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Comparative Study of the Efficacy of Misoprostol and Oxytocin Im in the Prevention of Post-Partum haemorrhage in a Low-Resource Setting

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Abstract

Background: In developing countries, postpartum hemorrhage is responsible for 30% of maternal deaths. Although the World Health Organization recommends the use of oxytocin for the prevention of postpartum hemorrhage, the use of misoprostol is increasingly common. The objective of this study was to determine the frequency of postpartum hemorrhage in parturients delivering at Saint-Vincent Hospital and to compare the effectiveness of misoprostol use versus oxytocin in preventing postpartum hemorrhage. **Material and Methods:** We conducted a comparative longitudinal study at the Saint Vincent Hospital comparing 10 units of intramuscular oxytocin with 600 micrograms of sublingual misoprostol. The study was conducted from 01 January 2017 to 31 December 2019, a period of 3 years. The study population consisted of 2161 consenting women. Of these, 1289 received 10 IU of intramuscular oxytocin and 872 received 600 micrograms of misoprostol. The collected data were entered using Microsoft Excel 2013 and analysed using SPSS version 21 software. **Results:** The frequency of administration of Misoprostol and oxytocin in parturients was 40.4% and 59.6% respectively in this study. One hundred and fourteen cases of

postpartum hemorrhage (114/2161 or 5.3%) were noted among the parturients. The average age of parturients who received oxytocin was 24.36 ± 4.45 years vs 24.63 ± 5.11 years among parturients who received Misoprostol; (p = 0.190). The mean parity was 2.52 ± 1.46 vs 2.66 ± 1.44; (p = 0.020). We noted a high proportion (78.3%) of postpartum hemorrhage from the oxytocin group vs. 21.7% from the Misoprostol group (OR 2.5-fold), with a statistically significant difference (p < 0.001). We noted high proportions of uterine atony (92.3%) from the oxytocin group vs 7.7% from the Misoprostol group (p = 0.004). Uterine atony was the actual factor associated with postpartum hemorrhage (OR = 10.0895% CI: 1.78 - 57.10; p = 0.009). **Conclusion:** Misoprostol 600 Microgram administered sublingually immediately after neonatal expulsion and before delivery was 2.5 times more effective than oxytocin 10 IU/IM. Misoprostol is therefore a good alternative to oxytocin and offers more advantages in management, use and outcome than oxytocin.

Keywords

Misoprostol, Oxytocin, Postpartum Hemorrhage, Saint-Vincent Hospital

1. Introduction

Maternal mortality is a global public health problem, with approximately 830 women dying every day worldwide from complications related to pregnancy or childbirth [1]. The maternal mortality ratio in developing countries in 2015 was 239 per 100,000 births, compared to 12 per 100,000 in developed countries [2].

Postpartum hemorrhage is one of the leading causes of maternal death in sub-Saharan Africa. In developing countries, postpartum hemorrhage is responsible for 30% of maternal deaths [2].

Despite the identification of risk factors, postpartum hemorrhage is most often unpredictable. The main causes of postpartum hemorrhage are uterine atony, placental insertion anomalies and coagulation disorders [2].

The Democratic Republic of Congo (DRC) has one of the highest maternal mortality rates in the world (693 deaths per 100,000 live births) [3].

Risk factors include multiple pregnancies, fetal macrosomia, primigravida, grand multiparity, older age, preterm births, genital tract injuries, non-use of uterotonic for PPH prophylaxis, labor induction, cesarean delivery, and intra-uterine fetal deaths a history of postpartum hemorrhage. The WHO standard is "All women should benefit from the administration of a uterotonic at delivery to prevent delivery hemorrhage and the recommended uterotonic is oxytocin (10 IU IV/IM)" [4].

Although the World Health Organization recommends the use of oxytocin for the prevention of postpartum hemorrhage, the use of misoprostol is becoming more common due to the advantages of ease of storage, shelf life and the potential for sublingual administration. Oxytocin, on the other hand, requires a number of storage conditions. The temperature sensitivity of oxytocin in solution

requires that the injectable product be supplied and stored refrigerated (2˚C - 8˚C) (it should never be frozen) or cool (<25˚C) to minimise oxytocin degradation and maintain quality.

