



Intrapartum and Post-Partum Factors Associated with Postpartum Haemorrhage among Women Seeking Maternity Care at Thika Level 5 Hospital in Kiambu County, Kenya

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Abstract

INTRODUCTION

Postpartum haemorrhage (PPH) is the major cause of maternal morbidity and mortality in the world. Notably, anecdotal literature obtained from patient records posits that Thika Level 5 Hospital (TL5H) reports approximately 30 PPH cases in a month. Thus, this study sought to assess intrapartum factors associated with PPH among women seeking maternity care at this health facility.

METHODOLOGY

The study adopted an institutional-based, unmatched case-control design. A sample size of 76 women (19 cases and 57 controls) were recruited using a simple random sampling technique from among women who had delivered at Thika Level five hospital and had or did not have a PPH diagnosis within 24 hours. Data were collected using a semi-structured questionnaire and analyzed using Statistical Package of Social Sciences (SPSS) version 26. Binary logistic regression was fitted to assess the association between dependent and independent variables. The crude odds ratios, together with their 95% confidence intervals were used to identify the strength of the association.

RESULTS

Most respondents were aged 18 to 35 years (84%), with 42.7% having secondary education and 69.3% married. Notably, 45.3% were self-employed. A significant percentage reported labour starting between 38-40 weeks (case: 84.2%; control: 87.5%), with nearly half experiencing labour lasting 6 to 9 hours. While most cases (68.4%) did not receive labour-inducing medication, compared to 57.1% of controls, binary logistic regression showed no significant association between socio-demographic or intrapartum factors and postpartum haemorrhage ($p > 0.5$).

CONCLUSIONS

None of the intrapartum and postpartum factors investigated in this study influenced the occurrence of postpartum haemorrhage. However, it remains a significant threat to maternal health; therefore, health managers need to review strategies for preventing postpartum haemorrhage among women of reproductive age.

Keywords: Postpartum; Haemorrhage; Maternity care; Maternal morbidity, Maternal mortality

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Introduction

Postpartum haemorrhage (PPH) is defined as blood loss exceeding 500ml following a vaginal birth and 1000ml after a cesarean birth (1). Postpartum haemorrhage is

divided into two categories; primary/early and secondary/late PPH that occurs in less than 24 hours and 24 hours to 6 weeks after delivery respectively. Research has demonstrated that close to 99% of PPH cases occur in less than 24 hours after delivery (1). Postpartum

haemorrhage is a major contributor of serious morbidities such as; coagulopathy, loss of fertility, pituitary necrosis, anaemia, respiratory distress syndrome and shock. Patients with PPH require blood transfusion which in some instances might introduce blood-borne infections such as Human Immunodeficiency Virus or cause adverse reactions (2). Common empirically documented predisposing factors to PPH include; preterm deliveries, multiparity, first-time pregnancies, previous history of PPH, fetal macrosomia, multiple deliveries, old age, genital tract injuries and poor management of deliveries (2). Other risk factors include; induced labour, cesarean delivery and intrauterine fetal deaths (3). It has been noted that despite the known risk factors, 20% of mothers who develop PPH do not have any risk factors (3).

Postpartum haemorrhage (PPH) is associated with significant maternal morbidity, long-term disability and mortality (2). Globally, PPH accounts for 25% of all maternal deaths and is a major cause of maternal morbidity and mortality (3). A survey by the World Health Organization revealed that the Maternal Mortality Ratio (MMR) attributed to PPH was 16 per 100,000 live births in developed countries. This was compared to 240 per 100,000 live births in developing countries (3). Globally, Kenya is ranked the eleventh country with the highest MMR of 530 per 100,000 live births (3). Despite the increased global focus on the reduction of maternal mortality, Kenya's MMR seems to have no significant change.

The fifth goal of the Millennium Development goal sought to reduce maternal mortality by two-thirds by 2015. As of 2015, this goal had not been achieved especially in sub-Saharan Africa (3). According to the third SDG, the maternal mortality ratio was to be reduced to less than 70 per 100,000 live births by the year 2030 (3). As of 2019, Kenya's MMR stood at 362 per 100,000 live births (4). These deaths not only pose an economic burden to the family but to the nation as well. Postpartum haemorrhage contributes to extended

length of hospital stay (4). This burden is not only significant to the individual patients, their families, and clinicians but also to the government which is involved in health policy, research, and development.

