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Predictors Post-Partum Sepsis Directly Related to Pnuemonia Among Post-Partum Women at Finote Selam General Hospital, West Gojjam Zone, Amhara, Ethiopia, 2022.

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Abstract:
Introduction: Puerperal Sepsis is an inflammatory response to the infection of the female reproductive system within six weeks of childbirth. Though studies were conducted on puerperal sepsis in Ethiopia, there is a lack of information on its determinants of puerperal sepsis directly related to pneumonia. Therefore, this study aimed to identify determinants of puerperal sepsis among post-partum women.
Method: Institutional based unmatched case-control study was conducted from May 10, 2022, to July 15, 2022, on post-partum women of 220 (55 cases and 165 controls with a 1:3 case-control ratio determined by the Open Epi version 3. Cases and controls were extracted by consecutive sampling. A structured face-to-face interviewer-administered questionnaire and checklist were used. Data were entered and analyzed using EPI data version 4.4.2.1 and SPSS version 25, respectively. Variables with a p-value ≤0.25 in the bi-variable logistic analysis were entered into a multivariable logistic regression model. Hosmer and Lemeshow's goodness-of-fit test and Multicollinearity were checked. Statistical significance was declared at P-value < 0.05 along with, 95% Confidence Interval.
Result: The result of multiple logistics regression revealed that the odds of developing PS directly related with post-partum pneumonia were caesarean delivery (AOR=2.802, 95 %CI: 1.207, 6.502), hypertension (AOR=2.431, 95% CI: 1.257, 4.700), history of anemia (AOR=0.343, 95%CI: 0.145, 0.811 were determinants of post-partum pneumonia. **Conclusion:** majority of the determinants were obstetric related.
Keywords: postpartum; post-partum pneumonia; Finote Selam, determinants; west Gojjam zone

Introduction:

Background:

Puerperium is defined as the time following delivery during which pregnancy-induced maternal anatomical and physiological changes return to none pregnant state. Its duration is understandably inexact, but it is considered to be the period of the first six weeks following childbirth or abortion.

Worldwide 49 million individuals were affected by sepsis and approximately 11 million potentially avoidable deaths occurred due to sepsis. Globally, the death of postpartum women due to PS was 11/1000 women giving birth [1-2].

Findings in African countries identified that PS ranges from the first to fourth leading cause of maternal death [3]. In those countries, PS women end up with Septicaemia, Pelvic peritonitis, Pelvic abscess, Endotoxic shock, Deep vein thrombosis (DVT), and Renal failure [4]. In Ethiopia, puerperal sepsis was the 4th leading cause of maternal mortality [5]. Moreover, in Ethiopia, 65% of maternal death occurred in the postpartum period and PS accounts for almost 82% of death [6].

Statement of the problem:

Nowadays Ethiopia adopted a sustainable development goal (SDG) that will be achieved in 2030. From the indicator of this SDG, the 1st one is to decrease maternal mortality to 70per 100,000 live births. But before 2030 there was a plan to decrease the maternal mortality ratio from 412 to 199/100,000 life birth by 2020. This gaol failed [7]. This was due to financial shortage, lack of national security, lack of continuous monitoring and evaluation, and accountability [8]. Moreover, puerperal sepsis was one of the leading causes of maternal mortality [9].

Studies investigated in Ethiopia and other countries have a controversy on the risk factors of PS. While, studies conducted in Ethiopia didn't consider some variables like personal-related determinants, medical problems, and behavioral-related factors [13-16]. Farther more studies in the world didn't say anything about puerperal sepsis directly related to pneumonia even if post-partum pneumonia is high. Therefore, this study aimed to identify determinants of puerperal sepsis directly related to pneumonia by using primary data in combination with a chart review at Finote Selam general hospital, 2022.

Methods and materials:

The study designs:

An Institutional based unmatched case-control study design was conducted.

Study setting and period:

The study was conducted at Finote Selam general hospital from May 10, 2022, to July 15, 2022. The hospital is found in Finote Selam town which is the administrative town of the west Gojjam Zone. The town is located 176 km and 387 km far from Bahir Dar (the capital city of the Amhara region) and Addis Ababa (the capital city of Ethiopia), respectively.

Population:

Source population:

All postpartum women who gave birth at Finote Selam general hospital were source populations.

Study population

Cases: Postpartum women who were diagnosed with PS directly related with pneumonia by a physician during the study period.

Controls: Postpartum women who attended late postpartum and postnatal care and were not diagnosed with PS directly related with pneumonia after being screened for PS during the study period.

