

The Prevalence and Determinants of Puerperal Sepsis among Postpartum Women at Hadiya Zone, Ethiopia

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ARTICLE INFO	ABSTRACT
<p><i>Article type:</i> Original article</p>	<p>Background & aim: One of the main global causes of maternal morbidity and death is puerperal sepsis. It remains the most unaddressed public health trouble, especially in emerging nations like Ethiopia. This study aimed to evaluate the prevalence and determinants of puerperal sepsis among postpartum women at Hadiya Zone, Ethiopia.</p>
<p><i>Article History:</i> Received: 17-May-2023 Accepted: 20-Jan-2024</p>	<p>Methods: This cross-sectional study was conducted on 422 participants who were selected by a systematic sampling method from a comprehensive specialized hospital, Hadiya Zone, Central Ethiopia between March 1st to April 30th, 2020. Questionnaires and Chart reviews were used to collect data. SPSS software (version 24) was used for data analysis. Both bivariate and multivariate logistic regressions were employed to ascertain the relationship between the explanatory factors and the dependent variable.</p>
<p><i>Key words:</i> Puerperal Sepsis Postpartum Ethiopia</p>	<p>Results: The prevalence of puerperal sepsis was 20.6%. Rural residency (AOR=5.8, 95% CI=3.12-11.02), home delivery (AOR=8.5, 95% CI=3.19-25.6), prenatal care visits fewer than four (AOR=9, 95% CI=4.52-16.12), caesarean delivery (AOR=8.4, 95% CI=4.27-16.69), obstructed labor (AOR=2.5, 95% CI=1.10,-6.19), and referral (AOR=3.9, 95% CI= 2.09 -7.61) were among the factors that predicted puerperal sepsis.</p> <p>Conclusion: Puerperal sepsis is an unsolved public health problem in the study area. Therefore, it is crucial to reduce the rate of puerperal sepsis among postpartum women by implementing aseptic techniques during cesarean section procedures, encouraging the use of antenatal care services, improving institutional delivery, preventing obstructed labor by regularly using partograph to manage labor, and offering timely referrals.</p>

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Introduction

Puerperal sepsis is an infection of the genital tract that can happen up to 42 days after delivery, at any time after the membranes have ruptured, or during labor. It is present along with two or more of the following circumstances: Pelvic pain, a high body temperature (defined as an oral temperature of 38.5°C or more on any occasion), an abnormal vaginal discharge (the presence of pus), an

unpleasant odor or foul discharge, and a delay in the uterus' size reduction (less than two centimeters per day within the first eight days) are all symptoms of pregnancy (1).

According to the World Health Organization (WHO), 358,000 maternal deaths occurred during labor and delivery, and 15% of these deaths have been attributed to puerperal sepsis. One of the diseases that can be prevented in

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both developing and developed countries is puerperal sepsis. In the first 24 hours following parturition, it generally happens after discharge (2). It is ranked as the sixth major cause of disease burden for women aged 15–44, following depression, HIV/AIDS, tuberculosis, abortion, and schizophrenia (3). As many as 5.2 million new cases of maternal sepsis are arising annually, and a projected 62,000 maternal deaths will result from the illness (3). Although maternal mortality is slightly reducing worldwide, most maternal mortality happens during childbirth and is high (4).

Global risk factors that contribute to infections are caused by poor hygiene practices during delivery and postpartum (4). This is related to repeated manipulation of patients during delivery, prolonged labor, or rupture of amniotic sacs, as well as poor sanitary conditions and poor services within healthcare facilities (4). In Africa, the maternal mortality ratio increased by nearly 5% from 2013 to 2015 (5, 6).

According to the Ethiopian Demographic Health Survey (EDHS, 2016), there were 412 maternal deaths per 100,000 live births in Ethiopia (5), with puerperal sepsis being a factor in 13% of these mortalities. This is despite the Ethiopian government making significant efforts to reduce mortality rates by building more healthcare facilities and improving connections between the facilities and the public to increase community access and utilization of maternal care services (6).

Puerperal sepsis can lead to secondary infertility, fallopian tube obstruction, and chronic pelvic pain. Additionally, it has a significant effect on newborn fatalities; it is estimated that one million newborn deaths occur annually as a result of such illnesses (7-9). The Sustainable Development Goals (SDGs) of the United Nations place a significant emphasis on maternal and neonatal health. Ethiopia has committed to implementing the SDGs to reduce maternal mortality to under 70 deaths per 100,000 live births by 2030 (10–12).

