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Post-Partum Hemorrhage and Associated Factors Among Mothers Who Gave Birth at Felege Hiwot Comprehensive Specialized Hospital in Bahir Dar City, North West Ethiopia, 2022

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A Thesis Report Submitted to the Department of Obstetrics and Gynecology, School of Medicine, College of Medicine and Health Sciences, Bahir Dar University for Partial Fulfillment of the Requirements for Specialty Certificate in Gynecology and Obstetrics

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Bahir Dar, Ethiopia

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Title	**Post-Partum Hemorrhage and Associated Factors among Mothers Who Gave Birth at Felege Hiwot Comprehensive Specialized Hospital in Bahir Dar City, North West Ethiopia, 2022**
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Declaration

This is to certify that the thesis entitled "Post-Partum Hemorrhage and Associated Factors among Mothers who gave birth at Felege Hiwot Comprehensive Specialized Hospital in Bahir Dar City, North-West Ethiopia" A cross-sectional study, submitted in partial fulfillment of the requirements for specialty certificate in gynecology and obstetrics, Bahir Dar University, is a record of original work carried out by me and has never been submitted to this or any other institution to get any other degree or certificates. The assistance help me received during the course of this investigation have been duly acknowledged.

| --- | --- | --- |
| Name of the candidate | Date | Place |

Approval of Thesis for Defense

I hereby certify that I have supervised, read, and evaluated this thesis entitled "Post-partum Hemorrhage and Associated Factors among Mothers who gave birth at Felege Hiwot Comprehensive Specialized Hospital in Bahir Dar City, North-West Ethiopia" by Dr. Destaw Tegegne Malede, prepared under my guidance. I recommend the thesis be submitted for oral defense.

Advisor's name:

1_____Signature_____Date_____

2_____Signature_____Date_____

Approval of Thesis for Defense result

We hereby certify that we have examined this thesis entitled 'Post-Partum Hemorrhage and Associated Factors among Mothers who gave birth at Felege Hiwot Comprehensive Specialized Hospital in Bahir Dar City, North-West Ethiopia" A cross-sectional study by Dr. Destaw Tegegne Malede

We recommend and approve the thesis for a degree of "specialty certificate in Obstetrics and Gynecology"

Board of Examiners

External examiner's name	Signature	Date
Internal examiner's name	Signature	16/12/14 Date
Chair person's name	Signature	

Acknowledgement

I would like to express my gratitude to Bahir-Dar University for giving me this opportunity.

I would like to extend sincere acknowledgements to my advisors Dr. Belaynew Keleb and Mr. Zelalem Mehari for their advising and constructive comments.

I would also like to say thanks for Felege Hiwot Comprehensive Specialized Hospital, data collectors and study participants.

ABSTRACT

Background: Postpartum hemorrhage defines as cumulative blood loss greater than or equal to 1,000 mL or blood loss accompanied by signs or symptoms of hypovolemia after the birth process regardless of route of delivery. On my recent experiences in the hospital and other health setting in the town patients with postpartum hemorrhage was become increased and I were planned to conduct a research in this catchment area to know exact figure and to identify associated factors.

Objective: To assess Post-Partum Hemorrhage and Associated Factors among mothers who gave birth at Felege Hiwot Comprehensive Specialized hospital in Bahir Dar City, North-West Ethiopia, 2022.

Methods: A cross sectional study was conducted among 577 mothers who gave birth at Felege Hiwot Comprehensive Specialized hospital in Bahir Dar, Ethiopia from January 30 to June 1 2022. Study participant were selected with systematic random sampling. An interviewer administered structured questionnaire and checklist were used to collect data. The collected data was entered into Epi-data version 3.1 and exported to SPSS version 26 for analysis. Simple binary logistic regression analysis was employed to identify candidate variables at P- value < 0.25. Then multivariable logistic regression analysis was employed to identify factors associated with post-partum hemorrhage at P-value 0.05.

Results: The proportion of PPH was 11.6 %(95%CI= 9.10-14.50). Being grand multiparty [AOR= 5.80(95% CI: (2.40, 14.10)]; having a history of PPH [AOR=2.76(95% CI :(1.27, 6.00)]; current APH [AOR=3.73(95% CI :(1.20, 11.35)]; having twin delivery [AOR=3.77(95% CI :(1.57, 9.03)]; developing labor abnormality [AOR=5.88(95% CI: (3.10, 11,10)] were factors significantly associated with the development of PPH.

Conclusion and recommendation: The proportion of postpartum hemorrhage was high in the study setting as compared to WHO figure. Women with APH and twin pregnancy should be label as high risk for PPH and better to take preventive measure for them. Grand multipara and

women with previous history of PPH should be followed as high risk women during intrapartum period. **Key words:** PPH, proportion, associated factors, and uterotonics.

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Acronyms and Abbreviation

C/D	**Cesarean delivery**
PPH	**Post-partum hemorrhage**
APH	**Antepartum hemorrhage**
AMTSL	**Active management of third stage of labor**
ARDS	**Adult respiratory distress syndrome**
ARF	**Acute renal failure**
BMI	**Body mass index**
E.C	**Ethiopian Calendar**
FHCSH	**Felege-Hiwot comprehensive specialized hospital**
Hct	**Hematocrit**
Dr.	**Doctor**
MM	**Maternal mortality**
PPH	**Postpartum hemorrhage**
TGSH	**Tibebe Ghion specialized hospital**

1. Introduction

1.1 Background of the Study

Postpartum hemorrhage defines as cumulative blood loss greater than or equal to 1,000 mL or blood loss accompanied by signs or symptoms of hypovolemia after the birth process (includes intra-partum loss) regardless of route of delivery(1, 2).

