INTRODUCTION

Delivery by cesarean section is one of the most commonly performed obstetrical operations all over the world, but it exposes women to the inherent risks of major abdominal surgery, e.g., injury to the pelvic structures, infection, and the need for blood transfusion ***(Ramadani, 2004).***

The massive physiological hyperperfusion of the uterus towards the end of pregnancy results in an average blood loss of approximately 1000 ml during cesarean delivery ***(Pritchard et al., 1962).***

A reduction of intraoperative blood loss at cesarean section is beneficial to the patients in terms of decreased postoperative morbidity and a decrease in risks associated with blood transfusion. The routine use of oxytocin is associated with a significant reduction in the occurrence of postpartum hemorrhage ***(Prendiville and Elbourne, 1989).***

Postpartum hemorrhage is a leading cause of maternal mortality and morbidity, especially in low-resource countries. The incidence of cesarean delivery is increasing, and the average blood loss during cesarean delivery (1000 mL) is double the amount lost during vaginal delivery (500 mL) ***(Magann et al., 2005).***

Postpartum hemorrhage can be defined clinically as any amount of blood loss that results in hemodynamic instability.

Traditional definitions state that PPH is a blood loss of 500 ml or more during puerperium, with severe PPH occurring with a blood loss of 1000 ml or more ***(Mousa and Alfirrevic, 2007).***

Uterine atony and failure of reduction of myometrial muscle fibers can lead to sever hemorrhage and hypovolemic shock. It is the typical cause of postpartum hemorrhage that occurs in the first 4 hours after delivery ***(Smith and Brennan, 2010).***

The most successful method for reducing PPH, active Management of the third stage of labor (AMTSL), requires prophylactic uterotonic drugs. The uterotonic drugs used include oxytocin, ergometrine malate and combinations of the two all of which must be administered by injection ***(Langenbach, 2006).***

Misoprostol, a prostaglandin E1 (PGE1) analogue, has potent uterotonic action, is cheap and stable at room temperature, and has few adverse effects. It is well absorbed when administered by oral, vaginal, sublingual, rectal, or buccal routes ***(Gülmezoglu et al., 2007).***

Recent pharmacokinetic study suggested that the bioavailability of misoprostol after sublingual administration was higher than those after oral or vaginal administration ***(Tang et al., 2002).***

AIM OF WORK

The aim of the work is to evaluate & compare the effectiveness of rectally administered PGE1 synthetic analogue (misoprostol) 400 microgram versus sublingually administered misoprostol before caesarean section to decrease blood loss during and after the operation.

POSTPARTUM HEMORRHAGE

Severe bleeding is the single most significant cause of maternal death worldwide. 140,000 women die of postpartum hemorrhage each year, one every 4 minutes most commonly from excessive bleeding ***(El-Refaey and Rodeck, 2003).***

Postpartum hemorrhage (PPH) is a clinical problem of indisputable importance to patients, clinicians and to those interested in achieving equity in reproductive health. As a condition, it is almost always associated with meaningful implications to patients. Even the mild self-limiting cases have consequences for the patient's puerperium in the form of fatigue, tiredness, failure to breast-feed and possible need for haematinics or blood transfusion. All are symptoms and consequences of anaemia and acute blood loss. PPH can transform a normal woman in labor to a critically ill patient within minutes ***(El-Refaey and Rodeck, 2003).***

PPH is considered a major cause of maternal morbidity and one of the top three causes of maternal mortality in both high and low income countries. Furthermore, it is the most preventable one ***(Jacobs et al., 2010).***

The physiologic changes over the course of pregnancy, including a plasma volume increase of approximately 40% and a red cell mass increase of approximately 25%, occur in anticipation of the blood loss that will occur at delivery.

