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Prevalence and determinants of neonatal sepsis among admitted neonates in Hiowt- Fana Specialized Referral Hospital, Harar, Ethiopia, 2019

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ABSTRACT

Background and Objective: Neonatal sepsis is a systemic infection occurring in the first 28 days of life and is a leading cause of disease and death of neonates. It accounts for five million newborn deaths the objective of this study was to assess prevalence and determinants of neonatal sepsis among admitted neonates at in Hiowt- Fana Specialized Referral Hospital, Harar, Ethiopia, 2019.

Methods: Hospital-based cross-sectional study with a retrospective chart review method was conducted in Tertiary Hospital in Harar town. Data were collected from April 1 to May 30, 2019. The sample size was calculated by using single population proportion sample formula and the final sample size was 292. Data were collected using a checklist and analyzed through SPSS-20. Binary and multiple logistic regressions were applied to find the association between independent and dependent variables.

Findings: In general, the prevalence of neonatal sepsis in this study was 52.7%. This study indicated that prolonged rupture of membranes (PROM) of the mother (P-value=0.002, AOR=2.74 (95% CI: 1.32, 4.39)), gestational age of neonates (P-value=0.001, AOR=0.85(0.34-0.815)) and birth weight of the neonate (P-value=0.001, AOR=0.45(0.04-0.61)) were significantly associated with neonatal sepsis.

Conclusion: The associated risk factors for neonatal sepsis were identified as PROM of the mother, gestational age of neonates and birth weight of the neonate. Therefore, service utilization of mothers, early detection of risky situations and appropriate practice of newborn care should be strengthened by training of health workers, provision of health care services as per standards, and monitoring and evaluation of obstetrical/neonatal care.

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Introduction

Neonatal sepsis is a systemic infection occurring in the first 28 days of life and is a leading cause of disease and death of neonates [1]. Based on the onset of clinical signs & symptoms, it is categorized as early and late [2]. Early-onset neonatal sepsis occurs within the 1st seven days of life and Late-onset neonatal sepsis occurs after

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that [3]. Neonatal sepsis accounts for five million newborn deaths and is mostly diagnosed in underdeveloped countries [4]. When the risk of neonatal death is compared, it is 6 times higher in developing countries than developed countries. Evidence showed that neonatal deaths accounted for 52% of all <5 children mortality in South Asia, 53% in Latin America & Caribbean, 34% in sub-Saharan Africa [5], 41 % in Ethiopia [6].

Neonatal sepsis signs and symptoms are nonspecific, may be unclear for some time and wrong for conditions distinctive of this period of life such as respiratory disorders caused by prematurity. In addition, there are many infants with presumed suspected clinical sepsis for every septic newborn [3].

It is difficult to diagnose early because the problem has no specific sign symptoms and treating neonates with antibiotics based on slight sign symptoms is liable to over-treat non-infected neonates [7]. Therefore, identification of risk factors and timely initiation of treatments can significantly decrease neonatal disease and death [5].

Different literatures represented that both maternal and neonatal factors cause neonatal sepsis for instance prolonged rupture of membrane (PROM), urinary tract infection, intra-partum fever, instrumental delivery, frequent vaginal examination, never attend antenatal care (ANC) and home delivery which were maternal factors and low birth weight, complicated or instrument-assisted delivery, low APGAR scores and invasive procedures during hospital admission in neonatal factors [8-14].

Some studies have been done in different parts of Ethiopia and suggested that the prevalence of neonatal sepsis is high despite a considerable burden of neonatal sepsis in our setting. Since there were no studies on the title; therefore, this study was conducted in Harar, Hiowt-Fana Specialized Referral Hospital to find prevalence and determinants of neonatal sepsis among admitted neonates in the past year. So, the study will give a picture from Harar, Ethiopia and will create an opportunity to reduce the problem based on factors identified.

Methods

Study setting and participants

A retrospective cross-sectional study was conducted for the last year's data. Data were collected from April 1 to May 30, 2019. All charts of neonatal sepsis from January 2018 to January 2019 G.C were retrieved from the registration book that met the inclusion criteria at in Hiowt- Fana Specialized Referral Hospital which is founded in Harar town, Ethiopia, and it is 514 km far away from the capital city Addis Ababa. The constructed hospital provides services in the Era of colonial Italy in 1933 G.C and for neighboring regions.

