

Prevalence of Neonatal Sepsis and Associated Factors among Neonates Admitted to Yirgalem General Hospital, Sidama Region, Southern Ethiopia

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Abstract

Neonatal sepsis is a global public health problem and causes a massive burden in developing countries including Ethiopia. Despite the presence of a few studies, there are some inconsistencies regarding the predictors of neonatal sepsis. This study was conducted to determine the prevalence of neonatal sepsis and associated factors among neonates admitted to Yirgalem General Hospital, Sidama Region, South Ethiopia. Randomly selected 246 charts of neonates admitted in the neonatal intensive care unit were reviewed. Overall prevalence of neonatal sepsis was 53.3% (95% CI: 47.1- 59.5%). Early-onset was 39.84% and the remaining 13.41% had late-onset neonatal sepsis. Logistic regression analysis revealed that odds of sepsis was increased among neonates born from mothers lived in the rural area (AOR = 2.74; 95% CI: 1.34, 5.24), had a history of foul-smelling liquor (AOR= 2.35, 95% CI: 1.23, 4.49) and maternal history of urinary tract infection (AOR=5.24, 95% CI: 2.69-10.22). Odds of neonatal sepsis also increased in neonates admitted to the unit at age less than seven days (AOR = 2.68, 95% CI: 1.31-5.52) and male sex (AOR=2.75; 95% CI: 1.41-5.36). The prevalence of neonatal sepsis was high, and the determining factors for the incidence of neonatal sepsis were the place of residence, maternal history of UTI and foul smelling liquor, age at admission and male gender. Strengthening preventive efforts during pregnancy, delivery, and neonatal period to address the problem were recommended.

Key word- Neonatal sepsis, Associated Factors, Yirgalem General Hospital, Sidama Region

1. Introduction

Neonatal sepsis is a systemic clinically suspected or culture-confirmed infection occurring in infants during the first 4 weeks of life. It is categorized as early-onset neonatal sepsis (occurring within seven days of life after birth) and late-onset neonatal sepsis (occurring after the seventh day of life) based on the onset of clinical features (1). Neonatal infections in healthcare facilities have been a reason for inflated death and illness in the neonatal intensive care units (2).

The diagnosis of neonatal sepsis is challenging due to its nonspecific clinical manifestations among neonates. Due to the scarcity of microbiological investigations, clinical criteria in identifying neonates with possible sepsis are a commonly used approach in developing countries. This ideal approach helped to identify high-risk neonates and targeting them for intensive therapy (3).

Sepsis is one of the leading causes of mortality and morbidity in all age groups. Globally, 48.9 million incident cases of sepsis and 11 million sepsis-related deaths were reported in 2017 representing 19.7% of all global deaths. Sepsis incidence and mortality varied substantially across regions, with the highest burden in sub-Saharan Africa, Oceania, South Asia, East Asia, and Southeast Asia (4).

In 2018, 2.5 million neonatal deaths (7,000 deaths every day) reported accounting for 47% of all under-five deaths worldwide. Sub-Saharan Africa continued to be the region with the highest neonatal mortality followed by Central and Southern Asia. The risk of neonatal death is estimated to be six times more in the low and middle-income countries compared to developed More than half of all under-five deaths in 2018 occurred in five countries: India, Nigeria, Pakistan, the Democratic Republic of the Congo, and Ethiopia (5).

Neonatal sepsis contributes substantially to neonatal morbidity and mortality. The major causes of neonatal deaths globally were estimated to be preterm births (35.7%), intrapartum-related complications (23.4%) followed by sepsis (15.6%). Different types of infections and related factors accounted for only 14.7% of neonatal mortality. Sepsis occurrence in the late neonatal period showed more contribution (37.2%) to neonatal deaths (6). In sub-Saharan Africa, seventeen percent among all neonatal death results from neonatal sepsis as compared to only six percent in developed countries (7).

In Ethiopia, one in every 35 children dies within the first month of age and one of every fifteen children dies before reaching their fifth birthday. Neonatal mortality decreased from 39 to 29 deaths per 1,000 live births between 2005 and 2016. The causes of neonatal deaths are closely linked and multiple (8). Neonatal sepsis was one of the most common causes of neonatal death, which accounted for more than one-third of neonatal deaths (9).

Varieties of studies were conducted to estimate the prevalence and associated factors of neonatal sepsis in Ethiopia. Despite the presence of a few studies, there are some inconsistencies regarding the predictors of neonatal sepsis (10-16). Therefore, this research was conducted to find out the prevalence of neonatal sepsis and associated factors in YGH, South Ethiopia.