Sample size determination:

The sample size was determined using Open Epi version 3 for an unmatched case-control study with the consideration of the following assumptions: confidence level 95%, power 80, and cases to control the ratio of 1:3. Delivery by C/S provided the largest sample size (208) and an additional 5% of the total sample size was added to compensate non-response rate and the final sample size became 220 (55 cases and 165 controls) **(table 1)**

Sampling procedure:

Women who had been diagnosed with Ps (55) directly related with pneumonia were selected by a consecutive sampling technique and three consecutive controls (165) were selected by consecutive sampling technique.

Eligibility criteria:

Inclusion criteria

Cases: all postpartum women who needed health care service with PS during data collection were included.

Controls: all postpartum women who needed late postpartum and postnatal care and have no diagnosis of PS in current delivery was included.

Exclusion criteria:

Cases: postpartum women who needed health care services were excluded from the study if they were unable to communicate until the end of the study period

Controls: postpartum women who needed late postpartum and postnatal care whose cards disappeared were excluded from the control group.

Operational definitions:

Puerperal sepsis: refers to post-partum women that have at least one of the infections (mastitis, breast abscess, UTI, pneumonia, wound infection, and uterine infection) with signs and symptoms of systemic infections (pyrexia more than 38° C, Hypothermia less than 36°C, tachycardia more than 90 beats/minute, a respiratory rate of more than 20 breaths/minute and systolic blood pressure less than 90mmhg) in the post-partum period [17].

Cases: postpartum mothers admitted with puerperal sepsis directly related with pneumonia after being diagnosed by a physician were included.

Controls: are those late postpartum or postnatal care women who have no diagnosis of puerperal sepsis at Finote Selam general hospital or other health institutions and after being screened for PS considered as controls. Post-partum pneumonia is a woman that develops pneumonia in the post-partum period.

Data collection procedure:

Data was collected from postpartum women attending health care services by using structured interviewer-administered questionnaires and chart review. Initially, it was prepared in English. The English version was translated to the Amharic language and back-translated to English to ensure consistency by two professionals. The questionnaires contain five major groups of variables: Maternal socio-demographic characteristics, obstetric-related determinants, medical-related determinants, behavioral-related determinants, and health service-related determinants [16,33,36].

Data quality control issues:

The data collectors and supervisor were trained for one day on the objective, relevance of the study, and confidentiality of information. Pre-test was done at Shegaw Motta general hospital. During the pre-testing, the questionnaire was assessed by 5% of respondents at Shegaw Motta general hospital. Cronbach's alpha coefficient was used to know the internal consistency of the questionnaire and it was 0.803. The data collection process was closely supervised by one graduate midwife.

Data management and analysis:

The collected data were entered into Epi data version 4.4.2.1 and exported to a statistical package of social science (SPSS) version 25 for further analysis. Descriptive analysis was carried out to check the levels of missing values and expected frequency. Bi-variable logistic regression, with 95% (CI), was used to see the association between each independent variable and the outcome variable. Independent variables with a p-value of ≤ 0.25 were included in the multivariable logistic regression analysis to control confounding factors. Hosmer and Lemeshow's goodness-of-fit test was checked to check whether the model was fit or not, and it was found to be insignificant (p-value = 0.478). Multicollinearity was checked by using the variance inflation factor, and it was found that the value of the variance inflation factor of variables was less than 4. Finally, a multivariable logistic regression analysis was done to assess the determinants of puerperal sepsis. The level of statistical significance was declared at p-value < 0.05 with, 95% CI. The backward stepwise technique method was used.

Result:

Socio-demographic characteristics of respondents:

The response rate was 100%. Almost one-third of cases and 71 (43%) controls were aged between 25 and 29 years old. The mean age of the total participants was 28.56±4.93. Nearly one-third of cases and 131(79.4%) of controls were from urban areas **(table 1).**

Obstetric characteristics of the respondents:

Of the overall participants (55 cases and 165 controls), more than one-third of and 68(41.2%) cases and controls were parity three and above respectively. Almost thirty-six percent of cases and nearly one-tenth of 18(10.9%) of controls were delivered by CS. **(table 2).**

Medical characteristics of the respondents:

24(43.6%) cases had a history of hypertension, while more than one-tenth of controls had a history of hypertension. More than one-fourth of cases had a history of UTI but, only 10(6.1%) of controls had a history of UTI **(table 3).**

Behavioral characteristics of the respondents:

Almost one-fourth of cases and nearly one-fifth of of controls had a history of multiple sexual partners. All cases and controls had no history of herbal usage **(table 4).**

Intuitional characteristics of respondents:
Nearly forty-seven 26 of cases were referred from other health institutions, but only 29 (17.6 %) of controls were referred from other health institutions **(table 5).**