Inclusion and exclusion criteria

Neonates diagnosed with neonatal sepsis according to established clinical and hematological criteria of Integrated Management of Neonatal and Childhood Illness (IMNCI) were included in this study, while charts with incomplete information were excluded.

Sampling and sample size

The sample size was calculated using the single population proportion formula using the prevalence of neonatal sepsis of 77.9% from a study conducted in Shashemene Town, Oromia Regional State**,** Ethiopia[15], and after adding 10% non-response, the total sample size was 292.

Data collection tools

Data were collected using a record review checklist that was adapted by reviewing the relevant literature to meet the objectives of the study. The checklist contains questions and statements in four parts that assess: sociodemographic characteristics, maternal birth history, maternal health status, and a part that assesses the

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general birth and health status of the newborn. Data were collected by 4 trained nurses. Daily, each questionnaire was checked for completeness by the study director and necessary feedback was given to the data collectors for the next day.

Operational definition

Case (Neonatal sepsis): The established IMNCI clinical features including the presence of two or more of persistent fever (≥37.5 °C) or persistent hypothermia (≤35.5 °C) for more than one hour, fast breathing (≥60 breath per minute), severe chest in drawing, grunting, not feeding well, movement only when stimulated, bulged fontanel, convulsion, lethargic or unconsciousness along with ≥2 of the hematological criteria such as total leukocyte count (< 4000 or > 12,000 cells/mm3), absolute neutrophil count (< 1500 cells/mm3 or > 7500 cells/mm3), platelet count (< 150 or > 450 cells/mm3), and random blood sugar (< 40 mg/dl or > 125 mg/dl) were used to diagnose neonatal sepsis cases.

Data analysis

After data collection, the questionnaire was checked for completeness and coded. The data were entered into Epi-info version 3.5.3 and exported, cleaned and analyzed by using SPSS 20. Mono, bi and multivariate analyses were performed. Variables with a $p<0.05$ in bi-variate analysis were entered into multiple logistic regression and variables with a $p<0.05$ in multivariate analysis were considered statistically significant associations.

Results

Socio demographic characteristics

A total of 292 neonatal charts were examinedin this study and the index mothers were included in the study. Of these, 197(67.7%) of the mothers/caregivers/ neonates were in the age group below 35 years, 153(52.40%) of them were rural dwellers, 181 (62%) were born male, 243(83.22%) were less than 7 days of age (table 1).

Obstetric characteristics of the respondents.

Out of the total 292 newborns included in the study, 170 (58.2%) mothers were multipara, 174 (59.59%) mothers had ANC follow-up during their pregnancy, 173 (59.25 %) had spontaneous vaginal delivery and 80 (27.4%) mothers had history of PROM (table 2).

Of the 292 samples included in the study, 185 (63.4%) showed birth asphyxia. As for gestational age, 203 (69.5%) were term-born and 180 (61.6%) of them weighed between 2.5 and 4kgs (table 3).

The main morbidity profile of all neonates admitted to the neonatal intensive care unit of the hospital of Hiowt Fana Specialized Referral was neonatal sepsis 154(52.7%), followed by 65 (22.3%) perinatal asphyxia and 27 (9.2%) meconium aspiration syndrome, respectively.

Determinants of neonatal sepsis

In bivariate logistic regression analysis, maternal age, place of residence, neonatal sex, medical history PROM, ANC, gestational age and birth asphyxia were statistically associated with neonatal sepsis. Variables that showed statistically significant associations with neonatal sepsis in bivariate analysis were included in multivariate logistic regression to control potential confounders. After controlling for the effect of other predictor variables, multivariate logistic regression analysis showed statistically significant association between, PROM, gestational age, birth weight and neonatal sepsis with $p<0.05$. AOR=2.74(1.32-4.39), AOR =0.85(0.34-0.815) and (AOR =0.45(0.04-0.61), respectively.

