

# Postpartum Hemorrhage: Incidence, Causes and Maternal Outcomes at Muhimbili National Hospital, Tanzania—A Retrospective Descriptive Hospital-Based Study

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## Abstract

Worldwide obstetric hemorrhage remains the leading cause of maternal mortality, accounting for over one quarter of maternal deaths. Over half of these deaths occur in Sub-Saharan Africa with mortality rates of 500 - 1000 per 100,000 births, compared to approximately 5 - 10 in developed countries. Over decades in Sub Saharan Africa preventive measures and treatment protocols have been made to reduce maternal mortality caused by PPH. While rates of postpartum hemorrhage have continued to rise, there is a need to evaluate if its etiology and patterns have changed over time. **Broad Objective:** This study aims at describing trends in incidence, causes and maternal outcomes of Postpartum Hemorrhage at Muhimbili National Hospital for a period of 7 years. **Methodology:** This is a retrospective descriptive hospital-based study that has included all cases of postpartum hemorrhage at Muhimbili National Hospital, a tertiary hospital in Tanzania from 2014 to 2020. The data was analyzed using SPSS Version 26 and presented using frequency tables, figures and percentages. The trends of postpartum hemorrhage over time were determined using chi-square test and P-value where less than 0.05 was considered statistically significant. **Results:** Overall, the incidence of postpartum hemorrhage has been fluctuating over the years with minimum

of 1.78% and maximum of 2.87% with no statistical significance. Out of 1113 enrolled cases of PPH, 422 (37.9%) were attributed to genital tears followed by uterine atony 285 (25.6%). A statistically significant increase in linear trend was observed in the postpartum hemorrhage cases due to uterine atony, uterine rupture and sub analysis on genital tears (cervical tear). Overall, there was a statistically significant change in trend of maternal outcomes throughout the years, with a P-value < 0.001 and likelihood of complications increasing over time. **Conclusion:** The trend in the incidence of postpartum hemorrhage has been fluctuating over the years during the study period. The leading cause of postpartum hemorrhage was genital tears, followed by uterine atony with a significant increase in adverse maternal outcomes over the years. Continuous health education to medical personnel to improve timely and proper diagnosis of women in danger of PPH and timely referral, thus improve maternal morbidity and mortality.

## Keywords

Postpartum Hemorrhage, Incidence, Causes, Maternal Outcomes and Tanzania

## 1. Background

Postpartum hemorrhage (PPH) is defined as vaginal bleeding in excess of 500 mls after vaginal delivery or 1000 mls after caesarean delivery or any blood loss following child birth that is sufficient enough to cause hemodynamic instability to the patient [1]. Postpartum hemorrhage is often classified as primary, occurring within 24 hours of birth and is the most common type of PPH and secondary PPH when it occurs after 24 hours up to six weeks postpartum [2].

Worldwide hemorrhage remains the leading cause of maternal mortality, accounting for over a quarter (27%) of maternal deaths [3]. Over half of these total maternal deaths occur in Low- and Middle- Income Countries (LMICs). According to the latest WHO figures, 10.5% of all live births were complicated with postpartum hemorrhage and around 13,795,000 women suffered from postpartum hemorrhage with 13,200 maternal deaths in the year 2000 [4].

The incidence of postpartum hemorrhage is reported to have increased in recent decades; this differs according to various data sources. In 2012, WHO reported that PPH affected 2% of childbirths worldwide [5]. According to a systematic review the incidence of PPH with  $\geq 500$  mls of blood loss was 6.4% in Netherlands [6], 4.5% in Nigeria [7] and 9% in Uganda [8]. The reported incidence of PPH in Tanzania varies from Mbeya region was 11.9% [9], while that reported in Shinyanga region was 19.2% [10].

The causes are derived from mnemonic four 'T's, 1) Tone: uterine atony; 2) Trauma: lacerations of the uterus, cervix, vagina or perineum; 3) Tissue: retained products of conceptions, like placenta, membranes or clots; 4) Thrombin: pre-existing or acquired coagulopathy [11]. Uterine atony is responsible for the ma-

majority (75 %) of PPH with its increased trend [12]. Atony can be explained by failure of the myometrium to contract after delivery due to over distention of the uterus, as happens in multiple gestations, excess amniotic fluid, big baby or multiparity [13].

