Introduction

Cesarean Section (C.S) is the most common major surgical procedure performed on women worldwide and its rates continue to rise steadily in both developed and developing countries**(Gibbons et al., 2012)**.

Epidemiologic data report a C.S. incidence of 20-30 % worldwide, with comparable rate in high-income and low-income countries (**Khawaja et al., 2009)** . The current rate of C.S., which is approximately 4-5 fold greater than that of the 1970s, can be attributed to factors such as assumed benefit to the fetus, low maternal risk, and social preference **(Toy et al., 2011)**.

Maternal morbidity following C.S is much higher than that following a vaginal delivery. Generally, it is 2–4 times higher than vaginal delivery **(Miller, 1988).** The main causes of death following C.S are infections, hemorrhage, pulmonary embolism, and anesthesia-associated complications, the most frequent being aspiration pneumonia and cardiopulmonary arrest. Cesarean section has been an important underlying cause of death in Norway and contributed to the increased maternal death ratio in the last decade **(Vangen and Bergsjo, 2003)**.

Postpartum hemorrhage (PPH) is a major cause of maternal mortality, especially in under-resourced countries, accounting for nearly one-quarter of all maternal deaths worldwide **(WHO, 2007)**. A study from developed countries reported an increase in the rate of PPH, which has been attributed (at least in part) to a rise in the rate of Cesarean section **(Bateman et al., 2010).**

PPH following a Cesarean section has been defined as blood loss over 1000 ml. **(ACOG, 2006) .** Some studies have estimated that the prevalence of PPH after Cesarean section ranges from 0.6% to 6.4% (median, 3%), although the frequency depends on the criteria used to define this condition and the method used to calculate blood loss **(Toledo et al., 2010).**

The most common cause of PPH is the failure of the uterus to contract adequately, which is responsible for approximately 70% of primary PPHs. With the increasing incidence of cesarean section, PPH may become more common, because the average blood loss during Cesarean section is twice that during vaginal delivery **(Magann et al., 2005)**.

The efficacy of routine administration of uterotonic agents, mainly oxytocin, to reduce the frequency of postpartum hemorrhage after vaginal birth is well-established **(Begley et al., 2011).**

Although most obstetric units use intravenous oxytocin, given as either a bolus or an infusion, as a first-line agent to prevent uterine atony and reduce blood loss during C.S, 10–42% of women receiving oxytocin were found to require additional oxytocic agents, such as ergot alkaloids and prostaglandins **(Owonikoko et al., 2011).** Moreover, oxytocin may not be the ideal agent for prevention of PPH in patients with pre-eclampsia, prolonged labor or cardiac disease, as it can cause tachycardia and hypotension (**Thomas et al., 2007, Svanstr€om et al., 2008)**. Specifically, it also has negative inotropic, antiplatelet and antidiuretic effects**.**In addition, oxytocin is both light and heat sensitive, and requires cold storage, which limits its use in developing countries**(Thomas et al., 2007)**.

Misoprostol, as a prostaglandin E1 (PGE1) analogue, not only has strong uterotonic activity through selectively binding E–series prostanoid receptors (Ep2/Ep3) **(Senior et al., 1993)** but is also relatively inexpensive and is stable at room temperature, unlike other prostaglandins. It is well absorbed when administered by oral, buccal, sublingual, vaginal or rectal routes **(Gulmezoglu et al., 2007)**. As a consequence of these properties, this agent has attracted great interest as an effective alternative for PPH prevention and management in resource-poor countries.

Studying the pharmacokinetic of misoprostol through assessment of its acid metabolite does not reflect the exact onset of action, for example, absorption and bioavailability of misoprostol after vaginal administration are affected by vaginal acidity and bacterial environment **(Sioutas et al .,2012).**Sublingual misoprostol has the shortest onset of action and the highest incidence of side effects **(Khan and El-Refaey, 2003 , Tang and Ho,2006)**. Rectally administrated misoprostol is associated with slower absorption, lower peak level, and reduced adverse effect when compared with oral and sublingual routes **(Khan and El-Refaey, 2003).**

Neither the use nor the efficacy of misoprostol during Cesarean section has been well studied. Although several studies concluded that misoprostol was as effective as oxytocin in reducing blood loss during Cesarean section , a systematic and comprehensive summary of the pertinent evidence has not been published **(Owonikoko et al., 2011)** .

