

# The Prevalence and Risk Factors of Post-Partum Haemorrhage in Africa: A systematic review.

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## Research article

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## **Abstract**

**Background** Postpartum Haemorrhage is the loss of blood that is 500 ml or greater than 500ml following a vaginal delivery or blood loss that is more than or equivalent to 1000 ml post-caesarean section. Post-partum Haemorrhage is the leading cause of maternal mortality, and to our knowledge, there is less evidence of a systematic review being published on the prevalence and associated risk factors of PPH in Africa. Additionally, findings from previous studies about the prevalence and risk factors of PPH in Africa are controversial. Therefore, we aimed to assess the prevalence and risk factors of PPH in Africa, so as to provide scientific evidence base findings that might be used to ensure maternal safety.

**Methods:** We conducted a systematic review of the prevalence and risk factors of Postpartum haemorrhage in Africa. Four electronic databases were searched for published observational and cross-sectional studies that reported on the prevalence and risk factors of PPH in Africa. Simple manual arithmetic calculation and descriptive critical reasoning were used to analyse pooled data on PPH prevalence and its associated risk factors in Africa.

**Results:** A total of 2005 publications were retrieved from our search, out of which 162 articles were selected for full-text review. A total of 12 studies met the inclusion criteria for this systematic review. All the included studies reported relatively different prevalence rates of PPH in Africa, ranging from 1.13% in Nigeria to 23.63% in Cameroon. This Review found the overall prevalence rate of PPH in Africa to be 3.51%. Nearly all the studies provided similar associated risk factors of PPH in Africa, but these risk factors vary relatively in the magnitude of association from one country to another. Notwithstanding, this review found: spontaneous vaginal delivery, older maternal age, and multiparty to be associated with increased risk of PPH in Africa.

**Conclusion:** We found that the PPH prevalence rate is lower than 4% in Africa and that its risk factors vary relatively in the strength of association from one geographical region to another. We suggest that future research focus on PPH prevention and control to ensure maternal and child safety.

## **Background**

Postpartum Haemorrhage (PPH) is defined as the loss of blood that is 500 ml or greater than 500ml following a vaginal delivery or blood loss that is more than or equivalent to 1000 ml post-caesarean section[1]. PPH is the principal cause of maternal death worldwide [2]. The prevalence of PPH is estimated to be 6 % globally and the highest-burden is experienced by women in low-income countries [3]. Approximately one out of every one thousand females that goes through labour and delivery experience PPH in low-income countries[4]. Maternal mortality remains a paramount global health problem, mainly in sub-Saharan Africa (SSA) where more than 50 % of maternal deaths occurred [5]. Worldwide, more women of reproductive age die annually from complications associated with pregnancy and childbirth. Annually, PPH contributes to 115,000 maternal deaths [6], and 99% of this mortality transpires in low-

resource settings. More than half of these deaths occur within the first 24 hours following childbirth and are associated with profuse bleeding[7]. PPH has become a very important topic of Public concern as it relates to maternal and child safety.

Many studies have assessed the prevalence of PPH, but the results are relatively different across studies and regions. In an organized review of studies which was augmented by low in-depth search on the Epidemiology of postpartum haemorrhage, the prevalence of PPH for blood loss that is  $\geq 500$  ml was 10.45% in Africa, 6.37% in North America, 6.38% in Europe and 2.55% in Asia[8]. We conducted a systematic review of published observational studies and a few cross-sectional studies about the prevalence of PPH in Africa, and our search reported marked differences in the pooled prevalence rates of PPH among the included studies. The pooled prevalence rate of PPH among the included studies ranged from 1.13% in Nnewi state, Nigeria [9] to 23.63% in Cameroon [7]. It is essential to understand whether variation in the prevalence of PPH is due to true variation as a result of the incomprehensiveness of the research method or the unrepresentativeness of the sample size.