This is in contrast to the more traditional definitions of postpartum hemorrhage as an estimated blood loss in excess of 500 mL after a vaginal birth or a loss of greater than 1,000 mL after a cesarean birth(1). Historically, a decrease in hematocrit of 10% had been proposed as an alternative marker to define PPH (1-3). In a patient with tachycardia and hypotension, the obstetrician–gynecologist or other obstetric care provider should be concerned that considerable blood loss, usually representing 25% of the woman's total blood volume (or approximately 1,500 mL or more), has occurred(1, 2, 4).

The etiologies of postpartum hemorrhage can be categorized as primary (early) or secondary (late) (1, 2, 5, 6). Primary postpartum hemorrhage refers to excessive bleeding that occurs within 24 hours of delivery, whereas secondary postpartum hemorrhage refers to bleeding that occurs from 24 hours until 12 weeks after delivery (1-3). When evaluating a patient who is bleeding, it may be helpful to consider "the 4 Ts" mnemonic device—tone, trauma, tissue, and thrombin (1, 2, 7). Abnormal uterine tone (uterine atony) is estimated to cause 70–80% of postpartum hemorrhage and usually should be suspected first as the etiology of postpartum hemorrhage (1, 2, 6, 8).

PPH has long and short term complications like a long period of hospital stay, blood transfusion, disability, increased risk of death, poor growth and development of their children, hepatic dysfunction, adult respiratory distress syndrome, shock, disseminated intravascular coagulation, acute renal failure, loss of fertility, and pituitary necrosis (Sheehan syndrome)(1, 3, 7, 9).

Many organizations have recommended active management of the third stage of labor as a method to reduce the incidence of postpartum hemorrhage(1, 2, 8, 9).

The three components of active management are as follows: 1) oxytocin administration, 2) uterine massage, and 3) umbilical cord traction(1, 2, 9, 10). Prophylactic oxytocin, by dilute intravenous infusion or intramuscular injection (10 units), remains the most effective medication with the fewest adverse effects (1, 2, 9).

1.2 Statement of the Problem

Postpartum hemorrhage (PPH) continues to be the leading single direct cause of maternal mortality worldwide(6, 8). Postpartum hemorrhage is a frequent complication of deliveries and its incidence worldwide is commonly reported as 6%(11). PPH is a significant contributor to severe maternal morbidity and long-term disability as well as to a number of other severe maternal conditions generally associated with more substantial blood loss, including shock and organ dysfunction(12).

Despite global efforts to ensure that women deliver with skilled birth attendants and have access to conventional uterotonics for PPH prevention, 60% births in low resource countries occur outside health facilities without a skilled attendant(9). Among this the highest burden is experienced in low-income countries(13). The magnitude of PPH in sub-Saharan Africa is high at 10.5 %(11).

The Ethiopian Maternal Mortality Ratio (MMR) is among the highest in the world, with an estimated 401 maternal deaths per 100,000 live births(6). With this high MMR, Ethiopia is one of the ten countries which together account for 59% of all maternal deaths worldwide(6, 12). Direct obstetric causes—obstetric hemorrhage, hypertensive disorders of pregnancy, and sepsis—are the leading causes of maternal death in Ethiopia, contributing to more than 80% of all deaths(6, 8).

Reducing maternal mortality is one of the hot agendas globally and nationally. The government of Ethiopia provides free maternal and pre delivery waiting services regardless of social and economic status of the women. But with this effort, still maternal mortality ratio is high at the national level(3).

Regarding causes for PPH, uterine atony is the most common cause of PPH, but genital tract trauma, uterine rupture, retained placental tissue, or maternal coagulation disorders may also result in PPH. Although the majority of women who experience PPH complications have no identifiable clinical or historical risk factors, grand multiparty and multiple gestations are associated with an increased risk of bleeding after birth. PPH may be aggravated by pre-existing anemia and, in such instances; the loss of a smaller volume of blood may still result in adverse clinical sequel (10, 12, 14). Therefore, this study was aimed to assess the proportion of PPH and associated factors among mothers who gave birth at FHCSH.

1.3 Justification of the study

On my recent experiences in the hospital and other health setting in the town patients with postpartum hemorrhage was become increased and I were planned to conduct a research in this catchment area to know exact figure and to identify associated factors.

Limited studies have been conducted to identify the risk factors of post-partum hemorrhage in Ethiopia. Moreover; the same is true in the Amhara region. Previous research result has wide variation regarding magnitude of PPH. Almost all studies identifies different significant risk factors associated with PPH and have no common risk factors among those study, so this factors also could not be consistent in the study area as well.

This local result is important for risk identification, early interventions, decrease hospitalizations, improve maternal outcome primarily for the study area.

1.4 Significance of the Study

Therefore this study were try to assess the proportion and associated factors of PPH in Felege Hiwot Comprehensive Specialized hospital in Bahir Dar city. Findings of the study are very important for those mothers who will go to develop PPH by identify modifiable risk factors.

It's important for hospitals to reducing maternal mortality due to PPH by developing action plan based on modifiable risk factors that were identified by study.

It also helps as baseline information regarding the proportion and factors associated with PPH in the study area for MOH, Amhara RHB and Bahir Dar city Zonal health department.

It will also use as a base line data in the study area for researchers.

As a teaching hospital, Bahir Dar University College of medicine and health science department of gynecology and obstetrics can use the result of the study as scientific evidence with more specific and local data for better patient care.

1.5 Literature Review

1.5.1 Proportion of Post-Partum Hemorrhage

Globally, the proportion of PPH was found to be 2-6% but even in high-income countries, the incidence of severe postpartum hemorrhage (PPH) has increased.

The research conducted in USA and Norway which is countries with similar socioeconomic status and thought to have good health care services show that 5%, 2.5% respectively(15, 16).