Uterine atony has consistently been the commonest cause of PPH in most high income countries, such as United States, Canada and LMICs, such as Pakistan, Afghanistan, Colombia and Ethiopia [14]-[20]. From Nigeria and Nepal genital tract laceration and retained placenta were reported to be the leading causes of PPH respectively and this was marked as the new trend on the causes of PPH [21] [22].

The International Postpartum Hemorrhage Collaborative Group in high income countries showed increasing transfusion rates after childbirth in the USA and Australia [16]. Studies in Australia, Wales and Canada showed that blood transfusion rates significantly increased overtime [23] [24] [25] [26]. In Canada, rates of hysterectomy for atonic PPH increased by 73% over the past nine years [16]. Respiratory failure is reported as the commonest cause of severe maternal outcome in Afghanistan, it accounts for 7% of all obstetric complications [18]. Mean while in Pakistan, maternal morbidity was (62%); the major morbidities were DIC (6%), acute renal failure (6%), shock (9.9%) and anemia (90.1%) [27]. Studies from LMICs Nigeria, South Africa, Colombia and South-Western Tanzania where blood availability is inadequate, studies showed an increase in the incidence of blood transfusion for PPH patients [28] [29] [30].

There are implementations of obstetrics emergencies aiming at reducing maternal morbidity and mortality, with protocols for PPH management. While rates of PPH have continued to change over time, more studies are needed to look if its pattern has changed over time [21]. From the current study we aim to describe the trends in incidences, causes and maternal outcomes of postpartum hemorrhage over a period of 7 years.

## 2. Methods

### 2.1. Study Design and Area

A retrospective descriptive hospital-based study was done from January 1<sup>st</sup> 2014 to December 31<sup>st</sup> 2020. The study was conducted at Muhimbili National Hospital (MNH), which is the largest National hospital in Tanzania. The hospital is located in West part of Dar es Salaam in a municipality called Upanga. Dar-es-Salaam has five district hospitals, upgraded to regional hospitals, *i.e.* Ilala, Temeke, Kinondoni, Ubungu and Kigamboni. Since 2016 there are two new upgraded hospitals that are Ubungu and Kigamboni. About 16 private hospitals and 10 health centers in Dar-es-Salaam have been recently upgraded to perform caesarean sections *e.g.* Sinza and Mnazimmoja in 2014, Chanika, Pugu and Buguruni in 2020 and more than 60 dispensaries, which are either government or privately owned.

Muhimbili National Hospital is also a teaching hospital for the Muhimbili University of Health and Allied Sciences (MUHAS). The hospital offers expert obstetrics services for Dar es Salaam serving a suburban population of about 6

million people. The MNH maternity unit receives women referred from district and regional hospitals in the city as well as self-referrals from home and other facilities all over the country. The Intensive care units (ICU) from some of referring facilities are not well equipped with few qualified staff, unavailability of blood bank, hence leading to an increased number of referrals to MNH. In the past 7 years, the department of Obstetrics and Gynecology at MNH has made improvements in number of specialists, infrastructure and equipment such as increase number of wards, ICU equipment and operating theatres.

## 2.2. Study Population

All women who were documented in the file they had postpartum hemorrhage quantified by  $\geq 500$  ml of per vaginal blood loss after spontaneous vaginal delivery or  $\geq 1000$  mls of per vaginal blood loss after cesarean section during the study period. All women labeled Postpartum hemorrhage measures using number of maternity pads changed or clinical presentation of anemia during 24 hours of delivery.

## 2.3. Study Settings

Information of all deliveries was obtained from medical records of the hospital and patients who had postpartum hemorrhage were identified. All women who suffered postpartum hemorrhage and documented were recruited in the study. Hence, the process of recruiting PPH case files with an entry point from an electronic database at medical records followed by cross checking from theatre record books and respective obstetric wards. Registration numbers for all identified PPH cases were recorded. The final list with numbers of deliveries for the entire study period was taken to medical records department to retrieve the files for filling questioners.

A structured questioner was used to collect information such as year of occurrence of PPH, socio-demographic information, obstetric characteristics (maternal age, parity, referral status, mode of delivery, number of fetuses), causes and maternal outcomes (long hospital stay in days) and severe maternal outcomes (maternal near miss and maternal death).

