Factors of Primary Postpartum Hemorrhage among Women Delivered at Yirgalem General Hospital Southern, Ethiopia: A case control study

Achamyelesh Gebretsadik[1], Nebiyu Melaku[2]

[1]College of Medicine and Health Science, Hawassa University, Hawassa, Ethiopia.
[2]Nutrition Core Process, Southern Nation Nationalities People Regional Health Bureau Maternal and Child, Ethiopia

ABSTRACT

Background: Primary postpartum hemorrhage continues to be the top leading cause of maternal mortality and morbidity all over the world, contributing about one third of all maternal mortality. Despite its public health importance of this problem, little is known about factors that contribute to primary postpartum hemorrhage especially in Ethiopia. The aim of this study was to assess the risk factors of primary postpartum hemorrhage.

Subjects and Method: Hospital based unmatched case control study design was used. The study was conducted in July 2019, among delivered women at Yirgalem general hospital from January 1, 2014 to December 30, 2018; to all cases of primary postpartum hemorrhage (n= 218) and 436 controls selected by using simple random sampling techniques. Women with primary postpartum hemorrhage were cases and women who had not diagnosed for primary postpartum hemorrhage were controls. Descriptive statistics and logistic regression analysis were made. Statistical association was measured by AOR and its 95% CI.

Results: Incidence of primary postpartum hemorrhage was 221 in 8,506 live births (2.6%) in the study period. Primiparas (AOR= 0.37 ;95% CI= 0.23 to 0.6; p= 0.001), grand multiparas (AOR= 5.80; 95% CI= 2.90 to 11.6; p <0.000) and rural maternal address (AOR= 1.90; 95% CI= 1.20 to 3.00; p= 0.008) were factors that have a statistically significant association with primary postpartum hemorrhage.

Conclusion: Parity and rural residence were associated factors. Therefore, the government and other responsible stakeholders should give attention to women with grand multiparas and those women residing in rural area. Immediate identification of risk factors and management might reduce largely the occurrence of primary PPH and related maternal deaths.

Keywords: Primary postpartum hemorrhage, case-control, risk factors, Ethiopia.

Correspondence:
Achamyelesh Gebretsadik College of Medicine and Health Science, Hawassa University, Hawassa, Ethiopia.Email: agtsadik@gmail.com.Tel. Mobile: +251911303128.

BACKGROUND

The most common definition of postpartum hemorrhage (PPH) is an estimated blood loss of ≥500 ml after vaginal birth or ≥1000 ml and ≥1500 ml after cesarean delivery and cesarean hysterectomy respectively. Another classic definition of PPH is a 10% decline in postpartum hematocrit concentration from antepartum (at admission) levels. But more practically it is defined by a delivery- related

blood loss that is excessive in nature and results in the patient symptomatically (e.g. Pallor, lightheadedness, weakness, palpitateons, diaphoresis,restlessness, confusion, air hunger, syncope) and/or results in signs of hypovolemia (for example, hypotension, tachycardia, oliguria and low oxygen saturation <95%) (Carrolietal., 2008; WHO, 2012; de Vogel et al., 2011).

PPH commonly classified as primary and secondary based on the time of its occurrence. Primary PPH is when it occurs within the first 24 h following delivery and if it occurs after 24 h of birth called secondary PPH. Primary PPH is far more common than secondary ones (Gary et al., 2014; Gabbe et al., 2012; Rath WH., 2011; Bibi et al., 2007) of which the uterine atony is the most common cause. But the predominant etiologic cause of primary PPH has been reported to be abnormal presentation rather uterine atony (GLOWM, 2007). PPH continues to be the top leading cause of maternal mortality (MM) and morbidity all over the world (Michael, 2013; Say et al., 2014) and about one-third of all maternal death and 99% of these deaths occur in developing countries (Michael, 2013; WHO, 2010).

In sub-Sahara Africa, studies have been shown that the major direct causes of MM were responsible by the following causes: Hemorrhage (especially primary PPH) 34%, infection10%, preeclampsia/ eclampsia 9%, and obstructed labor 4% (Khan et al., 2006).