However, in many resource-poor countries temperatures will exceed 25˚C and the cold chain infrastructure may be lacking or unreliable [5]. In some developing countries; the manufacture of oxytocin is not regulated as in developed countries, furthermore, it is not always stored under proper temperature control, resulting in deterioration of efficacy, especially when exposed to sunlight and high temperatures. Under these conditions, misoprostol seems to be a good alternative, but there is insufficient data on the comparative effectiveness of oxytocin 10 IU IM and sublingual misoprostol, especially at the recommended dose of 600 μg, for the prevention of postpartum hemorrhage during active labor management. [6]

The objective of this study is to determine the frequency of postpartum hemorrhage in parturients delivered at Saint Vincent Hospital and to compare the efficacy of misoprostol use versus oxytocin in preventing postpartum hemorrhage.

2. Materials and Methods

2.1. Study Setting

Our study was carried out in the Democratic Republic of Congo, in the Province of South Kivu, in the town of Bukavu, in the commune of Kadutu, more specifically at the Centre Hospitalier Saint Vincent, one of the health facilities in the Kadutu health zone. Bukavu has a low-altitude tropical sub-equatorial or humid tropical climate, with two seasons: a dry season (lasting about four months, from May to August) and a rainy season during the other months of the year. Temperatures rarely exceed 25˚C on average in the rainy season, while in the dry season, they range from 9.9˚C to 23˚C, with the hottest and lowest temperatures recorded in June and July.

The commune of Kadutu is one of three communes in the city of Bukavu.

The CH Saint-Vincent is a secondary hospital located in the health zone of Kadutu, which has an estimated population of 404,459 inhabitants. It is the most populous commune in the city. The hospital currently has a capacity of 75 beds, five doctors, twelve nurses, two laboratory technicians, one pharmacist, three administrative staff and seven workers.

The hospital has five departments: internal medicine, paediatrics with a neonatal unit, surgery, gynaecology and obstetrics and dentistry. The hospital also has a semi-automated laboratory.

A pharmacy with a galenic laboratory for the packaging of certain pharmaceutical products for internal use.

The hospital's main vocation is gynaecological-obstetrical and surgical. The maternity ward of St Vincent Hospital has a capacity of 30 beds. Its neonatology has a capacity of five incubators and 10 neonatal beds equipped with a baby wormer.

The maternity ward also organises a prenatal consultation service once a week, while the paediatric ward organises a pre-school consultation service once a week. The maternity team is made up of 4 doctors and 5 midwives and regularly receives medical training missions from professors of gynecology and surgery from the Universities of Parma (Italy) and Ohio (USA) as well as specialists and heads of gynecology and imaging from the Provincial Hospital of Mantua (Italy).

The average number of deliveries per year is 1100 deliveries. During our study, which ran from January 2017 to December 2019, there were 3426 deliveries. The number of postpartum hemorrhages during the study period was 294, or 8.6% of all deliveries.

The choice of study setting was made on the basis of accessibility and availability of quality data at the St-Vincent Hospital.

Type of study and period: We conducted a comparative longitudinal study at the Centre Hospitalier Saint Vincent comparing 10 units of oxytocin with 600 micrograms of sublingual misoprostol. The study was conducted for a period of 3 years (from 01 January 2017 to 31 December 2019).

Study population: The study population consisted of 3426 parturients who delivered in the maternity ward of Saint Vincent Hospital in Kadutu during the study period.

2.2. Selection Criteria

All parturients who gave birth at St Vincent's Hospital during the study period.

1) Inclusion criteria: All pregnant women who attended the antenatal clinic at Saint-Vincent Hospital and who delivered during the study period.

2) Exclusion criteria: Women who refused consent (428 women), women who did not attend ANC at CH Saint Vincent (664 women), women who had a caesarean section (173 women), and women with a contraindication to misoprostol.