Identification numbers were used instead of names in all questionnaires and they were kept in a locked cabinet and data template was stored in a computer for data storage with a password.

## 2.4. Statistical Methods

The collected data was checked for completeness and consistency. Thereafter was entered, cleaned and analyzed using Statistical Package for Social Science (SPSS) Version 26 (IBM Corp. Released 2019. IBM SPSS Statistics for Windows, Version 26.0. Armonk, NY: IBM Corp). Categorical variables were summarized using frequency and percentage then presented using tables and figures. Numerical variables such as age were summarized as median (IQR) since they were not normally distributed.

The incidence of PPH was calculated by dividing the number of all recorded PPH cases to the total number of all recorded deliveries at MNH in the respective year. The trend of incidences of PPH over time were determined using chi-square test, a P-value of less than 0.05 was considered statistically significant.

The four causes of postpartum hemorrhage (PPH) were assessed for their trend in occurrence over the years, and sub-analysis done on genital tears. However, other documented causes were also analyzed including uterine rupture, abruptio placenta, infections and surgical complications (encountered intraoperative complication with significant blood loss for PPH). Postpartum hemorrhage cases with undocumented or unknown causes were also included. The trend of maternal outcomes of interest was assessed for their occurrence over the years, using chi-square for trend and p value less than 0.05 being statistically significant.

## 2.5. Ethical Approval

Ethical clearance was obtained from Muhimbili University of Health and Allied sciences Senate Research and Publication Committee Ref. No.DA.282/298/06/C/767 as well as permission to conduct the study was obtained from Teaching, Research and Consultancy Unit under the Executive Director of MNH and Head of the department of Obstetrics and Gynaecology at MNH. Permission was also obtained from the nurse-in-charge of the wards and medical records department. To maintain anonymity and confidentiality, solely the research team used patient's identification numbers.

## 3. Results

### 3.1. Sociodemographic Data

There were a total of 52,030 deliveries recorded at MNH from 1<sup>st</sup> January 2014 to 31<sup>st</sup> December 2020. A total of 1394 cases were recorded as postpartum hemorrhage (PPH), 281 files were excluded due to missing information such as undocumented diagnosis of PPH, missing files and the five pretesting files. A total of 1113 cases with diagnosis of PPH were included in the analysis. The median age was 29 years (range = 15, 47) and majorities were aged between 20 and 34 years. The median parity was 2 (range = 1, 10) and majority 519 (46.6%) had parity of equal or more than three. Caesarean section deliveries (CS) account for (64.3%) of all deliveries (**Table 1**).