Yet it is arguable that PPH is a preventable and most treatable cause of death, as most of the studies were stated (Gary et al., 2014; Michael, 2013; Gabbe et al., 2012). Maternal mortality (MM) is about 100 times higher in resource-poor countries than in resource-rich countries due to their better and timely intervention management (Michael, 2013; Mousa et al., 2014). As true for that, the best standard treatments for

PPH are injectable oxytocin and ergometrine preparation to prevent/and control PPH (Michael, 2013; Gülmezoglu et al., 2007). But to use these drugs in low-income countries, safety is uncertain (Walraven et al., 2005).

Studies have found several risk factors for PPH, of which some of them are: Multiple births, lack of antenatal care (ANC) follow up, prolonged labor, multiple pregnancies, pelvic mass (Gary et al., 2014; Michael, 2013; Coombs et al.,1991), But among the women developing PPH, two-thirds of them do not have any identifiable clinical risk factors for PPH such as: Multiple gestation, grand multiparty, prolonged labor, or pelvic mass (Michael, 2013; Mousa et al., 2014; Fikree, 2002; Chohan et al., 2006). Furthermore, in certain conditions pregnant woman may be particularly susceptible to hemorrhage like pre-eclampsia and/or eclampsia (Gary et al., 2014). Regarding this, PPH is a variable equal-opportunity in its occurrence. However, it is not an equal-opportunity in causing death among women of low-income countries to that of women in high-income countries because of their better and timely intervention management (Michael, 2013; Mousa et al., 2014, Coombs et al., 1991). So, this specific problem could be an insidious reality if PPH, still remains an important issue. However, very few are known about primary PPH in Ethiopia and no study was done so far to assess factors associated with this specific problem in this hospital; hence this study was deemed necessary. Therefore, the primary aim of this study was to assess the risk factors of primary PPH at Yirgalem general and teaching hospital (YGH).

SUBJECTS AND METHOD

1. Study Design
The study was conducted at Yirgalem general and teaching hospital, Sidama zone,

SNNPR, Ethiopia. The hospital is located 322 km south of Addis Ababa and 47 km from Hawassa with an estimated catchment population of 4.2 million people. The hospital has seven departments. Of these, the department of gynecology and obstetrics is one of the major departments in which there are gynecologists, general practitioners, midwives and clinical nurses working in the department. The department was having a client flow of 300 mothers per month on average coming for delivery service.

Hospital based unmatched case control study design was used. This study was conducted in July 2019, by reviewing of five consecutive years' records done from January 1, 2014 to December 31, 2018.

2. Population and Sample

The source population for the study was all women who give birth in YGH. Women of any age or parity, who gave birth and admitted during the reference period, were included in the study.

Cases were retrieved from medical records. The women's charts were reviewed, and included as cases if the records were fulfilled a primary PPH definition. Controls were a record of women's who gave birth in hospitals and were not diagnosed as primary PPH.

A patient chart that cannot be retrieved (lost) and/ or with incomplete records were excluded. All records of cases were reviewed from all the possible sources/ places that were labor and delivery suite, operation room, obstetrics and gynecologic ward registration logbook records. Firstly, all PPH cases were traced by using the recorded diagnosis from the registration books of these sources. Then further reviewing of all cases (n=225) managed for PPH was done by checking the time elapsed between the delivery of a last fetus of the woman's index pregnancy and starting bleeding from the genital tract of a woman,

whether it was occurring within 24 h or after 24 h to identify and select cases of primary PPH. Of all identified charts (n= 218) of patients managed for primary PPH, among a total of 8506 delivered women were taken and their charts were retrieved.

To increase the quality of data, 218 of patients managed for primary PPH and two controls for each case of primary PPH was included in the study. Of 8281 delivered women within the same period of time as the cases, 436 controls were randomly selected. The sampling frame was made from labor, obstetrics and gynecology ward registration books and operation room register books. The sample of controls were selected every 19th case, after the first chart of controls were selected in the first 19 charts with lottery method. And then individual charts of patients were accessed by using maternal registration numbers and all necessary data were reviewed using checklists.

3. Study variables

Dependent variable was primary postpartum hemorrhage. Independent variables was previous pregnancy, parity, maternal age, residency, history of obstructed labor, antenatal care, mode of delivery, gestational age, multiple pregnancy, birth weight, onset of labor, place of delivery, the person who conducted the delivery.

4. Operational definition of Variables

PPH is a delivery-related blood loss that is excessive in nature and results in patient a symptomatic (e.g. pallor, lightheadedness, weakness, palpitations, diaphoresis, restlessness, confusion, syncope) and/ or results in signs of Hypovolemia (e.g. hypotension, tachycardia).