2.3. Data Collection Procedure

On admission to the labour ward, a haemoglobin test was performed and repeated on day 2 postpartum to determine the percentage change, if any. It was used to calculate blood loss in addition to the estimated blood loss that was recorded by the birth attendants at delivery according to standard hospital procedure. Labour is managed by nurses and midwives supervised by doctors, as is the current standard of care in the hospital. Partograms were also completed for all women. At completed dilation, the envelope drawn by the woman at the last prenatal visit is taken from the maternity wardrobe and opened to reveal the woman's choice of medication.

During delivery, at the expulsion of the shoulders, for parturients who have chosen oxytocin, 10 IU are injected intra-muscularly, while for women who have chosen misoprostol, three tablets of 200 micrograms each are administered sub-

lingually. The woman is instructed not to spit but to swallow the saliva regularly until the misoprostol is completely absorbed. The misoprostol used was donated by the association "Mama Africa" obtained from the organisation IHP. It is misoprostol under the brand name Cytotec 200 microgram from Pfizer. The oxytocin used is the one found on the market in Bukavu. There is no conflict of interest with Pfizer, with whom we have no relationship. We chose the brand because it was the only one available to us on a permanent basis.

The mode of delivery was recorded as spontaneous cephalic, spontaneous breech or assisted, vacuum delivery. All genital lacerations were also recorded to help to eliminate other causes of hemorrhage that could not be controlled by uterotonics. If additional medications were administered to control hemorrhage, they were also recorded.

The amount of blood loss was calculated according to the hospital's standard. After the expulsion of the newborn, a graduated tube was placed under the woman's buttocks to collect the blood loss. After two hours, the jump was removed and the amount of blood was marked on the monitoring sheet. If postpartum hemorrhage occurred, it was managed according to standard hospital procedure and recorded in the record. During the first 24 hours of delivery, staff monitored women for unusual bleeding and thus documented the treatment given.

The mother's vital signs were recorded during labour, as soon as possible after delivery, before transfer to her bed, and then twice a day until discharge.

All blood transfusions were recorded along with the indication, number of units, pre and post haemoglobin and patient response. Neonatal outcome included neonatal weight, sex, Apgar, survival to discharge, age at discharge and any other neonatal complications before discharge. The time when the baby is first put to the breast is noted and whether the mother is encouraged to feed because of the bleeding.

In addition to the vital signs, to capture the side effects of the uterotonics administered, we collected information on nausea, vomiting, diarrhoea, chills, fever and the treatment of each.

For the purposes of this study, postpartum hemorrhage is clinically defined as blood loss of 500 ml or more in the first 2 hours after delivery, which we have attempted to confirm by laboratory analysis of a 1.5 gram decrease in haemoglobin from admission to postpartum levels on day 2, taking transfusions into account. If we are lucky enough to have a haemoglobin done before transfusion, we collect this data: evidence of hypotension and/or tachycardia that appears to be related to blood loss and not misoprostol is used in the definition of postpartum hemorrhage. Where it is difficult to know whether they are due to blood loss or uterotonics, if there is no clinical evidence of postpartum hemorrhage, they have been attributed to uterotonics. Those who were transfused due to hemorrhage are included in postpartum hemorrhage.

2.4. Study Variables and Operational Definitions

The independent variables included age: the maternal age at delivery. It is estimated in years, Parity: the number of times the woman has delivered or carried a pregnancy that has reached the age of fetal viability (28 weeks of amenorrhea) [7]. Gestational: number of times the woman has carried a pregnancy. History of postpartum hemorrhage (HPP): women who have had a PPH in previous deliveries. Previous abortion: woman who has had an abortion in previous pregnancies.

The dependent variable in this study was the occurrence of postpartum hemorrhage and the use of oxytocin and misoprostol.

2.5. Statistical Data Management and Analysis

The collected data were entered using Microsoft Excel 2013 and analysed using Statistical Package for the Social Sciences (SPSS) version 21. Asymmetric quantitative variables were summarised by the median and interquartile range (IQR) or the mean and its standard deviation for symmetric distributions. Qualitative variables were presented as proportions and percentages.