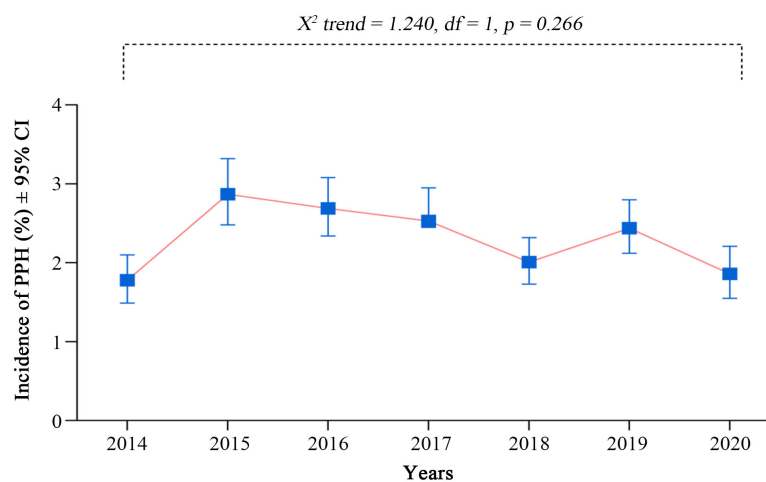
### 3.2. Trend of PPH

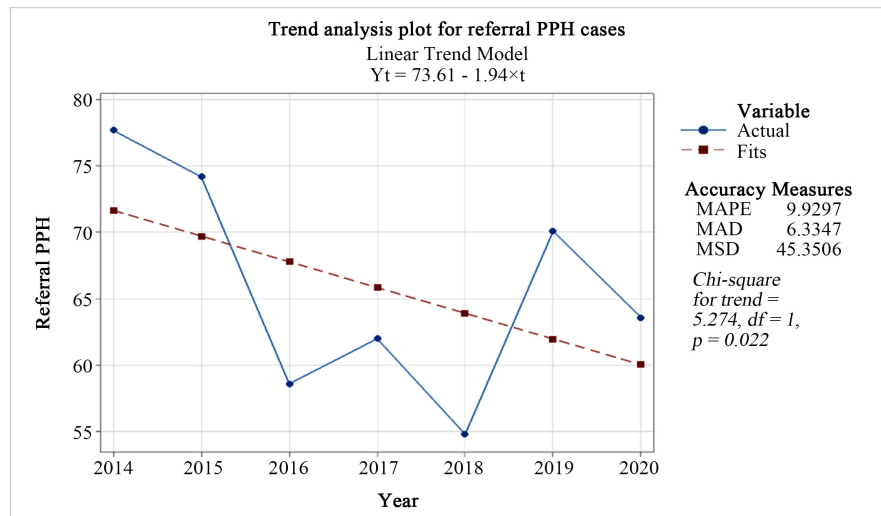
The incidences of postpartum hemorrhage occurred during the study period has been fluctuating over the years. There was no statistically significant difference in the trend of postpartum hemorrhage over these years, the highest being 2.87% in 2015 and the lowest being 1.78% in 2014 (**Figure 1**). The results showed referral cases were decreasing by 1.94% over the years from 2014 to 2020 (**Figure 2**).

**Table 1.** Socio-demographic and obstetric characteristics of the study participants (N = 1113).

Variable	Frequency (n)	Percent (%)
Age group (years)		
<20	92	8.3
20 - 34	778	69.9
≥35	243	21.8
Median age (years) (range)	29 (15, 47)	
Parity		
1	339	30.5
2 - 4	656	58.9
≥5	118	10.6
Median parity (range)	2 (1, 10)	
Mode of delivery		
Caesarian section	767	68.9
Vaginal delivery	346	31.1
Number of delivered babies		
Single	1008	90.6
Twins	97	8.7
Triplets	8	0.7
Birth Weight (Kg)		
<2.5	323	26.8
2.5 - 3.9	774	64.2
≥4.0	109	9.0
Median birth weight (IQR)	3.0 (2.4, 3.5)	

\*The total birth weight numbers include multiple deliveries.

**Figure 1.** Trend in Cumulative incidence of PPH occurred at MNH from January 2014 to December 2020.



**Figure 2.** Trend analysis in proportion of PPH cases referred from other health facilities.

### 3.3. Causes of PPH

Out of 1113 enrolled cases of PPH, 37.9% (422/1113) was attributed to genital tears followed by uterine atony 25.6% (285/1113). A statistically significant linear trend was observed in the postpartum hemorrhage cases due to uterine atony, uterine rupture and PPH cases without identified or unknown or documented cause (Table 2). However, sub-analysis on genital tears was done and there was a statistically significant increase in the incidence of cervical tears over the years (Table 3).

### 3.4. Maternal Outcome Following PPH

From 2014 to 2020 there is a statistically significant change in trend of maternal outcomes throughout the years, with a P-value < 0.001 and likelihood complications are increasing over time. Blood transfusion is the leading outcome over the years, (from 81.0% to 95.4%) followed by hysterectomy (from 5.8% to 24.7%) (Table 4).

## 4. Discussion

This 7 year retrospective study showed that, among all the postpartum hemorrhage (PPH) cases that have been included in this study, 34.4% of the cases were delivered and developed PPH at Muhimbili National Hospital while 65.6% developed PPH elsewhere and were referred to MNH for further management. The incidence of PPH has been fluctuating over the years with minimum of 1.78% and maximum of 2.87%. Genital tears are the leading cause of PPH (with cervical tears showing a statistic linear increase on its trend) followed by uterine atony. There is a statistically significant change in the trend of maternal outcomes in these years and blood transfusions being the leading complication over time.

