Original article

Prevalence of Primary Post-partum Haemorrhage and Factors Related to it among Women Delivered in a Tertiary Care Hospital of Lahore

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ABSTRACT

Background: Primary Post-partum haemorrhage (PPPH) is the multi-factorial and the leading cause of maternal mortality. The following study is set to identify prevalence and factors related to it among women delivering in a tertiary care hospital in Lahore.

Patient and methods: A cross-sectional study was conducted in the Departments of Obstetrics and Gynaecology, Services Hospital Lahore from January to June 2021. Data was collected on a structured questionnaire from three hundred and forty-eight women and their medical records using a non-probability purposive sampling technique. The variables included socio-demographics, antepartum, and intrapartum characteristics. Assessment of PPPH was carried out by primary obstetrician, by visual estimation and data was entered on SPSS version 23.0. The chi-square test was used as a test of significance, and binary regression was applied. A p-value <0.05 and Odds' Ratio >2 was taken as significant.

Results: Ninety-nine out of the total (28.4%) had PPPH. Illiteracy and low socio-economic status (income value less than the median) had significant associations with PPPH (AOR 4.26 p-value=0.015, CI 1.322-13.684) (OR 0.146, p-value=0.005, CI 0.259-0.789), respectively. A statistically significant association was found between PPPH and uterine atony (p-value=0.000, AOR=39.88, CI=60.84-2628.12), placental complications (p-value 0.035, AOR=3.321, CI=1.091-10.11), fatal demise (p-value 0.000, AOR=31.89, CI=7.99-128.243) and PIH (p-value 0.028, AOR=0.341, CI=0.130-0.892).

Conclusion: This study showed a high prevalence of PPPH. Illiteracy, socioeconomics, uterine atony, placental complications, and fetal demise were significant contributors. These findings highlight the importance of socio-demographics and good management of the third stage of labour. Further research with a larger sample size can refine these insights for the development of targeted preventive strategies.

Keywords:

Primary, Haemorrhage, Pakistan, Prevalence, Risk factors, Causes, Prevention

INTRODUCTION

Primary Postpartum Hemorrhage (PPPH) defined as a blood loss > 500ml during first 24 hours of delivery, poses a substantial global health concern with a direct leading cause of maternal mortality.[1] Over 303,000 annual maternal deaths attributed to childbirth-related complications, as estimated by the United Nations.[2] In regions like Africa and Asia, it accounts for over 30% of maternal deaths,[3] while developed countries exhibit significantly lower percentages, such as 3.4% in the UK and 11.4% in the USA.[4] This disparity raises the question of maternal management and prevention strategies.[5] Notably, Pakistan faces a disproportionately high maternal mortality ratio of 400 per 100,000 live births, with PPPH causing one third of fatalities.[6]

A comprehensive analysis of existing literature reveals maternal, obstetrical, antepartum and intrapartum factors. These include maternal age, education, occupation, and residential status, as well as the educational level of husbands.[7] Additionally, pregnancy-induced hypertension (PIH), antenatal anaemia, antepartum haemorrhage (APH), past history of PPH, multiple pregnancies, pregnancy outcomes, polyhydramnios, and uterine anomaly increase probability of PPPH.[6,8] Inadequate utilization of antenatal care (ANC), short birth intervals, home or in-route childbirth, and unmonitored labour[8,] extended third stage of labour, obstetric interventions, including mode of delivery are also significant contributor to this threat.[9]

Conflict of interest: The authors declared no conflict of interest exists.

Citation: Bakhtiari AF, Zahra T, Kamal A, Shahid A, Mushtaq F, Rasool S. Prevalence of primary post-partum haemorrhage and factors related to it among women delivered in a Tertiary Care Hospital of Lahore. J Fatima Jinnah Med Univ. 2024; 18(2):94-100.

DOI: http://doi.org/10.37018/JFJMU/9410

PPPH is a life threatening situation and requires multidisciplinary approach in a resource constraint country like Pakistan.[6] However, the scarcity of literature in the local context makes it inevitable quantify it's prevalence and pre-disposing factors among women who deliver in tertiary care setup of a provincial capital, where active management of third stage of labour is a routine practice.[6] Therefore, present study aimed to determine the prevalence of PPPH and relationship of non-obstetrical and obstetrical factors related to it among women delivering in a tertiary care hospital of Lahore.