This study is almost comparable to that of national data and in the United States the rate of post-partum hemorrhage increased by 26% during last two decades but maternal mortality from post-partum hemorrhage has decreased and stables as slightly more than 10%(1).

Recently conducted studies in Asian countries, Saudi Arabia and India showed that the incidence of post-partum hemorrhage ranges from 12% and 3.65% respectively. Which is similar to that of Africa countries and this shows PPH is still common causes for maternal mortality in middle to high income countries(14, 17).

The figures on proportion of PPH in the Africa reported relatively different prevalence of PPH and 1.13% in Nigeria, 9% in Uganda and 23.63% in Cameroon(18, 19).

A study conducted in Ethiopia showed the proportion of PPH 16.6%, 7.6%, 5.8% done in Wachemo, Debre Tabor and Dessie, respectively.(3, 4, 7) and maternal mortality from PPH in the country is also high(20).

1.5.2 Factors Associated with PPH

Regarding factors associated with post-partum hemorrhage it differs case by case and most of post-partum hemorrhage cases occur in patients leveled as low risk, so at times it is not good to classify laboring women as higher versus lower risk for PPH, but there are certain factors associated with the development of post-partum hemorrhage.

1.5.2.1 Maternal sociodemographic factors

Maternal sociodemographic factors like advanced maternal age has increased risk of PPH, having twin pregnancy and advanced parity are also higher risk for to develop PPH, living in rural and not attending formal education are factors which increased the likely to have post-partum hemorrhage (7, 9, 18, 19). This result is similar with international protocols and guidelines.

1.5.2.2 Intra-partum factors

Intra-partum factors like women having operative delivery is at increased risk of PPH, women who gave birth newborns with birth weight of more than four kilogram has increased risk of PPH, women with induced labor is increased for PPH development, pregnancy end up in post term is also higher risk for PPH and women having labor abnormality is increased risk of development of post-partum hemorrhage (3, 14, 21, 22).
Even countries and methodologies are different among those studies, but risk factors are still consistently reported as highly associated with that of post-partum hemorrhage.

1.5.2.3 Antepartum factors

Among ante partum factors women not having ANC follow up has higher risk for PPH, women having APH is also a risk factor for PPH, pregnant women with previous history of C/D and PPH is risk factors for post-partum hemorrhage(3, 4, 7, 14, 16).
This association is almost same with that of risk factors reported from world health organizations and other organizations adopted from different nations.

1.5.2.4 Medical Comorbidities

Medical comorbidities on the other hand like that women having anemia and obesity is reported to have strong risk factors for post-partum hemorrhage around the world (4, 14, 22).

1.6 Conceptual Framework

This conceptual frame work shows the association between post-partum hemorrhages and independent variables.

