Introduction

The single most important risk factor for postpartum maternal infection is cesarean delivery ***(Smaill and Gyte, 2010)***. Given the volume of procedures, post-operative infectious complications are a considerable concern. Using risk stratification, the National Nosocomial Infection Surveillance program found an incidence of post-cesarean surgical-site infections of 2.7% for women at lower risk for infection, 4.1% for those at higher risk, and 7.5% for those with the greatest number of risk factors for infection ***(Cardo et al., 2004)***.

Porphylactic use of antibiotics has been shown to be effective in reducing a variety of post-cesarean infection ***(Smaill and Gyte, 2010)***, as well as hospital costs ***(Chelmow et al., 2004)***. The American Congress of Obstetricians and Gynecologists issued a recommendation that all women receive antibiotics within 1 hour before incision for cesareran delivery ***(ACOG, 2009)***.

There may be concern regarding administration of antibiotics before cord clamping and unnecessary fetal exposure to antibiotics, as the transfer from maternal circulation to fetal circulation is rapid ***(Fiore et al., 2001)***. This exposure may theoretically mask infections and increase the need for sepsis evaluation in the neonate also; fetal exposure to antibiotics could lead to an increase in infection with drug-resistant organisms. These theoretical concerns have led some obstetricians to give prophylactic

antibiotics after cord clamping rather than before skin incision in an effort to protect the infant (but potentially increasing the risk of maternal infection). The efficacy and safety of administration of antibiotics after cord clamp has not been well studied. It remains unclear whether administering antibiotics after cord clamp is as effective as preincision antibiotic prophylaxis in reducing postoperative maternal infectious morbidity ***(Young et al., 2012)***.

The published data, however, did not support the hypothesis that antibiotic prophylaxis before skin incision conferred risks to the neonate. In addition, literature indicated that administering antibiotics before skin incision more effectively prevents postpartum surgical-site infection, including endometritis and cellulitis, following cesarean delivery than antibiotics administered after cord clamping ***(Sullivan et al., 2007; Costantine et al., 2008)***.

A Cochrane meta-analysis supported the use of surgical antibiotic prophylaxis, although it found inconclusive data to support antibiotic administration before skin incision. It commented that further studies should be performed evaluating theoretical adverse neonatal outcomes, such as oral thrush ***(Small and Gyte, 2010)***.

Which antibiotic to use has been the subject of ongoing debate; a first-generation cephalosporin and ampicillin have been found to be equally efficacious when used as single-dose regimens in the reduction of infectious morbidity in women undergoing cesarean delivery ***(Alfirevic et al., 2010)***.

A Cochrane meta-analysis found that an extended-spectrum regimen, including a first-generation cephalosporin plus metronidazole, is effective in reducing maternal infection after cesarean delivery, decreasing hospital stay, and is cost-effective ***(Betsy and Marya, 2012)***.

Research question:

In women undergoing CS, does injectable antibiotic prior to skin incision is superior than injectable antibiotic after cord clamping as regard wound infection.

In neonate, does injectable antibiotic after cord clamping is superior than injectable antibiotic perior two skin incision as regard evaluation of suspected sepsis.

Research hypothesis:

Null hypothesis: there is no difference between injectable antibiotic prior to skin incision and injectable antibiotic after cord clamping as regard wound infection and neonatal suspected sepsis.

Aim of the Work

This study aims to compare maternal and neonatal outcomes in women who receive prophylactic antibiotics (cephradine) prior to skin incision versus those who receive (cephradine) at cord clamping during cesarean section in Ain Shams University Maternity Hospital.

Primary objective:

- For wound infection, so the study discuss the effect of combined cephradine and metronidazole in elimination of post CS surgical site infections.

Secondary objectives:

- Endometritis.
- UTI.
- Pneumonia.
- Other excepted maternal infectious morbidities.
- Neonatal suspected sepsis.

So, the study discuss the effect of combined cephradine and metronidazole in elimination unwanted maternal and neonatal outcomes.