Determinants Of Puerperal Sepsis Directly Related to Pnuemonia:
Bi-variable logistic regression was done between each independent variable and PS to identify candidate variables for multivariable logistic regression. Residence, level of education, mode of delivery, duration of delivery, history of prom, manual delivery of the placenta, no of PV/4-hour, history of hypertension, history of UTI, history of anemia, history of malaria, nutritional status, and referral status were significant variables in bi-variable logistic regression. Those variables with a P-value of ≤ 0.25 in the bi-variable logistics analysis were entered into the multivariable logistic analysis. The backward stepwise method was used to identify the determinants of PS.
The result of multiple logistics regression revealed that the odds of developing PS were 2.802(AOR=2.802, 95 %CI: 1.207, 6.502) times higher among C/D as compared to vaginal delivery. Postpartum women having a history of hypertension had 2.431 (AOR=2.431, 95% CI: 1.257, 4.700) times higher odds of developing PS as compared to their counterparts. Mothers having a history of anemia had 0.343 (AOR=0.343, 95%CI: 0.145, 0.811) times higher odds of developing PS as compared with their counterparts (table 6).

Discussion:
This study identified the determinants of PS directly related with post-partum pnuemonia among postpartum women attending health care services at Finote Selam general hospital west Gojjam zone, Amhara, Ethiopia. The finding of this study revealed that CS delivery, having a history of hypertension and having a history of anemia was the determinants of puerperal sepsis.
The result showed that the odds of developing PS were higher among women delivered by CS as compared with mothers delivered through the vagina. The finding of this study is supported by a case-control study conducted in the West Shoa zone Oromia regional state(15), which conclude that postpartum women delivered by CS were four times at higher odds of developing PS as compared with women delivered through the vagina. And also, this result agreed with the findings of the cross-sectional studies conducted in Sudan, Tanzania, and Nigeria [12,20-21]. they concluded that PS was statistically significantly associated with delivery by CS compared with vaginal delivery. This might be due to the CS opening the skin which disrupts the natural defense mechanism of the body. Due to this microorganism have direct contact with the internal structure of the body leading to PS [22]. In addition to these operational producers might cause immunosuppression that decreases the defensive mechanism of the body both in vivo and in vitro in the post-operative period weakening the body's defense capacity [23].
Postpartum women having a history of hypertension were three times higher odds of developing PS as compared with their counterparts. This might be due to hypertension may result in Cerebrovascular complications like stroke [24]. Due to the treatment of severe hypertension, the patient develops hypotension [25]. Both of these complications may result in a coma. During a coma, the patient may aspirate secretions and things may go down in the incorrect tube results aspiration pneumonia [26]. Finally, this aspiration pneumonia may show systemic infection that is PS. The finding of this study was contradicted by a case-control study conducted at east Wollega [13]. which conclude that hypertension is not significantly affects PS. The reason might be the difference in the study setting.
Postpartum women having a history of anemia were five times higher odds of developing PS as compared with women having no history of anemia. This finding is in agreement with cross-sectional studies conducted in Ethiopia, Sudan, and Tanzania and a prospective cohort study in Bangladesh [12,14,20,27]. which concludes that there is an astatically significant association between PS and anemia. The reason might be untreated anemia can make human bodies more susceptible to illness infection, since lack of iron affects the body's natural defense system (immune system) [28].

Conclusion:
This study found that hypertension, anemia and CS delivery were important determinants of PS directly related to post-partum pneumonia.

Recommendations:
Depending on the findings of the research the following recommendations are given.

Post-partum women:
It is important to prevent hypertension and anemia attacks by avoiding hypertension and anemia facilitators (reducing salt intake and increasing iron intake).

Researchers:
I recommend that it is better if it is done by using cohort study designs.

Limitation:

This study has some limitations which have to be taken into consideration. As the study was a case-control study design, recall bias is recognizable, especially for controls since the interview was taken 6 weeks after delivery

Abbreviations:

ANC: Ante Natal Care AOR: Adjusted Odds RatioCOR: Crude Odds Ratio CS: Caesarean SectionHIV: Human Immune Virus MSP: Multiple Sexual Partners MUAC: Mid Upper Arm Circumferences PROM: Premature Rupture of Membrane PS: Puerperal Sepsis SDG: Sustainable Development Goal STI: Sexual Transmitted Infection UTI: Urinary Tract Infection

Availability of data and materials:

All the data included in the manuscript can be accessed from the corresponding author with an email address habtamu1207@gmail.com

Ethics approval and consent to participate:

Ethical approval was obtained from Debre Markos University. Written informed consent was obtained from respondents after giving them information about the study. Finally, the confidentiality, anonymity of all the responses was kept and used only for research purposes.

Competing interests:

The authors declare that they have no competing interests.

Authors' contributions:

The author had significant involvement in the design of the study, data collection and analysis and preparation of the manuscript. HA played a pivotal role in writing the proposal and designing the study. HA involved in the discussion as well as manuscript preparation. HA, FB, GB, and AA involved in data collection, supervision, data entry and analysis

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