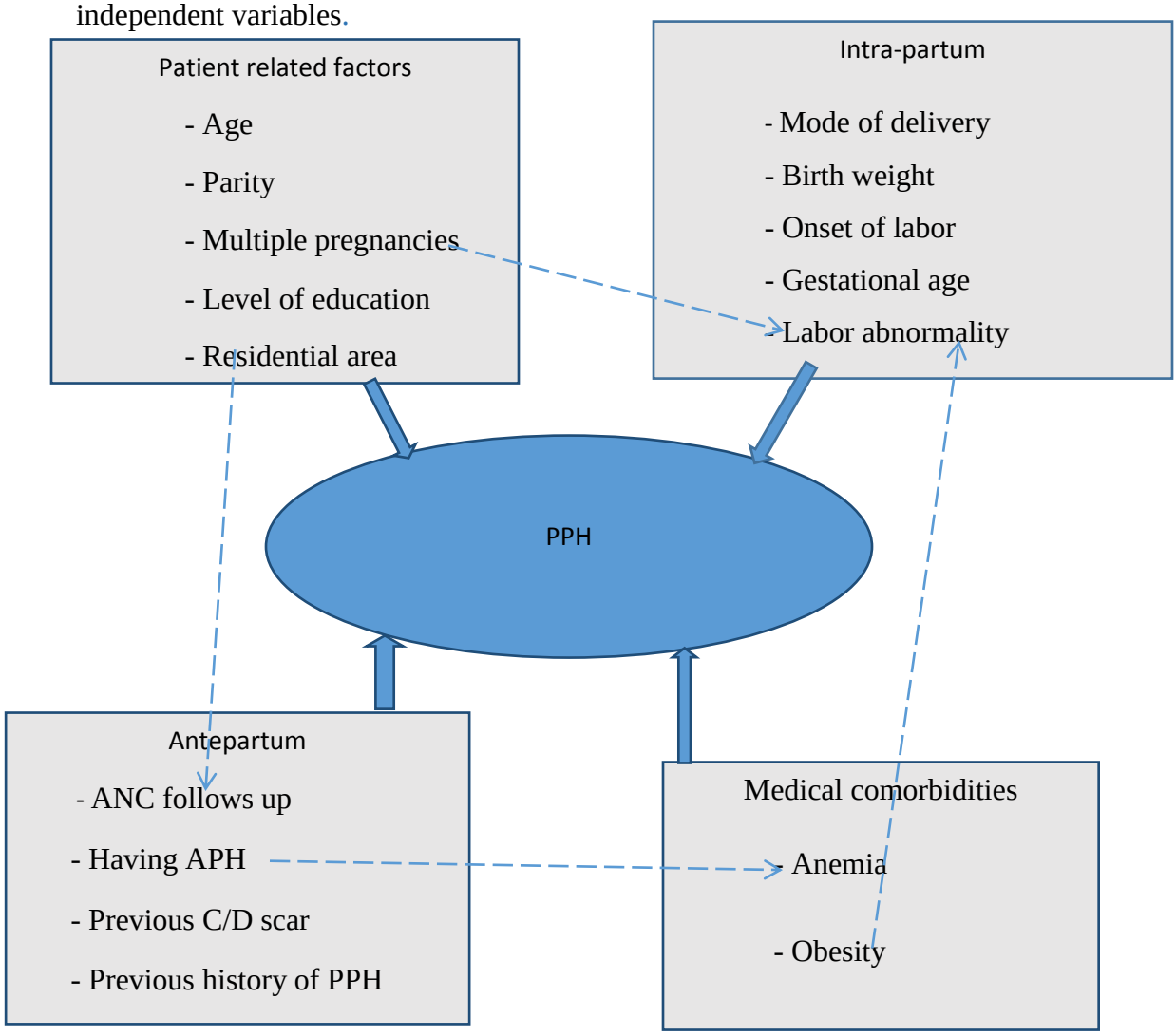

Figure 1 Conceptual framework of a study "proportion of postpartum hemorrhage and its associated factors at FHCSH in Bahir Dar city, Ethiopia" cross sectional study (2, 3, 9, 14, 18, 19)

N.B: arrow indicates the association b/n independent variables & dependent variable

And broken line on the other hand indicates association b/n independent variable Each other.

2 Objective of the study

2.1 General Objectives:

- To assess proportion of post-partum hemorrhage and its associated factors among mothers who gave birth at Felege Hiwot Comprehensive Specialized Hospital in Bahir Dar City, 2022.

2.2 Specific Objectives:

- To determine proportion of PPH at Felege Hiwot Comprehensive Specialized Hospital in Bahir Dar city, 2022.
- To identify associated factors associated with PPH among mothers who gave birth at Felege Hiwot Comprehensive Specialized Hospital in Bahir Dar City, 2022.

3 Methods

3.1 Study Design

A facility based cross-sectional study design was conducted at Felege Hiwot Comprehensive Specialized Hospital in Bahir-Dar City.

3.2 Study Area and Period

The study was conducted from January 30, 2022 to June 1, 2022 in Bahir Dar city at Felege-Hiwot comprehensive specialized hospital (FHCSH). Bahir Dar is the capital city of Amhara National Regional State, located 565 km Northwest of Addis Ababa, one of the ten most beautiful cities in Africa and one of the twelve UNESCO learning cities award of 2015 with estimated population of 168,899 as per 2021 world population review. Felege Hiwot Specialized Hospital is one of the three governmental hospitals in the town located along the shore of Lake Tana (the largest lake in Ethiopia and the source of the Blue Nile River) with its 37 islands harboring historical Ethiopian Orthodox churches and monasteries with estimated catchment population of seven million.

The hospital started its activity in 1954 E.C during the regime of Emperor Haile Selassie with the help of Germany peoples and working in different field of specialty like internal medicine, general surgery, pediatrics, orthopedics, radiology, psychiatry, dentistry, obstetrics and gynecology. The hospital has 3 operation theaters among which obstetrics and gynecology OR is the one. And it has separated adult, pediatric and neonatal ICU. There are 6 wards and 5 OPDs in the obstetrics and gynecology department.

Regarding human power there are five general gynecologists, 5 to 10 residents by monthly rotation from TGSH and around 40 midwives and nurses.

Felege Hiwot Comprehensive Specialized Hospital having ANC as FANC, active third stage management during intra-partum period as a means to decrease maternal mortality due to PPH and morning session is conducted on regular basis to teach junior physicians and midwives in order to treat maternal complications early among which PPH is leading.

3.3 Source population

All mothers who gave birth at Felege Hiwot Comprehensive Specialized Hospital in Bahir Dar city.

3.4 Study Population

All mothers who gave birth at Felege Hiwot Comprehensive Specialized Hospital in Bahir Dar city during the study period.

3.5 Sample size determination

A single population proportion formula $n = (Z\alpha/2)2p(1-p)/d2$ with the assumption of 95% level of confidence interval and 2% margin of error and using the most recent proportion of PPH which is 5.8%(p=0.058) done at Dessie Referral Hospital, magnitude of post-partum hemorrhage among women delivered at Dessie Referral Hospital, South Wollo, Amhara Region, Ethiopia and 10% nonresponse rate. By using the above formula: Z $\alpha/2$=1.96, d=0.02, p=0.058 the sample size n=524 + 53=577

Calculating sample size for second objectives: patient who had no ANC follow up, duration of labor≥24hour, having cesarean delivery and being multi-Para had significant association with PPH.

Table 1 Sample size calculation for associated factors

S.N	Variable	CI	Power	%of unexposed		AOR	Sample size	10% NRR	Final sample size	Reference
1	ANC	95%	80	3%		11.3	90	9	99	(23)
	Yes									
	No									
2	Duration of labor	95%	80	3.6%		8.3	110	11	121	(23)
	<24 hour									
	≥24 hour									
3	Mode of delivery	95%	80	4.3%		5.3	170	17	187	(23)
	SVD									
	C/D									
4	Parity	95%	80	1%		12.4	210	21	231	(23)
	Primipara									
	Grand multi-Para									

So sample size from first objective is greater than second objective, so my final sample size was 577.

3.6 Sampling Technique and procedure

Systematic random sampling technique was employed to select study participants. FHCSH monthly delivery load was around 500 and the data collection was for 4 months so 2000 were the approximated patient flow during the study period and the sample size was 577 and when 2000/577= 3.4 approximated to 3 . The study unit was selected as follow: the 1st case was selected by lottery method, then every 3^{rd} case (k=3) was taken to get the study units.