CESAREAN SECTION

Introduction:

Cesarean Section is the second most common surgical procedure in the United States. The safety of women undergoing surgical or obstetric procedures depends significantly on the competence, attentiveness, and experience of the peri-anesthesia nurse. It has been practised over centuries, but only relatively recently has it become such a safe procedure that women are requesting it be used to deliver their baby in the absence of any other indication. This has created much controversy amongst health professionals involved in childbirth and the public ***(DiBlasi, 2013).***

Unscheduled or emergent indications for CS include but are not limited to Fetal intolerance to labour, lack of progress of labour, umbilical cord prolapse, breech presentation, placenta previa, and placental abruption. Scheduled CS indications include factors such as elective repeat cesarean section, Fetal malpresentation, pelvic abnormalities, Fetal macrosomia, placenta previa, and more recently, maternal request ***(Tsai, 2011).***

History:

Numerous references to Cesarean section appear in ancient scripts. However, early history of this procedure is of dubious accuracy. Indeed, the commonly held belief that Julius Caesar himself was delivered this way is unlikely to be true. In many cultures, the removal of the fetus

abdominally had more religious significance than medical meaning as it was considered to be appropriate for the fetus to be buried separately from the mother ***(Simm and Ramoutar, 2005).***

The first cesarean was perimortem cesarean when a woman was dying in child birth. A Babylonian cuneiform tablet contains an apparent reference to a cesarean birth in 1772 BC ***(Lurie and Glezerman, 2003).***

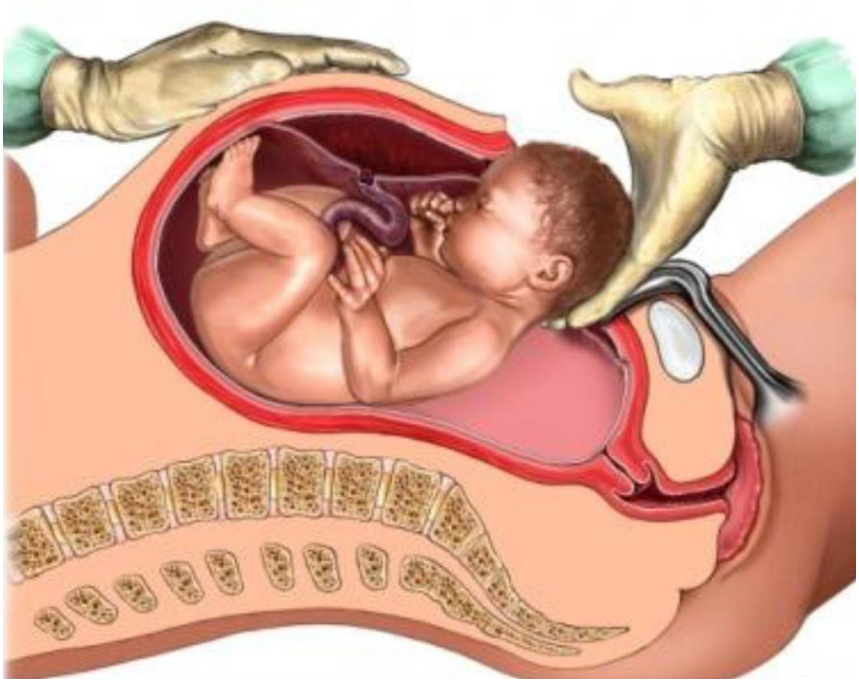

Fig. (1): C.S in diagram ***(Ford et al., 2000)***

In the eighth century BC law, Lex Regia, stated that a baby should be taken from a mother's womb if she dies before giving birth. The word cesarean is derived from the Latin verb "caedere," which means "to cut". "La section Caesarienne" was described but denounced in a midwife

text by Jacques Guillimeau in 1598. In 1879, a British physician in Uganda described the cesarean technique of Banyoro surgeons, which included banana wine for anesthesia and antisepsis, a red hot iron for thermocautery, suture of the abdominal wall and root paste for wound care. Aseptic technique was an important development in the safety of both vaginal and cesarean delivery. In 1882, Max Sanger emphasized the importance of suturing the uterus and introduced a silver suture which did not cause tissue reaction. The Pfannenstiel transverse skin incision was described in the early 1900s and first made popular when described by ***Kerr in 1926 (Lurie and Glezerman, 2003).***