MATERIALS AND METHODS

A cross-sectional quantitative analytical study was conducted after obtaining the ethical clearance obtained from IRB (IRB/2020/743/SIMS), and formal permission from the Head Department of Obstetrics and Gynaecology Department of Services Institute of Medical Sciences (SIMS)/Services Hospital, Lahore. The sample size was calculated using WHO S-size software, at a 95% confidence interval with an anticipated frequency of 14.6%[9], and a relative precision of 0.05 and data was collected from January to July 2021.A total of 348 women delivering in the labour rooms were included using a non-probability purposive sampling technique. Women who delivered within the last 6-24 hours of data collection and had 'Postpartum Haemorrhage (PPH)' labelled on their clinical files, by their primary obstetricians[2,4] and /or with blood loss more than 500 ml of blood in first 24 hours in case of vaginal delivery and >1000ml is lost during Caesarean section[1] through visual estimation, and/or receiving blood transfusion during first 24 hours were included in the study. Those with known bleeding disorders, extreme age (less than 18 years or above 40 years), gestational age <28 weeks and unwilling to participate in the study were excluded from the study.

Using a structured, and close-ended questionnaire covering non obstetrical factors such as socio-demographic profile and obstetrical factors such antepartum and intrapartum variables were included in the study. Socio-demographic profile included age, residence, education, occupation, husband's education, husband's occupation, and socioeconomic status, were collected through interviews by the researchers. Antepartum and obstetrical variables, including gravidity, parity, pregnancy interval, multiple gestation, anaemia during pregnancy, previous history of PPH, history of caesarean section, history of abortions, uterine pathology or anomalies, pre-pregnancy hypertension, Antenatal Care (ANC), antepartum haemorrhage (APH), and Pregnancy-Induced Hypertension (PIH), were noted from the patient file. Women who received more than 3 antenatal visits were categorized as "booked patients." Uterine anomalies included pre-pregnancy conditions such as uterine fibroids and genital tract trauma defined as any genital tract laceration received during vaginal delivery, were noted from the clinical notes. Hypertension and anaemia in this research were considered as those diagnosed by a healthcare worker in charge of the pregnancy.

Intrapartum variables included mode of delivery, labour complications, episiotomy, genital tract trauma, placental complications, uterine atony, uterine rupture, outcome of pregnancy, and fetal macrosomia, were noted from the patient file.

Data was entered and analysed utilized SPSS version 23.0. Quantitative variables (e.g., age, education, income) were summarized with mean and standard deviation, while qualitative variables (e.g. prevalence of PPPH) were expressed as frequency and percentage. Chi Square was used as test of significance with $p< 0.05$ taken as significant. Factors showing significant associations in bivariate analysis were further examined using Binary Regression with a Hosmer and Lemeshow Test for fit and homogeneity. Primary postpartum haemorrhage (PPPH) was taken as dependent variable in all these analysis. Confounders such as age, socio-economic status, bleeding disorders were handled using standardization, stratification, strict inclusion exclusion criteria and multivariate analysis.

RESULTS

Among 348 respondents, 78.4% were urban residents, 74.1% were unemployed, and 54.3% had a low socioeconomic status. Regarding education, 66 respondents (19%) had no formal schooling, while 282 (81%) were literate, with 87 of them (30.9%) experienced PPPH, as shown in Table 1.

The study results are summarized in Tables 2, 3, and 4, which provide information about the univariate and bivariate regression analyses regarding factors associated with Postpartum Primary Haemorrhage (PPPH) following in-hospital births. Table 2 explain the relationship between various antepartum and obstetric factors and the occurrence of PPPH was examined in participants. A statistically significant association was observed for pregnancy intervals of less than 2 years (36.7% vs. 25.6%, p-value = 0.045), indicating an increased risk of PPPH in such cases.