3.7 Variables of study

3.7.1 Dependent variable: Post-Partum Hemorrhage (yes/no)

3.7.2 Independent variables:

- **Patient related factors** - Maternal age
  - Parity
  - Multiple pregnancy
  - Level of education
  - Residential area
- **Intra-partum factors** - Mode of delivery
  - Birth weight
  - Onset of labor
  - Gestational age
  - Labor abnormality
  - Operative delivery
- **Antepartum factors** - ANC follow up
  - Having APH
  - Previous C/D scar
  - Previous history of PPH
- **Medical comorbidities** - Anemia
  - Obesity

3.8 Operational Definition

- **PPH:** a woman was considered to have PPH if she had pulse rate > 100, blood pressure<90/60, Hct drop of 10% or a care giver label her as a case of PPH.
- **Anemia**: if woman had pre-delivery hemoglobin of < 11g/dl.
- **Obesity**: If women's BMI≥ 30 kg/m^2
- **Previous history of PPH**: if a previously treating physician documented as a case of PPH in her previous deliveries.

3.9 Inclusion and Exclusion Criteria

3.9.1 Inclusion Criteria: All women who gave birth at Felege Hiwot Comprehensive Specialized Hospital in Bahir Dar city during the study period.

3.9.2 Exclusion Criteria: women who cannot communicate for any reason were excluded from study.

3.10 Data Collection Method and Tools

An interviewer administered structured questionnaire and checklist were used to collect data. The questionnaire was developed after reviewing different literature. The questionnaire was first developed in English and translated back to local language, Amharic. Data were collected by two BSc midwives. Upon gathering the relevant data for the study, next steps were undertaken. The complete lists of immediate post-partum mothers were sorted out first. For smooth interaction, a rapport with them was build.

3.11 Data quality control

The quality of data was ensured through pretesting with 5 %(29) of sample size at TGSH. This pre-testing was help to assess whether this questionnaire was easily understandable, memorable

and culturally relevant for patients and after pre-testing questionnaire was modified and important questionnaire for independent variables were included and questionnaire that is difficult to retrieve were omitted.

One day training and orientation on how to carry out data collection; how to use the questionnaire was given for the data collectors.

The questionnaire was checked by data collectors & supervisors on daily basis for completeness, accuracy, validity and consistency of data.

Finally, identified problems and errors were corrected daily before patient chart returned back to the archive.

3.12 Methods of Data Analysis

The collected data was entered into Epi-data version 3.1 and cleaned, coded and exported to SPSS 26 for statistical analysis. Descriptive statistics; like proportions were calculated and presented using tables and pie chart.

Simple binary logistic regression analysis was employed to identify candidate variables at P-value < 0.25. Then multivariable logistic regression analysis was employed to identify factors associated with post-partum hemorrhage at P-value 0.05.

The assumptions of binary logistic regression were checked using Hosmer-Lemeshow goodness-of-fit test if p-value was greater than 0.05 and value of Hosmer-Lemeshow goodness of-fit test of the associated factors of this study were 0.42.

3.13 Ethical Considerations

Ethical approval was asked and approved from the institutional review board of college of medicine and health sciences, Bahir Dar University. Accordingly, Permission letter to access charts of patients for retrieving data and to conduct the study was obtained from FHCSH hospital office of medical director and head of department of Obstetrics and Gynecology. Informed consent from patients was taken. Moreover, confidentiality was maintained when handling each case; all the information retrieved was kept in the way that not affects personal privacy and

confidentiality. Patients diagnosed with complications or morbidity was managed by the principal investigator or linked to responsible body for further management.

4 Results

4.1 Socio-demographic characteristics of study participants

A total of 577 study participants were reviewed with a response rate of 100%. The mean age of the study participants were 26.87 years (SD± 4.746).Two hundred thirty two (40.2%) were in the age group of 25-29 years. Hundred one (17.5%) of study participant were haven't formal education. Based on participants' residency, the majority of mothers 361(62.6%) were from urban (Table2).

Table 2 Sociodemographic characteristics of mothers who gave birth at FHCSH, Bahir Dar city, North West Ethiopia, 2022(N=577)

Variable	Category	Frequency(n)	Percent (%)
Age	<20	25	4.3
	20-24	161	27.9
	25-29	232	40.2
	30-34	106	18.4
	>35	53	9.2
Residence	Urban	361	62.6
	Rural	216	37.4
Educational status	No formal education	101	17.5
	Primary school	222	38.5
	Secondary school	132	22.9
	Higher level education	122	21.1

4.2 Antepartum characteristics of study participants

Among study participants 150(26%) were pregnant for the first time, 351(60.8%) of them had 2-4 birth experience and only 76(13.2%) of them had 5 or more birth. Four hundred (69.3%) of the

women gave birth between gestational age of 37–42 and 127(22%) did not know the gestational age.

Most of the pregnant mother 543(94.1) had ANC follow up. Seventy (12.1%) had previous cesarean delivery and 57(9.9%) had previous history of postpartum hemorrhage. On the other hand 22(3.8%) was having antepartum hemorrhage and 542(93.9%) were singleton delivery (Table 3).

Table 3 Antepartum characteristics of mothers who gave birth at FHCSH, Bahir Dar city, North West Ethiopia,2022(N=577)

Variable	Category	Frequency(n)	Percent (%)
Parity	1	150	26
	2-4	351	60.8
	≥5	76	13.2
Gestational age	<37	27	4.7
	37-42	400	69.3
	>42	23	4
	Unknown	127	22
ANC visit in current pregnancy at least once	Yes	543	94.1
	No	34	5.9
History of previous C/D	Yes	70	12.1
	No	507	87.9
Previous PPH	Yes	57	9.9
	No	520	90.1
Current APH	Yes	22	3.8
	No	555	96.2
Number of fetus conceived in current pregnancy	Singleton	542	93.9
	Twin	34	5.9
	Higher order	1	.2

4.3 Intrapartum characteristics of study participants

From all study participants 484(83.9%) gave birth by the spontaneous onset of labor. Three hundred sixty seven (63.6%) deliveries were spontaneous vaginal delivery, while 177(30.7%) were cesarean delivery, 25(4.3%) assisted by instruments and 8(1.4%) were vaginal breech delivery. Five hundred nine (88.2%) gave birth a normal birth weight and 37(6.4%) were develop uterine atony (Table 4).

