematurity (AOR=2.2; 95 % CI. 1.3 – 3.6, p=0.002) similar to findings reported by Jabir et al³ and Hagem et al.^[9] Also, about 91.0% of neonates who had sepsis were aged less than a week. Results also showed that neonatal sepsis was associated with age of the neonate (AOR=2.2; 95 % CI. 1.0 – 4.6, p=0.04).

Contrary to findings from other studies,^[3,10] results in this study showed that low APGAR score was not associated with sepsis. This was also true for the place of delivery. Having a small number of babies born at home could probably explain this difference. Other factors such, as premature rupture of membranes was not associated with neonatal sepsis.

Our study is limited by being a cross-sectional study hence it is difficult to determine potential causal-effect relationships between variables. It was conducted at a single centre; thus, the findings may not be generalized to the general population. Also, importantly, our study was limited by poor and un-standardized documentation in some of the medical case files that caused missing important data for analysis.

Conclusion

The prevalence of neonatal sepsis in this study setting is very high. It is recommended that the capacity of health care providers caring of newborn babies is improved, and there is routine assessment of newborns in order to identify risk factors for neonatal sepsis. Adherence to aseptic precautions while performing invasive procedures to newborns is also recommended. Furthermore, pregnant women should be encouraged to attend antenatal clinics as recommended and to seek medical attention whenever needed.

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Note:

More details on the methods used, the questionnaire and the facilities where the study was conducted in Songea are available from the authors.

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