In June 2013, Kenya, through a presidential directive abolished delivery fees in all public health facilities to promote skilled delivery service utilization and reduce pregnancy-related morbidity and mortality in the country (5). Despite all these efforts, deaths associated with PPH in Kenya have been on the rise. It is estimated that approximately 80% of maternal mortality in Kenya is attributed to pregnancy and childbirth (6). Based on anecdotal data obtained from the records office in Thika level 5 hospital (TL5H), approximately 30 PPH cases were reported in the month of March 2023 (7). There were limited studies done at Thika Level 5 Hospital on intrapartum and postpartum factors associated with postpartum haemorrhage among women seeking maternity care at Thika Level 5 Hospital in Kiambu County, Kenya. Therefore, this study focused on the assessment of intrapartum and postpartum factors associated with postpartum haemorrhage among women seeking maternity care at Thika Level 5 Hospital in Kiambu County, Kenya.

Methodology

Study design, setting, and period

An institution-based, unmatched case-control study was conducted from 1st May to 30th April 2023, at Thika level 5 hospital maternity unit in Kiambu County. Kiambu County is in the former Central Province of Kenya. Its capital is Kiambu and its largest town is Thika. It is adjacent to the northern border of Nairobi County and has a population of 1,896,490. The county is 40% rural and 60% urban attributed to Nairobi's consistent growth Northwards. There are a total of 364 health facilities spread across the county. The doctor/population ratio in the county is; nurses 89:100,000; doctors 12: 100,000 and clinical officers 27: 100,000. Thika level 5 hospital maternity unit has antenatal, labour and

postnatal wards. It has a total bed capacity of 50 beds. The staff compositions within the departments were; twenty-three (23) nurses (2 BSCNs, 1 ECN 20 KRCHNS), three (3) gynaecologists and a medical officer.

Study population

The study population comprised women of reproductive age who had delivered at Thika Level 5 hospital. Cases were mothers who gave birth at Thika level 5 hospital maternity unit, were diagnosed with PPH within 24 hours of delivery by the healthcare professionals during the study period, and were documented in the delivery logbook. On the other hand, controls were mothers who delivered at Thika level 5 hospital maternity units but were not diagnosed with PPH within 24 hours of delivery by the healthcare professionals during the study period and were registered in the delivery logbook. Mothers who were mentally unstable and very sick, those who had antepartum haemorrhage and mothers who had been referred from another health facility after the onset of PPH were excluded from participation in the study.

Sampling

The sample size was calculated using the Fleiss' sample size formula for comparing two proportions (18).

$$N_{\text{Fleiss}} = \frac{[z_{\alpha/2}\sqrt{(r+1)p(1-p)} + z_{\beta}\sqrt{rp_0(1-p_0) + p_1(1-p_1)}]^2}{r(p_0 - p_1)^2}$$

Where N represented the total sample size and Z_{α} represented recommendable deviate at a level of significance level where (when it was at 5%, $Z_{\alpha} = 1.96$). The $Z_{1-\beta}$ was the normal deviation for instance at 80% power = 0.84. P_1 and p_2 represented the proportion of events of interest (outcome) for group I and group II. B

According to Felarmine et al., the duration of labour is a risk factor for postpartum haemorrhage, with proportions of 95% among cases and 5% among controls (2). Based on a significance level of 5% and a power of 80%, the calculation was as follows:

$$N_{\text{Fleiss}} = \frac{[1.96 \times \sqrt{2 \times 0.425 \times 0.575} + 0.842 \times \sqrt{0.5 \times 0.95 + 0.95 \times 0.5}]^2}{(0.05 - 0.95)^2}$$

$$= 7 \times 3 = 21$$

Thus, the sample size was 21 cases and $21 \times 3 = 64$ controls. Simple random sampling was used to select participants for the study.

Study variables

The dependent variable was postpartum haemorrhage, while the independent variables were:

- Socio-demographic characteristics
- Intrapartum-related factors: duration of active labour, obstructed labour, malpresentation, augmentation or induction of labour, episiotomy, genital tract trauma, retained tissue, uterine atony, weight of the newborn and gestational age at delivery.
- Post-partum related factors: given oxytocin immediately after delivery, time taken for placenta to be delivered, and instructions given after placenta was removed

Data collection tools and procedure

Data was collected using a pretested semi-structured questionnaire and data extraction form. The study tool was pretested at Kiambu level 5 hospital maternity units on a 10% sample size (2 cases and 6 controls).

The semi-structured questionnaire consisted of socio-demographic, intrapartum factors (duration of active labour, obstructed labour, malpresentation, augmentation or induction of labour, episiotomy, genital tract trauma, retained tissue, uterine atony, weight of the newborn and gestational age at delivery) and post-partum (given oxytocin immediately after delivery, time taken for placenta to be delivered, and instructions given after placenta was removed). Data was collected through interviewer-administered questionnaires. A data extraction form was used to retrieve extra information from the medical files.