Table 4 Intrapartum characteristics of mothers who gave birth at FHCSH, Bahir Dar city, North West Ethiopia,2022(N=577)

Variable	Category	Frequency (n)	Percent (%)
Onset of labor	Spontaneous	484	83.9
	Induced	93	16.1
Labor augmented	Yes	33	6.8
	No	451	93.2
Mode of delivery	SVD	367	63.6
	C/D	177	31
	Instrumental delivery	25	4.3
	Vaginal breech delivery	8	1.4
Labor abnormality	Yes	76	13.2
	No	501	86.8
Obstructed labor	Yes	7	1.2
	No	570	98.8
Uterine rupture	Yes	5	0.9
	No	572	99.1
Uterine atony	Yes	37	6.4
	No	540	93.6

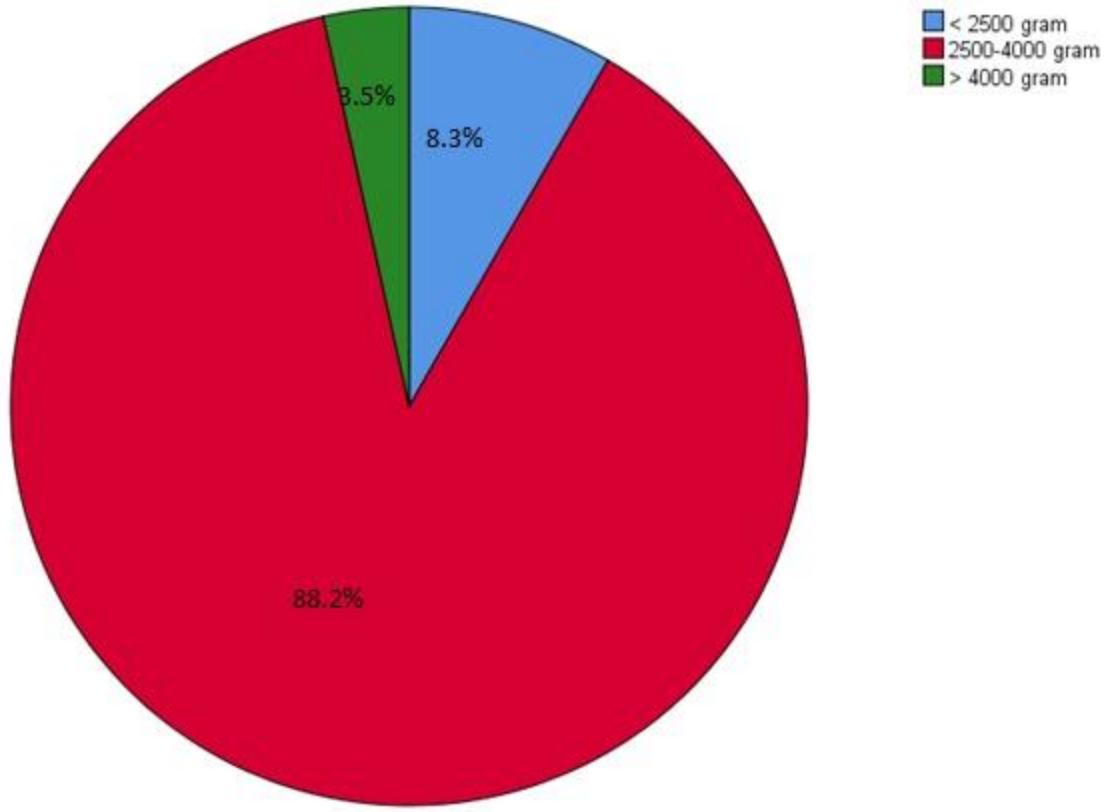

Figure 2 Distribution of deliveries by their birth weight at FHCSH, Bahir Dar city, North West Ethiopia,2022(N=577)

4.4 proportion of postpartum hemorrhage among study participants

Out of a total of 577 women who had deliveries at FHCSH during the study period 67(11.6 %) (95%CI=9.10-14.50) had postpartum hemorrhage.

4.5 factors associated with postpartum hemorrhage

Under Simple binary logistic regression analysis, those variables with P value of ≤ 0.25 were the candidates for multivariable logistic regression analysis. Parity, history of postpartum hemorrhage, current antepartum hemorrhage, having a twin delivery, labor abnormality, previous history of C/D scar and ANC follow up were variables fitted for multivariable logistic regression analysis. During multivariable logistic regression analysis parity, history of postpartum

hemorrhage, current antepartum hemorrhage, having a twin delivery and labor abnormality were significantly associated with the proportion of postpartum hemorrhage.

The odds of experiencing PPH among women with grand multipara was 5.80 [AOR = 5.80(95% CI: (2.42, 14.10)] times higher compared to women with primipara. Based on previous history of PPH, the odds of experiencing PPH among women who had previous history of PPH was 2.76[AOR = 2.76(95% CI: (1.27, 6.00)] times higher as compared to those who had no history of PPH. On the other hand the odds of experiencing PPH among women who had current APH was 3.73[AOR = 3.73(95% CI: (1.20, 11.35)] times higher as compared to those who had no APH in current pregnancy.

The odds of experiencing PPH among women with a twin delivery was 3.77[AOR = 3.77(95% CI: (1.57, 9.03)] times higher as compared to women with singleton delivery. Regarding labor abnormality, the odds of experiencing PPH among women with a labor abnormality was 5.88 [AOR = 5.88(95% CI: (3.10, 11.10)] times higher as compared to women with no labor abnormality (Table 5).