Comparisons of proportions were made using Pearson's chi-square tests or Fisher's exact test for proportions less than or equal to 5. Odds ratios (ORs) and their 95% confidence intervals were derived to measure the strength of association between the variables. The student's t-test was used to compare the means between the two study groups. Univariate and multivariate logistic regression was constructed for the variables that showed significant differences. The significance level was set at a p-value of less than 5%.

2.6. Ethical Considerations

The research protocol N˚CNES/DP-SK 021-2003110-082/2017, was approved by the provincial ethics commission of South Kivu and the Ethics Committee of the Faculty of Medicine of the Evangelical University in Africa. The objectives of the study were explained during an antenatal care visit and free and informed consent was obtained from the women. This study was considered low risk because it used drugs that had already been used, one for the same indications and accepted as treatment and the other for the same indication and various other indications.

3. Results

Sampling

We used a convenience sample of 2161 consenting women who gave birth during the study period and who met the pre-established selection criteria.

Of these, 1289 received 10 IU of intramuscular oxytocin and 872 received 600 micrograms of Pfizer misoprostol. We used the oxytocin available in the pharmaceutical warehouse of the city and stored it in the hospital according to the advice of the manufacturer.

The allocation of women to the groups was randomized. The drugs were cho-

sen randomly. The cards containing the drug code were put in numbered opaque envelopes, but not alternately oxytocin and misoprostol, but rather 3 - 4 of one and then 3 - 4 of the other. The adopted policy ensured that neither the nurses caring for the woman, nor the physicians could select a drug of their choice. Sealed envelopes containing the drug code were kept during labor at the maternity pharmacy, which was open 24 hours a day, 7 days a week.

Table 1 shows that the median age of the pregnant women was 24 (13 - 42) years and the majority of them 67.4% were between 21 - 30 years. The median pregnancy was 3 (1 - 11) and most of the 69.1% of the pregnant women had

Table 1. Socio-demographic and clinical characteristics of parturients.

Features	N = 2161 (%)
Median age (years) (IQR)*	24 (13 - 42) years
≤20	465 (21.5)
21 - 30	1457 (67.4)
31 - 40	238 (11.0)
≥41	1 (0.05)
Median age (IQR)*	3 (1 - 11)
≤1	576 (26.7)
2 - 5	1491 (69.1)
≥6	91 (4.2)
Median parity (IQR)*	2 (1 - 8)
0	27 (1.2)
1 - 5	2090 (96.9)
≥6	41 (1.9)
History of PPH	
No	2095 (96.9)
Yes	66 (3.1)
History of abortion	
No	1918 (88.8)
Yes	243 (11.2)
Uterine atony	
No	2136 (98.8)
Yes	25 (1.2)
SFA	
No	2133 (98.7)
Yes	28 (1.3)

*IQR: Interquartile range.

pregnancy between 2 - 5. The median parity was 2 (1- 8). We noted a history of postpartum hemorrhage in 3.1% of parturients and 11.2% of gestational carriers had a history of abortion, uterine atony in 1.2%, acute fetal distress in 1.3% and fever in 41.4%.

Table 2 shows that the age group of 21 - 30 years was the most represented among the oxytocin-treated parturients 68.2% vs. 66.3% among the Misoprostol-treated parturients. The majority of the parturients had a gestation of 2 - 5; we noted a proportion of 67.6% among the oxytocin-treated women vs. 71.2% in the misoprostol-treated group.

Table 2. Socio-demographic and clinical characteristics and use of oxytocin/misoprostol.

Features	Oxytocin n = 1289 (%)	Misoprostol n = 872 (%)	P-Value
Age group (years)			
≤20 (n = 465)	277 (59.6)	188 (40.4)	0.405
21 - 30 (n = 1457)	879 (60.3)	578 (39.7)	0.397
31 - 40 (n = 238)	133 (55.9)	105 (44.1)	0.443
≥41 (n = 1)	0 (0.0)	1(100.0)	
Gestity			
0 - 1 (n = 576)	363(63.0)	213 (37.0)	0.500
2 - 5 (n = 1491)	870 (58.4)	621 (41.6)	0.852
≥6 (n = 91)	54 (59.3)	37 (40.7)	
Parity			
0 (n = 27)	20 (74.1)	7 (25.9)	0.476
1 - 5 (n = 2090)	1240 (59.3)	850 (40.7)	0.399
≥6 (n = 41)	27 (52.9)	14 (47.1)	
Previous PPH			0.105
No (n = 2095)	1256 (60.0)	839 (40.0)	
Yes (n = 66)	33 (50.0)	33 (50.0)	
History of abortion			0.694
No (n = 1922)	1150 (59.8)	772 (40.2)	
Yes (n = 238)	139 (58.4)	99 (41.6)	
Uterine atony			<0.001
No (n = 2136)	1250 (59.1)	866 (40.9)	
Yes (n = 25)	39 (86.7)	6 (13.3)	
SFA			0.095
No (n = 2133)	1268 (59.4)	865 (40.6)	
Yes (n = 28)	21 (75.0)	7 (25.0)	