The risk factors of PPH also varies relatively between studies, from one region to another. A recent study, Fukami T. 2019 found that the risk factors of PPH include: the use of assisted reproductive treatment (ART), Pregnancy Induced Hypertension, severe vaginal/perineal lacerations and macrosomia[10], while another study by Oyelese and Ananth conducted in America, reported spontaneous delivery, caesarean section, forceps delivery, labour induction, non-use of oxytocin or other uterotonic agents in the third stage of labour, history of PPH, multiple pregnancies and fetal macrosomia as risk factors of PPH[11]. Early identification of risk factors associated with PPH in Africa is vital for the prevention and management of PPH, thus ensuring maternal and child safety.

Based on the variations in PPH prevalence and the relative difference of risk factors reported by many past studies and reviews, we carry out a comprehensive systematic review to objectively assess the prevalence and identify major risk factors of PPH in Africa, so as to provide scientific evidence base results to improve maternal and child safety.

## Methods

We conducted a systematic review of published observational studies (inclusive of cohort and case-control studies) and cross-sectional studies to assess PPH prevalence and risk factors among females age 14–49 years in Africa. We selected data using prespecified criteria and recorded dataset characteristics and methodological features for each of the included studies. We analysed the risk factors of PPH by ranking dataset in each of the included studies and manually derived the prevalence of PPH in Africa by using simple Arithmetic calculation. We examined datasets reporting prevalence rates of PPH from the included studies and realized there was high heterogeneity among the studies due to huge differences in sample size and other methodological features. Analyses were based on descriptive logical reasoning and simple arithmetic calculation. This review adheres to the Preferred Reporting Items for Systematic reviews and Meta-Analyses) statement-scoping reviews (PRISMA).

## **2.1 Search Strategy**

Potentially relevant articles were identified through advance computerized search of electronic databases (PubMed, Web of Knowledge, Cochrane Library and Google scholar) for studies published from January 1950 up to July 2019. The references cited by the retrieved articles were also reviewed to identify potentially eligible papers that may not have been captured by the electronic search strategy. The keywords used in searching were: ‘prevalence, risk factors, aetiology, postpartum haemorrhage, and Africa’ (see Table 1. For the search term and strategy per database).

## **2.2 Inclusion and Exclusion Criteria**

Two authors (PLB and XP) systematically screened titles and abstracts to identified articles relevant for inclusion. Studies published from 1950 up to 2019 where risk factors or Prevalence of PPH was presented, or where the prevalence could be calculated for from available data, were considered eligible for inclusion. Published Cross-sectional studies and observational studies (inclusive of cohort and case-control), reporting on prevalence or risk factors of PPH were included. Intervention studies, Case reports, reviews, animal study and abstract of studies not written in English were excluded. Studies reported as abstracts were not included if there was insufficient information to allow assessment of the risk of bias.

## **2.3 Quality assessment of included studies**

Articles included in this review were assessed for risk of bias. The Newcastle Ottawa Quality Assessment Scale (NOS) [12] was considered and a grade of one to nine stars (1–9) was used to assess the methodological quality of the included studies (See Table 2). Eight to nine stars were deemed as strong, six to seven stars were deemed as moderate and five or less than five stars were deemed as having weak methodological quality. Studies found to have weak methodological quality were excluded from the data extraction process.

## **2.4 Data extraction**

Data extraction was performed by two authors independently (PLB and XP), and the results were compared, minimizing the likelihood that errors would go unnoticed. In case of disagreement, a third author was consulted and the issue was discussed and resolved by general consensus. A data extraction form was used to extract relevant information from each study. Information extracted were country of study, study design, sample-sized, number of cases, number of control, year of study, method of data collection, pooled prevalence estimates, and risk factors of PPH.

## **Results**

### **3.1 Search results and pooled data analysis findings**

A total of 2005 publications were retrieved from our search, out of which 162 articles were selected for full-text review. On the title and abstract screening, 1,843 studies were excluded on counts that those were all none full-text articles, some written in different languages other than English and some with limited information on the outcome of interest. From the 162 articles which were subjected to full-text review, a total of 12 studies met the inclusion criteria for this systematic review.