Primary PPH: by reviewing from the cards of the patients, it is a bleeding from the genital tract which meets at least one of the above mentioned definition criteria of PPH but must be within 24 hrs of fetal (es)

delivery. To assure this, the time elapsed between the deliveries of the fetus (es) and starting of the bleeding from the genital tract of the women having PPH would be used &collected from the maternal charts by reviewing all the physicians' notes in an individual patient's medical record.

5. Study Instruments

The data were collected by four trained nurses. The quality of data was assured by using a properly designed checklist format. Training was given to the data collectors and data were collected from the main file of the patient and obstetrics and gynecology ward registration books. Data were checked for its completeness, accuracy, and consistency by the investigators.

6. Data analysis

The collected data were entered into SPSS for windows version 20 software and analyzed after checking the completeness, cleansed and coded. Descriptive statistics and logistic regression analysis were used to describe the data in relation to relevant variables. Bivariate logistic regression was performed and then all factors having a p-value <0.25 was entered for multivariate logistic regression analyses. Odds ratio with the 95% confidence intervals were computed to identify the presence and strength of association and statistical significance was taken as the $p < 0.05$. Goodness of fit was assessed by the Hosmer-Lemeshow test when not significant (p >0.05) and omnibus test which showed significance (p <0.001).

7. Research Ethics

Ethical clearance was obtained from Hawassa University Comprehensives Specialized Hospital (HUCSH), institutional review board (IRB). The official letter of co-operation was written to the hospital and further permission was obtained from YGH clinical service head. Since this study is to be obtained from a secondary data, there was no mother interviewed face to face and in order to protect the confidentiality of the information, names of the patients were not included in a written questionnaire/ checklists rather a coding was given for each card.

RESULTS

1. Sample Characteristics

During the study period, a total of 8506 women gave birth in YGH. Of which 218 delivered women diagnosed with primary PPH. Of which, 6 charts were excluded (4 cards were grossly incomplete and 2 cards was lost from the card room). So, 636 charts of (212 cases and 424 controls) were used in this analysis. The median (inter quartile ranges (IQ)) values for maternal ages among cases and controls were 26 (9) and 24 (6) years respectively. The cases and controls were having a similar 155 (73.1%) and 315 (74.3%) age profile of 21-34 years. Most of the study participants 178 (84%) of the cases and 295 (69.6%) of controls were from rural areas (Table 1).

Table 1. Sample characteristics of mothers, who gave birth from January 1, 2014 to December 31, 2018 at Yirgalem General and teaching Hospital, Ethiopia.

Variable		Case		Control	
		N:212	Percentage (%)	N:424	Percentage (%)
Age in year	≤20	21	10.4	88	20.8
	21 - 34	155	73.1	315	74.3
	>35	35	16.5	21	5.0
Residence	Urban	34	16.0	129	30.4
	Rural	178	84.0	295	69.6

Table 2. Distribution of current and past obstetric events and as well as health care characteristics of mothers who gave birth from January 1, 2014 to December 31, 2018 at Yirgalem General and teaching Hospital, Ethiopia.

Variable	Cases N=212 (%)	Controls N=424 (%)
ANC follow up		
Booked	162 (76.4)	360 (84.9)
Unbooked	50 (23.6)	64 (15.1)
Parity		
≤ 1	34 (16.0)	211 (49.8)
2 - 4	117 (55.2)	196 (46.2)
>5	61 (28.8)	17 (4.0)
History of previous PPH		
Yes	56 (26.4)	5 (1.2)
No	156 (73.6)	419 (98.8)
Previous history of APH		
Yes	11 (5.2)	9 (2.1)
No	201 (94.8)	415 (97.9)
History of caesarian section delivery		
Yes	3(1.4)	9(2.1)
No	209(98.6)	415(97.9)
Placenta previa		
Yes	6 (2.8)	11 (2.6)
No	206 (97.2)	413 (97.4)
Abruption placenta		
Yes	10 (4.7)	23 (5.4)
No	200 (98.6)	400 (94.3)
Polyhydramnios		
Yes	3 (1.4)	7 (1.7)
No	209 (98.6)	417 (98.3)
Preeclampsia/eclampsia		
Yes	5 (2.4)	16 (3.8)
No	207 (97.6)	408 (96.2)
Obstructed labor		
Yes	3(1.4)	9 (2.1)
No	209 (98.6)	415 (97.9)
Prolonged labor		
Yes	6(2.8)	8 (1.9)
No	206(97.2)	416 (96.1%)
Chrioamnionitis		
Yes	2 (0.9)	6 (1.4)
No	210 (99.1)	418 (98.6)
Multiple pregnancies		
Yes	8 (3.8)	17 (4)
No	204 (96.2)	407 (96.0)