Table 1: Socio-demographic characteristics of study participants and primary post-partum haemorrhage (n=348)

Variables	Categories	Frequency (%) Total	Postpartum haemorrhage		p-value*	Chi-Square Fisher's Exact Test[1]
			Yes Frequency (%) n=99	No Frequency (%) n=249		
Age of group (Year)	< 28	189 (54.3)	54 (28.6)	135 (71.4)	0.956	0.003
	≥ 28	159 (45.6)	45 (28.3)	114 (71.7)		
	Mean age: 27.72 Median: 27.00 SD: ± 5.502 Range: 18-45					
Residence	Urban	273 (78.4)	75 (27.5)	198 (72.5)	0.441	0.592
	Rural	75 (21.6)	24 (32.0)	51 (68.0)		
Education	Illiterate	66 (19.0)	12 (18.2)	54 (81.8)	0.040	4.217
	Literate	282 (81.03)	87 (30.9)	195 (69.1)		
Occupation	Employed	90 (25.9)	36 (40.0)	54 (60.0)	0.005	7.958
	Un-Employed	258 (74.1)	63 (24.4)	195 (75.6)		
Husband's Education	Illiterate	54 (15.5)	9 (16.7)	45 (83.3)	0.037	4.359
	Literate	294 (84.5)	90 (30.6)	204 (69.4)		
Husband's Occupation	Employed	303 (87.1)	87 (28.7)	216 (71.3)	0.776	0.081
	Un-Employed	45 (12.9)	12 (26.7)	33 (73.3)		
Socioeconomic Status	Low Income[1]	189 (54.3)	36 (19.0)	153 (81.0)	0.000	17.959
	Middle and high Income[2]	159 (45.6)	63 (39.6)	96 (60.4)		
	Mean income: 23258.62 Median:25000.0 SD:9910.147 Range:3000-50000					

[1] Low Income: Less than Median value
[2] Middle and high Income: More than Median value
*indicates p-value ≤ 0.05
[1] indicates Fisher's Exact Test

Table 2: Relationship between antepartum and obstetrics related factors with primary postpartum haemorrhage. (n=348)

Variables	Categories	Postpartum haemorrhage		Total Frequency (%)	p-value*	Chi-Square Fisher's Exact Test[1]
		Yes Frequency (%) n=99	No Frequency (%) n=249			
Gravidity	Primigravida	33 (29.7)	78 (70.3)	111 (100.0)	0.717	0.131
	Multi-gravida (more than 2 pregnancies)	66 (27.8)	171 (72.1)	237 (100.0)		
Parity	Primipara	84 (29.8)	198 (70.2)	282 (100.0)	0.252	1.310
	Multipara	15 (22.7)	51 (77.3)	66 (100.0)		
Pregnancy Interval ≥ 2 years	Yes	33 (36.7)	57 (63.3)	90 (100.0)	0.045	4.028
	No	66 (25.6)	192 (74.4)	258 (100.0)		
Multiple Gestation	Singleton	96 (28.2)	237 (71.2)	333 (100.0)	0.339	0.569[1]
	Twins and above	3 (20.0)	12 (80.0)	15 (100.0)		
Anaemia during pregnancy	Yes	57 (33.9)	111 (66.1)	168 (100.0)	0.03	4.792
	No	42 (23.3)	138 (76.7)	180 (100.0)		
History of PPH	Yes	6 (33.3)	12 (66.7)	18 (100.0)	0.637	0.223
	No	93 (28.2)	237 (71.8)	330 (100.0)		
History of Caesarean Section	Yes	54 (25.0)	162 (75.0)	126 (100.0)	0.148	2.088
	No	45 (34.1)	87 (65.9)	222 (100.0)		
History of Abortions	Yes	21 (25.0)	63 (75.0)	84 (100.0)	0.421	0.647
	No	78 (29.5)	186 (70.5)	264 (100.0)		
Uterine Pathology or Anomalies	Yes	21 (58.3)	15 (41.7)	36 (100.0)	0.000	17.618
	No	78 (25.0)	234 (75.0)	312 (100.0)		
Pre-pregnancy Hypertension	Yes	87 (29.6)	207 (70.4)	294 (100.0)	0.270	1.217
	No	12 (22.2)	42 (77.8)	54 (100.0)		
Antenatal Care (ANC)	Un-booked	87 (31.5)	189 (68.5)	276 (100.0)	0.013	6.191
	Booked	12 (16.7)	60 (83.3)	72 (100.0)		
PIH	Yes	33 (37.9)	54 (62.1)	87 (100.0)	0.028	5.124
	No	66 (25.3)	195 (74.7)	261 (100.0)		
Antepartum Haemorrhage (APH)	Yes	33 (40.7)	48 (59.3)	81 (100.0)	0.005	7.837
	No	66 (24.7)	201 (75.3)	267 (100.0)		

*indicates p-value ≤ 0.05
[1] indicates Fisher's Exact Test

Multiple gestations, anaemia during pregnancy, and a history of antepartum haemorrhage were significantly associated with PPH, as indicated by chi-square tests (p-value = 0.339, p-value = 0.03, p-value = 0.000, respectively).