Data analysis

Data entry, cleaning and coding was done to enhance data quality. They were cross-checked for errors, coded and entered into Statistical Package of Social Sciences (SPSS) version 26 (SPSS Armonk, NY: IBM Corp) software for data analysis. Descriptive statistics such as frequency and percentages were used to

describe the subject's characteristics about relevant variables. Binary logistic regression was fitted to assess the association between dependent and independent variables. The crude odds ratios, together with their 95% confidence intervals, were used to identify the strength of the association.

Ethical consideration

Ethical clearance was sought from the Jomo Kenyatta University of Agriculture and Technology Bioethics and Research Committee (Ref: JKU/2/4/896B). Permission to carry out the study was sought from the National Commission for Science Technology and Innovation (Ref: NACOSTI/296343), Thika level 5 hospital management (Ref: TL5H/TREC/VOL.1/364) and in charge of Thika level 5 hospital maternity unit. Participant's autonomy and privacy were maintained and confidentiality ensured. Informed consent was obtained from the study participants. Informed consent for participants

younger than 18 years old, was also obtained from their parents/guardians.

Results

Socio-demographic characteristics

The respondents' ages ranged from less than 18 to 50 years, where the majority of study participants 63 (84%) were 18 and 35. The majority in the case group had attained either a college or university education (42.1%, $n = 8$); followed by secondary education 31.6% ($n = 6$) and primary education 26.3% ($n = 5$). Educational attainment within the control group, revealed that about 46.4% ($n=26$) of the study participants achieved secondary level education, while 28.6% ($n=16$) completed college/university education and 25% ($n=14$) had primary education. Overall, the majority (42.7%, $n=32$) of the study respondents had secondary education. The majority of the study respondents 69.3% ($n=52$) were married.

Table 1:
Socio-Demographic Characteristics of Respondents

Variables	Case Group $n = 19$	%	Control Group $n = 56$	%	P – value	OR	95% CI Lower Upper	
Age								
Below 18 years	0	0%	1	1.8%	0.988	3.57	.000	.000
18-35 years	17	89.5%	46	82.1%		Ref		
36-50 years	2	10.5%	9	16.1%	1.000	4.30	.000	0.000
Education level								
Primary	5	26.3%	14	25%	0.242	.272	.031	2.413
Secondary	6	31.6%	26	46.4%		Ref		
College/University Education	8	42.1%	16	28.6%	0.250	.088	.0321	1.732
Marital Status								
Single	4	21.1%	11	19.6%	0.894	1.201	.081	17.730
Married	13	68.4%	39	69.6%		Ref		
Divorced/separated	2	10.5%	6	10.7%	0.570	1.967	.191	20.240
Employment Status								
Employed	3	15.8%	10	17.9%	0.498	.367	.020	6.695
Self-employed	10	52.6%	24	42.9%		Ref		
Unemployed	6	31.6%	22	39.3%	0.560	1.594	.333	7.642
Number of Children								
None	0	0%	1	1.8%	1.000	2.435	.000	.000
One	4	21.1%	18	32.1%		Ref		
Two	9	47.4%	13	23.2%	1.000	2.409	.000	.000
Three	2	10.5%	17	30.4%	1.000	2.891	.000	.000
Four	3	15.8%	5	8.9%	1.000	1.441	.000	.000
Five	0	0%	2	3.6%	1.000	1.118	.000	.000
Six	1	5.3%	0	0%	0.999	1.886	.000	.000

The results on employment status indicate that the majority of the respondents (45.3%, n=34) were self-employed. Respondents had between one and six children. In the case group, the majority had at least two children (47.4%, n=9), on the other hand, (32.1%, n=18) in the control group had only one child. A binary logistic regression indicated that none of the socio-demographic characteristics was significantly associated with PPH ($p > 0.5$) (Table 1).

Intrapartum factors influencing postpartum haemorrhage

The majority of the study respondents, 84.2% (n=16) of the cases and 87.5% (n=49) of the controls reported that labour began between 38-40 weeks of gestation. Nearly half of the participants, 47.4% (n=9) of the cases and 48.2% (n=27) of the controls, experienced labour lasting between 6 to 9 hours. Among the cases, most respondents (68.4%, n=13) did not receive any medication to induce labour,

whereas the majority of the controls (57.1%, n=32) were given drugs to induce labour. A higher proportion of respondents in both the case group (47.37%, n=9) and the control group (32.14%, n=18) experienced malpresentation. Additionally, 84.21% (n=16) of the cases and 94.64% (n=53) of the controls had newborns weighing more than 3.5 kg. Binary logistic regression analysis revealed that none of the intrapartum factors was significantly associated with postpartum haemorrhage ($p > 0.5$) (Table 2).