Globally the incidence of postpartum hemorrhage (PPH) ranges from 2% - 11%, with variation among countries [31]. In this study, the incidence of PPH

**Table 2.** Causes of PPH occurred in the study population from 2014 to 2020.

Cause of PPH	Years of PPH occurrence n (%)							P-value <sup>§</sup>
	2014	2015	2016	2017	2018	2019	2020	
Uterine atony	21 (17.4)	30 (16.9)	49 (25.7)	34 (23.9)	49 (29.2)	64 (33.0)	38 (32.2)	<0.001
Genital tear	51 (42.1)	61 (34.3)	63 (33.0)	45 (31.7)	70 (41.7)	81 (41.8)	51 (43.2)	0.126
Uterine rupture	2 (1.7)	4 (2.2)	10 (5.2)	3 (2.1)	12 (7.1)	7 (3.6)	8 (6.8)	<b>0.039</b>
RPOC	24 (19.8)	27 (15.2)	36 (18.8)	32 (22.5)	22 (13.1)	33 (17.0)	16 (13.6)	0.275
Coagulopathy	2 (1.7)	1 (0.6)	3 (1.6)	1 (0.7)	2 (1.2)	5 (2.6)	3 (2.5)	0.197
Infections	4 (3.3)	8 (4.5)	10 (5.2)	9 (6.3)	8 (4.8)	6 (3.1)	3 (2.5)	0.484
S Complications	7 (5.8)	7 (3.9)	16 (8.4)	6 (4.2)	7 (4.2)	9 (4.6)	10 (8.5)	0.783
Abruptio Placenta	9 (7.4)	9 (5.1)	9 (4.7)	10 (7.0)	10 (6.0)	11 (5.7)	9 (7.6)	0.740
Not indicated/unknown	20 (16.5)	41 (23.0)	23 (12.0)	23 (16.2)	21 (12.5)	16 (8.2)	9 (7.6)	<0.001

Key: RPOC: Retained Products of Conception; S Complication: surgical complication, such as extension of surgical incisions, massive adhesions lead to severe bleeding; <sup>§</sup> P-value: Was derived/calculated from Chi-square test for trend (or Cochran-Armitage test).

**Table 3.** Distribution of PPH cases by type of genital tear in the study population.

	Years of PPH occurrence n (%)							P-value <sup>§</sup>
	2014	2015	2016	2017	2018	2019	2020	
Cervical tear*	29 (56.9)	42 (68.9)	47 (74.6)	30 (66.7)	53 (75.7)	55 (67.9)	42 (82.4)	<b>0.039</b>
Vaginal tear*	6 (11.8)	8 (13.1)	10 (15.9)	8 (17.8)	13 (18.6)	20 (24.7)	6 (11.8)	0.204
Perineal tear*	21 (41.2)	23 (37.7)	15 (23.8)	15 (33.3)	29 (41.4)	27 (33.3)	14 (27.5)	0.429

Key: <sup>§</sup> P-value: Was derived/calculated from Chi-square test for trend (or Cochran-Armitage test); \*Variables were analyzed as sub-type of Genital tear.