Following critical descriptive pooled risk analysis and logical reasoning base on a simple arithmetic calculation of pooled prevalence rates, this review reports that the prevalence rate of PPH in Africa is 3.51% and that Spontaneous vaginal delivery, older maternal age, and multiparity are associated with an increased risk of PPH occurrence in Africa. Other potential risk factors of PPH include caesarean section, multiple pregnancies, PIH/Preeclampsia, forceps delivery, macrosomia, and grand multiparity.

### **3.2 Characteristics of included studies**

The characteristics of the included studies are illustrated in Table 3. Seven of the included studies have prevalence and incidence of PPH as their primary focus. The remaining studies focused on risk factors, causes, and management of PPH. The majority of the studies took place between 2001 and 2016, with one study being conducted from 1995-1999. Four studies collected data over 5 to 9 months, six studies within 1-5years and two studies collected data within a 9-10years period (See Table 3).

### **3.3 Results of Methodological Quality Assessment**

All included studies were judged as having strong or moderate methodological quality (See Table 2 & 3). The two studies judged as having moderate methodological quality were deemed so according to the standard grading criterion of the New Castle Ottawa Quality Assessment Scale.

### **3.4 Results of data extraction**

Data from each of the twelve included studies that were conducted in nine countries were extracted, reviewed and descriptively analysed. Seven studies were conducted in West Africa, (five in Nigeria, one in Senegal and Mali and One in Ghana), two in East Africa (Uganda and Zimbabwe), two in Central Africa (Chad and Cameroon) and one in North Africa (Egypt). Three studies (Olowokere et al. 2013, Green K.I. et al. 2015 & Halle-Ekane et al.2015) reported on the prevalence, risk factors, and management of Primary PPH. Valdes et al. 2018 [13] was the only study that reported on the prevalence of self-reported postpartum haemorrhage and examines the demographic, biological, and social risk factors for PPH, while Ifeadike et al. [9]reported on the changing trends in prevalence and causes of maternal death associated with postpartum haemorrhage. Adegbola O. et al. 2007 [14] reported the frequency, risk

factors, mode of management and maternal-fetal outcomes of Primary PPH. Three studies reported on incidence, risk factors, causes, management and outcomes of PPH. Two of the included studies reported on risk factors and predictive management of PPH. Tort et al. 2015 [5], is the only included study that reported on the assessment of contributing factors of maternal death during PPH. Data on subgroups of women's age, parity, educational status, occupation, and mode of delivery was presented in ten of the included studies. Detailed characteristics of included studies are presented in Table 3.

### 3.5 PPH Definition

There were some similarities and differences in how PPH was defined in each of the included studies. These definitions were reviewed and validated base on the definition given by WHO [15]and RCOG [16]. One study reporting on the Emerging trend in the aetiology of PPH in a low resource setting, defined PPH as a condition that arise from failure of the uterus to contract after delivery, leading to blood loss of  $\geq 500\text{mls}$  in vaginal delivery or  $\geq 1000\text{mls}$  in caesarean section or a substantial drop in maternal haematocrit compared with antepartum level that occur whether within the first 24 hours after delivery or between 24 hours to 6 weeks postpartum[9]. Most studies defined PPH in a similar fashion, as blood loss from the genital tract of 500mls or more following vaginal delivery and 1000mls or more blood loss following caesarean section delivery within the first 24 hours or between 24 hours to 42 days postpartum. Two of the included studies provided no clear definition for PPH but stated that the primary cause of maternal death in Sub-Saharan-Africa is PPH.

### Flowchart

This flow chart gives a graphical representation of how this systematic review search process started, highlighting databases that were accessible during the search process. It's explained that 2005 articles in total were retrieved from our search on PPH prevalence and risk factors in Africa involving the four mentioned electronic databases. From this flow chart, it is clear that 162 articles were subject to full-text review after excluding other articles base on the title and abstract screening. Base on the inclusion and exclusion standard set for this systematic review, 12 articles out of 162 papers met the requirements and were considered eligible for this review.