Postpartum factors influencing postpartum haemorrhage

All the respondents in the case group (100%, n=19) reported having received an injection of oxytocin after delivery, while only 94.6% (n=53) in the control group received the injection. Most respondents, 78.9% (n=15) in the case group and 75% (n=42) in the control group reported that placenta delivery took 2 to 5 minutes.

Table 2:
Intrapartum Factors Associated with Postpartum Haemorrhage

Intrapartum Factors	Case Group n = 19	%	Control Group n = 56	%	P – value	95% CI		
						OR	Lower	Upper
Gestation week that labour began								
38-40 weeks	16	84.2%	49	87.5%		Ref		
35-37 weeks	3	15.8%	7	12.5%	0.998	1.003	0.17	6.093
Labour duration								
Less than 5 hours	1	5.3%	7	12.5%	0.802	1.367	0.12	15.790
6-9 hours	9	47.4%	27	48.2%		Ref		.
10-12 hours	7	36.8%	9	16.1%	0.358	3.272	0.26	41.063
13-15 hours	1	5.3%	4	7.1%	0.753	1.651	0.07	37.513
16-18 hours	1	5.3%	8	14.3%	0.723	0.570	0.03	12.738
More than 18 hours	0	0%	1	1.8%	1.000	0.000	0.00	.
Drugs to induce labour								
Yes	6	31.6%	32	57.1%	0.147	0.372	0.09	1.418
No	13	68.4%	24	42.9%		Ref		
Problem during labour								
Premature rupture of membrane	2	10.53%	13	23.21%	0.347	3.129	0.29	33.733
Genital tract trauma/episiotomy	2	10.53%	5	8.93%	0.536	2.127	0.19	23.261
Obstruction due to macrosomia/fibroid	2	10.53%	7	12.5%	0.117	4.233	0.70	25.664
Malpresentation	9	47.37%	18	32.14%		Ref		
Precipitate labour	2	10.53%	8	14.29%	0.954	0.922	0.06	14.734
Uterine atony due to retained tissue	2	10.53%	5	8.93%	0.609	1.895	0.16	21.895
Weight of the newborn								
< 2.5 kg	1	5.26%	2	3.57%		Ref		
2.5- 3.5 kg	2	10.53%	1	1.79%	0.98	0.94	0.03	32.91
>3.5kg	16	84.21%	53	94.64%	0.81	0.74	0.07	8.20

On instruction given after the removal of the placenta, the majority of respondents (42.1%, n=8) in the case group were instructed to massage the lower abdomen every 15 minutes. On the other hand, most of those in the control group (37.5%, n=21) acknowledged having been instructed to empty their bladders frequently and massage their lower abdomen every 15 minutes. A binary logistic regression indicated that none of the post-partum factors was significantly associated with PPH ($p = >0.5$) (Table 3).

Discussion

Intrapartum factors influencing postpartum haemorrhage

The majority of the study participants reported that their labour had started at 38-40 weeks' gestation and they had experienced labour that lasted between 6 to 9 hours. Similarly, a study done by Magann *et al.*, (2016) indicated that most pregnant mothers had their labour starting at 37 to 40 weeks and lasted for 6 to 9 hours (8). Intrapartum complications reported included premature rupture of membranes, genital tract trauma/episiotomy, precipitate labour, uterine

atony due to retained tissue and obstruction due to macrosomia/fibroids. This was in line with the results of another study that established the same intrapartum complications experienced by mothers during labour (9). More than half of the respondents had experienced labour induction by administration of oxytocin. A study established that Oxytocin alone did not prove efficient unless used in combination with other drugs (10). The study established that some of the key factors that resulted in overstretching of the uterus among mothers who visited Thika Level Five Hospital included fibroids and macrosomia. Laughlin *et al.*, (2009) ascertained that overstretching of the uterus due to factors like fibroids (noncancerous growths in the uterus) and macrosomia (a large baby) increased the risk of postpartum haemorrhage (PPH) (11).

In cases of fibroids, the growths distort the uterine cavity, affecting its ability to contract effectively after delivery. This impaired contraction may lead to excessive bleeding during the postpartum period. Similarly, macrosomia, which is often associated with gestational diabetes or other factors, causes the uterus to be overstretched.