Puerperal sepsis affects 4.4% of live births globally (13). According to the most recent Global Burden of Disease Report for 2017, there were 12.1 million new cases of puerperal sepsis (14). But, in the case of Ethiopia, there are limited studies on puerperal sepsis, which

revealed a prevalence ranging from 8.4% to 17.2% (15-16). In general, there are significant differences in the prevalence of puerperal sepsis across study findings, regions, time periods, and the criteria employed to diagnose puerperal sepsis (13–16).

In general, the prevalence of puerperal sepsis varies greatly based on the findings of the studies, where it occurs, the times, and the diagnostic standards used (17–19). Data on the nature and predictors of this problem in Ethiopia tend to be insufficient, particularly in the study area. So as to develop appropriate mitigating measures and protocols tailored to the study setting, intervention planners must undoubtedly examine current data on the rate and contributing factors of puerperal sepsis. Therefore, this study evaluated the prevalence and determinants of puerperal sepsis among postpartum women at a comprehensive specialized hospital, Hadiya Zone, Ethiopia.

Materials and Methods

This cross-sectional study was conducted at the Wachemo University Nigist Eleni Mohammed Memorial Comprehensive Specialized Hospital, Hadiya Zone, Central Ethiopia. The hospital is located in Hossana town, which is the capital of the Hadiya Zone. The hospital serves more than three million people residing in urban and rural parts of south-west Ethiopia. The obstetrics and gynecology ward delivers all maternal and reproductive health care services, including postnatal care. The study was conducted from March 1st to April 30th, 2020.

Postpartum women visited with puerperal sepsis within 42 days of delivery during the study period, while postpartum women with puerperal sepsis who were severely ill, those who were in the intensive care unit and not comfortable up to the end of the data collection period, and those who were unable to talk and/or hear were excluded from the study. The sample size was calculated using a single population proportion formula with the following assumptions: a 95% confidence interval, a 5% margin of error, and a 50% proportion of puerperal sepsis. After adjusting 10% for the non-response rate, the minimum sample size was found to be 422. A systematic random sampling technique was employed to recruit the participants at every second interval.

According to the hospital records, 740 postnatal women visited the postnatal clinic. Therefore, by dividing 740 by 422, we found a k-value of two. The first participant was selected randomly using a lottery method on the first day of the data collection period.

Data were collected using a pre-tested, structured interviewer-administered questionnaire and chart review, which were used to retrieve data that could not be acquired by the interview. The questionnaire was prepared in English after a review of various pieces of literature and modified to suit and relate to the study objective and the area's context (15-16, 27). It was designed to collect information on sociodemographic characteristics, antenatal factors, intra-natal factors, fetal condition, and postnatal factors. Four BSc midwives who were able to speak both Hadiyissa and Amharic were recruited for the data collection, and two BSc midwives participated in supervising the data collectors.

To ensure the quality of data to be collected from the participants, at the beginning, the instruments were pretested on 5% of the sample size in Hossana Health Centre, and essential corrections were made based on the nature of shortcomings recognized in the instrument. The tool was translated first to Hadiyissa (a local language) and then translated back to English to check its consistency. The questionnaire's validity was confirmed by the correct application of validity criteria (content validity). Besides, to check the internal consistency (reliability) of the items, Cronbach's alpha was measured, yielding a value of 0.85. Data collectors and supervisors were given two days of training on the content of the tool, the purposes of the study, and the appropriate data collection procedure. Further, the supervisors and the investigators strictly followed the day-to-day data collection process during the pre-test and the actual data collection. The filled-out questionnaires were collected and signed by the supervisor after their completeness was confirmed by checking for any missing items and logicity.

Data were entered and analyzed using SPSS software (version 24). Initially, bivariate logistic regression was performed for selection of candidate variables into multivariable logistic

regression. In binary logistic regression, the variables with a p-value < 0.25 were transferred to the multivariate logistic regression model. It was conducted to discover the independent associated factors of the outcome variable and control probable confounders. Odds ratio with their 95% confidence intervals was calculated to identify the existence and strength of association, and statistical significance was stated at a P-value<0.05. The fitness of the model was approved by the Hosmer Lemeshow statistic test, which had a p-value of 0.86. Multicollinearity was confirmed for interactions between explanatory variables through the variance inflation factor, which was non-collinear.