Table 5 Factors associated with proportion of PPH for mothers who gave birth at FHCSH, Bahir Dar city, North west Ethiopia,2022(N=577)

Variables	Postpartum hemorrhage		COR(95%CI)	AOR(95%CI)	P Value
	Yes	No			
Parity					
Primipara	11	139	1	1	
Multi Para	36	315	1.40(0.71,2.92)	1.44(0.71,2.92)	0.1
Grand multipara	20	56	4.51(2.03,10.00)	5.80(2.42,14.10)	0.001
History of PPH					
Yes	13	44	2.55(1.29,5.03)	2.76(1.27,6.00)	0.01
No	54	466	1	1	
Current APH					
Yes	7	15	3.85(1.50,9.80)	3.73(1.20,11.30)	0.02
No	60	495	1	1	
Number of fetuses					
Singleton	55	487	1	1	
Twin	12	22	4.83(2.20,10.20)	3.77(1.57,9.03)	0.01
Higher order	0	1			
Labor abnormality					
Yes	25	51	5.35(3.00,9.50)	5.88(3.10,11,10)	0.001
No	42	459	1	1	
Previous history of C/D scar					
Yes	12	58	0.58(0.30,1.16)	0.70(0.34,1.76)	0.55
No	55	452	1	1	
ANC follow up					
Yes	61	482	1.70(0.67,4.25)	1.41(0.50,3.90)	0.51
No	6	28	1	1	

N.B: p value of Hosmer-Lemeshow goodness of-fit test of the associated factors were 0.42.

5. DISCUSSION

A total of 577 study participants were reviewed with a response rate of 100%. The findings of this study revealed that the proportion of postpartum hemorrhage was 11.6%(95%CI=9.10-14.50).The finding of this study is almost comparable to the study conducted in Hidar 11 Hospital North West Ethiopia 12.1%(24); Yirgalem General hospital 9.4%(25); Bedele hospital south west Ethiopia 9.7%(26); at university hospital in eastern Ethiopia 12.9(27); in Dilchora referral hospital in Diredawa city administration 13%(28) ; in South Gondar public health facilities 13.6% (5) ; Saudi Arabia 12.7%(17).

However the finding of this study is lower than the study done at Cameroon 23.6%(19) ; Yemen 29.1%(4) and Pakistan 21.3%(4) the explanation for the difference could be related to time difference study done in Cameroon was five years back and difference in study subjects since women from Cameroon, Yemen and Pakistan is different with this study(3, 9, 19) .

Since postpartum hemorrhage is among common cause of maternal mortality and countries are focused mainly on prevention strategies specially by applying universal usage of uterotonics so this could be the additional reasons why figures from this study is lower than above studies

The finding of this study is higher than the study conducted in Black lion specialized hospital 1.4%(9); Debre Tabor General hospital 7.6%(7); Dessie referral hospital 5.8%(3); hospital births in northwest Ethiopia 8.8%(29); Uganda 9%(18); Norway 2.5%(16); Japan 8.7%(30). The difference could be from operational definitions since this study label women's as having postpartum hemorrhage if they had hypovolemia symptoms in addition to being labelled as case of postpartum hemorrhage with treating physician, but most studies review only cases with registered on their card as a case of postpartum hemorrhage because of their retrospective study nature.

This study showed that parity, history of postpartum hemorrhage, current antepartum hemorrhage, having twin delivery and labor abnormality were significantly associated with the development of postpartum hemorrhage.

This study revealed that the proportion of postpartum hemorrhage is high in grand multipara compared with primipara. The findings of this study is in line with a study done in Debre Tabor

General Hospital(7) and Dessie referral hospital(3). When parity increase women's myometrial muscular strength may get reduced due to the replacement of myometrium with collagen fibers(2, 7). Therefore; when parity increases, the probability of developing PPH increases.

The finding of this study indicated that previous history of postpartum hemorrhage is significantly associated with the development of postpartum hemorrhage. This finding is consistent with the study done in selected hospitals in southern Ethiopia(4), Yirgalem general hospital(25), Debre Tabor General Hospital(7), Dessie referral hospital(3) and Norway(16). This is because once a woman develops postpartum hemorrhage then the probability of developing for next pregnancy is high due to inherent pathologic causes of postpartum hemorrhage is recurrent and among common causes uterine atony contributes a lot, which is also common while parity becomes advanced(1, 3).

In this study the probability of developing postpartum hemorrhage is high in woman's with having antepartum hemorrhage in their current pregnancy when compared with women's with no antepartum hemorrhage in current pregnancy. This finding is similar with a study done in a hospital births in northwest Ethiopia(29). This is because women's with antepartum hemorrhage is prone to develop anemia and uterine apoplexy which a known cause for postpartum hemorrhage(2, 12).

The likelihood of postpartum hemorrhage is greater among those who have twin delivery than those with singleton delivery. This finding is in line with a study conducted at six health facility in Uganda(18) and Norway(16). This is because twin pregnancy results atony due to over distended uterus and probability of operative delivery is high in twin pregnancy which is also known risks for postpartum hemorrhage (1, 16, 19).

Findings from the study shows having a labor abnormality is strongly associated with development of postpartum hemorrhage when compared with women's with no labor abnormality. This result is in line with a study done at Yirgalem General Hospital(20, 25). The reason for this is women's with labor abnormality is likely to be end up with labor augmentation and operative delivery which is also risks for postpartum hemorrhage(14).

Strength and Limitations of the study

This study done on a study participants while they are in the hospital that mean it was not chart review only, so important variable were not missed and from operational definition point of view cases with PPH were also considered for women who was having hypovolemia symptoms in addition to the traditional definition this makes the study more representative**.**

This study was conducted in one hospital so, women who gave birth in other hospital, health center and home deliveries were not included and this figure could change if it was done in including other health institutions found in the town. This study also shares all the limitation of cross sectional study; the cause and effect of PPH might not be known.