2. Methods

2.1. Study Area

This study was conducted in Yirgalem General Hospital, which is located in Sidama National Regional State, Yirgalem town, South Ethiopia. YGH is one of the pioneers Public Hospital in Southern Ethiopia established in 1957 with the support of Norwegian Missionaries and lead by those Missionaries until 2001. The Hospital is located at about 322 km south of Addis Ababa and 45 km of Hawassa, the capital of the region. With a total of 338 health care providers, the hospital provides services for approximately 4.5 million populations of the region and surrounding the Oromia region. Service like Outpatient, inpatient, emergency, surgery, pediatric, laboratory, pharmacy, and maternal care including delivery service are provided by the hospital. The NICUs of YGH contain well trained and mixed health professionals. Seven

hundred eight neonates admitted at NICUs during a study to get medical services.

2.2. Study period

The study period was from December 1/2018 to November 30/ 2019.

2.3. Study design

A facility based retrospective cross-sectional study was conducted using pretested checklists.

2.4. Source population

The source population was all neonates admitted to NICU of YGH during the study period.

2.5. Study population

The study population was all selected neonates who fulfill inclusion criteria.

2.6. Inclusion criteria

Neonates, whose age less than or equal to 28 days, admitted to YGH with all type of diagnosis during the study period was included in the study.

2.7. Exclusion criteria

Neonates with incomplete registration book and charts were excluded from the study.

2.8. Sample size and sampling techniques

A single population proportion formula was used to estimate the sample size. According to a study conducted at Wolaita Sodo Town, Southern Ethiopia, the prevalence of neonatal sepsis was 33.8% (14). The computation was made at a 95% confidence level, a 5% margin of error, and 10% non-response rate. The sample size of 246 determined to be sufficient and was recruited using a systematic random sampling technique, considering the number of sick neonates admitted to the neonatal intensive care unit (NICU).

2.9. Data collection tools

The data was collected using checklists prepared by reviewing different works of literatures that contain socio-demographic characteristics, maternal information, and neonatal information for neonatal sepsis. Records of neonates from December 1/2018 to November 30/ 2019 (one year) were reviewed. This involves going through logbook records of neonates with the diagnosis of sepsis. The medical files were traced using the patient card numbers on the logbook registry. If there was incomplete maternal information on the neonatal card, the

maternal card was traced by using the neonatal card number.

2.10. Data collection and quality control

Checklists were pre-tested before actual data collection. Data collectors and supervisors were trained for two days. Every day after data collection, the filled checklists were checked for its completeness and consistency by the supervisor, and corrections were made accordingly.

2.11. Data analysis

Principal investigators reviewed and organized data after the collection; then coded and entered into SPSS version 25 for analysis. The statistical significance and strength of the association between independent variables and an outcome variable was measured by a bivariable logistic regression model with a p-value of less than 0.25. Then multivariable logistic regression was used to decrease the effect of confounding factors and statistical significance was declared with $P < 0.05$. Finally, the result was presented using tables, texts, and figures.

2.12. Ethical consideration

Ethical clearance was obtained from the Institutional

Review Board of Yirgalem Hospital Medical College. Official permission was obtained from YGH and a legal letter from the hospital administrative body was directed to the NICU clinic. Oral consent was obtained from the department head of NICU and concerned staff. Mothers' /neonates' name was not included in the data collection tools and confidentiality of the information was maintained at all levels of data handling and management.

3. Result

3.1. Socio-demographic characteristics of mothers

A total of 246 charts of neonates admitted in the NICU were reviewed. The mean age of the mothers was 25.8 (± 4.9) years. The majority, 210 (85.4%) of the mothers were within the age range of 20-34 years whereas 227 (92.3%) were married. More than half of mothers, 136 (55.3%) lived in the rural area. Pertaining education status of mothers, nearly all, 232 (94.3%) attended primary education and above. Concerning occupation, 132 (53.7%) of the mothers were housewives. The median monthly income of the family was 1000 Eth birr and nearly two-third (61%) income level was < 1000 Eth birr (table 1).