Aim of the work

The aim of this study is to evaluate the effect of preoperative administration of rectal misoprostol on blood loss during and after Cesarean section .

Cesarean section

Definition of Cesarean section (C.S):

Cesarean section is defined as the delivery of the fetus through an incision in the abdominal wall (laparotomy) and the uterine wall (hysterotomy). This definition does not include the removal of the fetus from the abdominal cavity in the case of a rupture of the uterus or an abdominal pregnancy **(Cunningham el al., 1993)** . In past centuries, Cesarean section was done to save fetus in women who were full-term but had died before birth. The first modern Cesarean section was conducted by Dr. James Barry in South Africa on July 1826 **(Segen , 1992)**.

Etymology

The Roman Lex Regia (ruling law), later the Lex Caesarea (imperial law), of Numa Pom pilius (715–673 BCE) **(Segen , 1992)** required the child of a mother dead in childbirth to be cut from her womb. This seems to have begun as a religious requirement that mothers not be buried pregnant **(Högberg et al., 1987)** , and to have evolved into a way of saving the fetus, with Roman practice requiring a living mother to be in her tenth month of pregnancy before resorting to the procedure, reflecting the knowledge that she could not survive the delivery. Speculation that the Roman dictator Julius Caesar was born by the method now known as C-section is apparently false. Although C.S were performed in Roman times, no classical source records a mother surviving such a delivery, the earliest recorded survival dates to the 12th century scholar and physician Maimonides **(Pieter and van , 2009)** .

The term has also been explained as deriving from the verb *caedere*, to cut, with children delivered this way referred to as *caesones*. Pliny the Elder refers to a certain Julius Caesar (an ancestor of the famous Roman statesman) as *ab utero caeso,* "cut from the womb" giving this as an explanation for the cognomen "Caesar" which was then carried by his descendents **(Pieter and van, 2009).**

Notably, the Oxford English Dictionary does not credit a derivation from "caedere", and defines Cesarean birth as "the delivery of a child by cutting through the walls of the abdomen when delivery cannot take place in the natural way, as was done in the case of Julius Caesar" **(OED, 2013)** .

History of C.S:

The mother of *Bindusara* (born c. 320 BCE, ruled 298 – c.272 BCE), the second *Mauryan Samrat* (emperor) of India, accidentally consumed poison and died when she was close to delivering him. Chanakya, the Chandragupta's teacher and adviser, made up his mind that the baby should survive. He cut open the belly of the queen and took out the baby, thus saving the baby's life **(Lurie and Samuel, 2005 quoted from Wilhelm , 1908).**

European travelers in the Great Lakes region of Africa during the 19th century observed Caesarean sections being performed on a regular basis. The expectant mother was normally anesthetized with alcohol, and herbal mixtures were used to encourage healing. From the well-developed nature of the procedures employed **(National institute of health , 2010),** European observers concluded they had been employed for some time. Dr. James Barry carried out the first successful Caesarean section by a

European doctor in Africa in Cape Town, while posted there between 1817 and 1828 **(Pain and Stephanie, 2008)**.

The first successful C.S to be performed in America took place in what was formerly Mason County, Virginia (now Mason County, West Virginia), in 1794. The procedure was performed by Dr. Jesse Bennett on his wife Elizabeth **(Woman's Ills, 2009)**.