[Figure 1]

**[Due to technical limitations, the tables could not be displayed here.  
Please see the supplementary files section to access the tables.]**

#### **Description of table 4.**

From the twelve included studies, data were obtained from eleven studies on the risk factors of PPH in Africa. Each associated risk factor of PPH was pooled only if, it appeals in four or more than four of the included studies. These risk factors were extracted and critically analyzed.

#### **Description of Table 5:**

The pooled risk factors were ranked numerically in each study, based on sample size and the rank results for each of those risk factors were added and the average was calculated for each risk factor. This numerical ranking of risk factors was done to identify which risk factor has a mild, moderate or severe association on the occurrence of PPH in Africa.

This study found that the type of delivery (particularly Spontaneous vaginal delivery with a rank of 1.3), older maternal age (20-34years with rank 1.7), and multi-parity (rank 3) are associated with increased risk of PPH in Africa. All other associated risk factors of PPH have mild to moderate association with PPH occurrence in Africa. The larger the sample size of a risk factor, the smaller the rank, which indicates that the smaller the rank, the greater the association that risk factor has on the occurrence of PPH.

#### **Description of Table 6.**

The prevalence of PPH was calculated for ten of the included studies (as in table 6), based on the availability of data. Two studies (Lamina et al. 2015 & Adegbola O. et al 2007) were omitted from this section of Prevalence analysis because they are case-control studies. Eight of the ten included studies had prevalence rates that were relatively lower than 5%, ranging from 1.13%-4.81%. Two of the included studies reported high prevalence rates of 9% and 23.63%. Dividing the total number of cases by the total number of sample size the researchers obtained a PPH prevalence rate of 3.51%.

## **Discussion**

For nearly seven decades, several studies have addressed the issue of PPH prevalence and risk factors in Africa, but their results are conflicting and incomprehensive. There have been no comprehensive data regarding the prevalence and risk factors of PPH in Africa for the past few decades. In this review, we used descriptive analysis to synthesize the pooled prevalence and associated risk factors of PPH in Africa, with the aim to assess the prevalence and associated risk factors of PPH. To our knowledge, this systematic review is the first systematic review to provide comprehensive information about PPH prevalence and its associated risk factors among females age 14–49 years in Africa.

The prevalence of PPH in Africa has not been so clear over the past few decades. PPH prevalence in Africa varies relatively from one country or region to another among studies over the past few decades. One study conducted in Nigeria, (Ifeadike et al. 2018) provided the prevalence of 1.13% for PPH, while another study conducted in Cameroon, (Halle-Ekane et al. 2015) provided the prevalence of 23.63% for PPH. In the systematic review Carroli G. 2008, the PPH prevalence rate for Africa was estimated to be 10.45% while in another systematic review and meta-analysis, Calvert C. 2012 [17], PPH prevalence was reported to be 5.1 % (for blood loss that is greater than or equal to 1000ml) and 25.7% (for blood loss that is greater than or equal to 500ml) respectively. This huge variation in PPH prevalence between studies might have been strong due to the unrepresentativeness of the sample size used and the incomprehensiveness of the method used for data collection and analysis. Our systematic review of twelve studies showed that Africa has a PPH prevalence of 3.51%. This result is said to be much lower when compared with the findings from other past reviews [8, 17]. Our decrease estimates of PPH prevalence in Africa may have been influenced by the characteristics of the study population or due to improvement in the prevention and management strategies such as routine capacity-based training for health care providers, establishment of antenatal clinics for the widespread administration of oxytocin or misoprostol as prophylaxis thus increasing uterotonic coverage for hospital and home delivery and the used of uterotronics such as prostaglandin and ergometrine to manage PPH[18, 19]. Additionally, the practice of the active management of the third stage of labor (AMTSL) has been suggested for the regular management of spontaneous vaginal deliveries because it greatly lowers the risk of PPH.[20]

Associated risk factors of PPH, varies relatively from one geographical region to another, and this variation might largely be related to factors such as age, race, and social status. Our findings show that spontaneous vagina delivery, older maternal age, and multi-parity are associated with increased risk for PPH occurrence. However, other risk factors such as multiple pregnancies, PIH/Preeclampsia, and macrosomia are also considered to have a moderate association with the occurrence of PPH. We found that spontaneous vaginal delivery with a rank of 1.3 among other risk factors, is highly associated with PPH occurrence in Africa than any other risk factor. This is because most deliveries in Africa are spontaneous as justified by data from the included studies and are often attended to by middle health care workers with inexperience assistance in most African countries.