Table 1- Socio-demographic characteristics of neonates' mothers in Yirgalem General Hospital, Sidama Region, Southern Ethiopia, 2018/2019

Variables	Categories	Frequency	Percent (%)
Maternal age	< 20 years	14	5.7
	20-34 years	210	85.4
	≥ 35 years	22	8.9
Residence of mother	Urban	110	44.7
	Rural	136	55.3
Marital status of mothers	Single	19	7.7
	Married	227	92.3
Educational status of mothers	Illiterate	14	5.7
	Primary	128	52
	Secondary	68	27.6
	College and above	36	14.6
Occupation of mothers	Housewife	132	53.7
	Civil servant	65	26.4
	Daily laborer	35	14.2
	Merchant	14	5.7
Monthly income	≤ 1000 Eth Birr	150	61
	> 1000 Eth Birr	96	39

Prevalence of neonatal sepsis

Among 246 neonates selected for the study from the register, 131 (53.3%) (95% CI: 47.1- 59.5%) had

neonatal sepsis and the remaining 115(46.7%) have been admitted for other diseases. From those admitted for neonatal sepsis, 98 (74.8%) had early-onset and 33 (25.2%) had late-onset neonatal sepsis (fig1).

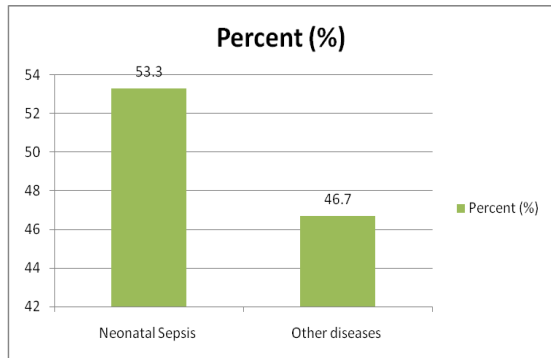


Figure 1- Prevalence of neonatal sepsis in Yirgalem General Hospital, Southern Ethiopia

3.2. Maternal Risk Factors for Neonatal Sepsis

Among a total of sampled neonates, 122 (49.6%) of their mothers had history of meconium stained amniotic fluid (MSAF). Out of this, 10(8.2%) developed neonatal sepsis. More than one third, 97 (39.4%) of mothers had history of foul smelling liquor and out of them, 66(68%) of their neonates developed neonatal sepsis. Slightly more than half, 135 (54.8%), mothers gave birth spontaneously vaginally. Neonates of mothers' who gave birth spontaneous vaginally, 77(57%) developed sepsis. Concerning place of residence, 136 (55.3%) mothers lived at rural, out of this, 87 (64%) their neonates developed neonatal sepsis.

3.3. Neonates Risk Factors for Neonatal Sepsis

The mean age of the neonates at admission was 4.5 (± 5.331) days. One hundred seventy-five (71.1%) neonates were aged between 0 and 7 days. More than

half, 152(61.8%), were male. Seventy-six (30.9%) neonates had low birth weight and out them 36(47.4%) developed neonatal sepsis. Concerning gestational age, 77(31.3%) neonates were reported to have gestational age less than 37 weeks and 45(58.4%) of them developed neonatal sepsis. Referring to APGAR score, about 164 (66.7%) neonates had APGAR score >7 and out of them 87 (53%) developed sepsis. Out of total neonates, 83(33.7%) resuscitated at birth and of these, 45 (54.2%) developed neonatal sepsis.

3.4. Factors Associated with neonatal sepsis

In this study, multivariable logistic regression analysis revealed that place of residence, sex of neonate, maternal history of foul-smelling liquor, and maternal history of UTI and age of neonate at admission were statistically significant associated with neonatal sepsis. Neonates of female sex had a 2.75 times higher risk to develop sepsis than male sex neonates (AOR=2.75; 95% CI: 1.41-5.36). Neonates admitted to NICU at age less than seven days had 2.68 times increased odds of developing neonatal sepsis compared to their counterparts.

Compared to neonates' born from urban mothers, odds of developing neonatal sepsis were 2.74 times higher in neonates born from rural mothers (AOR = 2.74; 95% CI: 1.34, 5.24). Neonates from the maternal history of foul-smelling liquor had a 2.35 times higher chance of neonatal sepsis compared to mothers without foul-smelling liquor (AOR= 2.35, 95% CI: 1.23, 4.49). Maternal history of UTI increased 5.24 times the risk of developing sepsis in neonates (AOR=5.24, 95% CI: 2.69-10.22) (table 2).