Most women had a parity of 1 - 5; 96.4% in the oxytocin groups versus 97.6% in the Misoprostol group. The proportion of previous postpartum hemorrhage was 2.6% in the oxytocin groups vs. 3.8% in the Misoprostol groups (p = 0.159). A history of abortion was noted in 10.8% of the oxytocin group vs. 11.4% of the Misoprostol group.

The mean age of parturients who received oxytocin was 24.36 ± 4.45 years vs. 24.63 ± 5.11 years among parturients who received Misoprostol; with a p-value of 0.19. The mean parity was 2.52 ± 1.46 vs 2.66 ± 1.44; p = 0.020.

In Table 4, we note that the frequency of postpartum hemorrhage was 5.3% overall. Misoprostol was administered in 40.4% of parturients and Oxytocin in 59.6%. Comparatively, the distribution of postpartum hemorrhage cases in the two groups noted a high proportion (78.3%) of postpartum hemorrhage in the oxytocin group versus 21.7% in the Misoprostol group, with a statistically significant difference (p < 0.001).

In Table 5, we noted a high probability of the occurrence of postpartum hemorrhage in the oxytocin group with a 2.5-fold higher risk than in the

Table 3. Socio-demographic and clinical characteristics between the two groups.

Features	Oxytocin (n = 1289)	Misoprostol (n = 872)	p-Value
Age (SD)	24.36 ± 4.45	24.63 ± 5.11	0.190
Gestity	2.76 ± 1.56	2.89 ± 1.54	0.050
Parity	2.52 ± 1.46	2.66 ± 1.44	0.020

*SD: standard deviation.

Table 4. Comparison of the incidence of postpartum hemorrhage between the oxytocin and misoprostol groups.

Features	Oxytocin n = 1289 (59.6%)	Misoprostol n = 872 (40.4%)	p-Value
Postpartum hemorrhage			
Yes (n = 115)	90 (78.3)	25 (21.7)	<0.001

Table 5. Logistic regression analysis of postpartum hemorrhage in the two groups/ocytocine versus misoprostol.

Features	AOR (95% CI)	p-Value
Postpartum hemorrhage		
No	1 (Ref)	
Yes	2.54 (1.61 - 3.99)	<0.001
Uterine atony		
No	1 (Ref)	
Yes	15.93 (4.60 - 55.14)	<0.001

misoprostol group ($p < 0.001$). The risk of uterine atony was 15 times higher for the oxytocin group than for the misoprostol group (AOR = 15.93; 95% CI: 4.60 - 55.14; $p = 0.001$).

4. Discussion

Among postpartum hemorrhages, those of the delivery are the most dreaded. The frequency of postpartum hemorrhage (PPH) in northern countries has decreased significantly over the last 20 years (0.09%), but it remains a serious concern in underdeveloped countries.

This fear is reinforced by the fact that it is the leading cause of maternal mortality and is estimated to be 50%- 80% preventable. [8] This viability is related to delayed diagnosis or delayed intervention. To better understand the risk of postpartum hemorrhage, it should be remembered that the flow of each uterine artery reaches 300 ml/min in late pregnancy. However, the search for more effective ways to reduce the risk of postpartum hemorrhage is a necessity for developing countries. In this attempt to find the solution, we conducted a study comparing Pfizer misoprostol 600 micrograms sublingual with 10 IU oxytocin IM in the prevention of postpartum hemorrhage. The study population consisted of 2161 consenting women.