2. Obstetric characteristics of the study participants

History of previous antepartum hemorrhage (APH) documented in 11 (5.2%) of cases and 9 (2.1%) of controls. Fifty-six (26.4%) cases and 5 (1.2%) controls had previous history of PPH, whereas only 3 (1.4%) cases and 9 (2.1%) controls had a history of previous

cesarean section. One hundred sixty -two (76.4%) of cases and 360 (84.9%) of controls had history of ANC follow up. Ten (4.7%) of cases and 23 (5.4%) of controls had history of placental abruption during the index pregnancy. Almost similar proportion of

cases and controls had placenta Previa 6 (2.8%) and 11 (2.6%), respectively. The proportion of polyhydramnios was also comparable in cases 3 (1.4%) and 7 (1.7%) controls (Table 2).

Table 3. Labor and delivery conditions of mothers who delivered from January 1, 2014 to December 31, 2018 at Yirgalem General Hospital Ethiopia.

Variables	Case		Control	
	N	%	N	%
Prolonged 3rd stage of labor				
Yes	24	11.3	2	0.5
No	188	89.2	422	99.5
Labor augmentation				
Yes	8	3.8	4	0.9
No	204	96.2	420	99.1
Mode of delivery				
Normal vaginal delivery	156	73.6	313	73.8
Cesarean section delivery	36	17	67	15.8
Operative vaginal delivery	20	9.4	44	10.4
Labor onset				
Spontaneous	208	98.1	408	96.2
Induced	4	1.9	16	3.8

3. Labor and delivery characteristics of study population

Incidence of primary postpartum hemorrhage was 218 in 8,506 live births (2.6%) in the study period. Out of 212 primary PPH (cases), 204 (98.1%) cases had spontaneous onset of labor, whereas only eight (3.8%) cases had augmentation in a health facility.

One hundred fifty-six (73.6%) cases developed primary PPH after spontaneous vaginal delivery, 36 (17%) cases after cesarean section and 20 (9.4%) cases after operative vaginal delivery. Most of 88.7% of cases and 99.8% of controls were managed by active third stage of labor management. However, 24 (11.3%) cases and 2 controls (0.5%) had prolonged third stage of labor (Table 3).

4. Factors associated with primary PPH of the study participants

As Table 4 showed, in the bivariate analysis, maternal age, parity, status of the ANC,

maternal residence, prolonged-third stage of labor, preeclampsia/eclampsia, previous ceaseran section delivery and as well as previous history of pregnancy complicated with APH and/or PPH was identified to be factors that are significantly associated with primary PPH. However, multivariable logistic regression analysis showed that parity, maternal residence and having a previous history of PPH were remained significantly associated with primary PPH.

Being grand multiparous and primiparas have a significant statistical association with primary PPH of (AOR= 5.80; 95% CI= 2.9 to 11.6; p <0.001) and (AOR= 0.37; 95% CI= 0.23 to 0.60; p= 0.001), respectively, grand multiparas were almost near 4.5 times more likely to develop primary PPH as compared to that of multiparous. Those mothers having a previous history of PPH and those who came from and residing in rural areas were more likely to develop primary PPH

(AOR= 16.0; 95% CI= 6.54 to 6.00; p< 0.001) and (AOR= 1.90; 95% CI= 1.20 to 3.00; p= 0.008) respectively (Table 4).

Table 4. Multivariable analysis, among cases and controls of mothers delivered at Yirgalem General Hospital Ethiopia, January 1, 2014 to December 31, 2018.