Incidence and Rate of C.S :

C.S is the most common major surgical procedure performed on women worldwide and its rates continue to rise steadily in both developed and developing countries**. (Gibbons et al., 2012).**

The total Cesarean section rate, defined as the percentage of Cesarean deliveries out of all births in a given year , Similar to the total Cesarean section rate, the primary Cesarean delivery rate, defined as the percentage of Cesarean deliveries out of all births to women who have not had a previous Cesarean delivery, also has increased ***(*MacDorman et al.,2011*)*** .

Epidemiologic data report a C.S. incidence of 20-30 % worldwide, with comparable rate in high-income and low-income countries (**Khawaja et al., 2009)** . The current rate of C.S , which is approximately 4-5 fold greater than that of the 1970s, can be attributed to factors such as assumed benefit to the fetus, low maternal risk, and social preference **(Toy et al., 2011)**. This increasing incidence has been observed despite the recommendation of the World Health Organization (WHO) to keep it below 10–15% **(Rozenberg ,2004).**

Factor affecting C.S rate :

Increasing C.S rates coincided with several changes in obstetric practice, including the introduction and dissemination of technology (ultrasound, cardiotocography); women becoming pregnant and delivering despite severe diseases; improved safety for women undergoing operative delivery; the increased inclination of obstetricians to operative delivery, uncritically transferring the experiences of others to their own institution; and ever-less obstetrical experience in maternity hospitals with a decreasing number of deliveries, resulting in obstetricians being no longer skilled in various operative deliveries(e.g., breech delivery) **(Duff ,1987)** .

The incidence of C.S performed on request without a medical indication is rising too. The reasons for this are not only a perceived medical benefit but also social, cultural, and psychological factors. The legal and ethical issues of Cesarean section on request are complex. In dealing with requests for a Cesarean section, obstetricians should establish the reasons for the request and provide clear, unbiased information based on the best available evidence **(Devendra and Arulkumararan ,2003) .**

In our opinion, and that of many others, the C.S rate could be decreased by decreasing the number of repeat cesareans, active management of dystocia , efforts to increase the vaginal breech delivery rate, improving methods of diagnosing fetal distress , and preventive and timely active management of labor (timely termination of pregnancy, augmentation of weak contractions, external cephalic version for a transverse lie and breech presentation, etc.) **(Elferink et al., 1995) .** On the basis of recommendations by the International Federation of Gynecology and Obstetrics Committee on Perinatal Health , Eskes and Wallenburg proposed a solution to the problem, i.e. external cephalic version at term, as

well as the use of physicians well trained and experienced in handling vaginal breech delivery **(Eskes and Wallenurg ,1995).**

Indication of C.S :

There are various indications for C.S. Generally, they can be divided into fetal, maternal, and fetomaternal indications. However, they are greatly affected by the different policies of individual maternity hospitals, and by individuals; this has also been reported in a study performed in five maternity hospitals **(Hueston, 1995)** .

American College of Obstetricians and Gynecologists (ACOG) mapped the indications for primary C.S into 15 predefined categories as follows: failure to progress (arrest of dilation in the first stage of labor or arrest of descent in the second stage of labor) and cephalopelvic disproportion; nonreassuring fetal heart rate (FHR) tracing and fetal distress; fetal malpresentation; suspected fetal macrosomia; preeclampsia and eclampsia; chorioamnionitis; fetal anomaly; multiple gestation; obstetric factors (uterine rupture, cord prolapse , placenta previa, vasa previa, abruption, or other obstetric emergency); previous uterine scar (including hysterotomy or myomectomy); human immunodeficiency virus and herpes simplex virus; history of shoulder dystocia; shoulder dystocia this pregnancy **(Boyle et al. , 2013)**.

Other Indications in the elective category included maternal request, multiparity, women desiring a tubal ligation, advanced maternal age, diabetes mellitus, human papilloma virus, post term or postdates, pregnancy remote from term, group B streptococcus, polyhydramnios, fetal death, and social or religious concerns. Other indications included all maternal factors not elsewhere specified **(Boyle et al. , 2013)**.