In our study, the median pregnancy was 3 (1 - 11) and most of the 69.1% of the pregnancies had pregnancy between 2 - 5. The median parity was 2 (1- 11). In the Uganda study, most of the women had a parity of 1 - 4, as in our study [6], in the Singapore study [9] it was 1 - 2. The Singapore study group was therefore predominantly pauciparous women but with a higher median age.

In our study, the mean age, parity, and gestation were similar in both groups.

In our study, the age group 21 - 30 years was more represented among the oxytocin group (68.2%) compared to 66.3% in the misoprostol group. Compared to the Ugandan study by Esther C *et al.* the age group most represented in both groups was 18 - 35 years. In the study by Ballad *et al.* the majority age group in both groups was 24 - 31 years. The results of these three studies are consistent in that the majority age group is similar in all three studies. The mean age and parity between the misoprostol and oxytocin groups did not show any significant difference in our study. They were therefore homogeneous groups.

In our study, Misoprostol was administered to 40.6% of the parturients and oxytocin to 59.9%. In the three studies mentioned above, both groups had 50% of the parturients each.

In the whole sample, 115 cases of postpartum hemorrhage were observed, a frequency of 5.3%. This is within the norm compared to values found in other studies [6].

The distribution of postpartum hemorrhage cases in the two groups noted that a high proportion (78.3%) of postpartum hemorrhage came from the oxytocin group versus 21.7% in the misoprostol group, with a statistically significant difference. This result confirms our initial hypothesis that "the use of Pfizer Mi-

soprostol 600 Microgram sublingual would significantly reduce the risk of postpartum hemorrhage compared to the prevention offered by oxytocin 10 IU IM".

Our results are similar to those found by Bellad M *et al.* on a study conducted on a sample of 652 cases, who found that sublingual misoprostol was more effective than intramuscular oxytocin in reducing postpartum hemorrhage [10]. A systematic review analysis by Zümrüt Bilgin and Nuran Komürcü in 2019 that included 12 randomised controlled articles (n = 6290) concluded that in the misoprostol group, the rate of blood loss > 500 mL was lower than in the oxytocin group [11]. The dosage of misoprostol was the same as in our study (600 micrograms). Misoprostol was more effective than oxytocin in all 10 of the 12 studies [11]. Another study conducted in India between 2012 and 2014, although with a small sample size, found more bleeding in the oxytocin group than in the misoprostol group [12]. Some studies that found the same results as ours found that sublingual misoprostol was more effective than intramuscular oxytocin in reducing delivery hemorrhage. The sublingual mode and/or powder formulation may increase the efficacy of misoprostol and make it superior to injectable oxytocin for the prevention of postpartum hemorrhage [9].

However, there are other studies that have found different results from ours. Some studies have found misoprostol to be clinically equivalent to oxytocin when used to prevent bleeding of delivery suspected to be due to uterine atony in women who received oxytocin prophylactically in the third stage of labour [13] [14]. It should be noted, however, that in these two studies, misoprostol was used at 400 micrograms, whereas in our study it was used at 600 micrograms. This difference in dosage would justify the different results between the two studies. Also in the study by G. Prema Priya *et al.* the sample was made up of parturients at lower risk of postpartum hemorrhage: exclusively primiparous women [13]. These two elements would justify the difference in results between our study and the other two studies.

A meta-analysis, including 24,754 parturients, conducted by Hatem *et al.* in February 2022, suggests that the efficacy of misoprostol in postpartum hemorrhage is similar to that of oxytocin [15]. The study acknowledges, however, that the included studies used different dosages for misoprostol. This already constitutes a bias. The authors also acknowledge the limitation of this study related to the quality of the included literature, although the inclusion and exclusion criteria of this meta-analysis are strictly adhered to, most of the included studies had a small sample size; in different included studies, the dosage of misoprostol and oxytocin is inconsistent, and the above factors may affect the accuracy of the conclusions of this meta-analysis.