Furthermore, a history of caesarean section, history of abortions, uterine pathology or anomalies, and pre-pregnancy hypertension did not show statistically significant associations with PPH. However, booked antenatal care exhibited a significant association

with a lower PPPH compared to unbooked care (31.5%vs. 16.7%, p-value = 0.013). Pregnancy-induced hypertension (PIH) and antepartum hemorrhage (APH) also showed significant associations with PPH, indicating their potential roles as risk factors (p-value = 0.028 and p-value = 0.005, respectively).

The relationship between intrapartum characteristics and postpartum haemorrhage has been explained in Table 3. More than half of the women had undergone Caesarean section deliveries (198/348=56.89%), while the remainder had vaginal deliveries, and 56% of these had episiotomies. Genital tract trauma and tears were observed in 14% of women with vaginal deliveries. The mode of delivery showed statistical significance with a p-value of 0.04. Episiotomy was significantly associated with PPPH, evidenced by a p-value of 0.001. Genital tract trauma was also significantly linked to primary PPH, with a p-value of 0.000. Placental complications were found to be statistically significant with a p-value of 0.009, where 46.2% of women with PPPH had placental complications, as opposed to 26.2% who did not. Uterine atony and uterine rupture were also statistically significant in their association with postpartum Haemorrhage, with a p-value of 0.000.

In the binary regression analysis, as shown in Table IV, various variables demonstrated significant associations with PPPH, yielding adjusted odds ratios (AOR) and 95% confidence intervals. Educational status emerged as a significant factor, with an AOR of 4.254 (95% CI: 1.322, 13.664, adjusted p-value = 0.015), suggesting that individuals with higher education levels were more likely to experience PPPH. Conversely, socioeconomic status exhibited a protective effect, indicated by an AOR of 0.146 (95% CI: 0.055, 0.383, adjusted p-value = 0.005), highlighting a lower likelihood of PPPH among those with higher socioeconomic status.

Uterine atony emerged as a substantial risk factor, with a notably high AOR of 39.88 (95% CI: 60.84, 2628.212, adjusted p-value = 0.000), underscoring its significant association with increased odds of PPH. Placental complications also demonstrated a meaningful correlation, with an AOR of 3.321 (95% CI: 1.091, 10.112, adjusted p-value = 0.035), implying an elevated likelihood of PPH in the presence of such complications. Pregnancy-induced hypertension (PIH) exhibited a protective effect, with an AOR of 0.341 (95% CI: 0.130, 0.892, adjusted p-value = 0.028), indicating a reduced likelihood of PPH in cases with PIH.

Furthermore, the outcome of pregnancy significantly influenced the odds of PPH, as reflected in an AOR of 31.897 (95% CI: 7.993, 128.243, adjusted p-value = 0.000), emphasizing the substantial impact of pregnancy outcome on the occurrence of PPH. However, uterine rupture did not demonstrate a statistically significant association (AOR = 4.924, 95% CI: 0.583, 41.590, adjusted p-value = 0.143).

DISCUSSION

The prevalence of PPPH was notably high, 28.6% among 348 women studied, in contrast to lower rates in other global studies, like 16.6% in Ethiopia, 3.3% in India, and 2.5% in Egypt and 2.5% in Afghanistan as well .[4,10-12] These variations may stem from differences in study settings, designs, and timeframes. For instance, in the UK, Bell and coworkers. Found only 8.6% of women lost 1000ml-1500ml of blood within 24 hours after delivery, significantly lower than our findings.[13] Gul and Jabeen reported a high 96.9% incidence of PPH in Kohat, while Sultana and colleagues noted a mere 0.74% PPPH incidence, raising questions about the effectiveness of national maternal healthcare strategies. [14,15]This high level might be due to a fact that research setting was tertiary care hospital in heart of a metropolitan city and most of complicated cases are presented here. Further, over-estimation of blood loss on part of obstetrician, and use of patients records can be taken as an argument but, this difference could also highlight ineffectiveness of national strategies for maternal health care service.[10]