Table 3:
Postpartum Factors Associated with Postpartum haemorrhage

Postpartum Factors	Case Group n = 19	%	Control Group n = 56	%	P – value	OR	95% CI	
							Lower	Upper
Given oxytocin immediately after delivery								
Yes	19	100%	53	94.6%		Ref		
No	0	0%	3	5.4%	0.999	0.000	0.000	
Time taken for placenta to be delivered								
2-5 Minutes	15	78.9%	42	75%		Ref		
6-10 Minutes	2	10.5%	4	7.1%	0.650	1.550	0.234	10.281
11-15 Minutes	1	5.3%	7	12.5%	0.218	0.211	0.018	2.510
15-20 Minutes	1	5.3%	1	1.8%	0.377	3.685	0.204	66.604
More than 1hour	0	0%	2	3.6%	0.999	0.000	0.000	.
Instructions given after the placenta was removed								
Empty bladder frequently	4	21.1%	21	37.5%	0.486	1.648	0.404	6.727
Massage lower abdomen after 15 minutes	8	42.1%	21	37.5%		Ref		
Checking the pad for the amount of blood loss	3	15.8%	5	8.9%	0.207	3.292	0.516	20.984
Breastfeeding to increase the involution of the uterus	4	21.1%	9	16.1%	0.153	3.821	0.606	24.078

A larger baby requires more extensive stretching of the uterus during delivery and this contributes to difficulties in uterine contraction post-delivery, potentially leading to an increased risk of PPH.

In both scenarios, careful monitoring during pregnancy and skilled medical management during labour and delivery are crucial to mitigate the risk of postpartum haemorrhage. Obstetricians may employ various interventions, such as controlled delivery techniques or medications to assist uterine contraction, to minimize the likelihood of post-partum bleeding. None of the intrapartum factors was significantly associated with postpartum haemorrhage. However, in a study done by Tort *et al.*, (2015) it was noted that precipitate labour and uterine atony due to retained tissue were significantly associated with PPH (9). Another study established that obstruction due to macrosomia/fibroids was strongly associated with PPH. Timely recognition and management of these factors during labour are essential in preventing excessive postpartum bleeding (12).

Postpartum factors influencing postpartum haemorrhage

It was reported that almost all respondents in the study had received an injection of oxytocin. This is an interesting observation since in the context of existing literature, injections administered after delivery might pertain to uterotonic medications. Uterotonics are known to reduce the risk of PPH by promoting uterine contractions and preventing excessive bleeding (13). The study's findings reported a lack of significant association between receiving an injection of oxytocin and PPH. Similarly, another study reported that oxytocin administration during the postpartum period was insignificantly associated with PPH (14). The study also found that the majority of study respondents in both groups (case and control) reported that placenta delivery took 2 to 5 minutes. As much as the time taken for placenta delivery might not have shown a significant association with PPH,

existing literature suggested that prolonged third-stage of labour (the time between the baby's birth and placental expulsion) contributed to the risk of PPH (15). The prolonged third stage of labour can be caused by uterine atony. Uterine atony is a significant intrapartum factor linked to PPH (16).

Mothers under investigation admitted to having been given various instructions upon removal of placentas. The instructions given included: emptying their bladder frequently, massaging the lower abdomen every 15 minutes, breastfeeding to increase involution of the uterus and checking the pad for the amount of blood loss. Bladder emptying and abdominal massages were often recommended to prevent uterine atony and encourage uterine contractions (17). The bivariate results showed that none of the postpartum factors investigated in this study was found to have a significant association with PPH. In this case, the lack of significant association could indicate that the specific postpartum factors provided in this study might not directly influence the occurrence of PPH. This could be due to the complex interplay of multiple variables not captured in this investigation. Existing literature acknowledged that PPH was a multifactorial condition influenced by a combination of factors, including uterine atony, placental retention, coagulation disorders, and more (15). Contrary, another study reported that prolonged third-stage of labour was significantly associated with PPH (10).

Strengths and Limitations of the study

This study employed simple random sampling procedures to reduce selection bias in the process of choosing both cases and controls from the same source group of people. Pre-testing of the questionnaire was conducted, and any necessary adjustments were made. However, this study relied on recall, which resulted in the omission of some variables and only one facility was used as the site of data collection. The present study was also limited in terms of sample size.

Conclusion

None of the intrapartum factors (gestational age at labour onset, labour duration, use of labour-inducing drugs, labour complications, or newborn weight) or postpartum factors (administration of oxytocin immediately post-delivery, time to placental delivery, or postpartum care instructions) showed a significant association with postpartum haemorrhage.

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