Although the result is not the same as in our study, this result supports our study which aimed to provide an effective alternative to oxytocin in the prevention of postpartum hemorrhage. A theoretical advantage of sublingual misoprostol could be a better bioavailability obtained by avoiding first pass metabolism [12].

We could not find many studies comparing IM oxytocin to sublingual misoprostol done in African settings similar to our study setting, except for a study done in Uganda in 2014, which found a modest benefit of oxytocin over misoprostol. The Ugandan study found no significant difference in the rate of severe postpartum hemorrhage, need for blood transfusion, postpartum haemoglobin, change in haemoglobin or use of additional uterotonics between the study groups [6]. The same study concludes that "the significant results between treatment groups also offer promising preliminary evidence that sublinual misoprostol at a dose of 600 mg is likely to be of significant benefit where oxytocin is not available

This study reinforces a major weakness that could explain the different results of our study. In this study, high-risk cases are excluded beforehand [6]. This does not allow us to study the real effect on the population most theoretically exposed to postpartum hemorrhage. Our study included nappies at risk of postpartum hemorrhage. The study, by including only the lowest risk cases, may justify the different results from our study, which included both high and low-risk cases. The exclusion of cases at risk of postpartum hemorrhage would explain this difference with the results of our study as well as other studies, notably the study conducted in Taiwan, the Ballad study.

After observing that the oxytocin group had more postpartum hemorrhage, we further analyzed. Comparing the socio-demographic and clinical characteristics of the women who presented with PPH, we found high proportions of uterine atony (92.3%) among the women who received oxytocin vs. 7.7% in the group of women who received Misopros- tol with a statistically significant difference. It is therefore established that uterine atony was the actual factor associated with postpartum hemorrhage. This is in line with what was already accepted by several authors and previous research. Indeed, 75% - 90% of postpartum hemorrhage is related to uterine atony [9]. These results seem to be consistent with the observation in relation to the risk of hemorrhage. The high percentage of cases of hemorrhage among women who have been subjected to oxytocin correlates with the high risk of developing atony observed in women on oxytocin. Indeed, these women had a 15 times higher risk of developing atony when compared to the general population which includes women with hemorrhage and those without hemorrhage in both groups. The set of studies we looked at did not specifically analyse the risk of atony in the two groups and therefore lost a piece of data that could help understand the occurrence of hemorrhage in either group. It would have been more interesting to compare this frequency of occurrence of atony in the other studies in order to understand more about the mechanism by which misoprostol reduces the frequency of delivery hemorrhage. Unfortunately, this aspect was not addressed in the other studies consulted. Most, if not all, of the studies only reported the frequency of bleeding.

Our study could be criticised for not being a strict randomised study because it did not introduce a factor that would make it impossible to identify exactly

which group one was in. Indeed, some parturients were treated by injection and another group by oral treatment. It might have been necessary to add an oral placebo for those given oxytocin and an injectable placebo for those given misoprostol.

Our study aimed to compare the efficacy of oxytocin under the conditions where it is stored and used in low settings resource. This may give place to a criticism of the strict respect of the cold chain, but this aspect is part of the effects verified by our study.

There is a need to repeat this same study in other hospitals in the province and the country, perhaps introducing the placebo, to do strict randomized studies that will allow definitive conclusions to be drawn that may change the guidelines for the prevention of postpartum hemorrhage in our country.

The value of this study is to show that Misoprostol is best suited for active management of third stage labor in sub-Saharan Africa where there is a problem of poor storage for Oxytocin. thereby rendering them ineffective due to the impact of the elements The study would be used in future analyses to provide evidence where appropriate.

5. Conclusions

In this study, we found a higher probability of the occurrence of postpartum hemorrhage in women who received oxytocin than in women who received Misoprostol.

Pfizer misoprostol 600 micrograms sublingual immediately after fetal expulsion and before delivery was 2.5 times more effective than oxytocin 10 IU/IM in our study. Uterine atony is the actual risk factor associated with postpartum hemorrhage.

Misoprostol is therefore a good alternative to oxytocin and offers more advantages in management, use and outcome than oxytocin. Further studies in sub-Saharan Africa are needed to confirm this result.

Conflicts of Interest

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

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