6. CONCLUSION, FUTURE DIRECTION AND IMPLICATIONS

6.1 CONCLUSION

The proportion of postpartum hemorrhage was 11.6 %(95%CI=9.1-14.5) in the study setting. Grand multipara, previous history of postpartum hemorrhage, current antepartum hemorrhage, twin delivery and labor abnormality were factors significantly associated with postpartum hemorrhage. Women with APH and twin pregnancy should be label as high risk for PPH and better to take preventive measure for them. Grand multipara and women with previous history of PPH should be followed as high risk women during intrapartum period.

6.2 Future direction/Recommendations

- Women with APH and twin pregnancy should be label as high risk for PPH and better to take preventive measure for them. Grand multipara and women with previous history of PPH should be followed as high risk women during intrapartum period.
- To conduct further study on proportion of postpartum hemorrhage and its associated factors by including other public health institution

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Annex: Questionnaire

Bahir Dar University College of Medicine and Health Science, Department Of Obstetrics and Gynecology, Questionnaire format for evaluation of "Proportion of Post-partum Hemorrhage and Its associated factors among mothers delivering at Felege Hiwot Comprehensive Specialized Hospital in Bahir Dar city"

ባህር ዳር ዩኒቨርሲቲ ህክምና እና ጤና ሳይንስ ኮሌጅ የሚህፀንና ፅንስ ትምህርት ክፍል

ባህርዳር

መግቢያ

ጤና ይስጥልኝ ስሜ.....ይባላል፡ ፡ የምሰራው.....ነው፡ ፡

ወደዚህ የመጣሁበት ምክንያት በፈለገ ህይወት ኮምፕረሄንስቭ ስፔሻላይዝድ ሆስፒታል ከወሊድ በኃላ በሚከሰት የደም መፍሰስ እና ተዛማጅ ምክንያቶች ጥናት ለማካሄድ ሚጃ ለማሰብሰብ ነው፡ ፡ጥናቱን የሚያካሂዱት በባህርዳር ዩኒቨረሲቲ የህክምና እና ጤና ሳይንስ ኮሌጅ በሚህፀን እና ፅንስ ትምህርት ክፍል የአራተኛ አመት የእስፔሻላይዜሽን ተማሪ የሆኑት ዶክተር ደስታው ተገኘ ናቸው፡ ፡ጥናቱ የሚካሄደው ከጥቅምት አንድ እስከ ግንቦት አንድ 2014 ዓ.ም በአማራ ክልል በባህርዳር ከተማ በፈለገ ህይወት ኮምፕረሄንስቭ ስፔሻላይዝድ ሆስፒታል ነው፡ ፡ በጥናቱ የሚ ኘውውጠው ለሚሰላከታቸውአካላት ግብዓት የሚሆንና የመፍትሄ እርምጃ ለመወሰድ አቅጣጫጠቋሚይሆናል፡ ፡ ስለሆነ ም ጥያቄወን ለመመለስ ፈቃደኛ ከሆኑ በታማኝነት ለሚጠየቁት ጥያቄ ተገቢወን መልስ ይሰጠኛ ዘንድ በትህትና እጠይቃለሁ!!!

ጥያቄወን ለመመለስ ፈቃደኛ ነዎት?

አወ..... አይደለሁም.....

ፈቃደኛ ከሆኑ

- ቀን .....
- መጠይቁን የሞላውስም..... ፊርማ
- የሱፐርቫይዘሩ ስም .....ፊርማ

Case code number----------

I, Socio-demographic Characteristics

100. Age in years…….

101. Address

A. Bahir Dar B. Out of Bahir Dar

102. Educational status

A. has no formal education B. completed first cycle (1-4) C. completed second cycle (5-8)

D. Completed 9-12 E. Attained tertiary education

II, Obstetric History

200. Gravidity-------

201. Parity

A. 1 B. 2-4 C. >=5

202. Gestational age (weeks)

A. <37 B.37-42 C.>42 D. unknown

203. Does she has ANC (antenatal care) follow up at least once?

A. yes B. no

204. Does she has history of previous C/D

A. yes B. no

205. If yes, how many times------

206. Does she has history of previous PPH

A. yes B. no

III. Ante partum Obstetric event

300. Does she has ante partum hemorrhage

A. yes B. no

301. Number of fetus conceived in current pregnancy

A. Singleton B. twins C. higher order

302. Body mass index of the mother

A. < 18.5 kg/m^2 B. 18.5-24.9kg/ m2 C. 25-29.9kg/ m2 D. ≥ 30kg/ m2 E. unknown

Pre-pregnancy weight

303. Hematocrit/Hemoglobin at admission…….

IV. Intra-partum Obstetric event

400. Does she has post-partum hemorrhage?

A.yes B.no

401. Does she has obstructed labor

A. Yes B. no

402. Does she has labor abnormality

A. Yes B. no

403. Mode of delivery

A. Vaginal B. C/D

404. If vaginal, is it

A. Spontaneous vertex delivery (SVD) B. SVD with episiotomy C. forceps/vacuum D. Breech E. destructive

405. Was the labor

A. Spontaneous B. induced

406. If spontaneous, is labor augmented

A. Yes B. no

407. Is 3rd stage of labor prolonged?

A. Yes B. no

408. If yes, placenta removed

A. Spontaneously B. Manual removal

409. Birth weight of newborn

A. < 2500 gram B. 2500-4000 gram C. > 4000 gram

410. Does she has genital tract trauma

A. Vaginal wall laceration B. cervical tears C. perineal tear D. absent

411. Does she has uterine rupture?

A. Yes B. no

412. Was she developed uterine atony?

A. Yes B. no