Results

An entire group of 422 mothers were involved in this study, making the response rate 100%. The mean age of the mothers was 26.7 (standard deviation \pm 5.06) years. The majority of mothers were married: 408 (96.7%), 274 (64.9%) were Hadiya ethnically, 276 (65.4%) were protestants, and 174 (41.2%) were housewives. Academically, 157 (37.2%) had followed a primary level of education, 246 (58.3%) lived in urban areas, and 327 (77.5%) of the mothers earned a monthly income of \leq 1000 Ethiopian birr (Table 1).

Table 1. Socio-demographic characteristics of postpartum women at Nigist Eleni Mohammed Memorial Comprehensive Specialized Hospital, Central Ethiopia (N=422)

Variables	Frequency (%)
Age in years	
<20	74 (17.5)
18-35	335 (79.4)
\geq 35	13 (3.1)
Residence	
Urban	246 (58.3)
Rural	176 (41.7)
Marital status	
Married	408 (96.7)
Unmarried	14 (3.3)
Religion	
Muslim	48 (11.4)
Orthodox	93 (22.0)
Protestant	276 (65.4)
Catholic	5 (1.2)
Occupation	
Housewife	251 (59.5)

Variables	Frequency (%)
Merchant	35 (8.3)
Government employee	74 (17.5)
Private employee	49 (11.6)
Student	13 (3.1)
Ethnicity	
Hadiya	274 (64.9)
Kambata	38 (9.0)
Gurage	35 (8.3)
Silte	5 (1.2)
Educational status	
No formal education	117 (27.7)
Primary education	157 (37.2)
Secondary education	82 (19.4)
College and above	66 (15.6)
Monthly income in the Ethiopian birr	
≤1000	327 (77.5)
>1000	95 (22.5)

Two hundred twenty-two (52.6%) participants were multiparous, 358 (84.8%) had ≥ 4 ANC visits, and 412 (97.2%) delivered at the gestational age of ≥ 37 weeks. During their last pregnancy, 39 (9.2%), 117(27.7%), and 47(11.1%) of the participants faced antepartum hemorrhage, premature rupture of fetal membranes, and obstructed labor, respectively. Nine (2.1%) participants were tested HIV positive, and 16 (3.8%) had hemoglobin <11gm/dl. The majority of the participants 409(96.9%) had a spontaneous onset of labor, while 350(82.9%) gave birth vaginally. Additional obstetrics, medical, and fetal characteristics are shown in (Table 2).

Table 2. Obstetric, medical and fetal characteristics of postpartum women at Nigist Eleni Mohammed Memorial Comprehensive Specialized Hospital, Central Ethiopia (N=422)

Variables	Frequency (%)
Para	
Primiparous	171 (40.5)
Multiparous	222 (52.6)
Grand multiparous	29 (6.9)
Number of ANC visit	
≥4	358 (84.8)
<4	64 (15.2)
Unsafe abortion	
Yes	77 (18.2)
No	345 (81.8)
Antepartum hemorrhage	
Yes	39 (9.2)

Variables	Frequency (%)
No	383 (90.8)
Obstructed labor	
Yes	47 (11.1)
No	375 (88.9)
Onset of labor	
Spontaneous	409 (96.9)
Induced	13 (3.1)
Duration of labor in hours	
≤24	238 (79.3)
>24	60 (20.0)
Mode of delivery	
Vaginal delivery	350 (82.9)
Caesarean delivery	72 (17.1)
Number of vaginal examination	
≤4	293 (96.4)
>4	129 (30.6)
Referred from other health facility	
Yes	121 (28.7)
No	301 (71.3)
Place of delivery	
Home	16 (3.8)
Health facility	406 (96.2)
Duration of PROM in hour	
<8	81 (19.2)
≥8	32 (7.6)
Gestational age at delivery	
< 37 weeks	12 (2.6)
≥37weeks	412 (97.2)
Hemoglobin level intrapartum in g/dl	
<11	16 (3.8)
≥11	406 (96.2)
HIV status	
Negative	413 (97.9)
Positive	9 (2.1)

In this study, the overall prevalence of puerperal sepsis was observed to be 87 (20.6%). Less than half of the study participants, 158 (37.4%), heard about puerperal sepsis. The most frequently reported symptoms include fever 85 (20.1%), delay in reduction of uterine size 82 (19.4%), abnormal vaginal discharge 74 (17.5%), and pelvic pain 70 (16.4%).