**Table 4.** Trend in Maternal outcomes of postpartum hemorrhage (PPH) from 2014 to 2020.

Variable	Years of occurrence of severe outcome							P-value
	2014 n (%)	2015 n (%)	2016 n (%)	2017 n (%)	2018 N (%)	2019 n (%)	2020 n (%)	
Hospital stay ≥ 7	33 (27.3)	59 (33.1)	66 (34.6)	44 (31.0)	57 (33.9)	74 (38.1)	40 (33.9)	0.160
<b>SMO</b>								
Shock	2 (1.7)	3 (1.7)	3 (1.6)	8 (5.6)	8 (4.8)	28 (14.4)	9 (7.6)	<0.001
ARDS	0 (0.0)	0 (0.0)	0 (0.0)	2 (1.4)	2 (1.2)	6 (3.1)	3 (2.5)	<b>0.001</b>
ICU admission	1 (0.8)	2 (1.1)	4 (2.1)	9 (6.3)	27 (16.1)	32 (16.5)	21 (17.8)	<0.001
Cardiac arrest	0 (0.0)	3 (1.7)	2 (1.0)	3 (2.1)	3 (1.8)	8 (4.1)	5 (4.2)	<b>0.005</b>
ARF	0 (0.0)	3 (1.7)	3 (1.6)	5 (3.5)	10 (6.0)	17 (8.8)	13 (11.0)	<0.001
Severe anemia	1 (0.8)	3 (1.7)	6 (3.1)	7 (4.9)	9 (5.4)	33 (17.0)	22 (18.6)	<0.001
DIC	1 (0.8)	2 (1.1)	1 (0.5)	7 (4.9)	8 (4.8)	20 (10.3)	7 (5.9)	<0.001
Hysterectomy	7 (5.8)	17 (9.6)	35 (18.3)	25 (17.6)	40 (23.8)	48 (24.7)	26 (22.0)	<0.001
Maternal death	0 (0.0)	4 (2.2)	5 (2.6)	8 (5.6)	4 (2.4)	14 (7.2)	7 (5.9)	<b>0.001</b>
Re-laparotomy	3 (2.5)	3 (1.7)	6 (3.1)	6 (4.2)	11 (6.5)	10 (5.2)	3 (2.5)	0.115
BT	98 (81.0)	144 (80.9)	170 (89.0)	117 (82.4)	153 (91.1)	185 (95.4)	109 (92.4)	<0.001
BT ≥ 10 unit	1 (0.8)	2 (1.1)	5 (2.6)	5 (3.5)	10 (6.0)	23 (11.9)	13 (11.0)	<0.001



has been fluctuating over the years with a minimum of 1.78% and a maximum of 2.87. This fluctuation has been affected by the rise and fall of number of deliveries and referrals over these years. Nevertheless, in this study from 2016 to 2020 there was a variation and a gradual decrease in incidence of PPH which might be influenced by improvements made at the referring facilities [32] evidenced by a decrease in linear trend of referral cases overtime. This trend differs from that in The United States of America (USA), where PPH increased from 2.3% to 2.9% over a period of 13 years [14]. However, this is also seen in other high income countries such Australia, Japan, Netherlands and Saudi Arabia where there was an overall significant increase in the trends of PPH over the years [24] [33] [34]. Nevertheless, from 2016 to 2020 there was a variation and a gradual decrease in the incidence of PPH, which might be influenced with the decrease in the trend of referral cases and variations in number of deliveries, which is the result of the regional hospitals being equipped and availability of specialists. Thus reducing number of PPH and its morbidity and mortality needs skilled and equipped personnel.

According to WHO report, the commonest cause of postpartum hemorrhage is uterine atony, followed by genital tears [35]. Uterine atony has consistently been the commonest cause of PPH in most high income countries (such as United States, Canada) and LMICs (such as Pakistan, Afghanistan and Colombia and Ethiopia) [14]-[20]. However, this has been contrary to our study, whereby we found genital tears to be the leading cause of PPH over the study period. This is could be explained by improvement in active management of the third stage of labour (AMSTL) among deliveries and early identification of high-risk pregnancy during antenatal care at the referring facilities. Among the types of genital tears, cervical tear was observed to exhibit statistically significant linear trend on its occurrence over years. These findings are similar from that reported in Nigeria and Nepal, where genital tract laceration was reported to be the leading cause of PPH. High number of primipara women who are uncooperative during process of labour and hence lack of perinea support thus could explain the high incidences of genital tears, thus marked as the new trend of the causes of PPH [21] [22]. From the observed trends more counseling on process of labour and delivery at antenatal clinic should be emphasized especially to primipara women to increase cooperation during deliveries.

The most common maternal complications in this study were blood transfusion as well as massive transfusion has been increasing significantly over the years. This increase in trend is comparable to that in Australia [24], as well as in USA [15]. Furthermore, studies in Australia, Wales and Canada showed that blood transfusion rates significantly increased overtime [23] [24] [25] [26]. This could be explained by timely diagnosis of PPH and availability of blood product for timely management. In LMICs (Nigeria, South Africa, Colombia) where blood availability is inadequate, studies also show an increase in the incidence of blood transfusion for PPH patients [27] [28] [29]. In South-Western Tanzania the rate of blood transfusion among PPH patients was reported to be increasing [9]. De-

spite the fact that the incidence of PPH in this study has been fluctuating with time, the trend of severe anemia was significantly increasing, so this can explain why blood transfusion has increased in our study. PPH goes hand in hand with need of blood products thus availability should be timely ensured.