Socio-economic disparities significantly impact pregnancy outcomes, as shown in this study. Low socio-economic status (defined as income below the median) and illiteracy were notably associated with primary postpartum haemorrhage (PPPH).[16] Interestingly, a protective association was observed with low socio-economic status, as the majority of participants came from low-income backgrounds (54.3%). This highlights a clear link between the use of public hospital facilities and family socio-economic status. Jennifer Jardine and colleagues in 2022 found that as socio-economic deprivation increased, the risk of PPPH decreased. Among other sociodemographic factors, illiterate women had 4.254 times higher odds of PPH compared to literate women,[17] aligning with findings by Park et al. in 2019, indicating that poor educational status is significantly linked to maternal morbidity and adverse outcomes.[18] This may be due to the absence of continuous health education programs in the community and households, potentially resulting in

Table 3: Relationship between intrapartum characteristics and primary postpartum haemorrhage. (n=348)

Variables	Categories	Postpartum haemorrhage		Total Frequency (%)	p-value*	Chi-Square Fisher's Exact Test[1]
		Yes Frequency (%) n=99	No Frequency (%) n=249			
Gestational Age	28- 36 weeks	51 (32.1)	108 (67.9)	159 (100.0)	0.169	1.892
	37-42 weeks	48 (25.4)	141 (74.6)	189 (100.0)		
Mode of delivery	Vaginal Delivery	51 (34.0)	99 (66.0)	150 (100.0)	0.04	3.992
	C-Section	48 (24.2)	150 (75.8)	198 (100.0)		
Labor Complications	Yes	45 (33.3)	90 (66.7)	135 (100.0)	0.108	2.586
	No	54 (25.4)	159 (74.6)	213 (100.0)		
Episiotomy	Yes	36 (42.9)	48 (57.1)	84 (100.0)	0.001	11.294
	No	63 (23.9)	201 (76.1)	264 (100.0)		
Genital Tract Trauma	Yes	15 (71.4)	6 (28.6)	21 (100.0)	0.000	20.282
	No	84 (25.7)	243 (74.3)	327 (100.0)		
Placental Complications	Yes	18 (46.2)	21 (53.8)	39 (100.0)	0.009	6.764
	No	81 (26.2)	228 (73.8)	309 (100.0)		
Uterine Atony	Yes	45 (100.0)	0 (0.0)	45 (100.0)	0.000	129.991[1]
	No	54 (17.8)	249 (82.2)	303 (100.0)		
Uterine Rupture	Yes	15 (100.0)	0 (0.0)	15 (100.0)	0.000	0.000[1]
	No	84 (25.2)	249 (74.8)	333 (100.0)		
Outcome of pregnancy	Live Birth	84 (25.7)	243 (74.3)	327 (100.0)	0.000	20.282
	Fetal death	15 (71.4)	6 (28.6)	21 (100.0)		
Fetal macrosomia	Yes	3 (16.7)	15 (83.3)	18 (100.0)	0.255	1.294[1]
	No	96 (29.1)	234 (70.9)	330 (100.0)		

*indicates p-value ≤ 0.05 [1] indicates Fisher's Exact Test

Table 4: Binary Regression model for the factors showing significant relationship in bivariate analysis. (n=348)

Significant Variables	Binary Regression	Adjusted Odds Ratio	95% Confidence interval	Adjusted p-value*
Educational status	1.448	4.254	1.322, 13.664	0.015
Socioeconomic Status	-1.927	0.146	0.055, 0.383	0.005
Uterine Atony	5.991	39.88	60.84, 2628.212	0.000
Uterine Rupture	1.594	4.924	0.583, 41.590	0.143
Placental Complications	1.200	3.321	1.091, 10.112	0.035
PIH	-1.185	0.341	0.130, 0.892	0.028
Outcome of pregnancy	3.463	31.897	7.993-128.243	0.000

*indicates significant p-value (≤ 0.05)

differences that go unnoticed. Unlike some studies, this research did not find a relationship between PPPH and maternal age, gestational age, gravidity and multiparity.[19-21]