Circulating blood volume rises by 37% from approximately 4000 ml to 5500ml, providing not only adequate placental perfusion but also a compensatory reserve such that a healthy woman can usually tolerate acute losses at delivery of up to 1000ml ***(Chesley , 1972).***

This protective hemodilution initiates a fall in hemoglobin; hematocrit and red cell count, but maintain mean corpuscular volume and mean corpuscular hemoglobin concentration ***(Bose et al., 2006).***

DEFINITION

There is no single, satisfactory definition of postpartum hemorrhage. Traditionally PPH has been defined as estimated blood loss of 500 ml or more after vaginal delivery, or 1000 ml or more after a cesarean delivery. There are, however, two problems with this definition. First, studies have shown that objectively measured average blood loss after vaginal and cesarean deliveries is about 500 ml and 1000 ml, respectively ***(Andolina et al., 1999).*** Second, clinicians are more likely to underestimate than overestimate the volume of blood loss ***(Stafford et al., 2008).***

Using the traditional definitions would thus inaccurately categorize at least one-half of deliveries as having PPH. Another classic definition of PPH is a 10% decline in postpartum hemoglobin concentration from antepartum levels. The problem with this definition is that determinations of hemoglobin or hematocrit concentrations may not reflect the

current hematologic status, because this change depends on the timing of the test and amount of fluid resuscitation given ***(Combs et al., 1991).***

Some clinicians have suggested defining PPH as excessive bleeding that makes the patient symptomatic (e.g. lightheadedness, weakness, palpitations, diaphoresis, oliguria and low oxygen saturation [< 95%]). However, this method of diagnosis also has its shortcomings. Maternal blood volume expands 40% to 50% during pregnancy because of an increase in both plasma volume and red blood cell mass. This increased blood volume, to some extent, protects the mother from the consequences of hemorrhage during and after delivery. Thus, after delivery a woman may lose up to 20% of her blood volume before clinical signs become apparent. Consequently, waiting for signs of excessive bleeding may delay initiating appropriate treatment ***(ACOG, 2006).***

INCIDENCE

It is estimated that more than 500 000 women die of complications of pregnancy and childbirth every year, worldwide ***(WHO, 2008).***

Postpartum hemorrhage is the single most important cause of maternal mortality worldwide, accounting for 25% to 30 % of all maternal deaths and complicates up to 18% of all deliveries ***(Devine, 2009).***

The incidence of PPH ranges between 5% and 8% in places where some form of prophylaxis is practiced, but may

be as high as 18% when a physiological approach is the norm ***(Prendiville and Elbourne, 1989).***

TYPES AND ETIOLOGY

Postpartum hemorrhage is classified as primary PPH, occurring within the first 24 hours postpartum and secondary PPH occurring between 24 hours and up to six weeks postpartum ***(Kominiarek et al., 2007).***

Causes of secondary type include ***(WHO, 2008):***

1. Retained fragments of placenta or membranes.
2. Shedding of dead tissue following obstructed labor (this may involve cervix, vagina, bladder, and rectum).
3. Breakdown of uterine wound (after caesarean section or ruptured uterus).

Physiological control of postpartum bleeding occurs by contraction and retraction of the interlacing myometrial fibres surrounding maternal spiral arteries in the placental bed. Myometrial contraction compresses the spiral arteries and veins, thereby obliterating their lumina ***(El-Refaey and Rodeck, 2003).***

Primary PPH may result from failure of the uterus to contract adequately (atony), genital tract trauma (i.e. vaginal or cervical lacerations), uterine rupture or genital tract lacerations, retained placental tissue or maternal bleeding disorders ***(WHO, 2008).***

The most common cause of primary PPH is uterine atony (i.e., lack of effective contraction of the uterus after delivery), which complicates 1 in 20 births and is responsible for at least 80 percent of cases of PPH ***(Combs et al., 1991)***

One should keep in mind that only a focal area of the uterus can be atonic, which is difficult to appreciate on physical examination, or the uterus may not be maximally contracted ***(Jacobs et al., 2010).***

The most common risk factors of atonic uterus were summarized by ***(WHO, 2008)*** as follows:

Risk factors Interfering with the ability of uterus to contract:

1. Retained placental tissue or membrane.
2. Full bladder.
3. Ante partum hemorrhage {placenta praevia (less oblique muscle fibers in the lower uterine segment), or placental abruption (muscle fibers are damaged due to concealed uterine hemorrhage)}.

Overstretched uterus that may be caused by:

1. High parity (uterus loses elasticity).
2. Multiple pregnancy.
3. Polyhydramnios.

Tired uterus that caused by:

Prolonged labor (avoid by correct use of the partograme and timely referral for assessment and, if no

contraindication, augmentation of labor, or operative delivery, if indicated).

Wrong practice as:

Mismanagement of third stage labour.