The rate of hysterectomy is shown to rise in this study with statistically significant increase in trend overtime, this might be explained with linear increase in atonic PPH. Overall; hysterectomy has contributed to 17.9% of the complications. A comparable study in the US shows an increasing rate of hysterectomy, almost half of the cases being caused by uterine atony [36]. However, another study in Canada shows the rate of hysterectomy for atonic PPH increased over the years of the study period [16]. Another explanation for this increase rate of hysterectomy in this study might be due to significant linear increase in uterine rupture. This finding relates to that in Nepal, where hysterectomy trend was increasing over the years with majority of cases arising from uterine rupture leading to PPH [37]. With an increase number of cesarean sections unpublished data from Tanzania by Zahra *et al.*, showed that in the ten-year period there was a rise in rate of peripartum hysterectomy from 2008 to 2017 [38]. This explains late presentation of women from the low settings thus ends up with major complications, which need major surgery.

Other severe maternal outcomes in this study including respiratory failure, shock, acute renal failure and disseminated intravascular coagulopathy (DIC) showed statistically significant increase over the years. This explains why there is also an increase of intensive care unit (ICU) admissions over the years. As seen in Australia where there was a significant ICU admission [39], while in India about two-third of the cases of PPH ends up in ICU and this was explained by most of the cases that were referred from other health facilities complicated into DIC and other complications [40]. A similar study that was done in the US showed the rates of complications that increased significantly during the study period included renal failure [41].

In this study, overall maternal death accounts for about 3.8%, which is not far from the rate reported by 3.1% maternal deaths from WHO multi country survey [42]. This study shows a statistically significant increase in maternal deaths over the years. This can be explained by the fact that, most of the severe maternal outcomes have also been increasing. Report from US study where overall maternal death was reported to be 6.5% with decrease in trend as this could be explained by early risk identification, timely diagnosis and management, and availability of ICU for maternal care [43].

## 5. Limitations of the Study

The present study was done in a retrospective manner; there was some missing information due to poor documentation thus difficult to retrieve important cases. Moreover, some files were not accessible due to lack of storage capacity of files in maternity medical record department. There was selection bias as this

study was supposed to involve all lower centers surrounding Muhimbili National hospital for good representation of the data.

Since the study was hospital based, generalization of these results may be limited especially to lower level facilities. However, these results may be useful in making innovations for combating maternal mortality due to postpartum hemorrhage. Despite the limitations encountered in this study, it has been a real eye opener on the overview of postpartum hemorrhage on the trend, causes and outcome from these women.

## **6. Conclusion**

The trend in incidence has been fluctuating over the years during the study period; the leading cause of postpartum hemorrhage was genital tears with significant increase in adverse maternal outcome over the years. Continuous health education should be provided to medical personnel to improve timely and proper diagnosis of women in danger of PPH, thus reducing maternal morbidity and mortality.

## **Consent for Publication**

Not applicable.

## **Authors' Contributions**

This study arose from an origin idea from RNM, who is the principle investigator upon her stay in labor ward at Muhimbili National Hospital. All authors contributed to the discussion, conclusion and review of this work. However, DJ and PPM advised on the analysis and statistic part. All authors contributed to this study design, and drafting and manuscript preparation.

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## **Conflicts of Interest**

The authors declare no conflicts of interest regarding the publication of this paper.

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## Abbreviations

AMTSL	Active Management of the Third Stage of Labor
ANC	Antenatal Clinic
APH	Antepartum Hemorrhage
CS	Cesarean Section
DIC	Disseminated Intravascular Coagulopathy
GA	Gestational Age
ICU	Intensive Care Unit
KCMC	Kilimanjaro Christian Medical Centre
MMR	Maternal Mortality Ratio
MNH	Muhimbili National Hospital
MUHAS	Muhimbili University of Health and Allied Sciences
PPH	Postpartum Hemorrhage
SMO	Severe Maternal Outcome
SPSS	Statistical Package for the Social Sciences
SVD	Spontaneous Vertex Delivery
WHO	World Health Organization