As shown in Table 3, in the multivariate logistic regression analysis, residence, having less than four ANC visits, caesarean delivery, home delivery, obstructed labor and referral status were significant at p-value < 0.05.

Mothers living in rural areas were nearly six times more likely to experience puerperal sepsis than those who resided in urban areas (AOR = 5.8, 95% CI = 3.12-11.02).

Similarly, mothers who attended fewer than four ANC visits were nine times more likely to experience puerperal sepsis as compared to those mothers who attended four or more ANC visits (AOR = 9, 95% CI = 4.52-16.12).

Additionally, mothers who delivered by cesarean section were 8.4 times more likely to experience puerperal sepsis than those mothers who delivered vaginally (AOR = 8.4, 95% CI = 4.27-16.69).

Moreover, mothers with obstructed labor were 2.5 times at higher risk of developing puerperal

sepsis compared with their counterparts (AOR = 2.5, 95% CI = 1.10-, 6.19).

Likewise, the odds of puerperal sepsis were 8.5 times higher among mothers who delivered at home compared with those who delivered at health facilities (AOR = 8.5, 95% CI = 3.19-25.62). Furthermore, mothers who were referred from other health facilities were 3.9 times more at risk of experiencing puerperal sepsis than their counterparts (AOR = 3.9, 95% CI = 2.09-7.51).

Table 3. Determinants of puerperal sepsis among postpartum women at Nigist Eleni Mohammed Memorial Comprehensive Specialized Hospital, Central Ethiopia (N=422)

Variables	Puerperal sepsis		COR (95% CI)	AOR (95% CI)
	Yes	No		
Residence				
Rural	110	66	6.4 (3.74-11.04) *	5.8(3.12-11.02)**
Urban	21	256	Reference	Reference
The frequency of ANC visits				
<4	38	26	9.2(5.14-16.51)*	9(4.52-16.12)**
≥4	49	309	Reference	Reference
Mode of delivery				
Cesarean delivery	42	30	9.5(5.42-16.71)*	8.4(4.27-16.61)**
Vaginal delivery	45	305	Reference	Reference
Place of delivery				
Home	11	5	9.6(3.22-28.32)*	8.5(3.19-25.62)**
Health facility	76	330	Reference	Reference
Heard about puerperal sepsis				
No	53	105	3.4(2.01-5.62)*	3.3(0.83-5.91)
Yes	34	230	Reference	Reference
Premature rupture of membrane				
Yes	34	83	1.9(1.18, 3.21)*	1.4(0.72, 2.68)
No	53	252	Reference	Reference
Obstructed labor				
Yes	17	30	2.47(1.29, 6.21)*	2.5(1.10, 6.19)**
No	70	305	Reference	Reference
Referral				
Yes	42	79	3.02(1.85, 4.93)*	3.9(2.10, 7.62)**
No	45	256	Reference	Reference

*p-value≤ 0.25, **p-value<0.05, COR: Crude odd ratio, AOR: Adjusted odd ratio

Discussion

Puerperal sepsis was reported to be prevalent in this study at a rate of 20.6%, which is greater than the findings from studies conducted in Gondar, Nigeria, Kenya, Pakistan, and Nepal, where the rates were found to be 17.2%, 1.7%, 12.2%, 3.89%, and 6.28%, respectively (16, 20-23). Our findings differ from those of those countries, which might be attributed to stronger

preventative measures, better accessible maternal healthcare services, or more advanced infrastructure. As opposed to research conducted in Zambia, Benin, and India, which reported puerperal sepsis prevalence rates of 34.8%, 64.4%, and 62.8%, respectively, this study found a lower prevalence (24-26). Our findings may vary due to differences in study design, geographical context, sample size, and other factors.

The puerperal sepsis found in this study had a strong association with rural living, a finding that is corroborated by research from Ethiopia (27) and Uganda (28). In contrast to these investigations, a Bangladeshi study, however, found no evidence of a significant association between the participant's place of residence and puerperal sepsis (29). The association may arise from unhygienic home deliveries, a lack of awareness regarding ANC follow-up, and inadequate sanitation in rural areas.