Medical factors as:

1. Anemia.
2. Previous third stage complication (previous retained placenta, previous PPH).
3. Severe pre-eclampsia and eclampsia.
4. Induced or augmented labor.
5. Precipitate labor.
6. Caesarean section.
7. Chorioamnionitis or endometritis (potentially avoidable).
8. General anesthesia.

Damage of the genital tract may occur spontaneously or through manipulations used to deliver the baby.Trauma is considered the second most frequent cause of postpartum hemorrhage, as injury during or after delivery can cause significant bleeding because of increased tissue vascularity during pregnancy ***(Yiadom and Carusi, 2010).***

The possibility that additional products of conception remain within the uterine cavity should be considered. Ultrasonography can help diagnose a retained placenta. Retained placental tissue is unlikely when ultrasonography reveals a normal endometrial stripe.When a retained placenta is identified, a large instrument, such as ring forceps, guided by

ultrasonography, makes removal of the retained tissue easier and reduces the risk of perforation ***(Hertzberg and Bowie, 1991)***

Less commonly, postpartum hemorrhage may be caused by coagulopathy. Clotting abnormalities should be suspected on the basis of patient or family history or clinical circumstances. When a coagulopathy is suspected, appropriate testing should be ordered, with blood products infused as indicated ***(ACOG, 2006).***

COMPLICATIONS

Most patients with PPH are quickly identified and successfully treated before major complications develop. The most common problem is anemia and loss of iron stores, which results in fatigue in the postpartum period ***(Smith and Brennan, 2010).***

Complications from postpartum hemorrhage include ***(Anderson and Etches, 2007):***

1. Hemorrhagic shock.
2. Orthostatic hypotension.
3. Anemia.
4. Fatigue (which may make maternal care of the newborn more difficult).
5. Increases the risk of post-partum depression.
6. Anterior pituitary ischemia (i.e., postpartum pituitary necrosis; Sheehan's syndrome).
7. Occult myocardial ischemia.

8. Adult respiratory distress syndrome.
9. Dilutional coagulopathy.
10. Damage to major organs is possible e.g. Respiratory (adult respiratory distress syndrome) & Renal (acute tubular necrosis)
11. Death also may occur.

DIAGNOSIS

PPH is best diagnosed clinically as excessive bleeding that makes the patient symptomatic (e.g., lightheadedness, weakness, palpitations, diaphoresis, restlessness, confusion, air hunger, syncope) and/or results in signs of hypovolemia (e.g., hypotension, tachycardia, oliguria, low oxygen saturation [<95 percent]). Vaginal bleeding is usually noted, but may not be present in cases where hemorrhage is related to abdominal bleeding from a cesarean delivery or a broad ligament hematoma after a sulcus laceration ***(Jacobs et al., 2010).***

A 10% fall in hematocrit value can also be used to diagnose PPH, but this change is dependent on the timing of the test and the amount of fluid resuscitation given. Also PPH usually manifests with such rapidity that diagnostic procedures are almost entirely limited to a physical examination of the involved structures ***(Smith and Brennan, 2010).***

Physical examination should focus on determining the cause of the bleeding. The patient may not have the typical hemodynamic changes of shock early in the course of the hemorrhage due to physiologic maternal hypervolemia, and

they also focused on the importance of assessing important organ systems such as the pulmonary system (evidence of pulmonary edema), the cardiovascular (heart murmur, tachycardia, strength of peripheral pulses), neurological systems (mental status changes from hypovolemia). Skin should also be checked for petechiae or oozing from skin puncture sites, which could indicate a coagulopathy, or a mottled appearance, which can be indicative of severe hypovolemia, Checking also for occult postpartum hemorrhage in the form of a pelvic, vaginal, uterine, or abdominal wall hematoma, or intra-abdominal or perihepatic bleeding is always important when unstable hemodynamic findings are present without evidence of excessive vaginal blood loss **(*Yiadom and Carusi, 2010).***

The following examinations can help in the diagnosis of PPH: ***(Yiadom and Carusi, 2010)***

- Abdominal examination: Rigidity and tenderness (concerning for retained placenta tissue, rupture, or endometritis), distension, boggy or grossly palpable uterus (at or above the umbilicus) is suggestive of atony. Palpation of an overdistended bladder may indicate a barrier to adequate uterine contraction.
- Perineal examination: A brisk bleed should be visible at the introitus; identify any perineal lacerations.
- Speculum examination: Gently suction blood, clots, and tissue fragments as needed to maintain the view of the vagina and cervix. Careful inspection of the cervix and

vagina under good light may reveal the presence and extent of lacerations.