Table 2 - Bivariable and Multivariable Logistic Regression Analysis Predicting Associated factors of Neonatal Sepsis among Neonates Admitted Pediatrics Clinic of Yirgalem General Hospital, Sidama Region, Southern Ethiopia, 2018/2019

Variable	Category	Neonatal sepsis		COR	AOR
		Yes	No		
Residence	Rural	87	49	2.66 (1.59-4.47)	2.74(1.43-5.24)*
	Urban	44	66	1	1
Monthly income of family	≤ 1000 Eth birr	87	63	1.63(0.97-2.73)	1.71(0.86-4.31)
	>1000 Eth birr	44	52	1	1
Sex of neonate	Female	63	31	2.51(1.47-4.29)	2.75(1.41-5.36)*
	Male	68	84	1	1
Maternal history of UTI	Yes	78	32	3.82(2.23-6.53)	5.24(2.69-10.22)*
	No	53	83	1	1
History of foul smelling liquor	Yes	66	31	2.75(1.61-4.70)	2.35(1.23-4.49)*
	No	65	84	1	1
Gestational age of neonate	<37 weeks (preterm)	45	32	1.36(0.79-2.34)	1.57(0.73-3.41)
	≥37 weeks (term)	86	83	1	1
Labor duration	<24 hours	95	85	1	1
	≥24 hours	36	30	1.07(0.61-1.89)	0.90(0.44-1.86)
ROM duration	<18 hours	114	93	1	1
	≥18 hours	17	22	0.63(0.32-1.25)	2.35(0.89-6.19)
Mode of delivery	Spontaneous vaginal	77	58	1.40(0.85-2.32)	1.08(0.51-2.29)
	Instrumental/ CS	54	57	1	1
Resuscitation at birth	Yes	45	38	1.06(0.62-1.82)	0.79(0.38-1.67)
	No	86	77	1	1
History of MASF	Yes	59	63	0.67(0.41-1.12)	1.95(0.89-4.31)
	No	72	52	1	1
Neonate birth weight	<2.5 kg	36	36	0.83(0.48-1.44)	0.54(0.26-1.21)
	≥ 2.5kg	95	79	1	1
Admission age	≤ 7 days	98	77	1.46(0.84-2.55)	2.68(1.31-5.52)*
	8-28 days	33	38	1	1

4. Discussion

This study was aimed to assess the prevalence and associated factors of neonatal sepsis in Yirgalem General Hospital. The prevalence of neonatal sepsis was 131(53.3%). This finding is similar to a study conducted in Gondar (17). The finding was higher than previous studies done in Wolayita Sodo (14), Sudan (18), and Dare Salaam (19). The findings of this study were also lower than studies conducted in Arbaminch (13), Shashemene (16), Bishoftu (20), and Dhaka (21). The difference could be due to difference in the study area, socio-economic status of the population, health service seeking behavior, availability of trained health personnel, and use of laboratory/culture confirmation to define cases.

This study came up with that a significant number of neonates born from mothers' with a history of UTI and foul smelling liquor developed sepsis. Maternal history of UTI increased 5.24 times whereas the

history of foul-smelling liquor increased 2.35 times the risk of developing sepsis in neonates. This finding is congruent with the findings of studies conducted in, Gondar (22), Mekele (15), Bishoftu (20), and Northwest Ethiopia (23). This could be happening because the most common pathogens found on the vaginal wall possibly increase the risk while the child was born and pass through the vaginal wall (24-26).

The current study finding revealed that the probability that a neonate develops sepsis increased with an early age admission to the hospital. It was also realized that 74.8% had early onset of neonatal sepsis (<7days). Our study finding is comparable to the study conducted in Ethiopia (16) and Ghana (27). The early onset of sepsis in the present study could be due to ascending infections from the maternal perineum due to bacterial colonization or probably due to direct contact with microorganisms and the newborn's body during the delivery process.

5. Conclusion

Generally, results of this study showed the prevalence of sepsis among neonates admitted to NICU of Yirgalem General Hospital is high. The determinants of neonatal sepsis are: rural dwelling maternal history of UTI and foul smelling liquor, age at admission and gender of neonates. Therefore, preventive efforts should focus during pregnancy, delivery, and neonatal period in order to address the problem of neonatal sepsis were recommended.

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Abbreviations

AOR: Adjusted Odds Ratio; APGAR: Activity, Pulse, Grimace, Appearance, Respiration; CI: Confidence Intervals; COR: Crude Odds Ratio; CS: Cesarean Section; EDHS: Ethiopia Demographic and Health Survey; EONS: Early Onset Neonatal Sepsis; LONS: Late Onset Neonatal Sepsis; MSAF: Meconium Stained Amniotic Fluid; NICU: Neonatal Intensive Care Unit; OR: Odds Ratio; SD: Standard Deviation; UTI: Urinary Tract Infection; YGH: Yirgalem General Hospital; WHO: World Health Organization

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Author's Contribution

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Conflict of Interests

The authors declare that there was no conflict of interest.

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