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Table 1. Socio demographic characteristics of mothers and infant admitted in Hiowt- Fana Specialized Referral Hospital, Harar, Ethiopia, 2020

Variables	Category	Frequency	Percentage
Age of mothers	< 35 years	197	67.47
	≥ 35 years	95	32.53
Residence	Urban	139	47.60
	Rural	153	52.40
Marital status Currently	married	248	84.93
	un married	44	15.07
Educational status	Not attended formal education	167	57.19
	Attended formal education	125	42.81
Occupation	House wife	211	72.26
	Employed	81	27.74
Sex of neonate	Male	181	61.99
	Female	111	38.01
Age of neonate (in days)	1–7 days	243	83.22
	8–28 days	49	16.78

Table 2. Obstetric characteristics of mothers of admitted neonates in Hiowt- Fana Specialized Referral Hospital, Harar, Ethiopia, 2020

Variables	Category	Frequency	Percentage
Parity	Primi para	122	41.78
	Multi para	170	58.22
PPROM	Yes	80	27.40
	No	212	72.60
Ante Partum Hemorrhage	Yes	9	3.08
	No	283	96.92
Ante Natal Clinic follow up	Yes	174	59.59
	No	118	40.41
Place of delivery	Health institution	288	98.63
	Other than health institution	4	1.37
Mode of delivery	Spontaneous Vaginal Delivery	173	59.25
	Cesarean Section	113	38.70
	Instrumental	6	2.05
Duration of labor	< 24 h	282	96.58
	≥ 24 h	10	3.42
Maternal HIV status	Positive	2	0.68
	Negative	290	99.32
Urinary tract infection (UTI)	Yes	37	12.67
	No	255	87.33

Table 3. Characteristics of neonate who were admitted in Hiowt- Fana Specialized Referral Hospital, Harar, Ethiopia, 2020 in relation to risk factors

Variables		N	%	P-value
Birth asphyxia	Yes	185	63.36	0.002
	No	107	36.64	
Gestational Age	Preterm	19	6.51	0.001
	Term	266	91.10	
	Post term	7	2.40	
Birth weight	LBW	112	38.36	0.001
	Normal	180	61.64	

Discussion

In this study the prevalence of neonatal sepsis was 52.7%. It is lower than studies done in Debrezeit, 72.2%, [16] Shashamene, 77.9% , [15] and Douala(Cameron), 79.1% [17] and it is also higher than studies done in India, 7.6% , [18]

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Iran, 18.4% [19] , Kenya, 23.9%, [20] Temeke and Mwananyamala hospitals, Tanzania, 31.4%, [21] Egypt, 40.7% [22] and Black Lion specialized hospital (Ethiopia), 44.7%.[23] The difference could be due to socio-demographic/economic/variations, methodological differences like that of sample size, study design.

Newborns of mothers with PROM had more than 2-fold higher risk of developing neonatal sepsis than newborns of mothers who did not have PROM (AOR =2.74(95%CI 1.32, 4.39) the result is consistent with studies from Mexico [11], Brazil [24] and Mekelle [9]. It is evident that early rupture of the membrane favours ascending infection leading to sepsis.

In this study neonates born at 37 weeks gestational age had a 15% lower risk of developing neonatal sepsis than preterm infants (AOR =0.85(0.34-0.815)). This shows that neonates born at term have a lower risk of developing neonatal sepsis than neonates born preterm. This result is consistent with studies conducted in Tikur Anbsa, [23] Gondar, [8] Tanzania [21] and Mexico [25]. The possible explanation is that preterm infants are immature, their immune systems are not well developed and they are poorly breastfed, which predisposes them to poor nutrition and body defenses and eventually to sepsis.

In this study, it was found that those neonates with a normal birth weight (>2500g) had a significantly lower risk of developing neonatal sepsis than neonates with a low birth weight. This result is in agreement with the findings of studies from Mexico, Tanzania, Gondar and Tikur Anbesa [8, 21, 23, 25]. This could be due to the fact that low birth weight neonates have an increased risk of hypothermia because they have little subcutaneous fat, have a large body surface area relative to weight and have a poorly developed immune system.

Limitations of the Study

Because the study included only public, not private, institutions, the results may be difficult to generalize to the general population. A control group is required to determine risk factors associated with morbidity such as sepsis, as this is a cross-sectional study with no control group.

Conclusion and recommendation

Maternal PROM gestational age and neonatal birth weight have been identified as risk factors for neonatal sepsis. Therefore, maternal service utilization, early identification of risk situations and appropriate neonatal care should be strengthened through by training of health workers, provision of health services according to standards, and monitoring and evaluation of obstetric/neonatal care.

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Ethical Code

Ethical approval was obtained from the Harar Health Sciences College Research Review Ethical Committee (Ref.No.HHSC-70/2019). Approval was obtained from the appropriate hospital authorities.

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Conflict of interest

The authors declare that there is no conflict of interest.

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