Epidemiology:

Cesarean section is the most frequent major surgery performed in the United States with approximately 2 Cesareans started every minute. The US cesarean section rate for 2009 hit an all-time high of 32.9%. The rate increased every year from 1996 when the rate was 20.7% to 2009, however the preliminary 2010 cesarean rate demonstrated a slight decrease to 32.8% ***(Tsai, 2011).***

The World Health Organization recommended 15% as an ideal cesarean rate and US Healthy People 2020 goals have recommended decreasing the primary cesarean rate to 23.9%and increasing the vaginal birth after cesarean (VBAC) rate to 18.3%, although there is limited evidence to support specific goals ***(Jenks et al., 2014).***

A 2011 study extrapolating the effect of recent cesarean trends to the future found that "if primary and secondary cesarean rates continue to rise as they have in recent years, by 2020 the cesarean section rate will be 56.2%, and there will be an additional 6236 placenta previas, 4504 placenta accretas, and 130 maternal deaths annually. The rise in these complications will lag behind the rise in Cesareans by approximately 6 years" ***(Crusz et al., 2014).***

Classification:

Cesarean was classified as emergency (required because of an emergency situation such as Fetal distress or labour dystocia) or elective (carried out as a planned procedure before the onset of labour, or following the onset of labour when the decision had already been made before the onset of labour). The hospital has implemented policies to make cesarean section safer and to minimize postnatal complications. Weekly meetings are attended by medical and midwifery staff to audit labour and emergency Cesareans ***(O'Dwyer et al., 2012).***

C.S may be planned or unplanned. a) Planned / elective Cesarean: An elective Cesarean (sometimes called a 'cold section' in medical jargon) is carried out before labour begins. Cesarean sections are planned when a known medical problem would make labour dangerous for the mother or baby. b) Unplanned/Emergency Cesarean: An emergency Cesarean is one that is carried out as a result of some complication arising during labour ***(Thapa et al., 2012).***

Classifying cesarean section into "emergency" and "elective" is no longer common practice as it does not convey the degree of urgency. The "emergency" category is too broad as it may include procedures done within minutes to save the life of mother or baby, as those in which no immediate danger is anticipated ***(Thapa et al., 2012)***.

Table (1): New classification of urgency

Grade	Grade- definition	Equivalent "old" term	Time to section
1	Immediate risk to mother or fetus	Crash section	15 minutes
2	Maternal or Fetal compromise	Emergency	30 minutes
3	No compromise but needs early delivery	"Semi-elective"	Same day
4	Delivery timed to suit woman or staff	Elective	Unspecified

(Karkee et al., 2014).

The generally accepted standard in cases of serious maternal or fetal compromise is that decision-to- delivery interval (DDI) time by cesarean section should be within 30min. However, there is no conclusive evidence to show that minutes improved ***(Bonney and Myers, 2010).***

INDICATIONS

Maternal-Fetal:

- Failure to progress in labour (30%).
- Arrest of descent
- Arrest of dilation
- Failed forceps
- Placenta abruption
- Placenta previa
- Conjoined twins
- Perimortem

Fetal:

- Non-reassuring Fetal heart pattern (10%)
- Very low birth weight (< 2500 g)
- Malpresentation (11%):
  - Transverse lie/arrest
  - Breech (if vaginal criteria not met)
  - Brow
  - Face – mentum posterior
  - Cord prolapse
  - Congenital anomalies

Maternal:

- Repeat cesarean section (30%)
- Human immunodeficiency virus (viral load dependent)
- Active herpes virus
- Immune Thrombocytopenic Purpura (ITP)
- Contracted pelvis, e.g., congenital, fracture
- Obstructive tumors
- Abdominal cerclage
- Reconstructive vaginal surgery, e.g., fistula repair
- Medical conditions, e.g., cardiac, pulmonary, thrombo-cytopenia, HELLP

(Murphy et al., 2012)

Contributing Factors to Primary Cesarean:

Brown (2012) examined indications contributing to the increasing cesarean section rate from 32, 443 live births at a major academic hospital between 2003 and 2009. A 50% of the increase was attributed to primary Cesarean, with the leading indications being non-reassuring Fetal heart tracing (32%), arrest of labour (18%), multiple gestation (16%), preeclampsia (10%), macrosomia (10%), elective (8%), maternal Fetal (5%), and obstetrical (1%). There was also a difference in cesarean rates between patients managed at private, university, and high-risk services. The cesarean rate for private patients was 33.2% compared with a rate for university patients of 25.6%, and the "high-risk" cesarean rate was 44.6%.