In this study, 168(48.3%) had antenatal anaemia, and women with PPPH, 57.6% were anaemic. While an initial association between anaemia and PPPH was observed, in final regression analysis the odd's ratio (OR) fell within a 95% confidence interval of 0.22 to 1.126. A potential hypothesis is that healthcare professionals might overestimate blood loss in severely anaemic women, raising reported PPPH rates. Although a dose-effect relationship between anaemia severity and maternal death appeared, but Park et al also found no it was not statistically significant relationship.[18] Sample size and event limitations in both studies may have contributed to this outcome. It is plausible to hypothesise that because caregivers of severely anaemic women have legitimate concerns, healthcare professionals are more prone to overestimate blood loss, which leads to greater rates of postpartum haemorrhage. In contrast, Daru et al. found severe anaemia linked to morbidity and mortality in women with low- and middle-income countries,[21] Sultana's study et al. found no significant PPPH association with anaemia, multiparity, or multiple pregnancies.[6] Nyflot and co-researchers reported severe pre-eclampsia and HELLP syndrome increased PPPH risk,[22] which our study didn't find. Difficulty categorizing blood loss and pregnancy-induced hypertension (PIH) may contribute for this outcome.

The three-delay model emphasizes the crucial role of adequate healthcare facility care, highly significant in this study. Placental complications increased the risk PPPH by 3.32-fold, emerging as the most prominent risk factor, consistent with Nyflot and colleagues' findings[22], Sultana et al [6]and Yang et al.[5] Unlike Fukami and co-workers' didn't not find any significant relationship between placental complications and PPPH. This is interesting as coincidently in their study, no women had placental adhesion or uterine anomaly. [23] Further, the study emphasized uterine atony as a significant factor in PPPH, with a substantial association (OR = 39.88). This finding is consistent with

previous research in Afghanistan, China, Norway, and Zimbabwe, all highlighting uterine atony as a primary cause of PPPH in diverse settings.[4,22,24,25] In this study, uterine atony was the leading cause, affecting all women with PPPH. Surprisingly, PPPH remained prevalent despite widespread oxytocin use, indicating over stretching of uterus for a longer period of time[23] and raising concerns about oxytocin's cold chain maintenance in the settings. Other research suggested considering misoprostol as an alternative uterotonic for settings with uncertain cold chain maintenance. However, it's worth noting that misoprostol carried a 36% higher risk of PPPH compared to oxytocin in women receiving prophylaxis[19], making management of PPPH a researchable topic.

Fetal demise during pregnancy was identified as a significant PPPH risk with high odds (31.897, p-value 0.000). This differs from Trinueh et al.'s findings where pregnancy loss wasn't significantly linked to PPPH.[18] In this study, out of PPPH cases, 42.9% and 71.4% had episiotomies, experienced genital tract trauma respectively. However, both were found to have no significant PPPH relationship in the final regression model. This augments the importance of further investigations to provide the best practices for safe and quality maternity healthcare services in a tertiary care hospital. Traumatic vaginal birth's significance in PPPH aligns with studies from Zimbabwe, Ethiopia, and Japan, highlighting the importance of addressing delays in PPPH management and the need for improved maternity healthcare practices.[18,25]

Postpartum Haemorrhage, especially PPPH, is a facility-based emergency. Despite extensive research, some cases still have unknown causes, as seen in prior studies. This study, in light of the limited recent data on the prevalence, and factors of primary postpartum haemorrhage (PPPH) in Pakistan, has the potential to prompt further research into this critical contributor to maternal mortality and morbidity. The factors highlighted in our research could serve as a foundation for early identification of PPPH-associated factors and the development of strategies to mitigate this serious issue. Despite these challenges, comprehensive exploration of both preventive and curative management aspects of PPPH makes it unique in local context.

CONCLUSIONS

Early postpartum care is crucial for rapid identification and treatment of excessive blood loss. High percentage of PPPH indicates addressable and neglected issue. The study further highlights role of sociodemographic factors such as illiteracy and low socio-economic status which while chalking out tailored made preventive strategies, can be helpful in the local context. Capacity-building of healthcare providers and evidence-based practices are vital, especially in resource-constrained settings where curative measures often take precedence over preventive ones.

However, this study was not without limitations. The measurement of blood loss lacked a well-established calibration method, potentially affecting the precision of clinician assessment, especially in distinguishing between moderate and severe losses within the initial 24 hours. Furthermore, the study's figure may be an under estimation as it didn't include women who delivered at home or other facilities. Data diversity was limited as information was primarily collected from a public hospital, and resource constraints including time, hindered collection of more data and participants' follow-up.

Acknowledgment: The authors express their gratitude to the Department of Obstetrics and Gynaecology at the Services Institute of Medical Sciences for their invaluable support during the data collection and compilation phases of this study.

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