A study in 2013 involving 106 participating centers in 25 countries came to the conclusion that, in a twin pregnancy of a gestational age between 32 weeks 0 days and 38 weeks 6 days, and the first twin is in cephalic presentation, planned Cesarean section does not significantly decrease or increase the risk of fetal or neonatal death or serious neonatal disability, as compared with planned vaginal delivery. In this study, 44% of the women planned for vaginal delivery still ended up having Cesarean section for unplanned reasons such as pregnancy complications **(Barrett et al., 2013)**. In comparison, it has been estimated that 75% of twin pregnancies in the United States were delivered by C.S in 2008 **(Lee et al., 2011)**.

A study was done by **Boyle., et al 2013** This study examined a subset of the data collected by the Consortium on Safe Labor, a large, multisite, retrospective cohort study of contemporary labor and delivery practice. The Consortium on Safe Labor collected detailed information from electronic medical records of 228,562 deliveries at 23 weeks of gestation or more from 12 clinical centers, including 19 hospitals, found that the most common indications for primary C.S were failure to progress (35.4%), nonreassuring FHR tracing (27.3%), and fetal malpresentation (18.5%), although frequencies for each indication varied by parity. For primiparous women, failure to progress was the most common indication (41.3%), followed by nonreassuring FHR tracing (23.4%) and fetal malpresentation (15.8%). For multiparous women, the most common indication was fetal malpresentation (25.8%), followed by nonreassuring FHR tracing (24.6%) and failure to progress (19.5%)**.**

Types of C.S:

There are several types of CS. Two uterine incisions are mainly used:

- Upper segment C.S
- lower segment C.S

Some distinguish between the vertical incision of the lower uterine segment and the high vertical incision of the uterine corpus. Frequent occurrence of serious uterine ruptures during subsequent pregnancies following a high vertical approach has made this incision nearly obsolete **(Hibbard , 1988) .**

Another classification lies in the type of incision (longitudinal or latitudinal) made on the uterus, apart from the incision on the skin

- Transverse (eg, Pfannenstiel or Joel-Cohen) incision : is most commonly used for Cesarean section since it is associated with less postoperative pain, greater wound strength, and better cosmetic results than the vertical midline incision **(Berghella et al., 2005).**

- Vertical incisions : It generally allow faster abdominal entry ,cause less bleeding and nerve injury, and can be easily extended if more space is required for access **(Wylie et al., 2010)**.

Randomized trials have not evaluated outcomes related to the choice of skin incision separately from other aspects of Cesarean section. A prospective cohort study including over 3500 emergency Cesarean section confirmed that median incision to delivery intervals were faster for vertical than transverse skin incisions (3 versus 4 minutes for primary Cesareans and 3 and 5 minutes for repeat Cesareans). However, neonatal outcomes

were not improved and some maternal and neonatal outcomes were worse in the vertical incision group (eg, need for postpartum maternal transfusion [8.5 versus 5.3 percent], neonatal intubation in the delivery room [17 versus 13 percent]); this was attributed to unidentified confounders **(Wylie et al., 2010).**

Other Types of C.S

- An unplanned C.S is performed once labor has commenced due to unexpected labor complications.

- A crash / emergent / emergency C.S is performed in an obstetric emergency, where complications of pregnancy onset suddenly during the process of labor , and swift action is required to prevent the deaths of mother, children or both.

- A planned Cesarean section (or elective/scheduled cesarean), arranged ahead of time, is most commonly arranged for medical reasons and ideally as close to the due date as possible.

- A Cesarean hysterectomy consists of a C.S followed by the removal of the uterus. This may be done in cases of intractable bleeding or when the placenta cannot be separated from the uterus.

- Traditionally, other forms of C.S have been used, such as extraperitoneal Cesarean section or Porro Cesarean section.

- A repeat C.S is one that is done when a patient had a previous C.S. Typically it is performed through the old scar **(Stark et al.,1995) .**

C.S can be performed with single or double layer suturing of the uterine incision. A Cochrane review came to the result that single layer closure compared with double layer closure was associated with a statistically significant reduction in mean blood loss **(Dodd and Anderson , 2008)** .