Indications:

Grade 1: Immediate risk to mother or fetus, e.g:

- Fetal pH <7.2
- Cord prolapse
- Uterine rupture

Grade 2: Maternal or Fetal compromise, e.g:

- Failure to progress.
- Anteparum hemorrhage
- Suspected "Fetal distress" without Fetal blood sample

Grade 3: No compromise but needs early delivery, e.g:

- Pre-labour SROM in woman booked for elective CS.
- Early labour in woman booked for elective LSCS
- Failure to progress with no evidence compromise
- Some cases of PET
- Poorly controlled diabetes with retinopathy of pregnancy or minor abnormalities on CTG
- Failure of induction for post term pregnancy (induction indicated at term plus12 days)

Grade 4: Delivery timed to suit woman or staff

- Previous two sections
- Previous section one section and declines "trial of scar "
- Placenta previa.
- Breech presentation
- Twin pregnancy with first fetus breech
- HIV – reduces vertical transmission
- Third trimester primary herpes simplex
- Tocophobia despite counselling (fear of labour)
- CS without medical indication (controversial)

(Khanem et al., 2012)

Several labour management practices are associated with an increased cesarean section rate, including, but not

limited to, early admission, diagnosis of the active phase of labour at 3-4 cm dilatation, and continuous electronic Fetal monitoring. In contrast, midwifery management and continuous support during labour are associated with lower cesarean section rates in both observational and randomized controlled trials (RCTs) ***(Adriaensens et al., 2013).***

One of the most prevalent indications for primary cesarean section is 'non-progressive' labour, despite lack of association between relatively prolonged labour without indications of Fetal distress and detrimental health outcomes. Intervention in such cases may be a consequence of misunderstanding physiology and the perception of Western, technological medicine as offering control over 'unpredictable' natural processes. Ingrained biases arising from discriminatory terminology such as 'failed' labour may contribute to the ways in which both health professionals and women approach childbirth ***(King, 2012).***

Combinations of indications for cesarean delivery. In 37.1% of the cases, more than one indication was reported. The most frequent combinations between the first and second choice were:

1- Fetal stress was reported to be the prime reason; the most frequent reported second reasons were failure to progress (15.1%), intrauterine growth restriction (7.1%), and preeclampsia (4.4%).

2- Failure to progress as first choice was associated with Fetal stress in 12.8%, previous cesarean section in 7.5%, and failed induction in 3.5%.

3- Previous cesarean section as first choice was associated with failure to progress in 10.4%.

4- Maternal request as first choice was associated with previous cesarean section in 12.8%.

5- Preeclampsia and failed induction were the most frequent combination of indications, regardless of which one was the first (10.5% and 12.5%, respectively).

(French et al., 2002)

Surgical Techniques for Cesarean Section

Preparation:

It is good practice that the operator should have full knowledge of the patient's history especially in relation to any previous surgery. A hemoglobin assessment should be performed before C.S to identify those who have anemia. Although blood loss of more that 1000ml is infrequent it is a potentially serious complication. NICE suggest that grouping and saving of serum, cross-matching of blood or performing a clotting screen is not necessary. The mother is usually given H_2 receptor antagonists or a proton pump inhibitor pre-operatively to reduce the gastric acid content in case of the need for a general anesthesia. A previous C.S increases the risk of placenta previa and accreta in subsequent pregnancies. It is essential to identity the location of the placenta prior to any C.S. Prophylactic antibiotics have been shown to substantially reduce the incidence of maternal fever, endometritis, wound infection and serious infection morbidity in women who undergo C.S. Both ampicillin and first generation cephalosporin's have similar efficacy and one is usually administered after clamping of the umbilical cord ***(Bonney and Myers, 2010).***