Multiparity has not been recorded in many studies as a vital risk factor or being used as an essential clinical marker for PPH by clinicians over the past years. Interestingly, in the study Sosa C. G. 2009 [21], multiparity was considered one of the protective factors against the occurrence of moderate PPH, which

is contrary to the finding of this review. After a critical descriptive pooled risk analysis of PPH in this present review, multiparity had a rank of 1.3 and as such was considered to be associated with increased risk of PPH. This is evidenced by the science that due to multiparity, the uterus loses its muscle tone and ability to adequately contract post-delivery, described as uterine atony, which is a root cause of PPH.

The issue of maternal age being a risk factor has been controversial in reports over the past few decades. In Claudio G. Sosa 2009, older maternal age was not considered a major risk factor for PPH as it is considered in this current review. This is because in this review, during the descriptive pooled risk factors analysis, all the risk factors with a rank of three or lesser than three were considered to be major contributors of PPH and older maternal age had a rank of 1.7 for which it is considered a major risk factor of PPH.

Finally, this review found the overall Prevalence of PPH in Africa to be lower than four percent, despite the variation of PPH prevalence rate among countries in Africa. Based on differences in risk factors associated with PPH and the unrepresentativeness of some sample size used by researchers, there is a need for further research to be conducted in Cameroon and Uganda to reassess the high prevalence rates of PPH in these nations.

## Limitations

This present systematic review is subject to several limitations. Firstly, there was no eligible study from some regions in Africa to be included in this review. For example, none of the included studies in this review came from the southern region of Africa. For some African regions, there were only a few studies that may or may not have been representative of the prevalence of PPH in that whole region. Secondly, two of the included studies with a large sample size [5, 9] influenced the overall result. We tried to be as inclusive as possible, but we could not meta-analysis our findings because we were unable to obtain most of the data necessary for meta-analysis, thus limiting our potential to add more new knowledge of PPH to clinical practice. Finally, most of the included studies [3, 5, 7, 9, 14, 22–27] were conducted in hospitals with sample size which may not have been representative of the region in which the hospital is situated.

## Conclusion

This review provides knowledgeable information that associated risk factors of PPH such as older maternal age, multiparity, and spontaneous vaginal delivery are associated with increased risk of PPH occurrence in Africa. It also provides a low PPH prevalence rate for Africa which is 3.51% that is grounded on comprehensive evidence base research. The findings of this study are important for national policymakers and health institutions because it sought to open up new perspectives in early identification of women at risk for PPH, early diagnosis and might provide new strategies to prevent and control PPH. To conclude, in the near future the standardization of the method used for measuring blood loss during

the postpartum period must be prioritized to ensure maternal child safety, so that data from different regions might be comparable.

## **Declaration**

## **Ethics approval and consent to participate**

Ethical approval and consent to participate were not necessary for this systematic review as it relied on secondary data.

## **Consent for publication**

Not applicable.

## **Availability of data and materials**

The authors declare that all the data supporting the findings of this study are available within this manuscript.

## **Competing interests**

The authors declare that they have no competing interests to disclose.

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## **Authors' contributions**

PLB developed the search strategy, which was reviewed by JYL. PLB and JYL assessed the quality of the included papers and selected eligible studies for inclusion. PLB and XP independently extracted data from all the included studies. PLB and JYL descriptively analyzed pooled results from the included studies. PLB drafted the final paper and all authors commented and agreed that the paper was ready for submission.