Benefits and risks of C.S:

(A) Maternal

Maternal morbidity following C.S is much higher than that following a vaginal delivery. Generally, it is 2–4 times higher than with vaginal delivery ***(Miller, 1988).*** The main causes of death following C.S are infections, hemorrhage, pulmonary embolism, and anesthesia-associated complications, the most frequent being aspiration pneumonia and cardiopulmonary arrest. Cesarean section has been an important underlying cause of death in Norway and contributed to the increased maternal death ratio in the last decade ***(Vangen and Bergsjo , 2003)***.

Also numerous articles have been published on the effects of vaginal delivery on the pelvic floor, urinary incontinence, pelvic organ prolapse, and, especially, fecal incontinence. All these publications conclude that C.S has a protective effect **(Rozenberg , 2004)** . An association exists between pelvic floor damage and childbirth, but this cannot be attributed entirely to vaginal delivery and occurs after C.S as well **(Devendra and Arulkumararan , 2003).** Conversely, a large, 12-year, postpartum cohort study has reported C.S was not protective for urinary incontinence unless all the women's births were exclusively by C.S. Moreover, even after

women having exclusively C.S, the prevalence of urinary incontinence was high at 40% **(MacArthur et al., 2011).**

Dehiscence and wound infections are less frequent. Infections are often associated with low socioeconomic status of the mother, frequent vaginal examinations, long duration of labor, and a long interval from rupture of membranes to C.S. In long labor, in which delivery starts more than 6 h after the rupture of the membranes, endometritis occurs in up to 85% of cases **(De Palma et al .,1982)** .

Despite the advances in medical science, C.S is accompanied by complication during labor and after that such as atonic uterus and bleeding, uterine rupture, increasing the risk of bowel adhesions and damage to the urinary tract **(Mukhergee, 2006)** .

C.S also increases the risk of subsequent uterine rupture, placenta accreta, hemorrhage, hysterectomy, ectopic pregnancy , implantation endometriosis , adenomyosis , increased hospital re-admission and maternal death **(Silver et al ., 2006)** . Safely lowering the total cesarean delivery rate is a stated objective of the U.S. Department of Health and Human Services **(Clark and Silver , 2011)** .

C.S has also been associated with emotional difficulties **(Clement , 2001)** including postpartum depression and negative feelings about the experience of childbirth, but not specifically among women undergoing C.S by choice **(Minkoff and Chervenak ,2003)**.

As with all types of abdominal surgeries, C.S is associated with risks of postoperative adhesions, incisional hernias (which may require surgical

correction) and wound infections. If C.S is performed under emergency situations, the risk of the surgery may be increased due to a number of factors. The patient's stomach may not be empty, increasing the anesthesia risk. Other risks include severe blood loss (which may require a blood transfusion) and postdural-puncture spinal headaches **(Lee et al., 2011)**.

(B) Neonatal :

Although some claim that over 20 years decrease in the perinatal mortality rate from 20–30 per 1000 to 10 per 1000 is mainly due to the increased C.S rate, there are others who disagree this. For example, while data show a close relationship between mortality and cesarean rate in the USA, the same fall in mortality was observed in Ireland without a significant change in its C.S rate **(O'Driscoll and Foley , 1983) .**

The decrease in perinatal mortality has occurred for various reasons, such as higher patient educational and socioeconomic levels and generally improved prenatal care, but primarily, it has been due to better neonatal intensive care and therapy .Many studies have found no relationship between the frequency of C.S and the level of prenatal mortality .The comparison among different countries has also shown that in some populations, low levels of early infant mortality can be achieved despite a low cesarean section rate**.(Enkin et al .,1993 , Verdenik et al .,1996)**

Also C.S is associated with increased risks for the baby delivered by C.S It include, increased admission to neonatal units , separation of the mother from neonate, iatrogenic prematurity **(Wagner , 2000)**, laceration