- Bimanual examination: Bimanual palpation of the uterus may reveal bogginess, atony, uterine enlargement, or a large amount of accumulated blood. Palpation may also reveal hematomas in the vagina or pelvis. Assess if the cervical os is open or closed.
- Placental examination: Examine the placenta for missing portions, which suggest the possibility of retained placental tissue.

PREVENTION OF POSTPARTUM HEMORRHAGE

PPH is considered the most preventable cause of maternal mortality. Here comes the importance of its prevention; all patients with risk factors for PPH should be identified and counseled, as appropriate for their level of risk. Planning for these patients involves ensuring availability of resources that might be needed, including personnel, medication, equipment, and blood products ***(Jacobs et al., 2010).***

Strategies for minimizing the effects of postpartum hemorrhage include identifying and correcting anemia before delivery, eliminating routine episiotomy and reexamining the patient's vital signs and vaginal flow before leaving the delivery area may help detect slow, steady bleeding, and the best preventive strategy is active management of the third stage of labor ***(Anderson and Etches, 2007).***

Data support the routine use of active management of the third stage of labor (AMTSL) by all skilled birth attendants, regardless of where they practice; AMTSL reduces the incidence of PPH, the quantity of blood loss, and the need for blood transfusion, and thus should be included in any program of intervention aimed at reducing death from PPH ***(Prendiville et al., 2000).***

The usual components of AMTSL include ***(Prendiville et al., 2000)*:**

1. Administration of oxytocin or another uterotonic drug within 1 minute after birth of the infant.
2. Controlled cord traction (Brandt-Andrews maneuver).
3. Uterine massage after delivery of the placenta.

1. **Utertonics**

Uterotonics that is used for the prevention include ***(Anderson and Etches, 2007):***

a. ***Oxytocin*** reduces rates of postpartum hemorrhage by 40 percent; this reduction also occurs if oxytocin is given after placental delivery. Oxytocin is the drug of choice for preventing postpartum hemorrhage because it is at least as effective as ergot alkaloids or prostaglandins and has fewer side effects.

b. ***Misoprostol (Cytotec®)*** has a role in the prevention of postpartum hemorrhage; this agent has more side effects but is inexpensive, heat- and light-stable, and requires no

syringes.

c. ***Syntometrine*** (ergometrine 0.5 mg with 5 IU oxytocin) is the drug of choice for most women. By some clinicians, oxytocin alone (10 IU) is preferred in women with hypertension.

2. **Brandt-Andrews maneuver**

Controlled cord traction involves traction on the cord while maintaining an upwards counter-pressure on the lower segment of the uterus by placing a hand on the lower abdomen of the mother ***(Anderson and Etches, 2007)*** (figure 1).

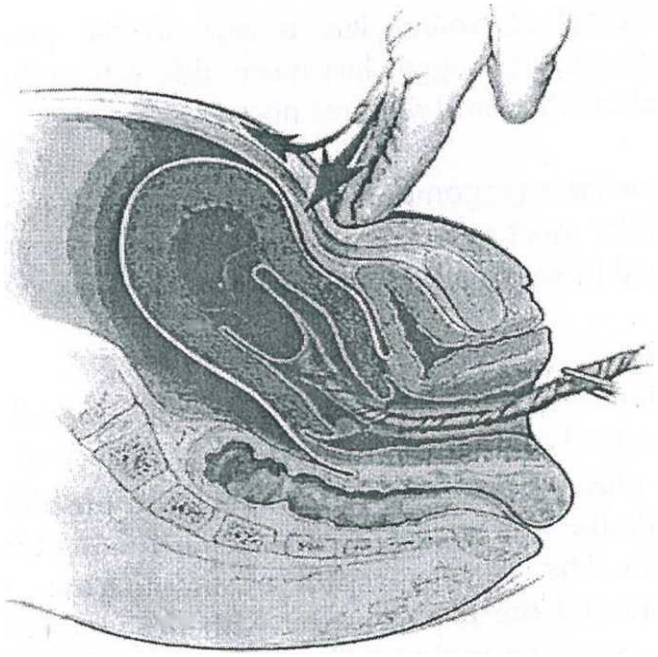

Figure (1): Brandt-Andrews maneuver *(Anderson and Etches, 2007)*