Additionally, this study showed that the risk of puerperal sepsis increased with fewer than four ANC visits, which is consistent with the results of studies conducted in Nigeria (20), Nepal (23), Ethiopia (27), and Uganda (28). This could be a result of the fact that ANC services can enhance health promotion and enable prompt identification and prevention of puerperal sepsis-related problems.

Additionally, this study found that obstructed labor was associated with a higher risk of puerperal sepsis, which is consistent with findings from research done in Kenya (21) and Nigeria (20). Puerperal sepsis, which occurs by obstructed labor and repeated vaginal exams, may be the cause.

Besides, our investigation demonstrated that women's referral status was a contributing factor to puerperal sepsis, which is consistent with research conducted in Ethiopia (27), Uganda (28), and Pakistan (22). This could be because of the lengthy trip to the hospital and possibility of an unclean vaginal exam performed while traveling, both of which are contributors to the occurrence of puerperal sepsis.

According to this study's findings, having a cesarean delivery increases the risk of puerperal sepsis, which is in line with studies from Ethiopia (16, 27), Nigeria (20), and Kenya (21). However, there is no statistically significant association observed by studies conducted in either Sudan (30) or Nepal (23) between cesarean delivery and puerperal sepsis. This could be associated to the formation of fluid after surgery, tissue necrosis, and the presence of germs at the surgical site, which causes puerperal sepsis.

Furthermore, mothers who received referrals from other health institutions were more likely

than other mothers to get puerperal sepsis. This result is consistent with research carried out in Ethiopia (27). This may be because it took some time for Mother to get to the hospital, and it is possible that you had an unclean vaginal exam on the way there, which contributed to the development of puerperal sepsis. These findings have significant clinical implications for improving referral conditions by enhancing access to communication and transportation networks, making referrals more effective and efficient, and ensuring the preparedness of high-level healthcare institutions (referral sites) to improve the quality of care. Finally, in this study, home delivery was associated with postpartum sepsis, consistent with studies conducted in Nepal (23), Kenya (31), and Pakistan (32). The reason could be that in home deliveries there may be a lack of practice of aseptic measures like hand washing, use of antiseptic materials, and perinatal hygiene by unskilled birth attendants, which are important features for increasing puerperal sepsis.

Among the strengths of study is the fact that respondents were included using the probability sampling approach in order to maintain the study representativeness. Besides, numerous techniques were used to maintain the quality of the data. However, there are some issues with this research. This study has the same drawbacks as cross-sectional studies do. Initially, because the study was cross-sectional, no cause-and-effect relationship could be shown by the associations found between the explanatory variables and the outcome variable. Second, because this was a hospital-based cross-sectional study, its findings might not accurately reflect the prevalence of puerperal sepsis in the general population.

Conclusion

In the study area, puerperal sepsis remains an unresolved public health problem. It was predicted by a number of factors, including living in a distant region, giving birth at home, having obstructed labor, having less than four ANC visits, and being referred. Therefore, reducing the rate of puerperal sepsis among postpartum women requires the use of aseptic techniques during cesarean section procedures, encouraging the use of antenatal care services, improving institutional delivery, preventing

obstructed labor by regularly using partograph to manage labor, and promptly making referrals. Additionally, the hospital needs to update its infection control protocols and inform health care providers of the risk factors that have been discovered. Puerperal sepsis features and severity may differ according to the surrounding circumstances. As a result, conducting more community-based research is recommended.

Declarations

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Conflicts of interest

The authors declared no conflicts of interest.

Ethical Considerations

The study adhered to the Helsinki Declaration and national research ethics guidelines. Ethical clearance was granted by the Wachemo University Research and Community Service Office (Ref. No. WCURCSO/744/20, dated 26/05/2020), with additional approval from the study hospital's administration. Participants were informed about the study's objectives, methods, potential risks, and benefits. Written informed consent was obtained, with parental or guardian approval required for those under 18. To ensure confidentiality, participants' names were omitted from the questionnaire, and they were assured that their participation would not affect their access to care.

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Authors' contribution

HM, and RA, executed the research, participated in the data collection, and wrote the manuscript. AA and SO were participating in the study design and conducting the statistical analysis. All authors read and approved the final

manuscript.

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