Variable	Cases N=212 (%)	Controls N=424 (%)	COR (95% CI)	AOR (95% CI)
Age(years)				
≤ 20	22 (10.4)	93 (21.9)	1	1
21 – 34	155 (73.1)	310 (73.1)	2.1 (1.2 to 3.5)	1 (0.5 to 1.7)
>35	35 (16.5)	21 (5.0)	7 (3.4 to14.3)	0.9 (0.3 to 2.4)
Residence				
Urban	33 (15.6)	129 (30.4)	1	
Rural	179 (84.4)	295 (69.6)	2.4 (1.5 to 3.6)	1.9 (1.2 to 3.0)
Parity				
Multiparas	114(53.8)	195 (46.0)	1	
Primiparas	37(17.5)	213 (50.2)	0.3(0.2 to 0.51)	0.37 (0.23 to 0.6)
Grand multipara	61(28.8)	16 (3.8)	6.5(3.5 to 11.8)	5.80 (2.9 to 11.6)
Having of ANC				
Yes	162 (76.4)	360 (84.9)	1	
No	50 (23.6)	64 (15.1)	1.7 (1.1 to 2.6)	1.60 (0.88 to 2.7)
Previous history of PPH				
Yes	56 (26.4)	5 (1.2)	30 (11.8 to 44.6)	16.0 (6.3 to 36.0)
No	156 (73.6)	419 (98.8)	1	
Previous history of APH				
Yes	11 (5.2)	9 (2.1)	2.5 (2 to 6.1)	1.4 (0.5 to 3.9)
No	201 (94.8)	415 (97.9)	1	
Skill birth attendants				
Midwife	68 (38.6%)	252 (60.1)	0.7 (0.24 to 3.35)	0.7 (0.14 to 3.39)
Intern students (Dr)	33 (18.8%)	81 (19.3)	1.15 (0.35 to 5.25)	1.0 (0.2 to 5.24)
General practitioner (GP)	6 (3.4%)	7 (1.7)	2.2 (0.53 to 15.47)	1.5 (0.2 to 11.79)
IESO-students	64 (36.4%)	66 (15.8)	2.5 (0.85 to 12.3)	3.4 (0.7 to 16.8)
Trained senior health workers	5 (2.8%)	13 (3.1)	1	

DISCUSSION

This is facility based case-control study done to assess risk factors of primary PPH. And it was revealed that grand multiparous, maternal residence and having a previous history of PPH were factors associated with primary PPH. Primiparas found to be a protective factor for primary PPH. Grand multiparas were 5.8 times more likely to develop primary PPH as compared to multiparous. This might be due to many births the uterine muscle fails to contract strongly to control bleeding. This has an agreement with study done in Lahore (Chohan et al., 2006). But contrary to studies done in selected three health care facilities in Ile-Ife, a semi-urban town in southwestern Nigeria and a WHO multicounty survey was done for maternal and newborn health from 352 health facilities were on the women's giving birth in 28 different countries (Sheldon et al., 2014; Olowokere et al., 2013). This could be due to the difference of socio-cultural beliefs and educational status of the communities of these countries.

This study showed that those who reside in a rural area were more likely to develop primary PPH compared to those women residing in urban areas. This could be related to the differrence in the level of

awareness of danger sign and symptoms of pregnancy complications. In addition, there is a difference in access to health facility. The finding is in line with a study done in France (Karine et al., 2017).

Furthermore, mothers who had a previous history PPH were 16 times more likely to develop primary PPH than those mothers who don't have. This might be mothers who have identified risks for developing PPH like anemia, pregnancy-induced hypertension, prolonged labor, etc. This previous history of primary PPH is important for the health workers to aware themselves and to act timely.

Studies conducted in Lahore and isle-Ife, in southwestern Nigeria is consistent with our findings (Chohan et al., 2006; Olowokere et al., 2013). In addition, this has an agreement with the reports that was highlighted in the new 2012 WHO recommendations of prevention and management of PPH and Oslo (Lill et al., 2017; WHO, 2011).

In this study since it was a retrospective study, it was impossible to measure some essential parameters, which may significantly contribute for primary PPH like BMI, fibroid mass, uterine anomaly (e.g. septated uterus), educational status of the woman, occupational status and household income per month. The scarcity of data availability in the country on this specific subject as well as no similar published data having the same objective of the region makes the findings difficult for comparison

In conclusion of this study revealed that parity, maternal address and previous history of PPH were the most significant risk factors associated with primary PPH. Therefore, the government and other responsible stakeholders should give attention to women with grand multiparas and those women residing in rural area. Immediate identification of risk factors and manage-

ment might reduce largely the occurrence of primary PPH and related maternal deaths.

AUTHOR CONTRIBUTION
Both Authors contributed from the inception to final write of the manuscript.

CONFLICT OF INTERESTS
The authors have not declared any conflict of interests.

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