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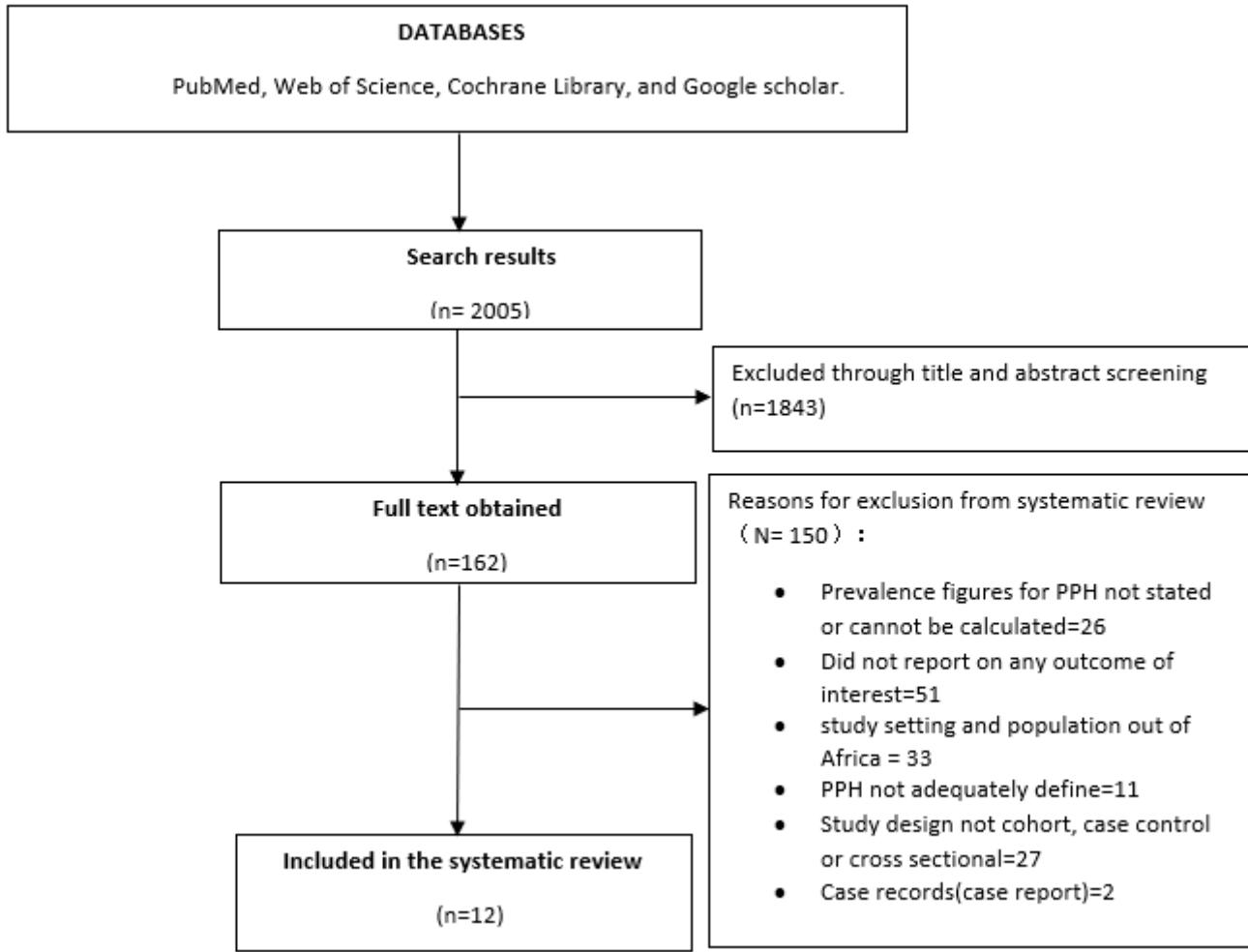
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## Figures



**Figure 1**

Process of study selection for inclusion in this systematic review

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