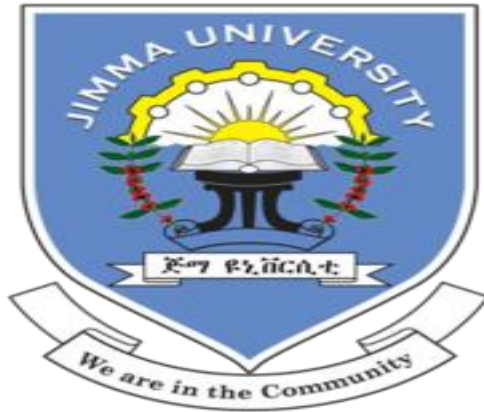**DECISION TO DELIVERY INTERVAL IN EMERGENCY CAESAREAN SECTION AND ITS EFFECT ON FETUS OUTCOMES, JIMMA MEDICAL CENTER, SOUTHWEST ETHIOPIA**



*JIMMA UNIVERSITY*

*INSTITUTE OF HEALTH SCIENCES*

**DEPARTMENT OF OBSTETRICS AND GYNECOLOGY**

**A THESIS TO SUBMITTED TO JIMMA UNIVERSITY, DEPARTMENT OF OBSTETRICS AND GYNAECOLOGY AS PARTIAL FULFILLMENT FOR SPECIALTY CERTIFICATE IN OBSTETRICS AND GYNECOLOGY**

**PRINCIPAL INVESTIGATOR: JOK MONYCHOL (MD)**

**OCTOBER 2021**

**JIMMA, ETHIOPIA**

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# Abstract

**Background:** Emergency cesarean section is a vital part of global maternal health care and the modern evidence point out that the goal of the World Health Organization for secure access and quality of care for pregnant women and newborns in Africa has not yet been achieve. This study was aimed to determine the average DDI for an emergency caesarean section in pregnant women and its effect on fetal outcomes, at JMC- Jimma, Southwest Ethiopia.

**Method:** A prospective observational cohort study was conducted from May first to October 20th 2021 at Jimma Medical Center Obs & Gyn department, Jimma University. A total of 360 clients who were undergone emergency caesarean section were included in this study. Statistical analysis was performed using electronic Kobo collect structured questionnaire then transferred in to SPSS version 26. Bivariate and multivariate logistic regression and crosstabs with a 95% confidence interval was used to determine the association of decision to delivery time interval with predictor variables and fetal outcomes.

**Results:** Only 2.8% of women had a decision to delivery time interval below 30 min. The mean decision to the delivery time for emergency caesarean section in our study was 40± SD 5.7 min. This study showed that the time from decision to transfer patient to OT [AOR=3.85,95%CI=2.7-21.3], time taken to give anesthesia, Skin incision to delivery [AOR=17.3,95%CI =3.7-80.7], cervical dilatation [AOR=12,95%CI=1.4-105] were statistically significant predictors for DDI. In our study we found that the predictors for NICU admission were; type of newborn resuscitation, duration of labor, duration rupture of membranes and skin incision to delivery were statistically had significant influence on fetal admission in to NICU P<0.05. DDI influence on fetal outcomes in emergency caesarean section was not significant with P value; >0.05.

**Conclusion:** Delivery was not achieved within the recommended time interval in the majority of emergency caesarean sections. DDI for emergency caesarean section has not revealed a statistically significant influence on fetal outcomes.

**Recommendation**: To JMC and department of Obstetrics and Gynecology to have audit cycles to assess the gap of delaying DDI and create strategies to address factor associated with DDI delays.

Keywords: Emergency Caesarean section, Decision to delivery interval, fetal outcomes.

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## ACRONYMS AND ABBREVIATIONS

# CHAPTER ONE: INTRODUCTION

## 1.1.BACKGROUND

Cesarean section (CS) was introduced in clinical practice as a lifesaving procedure both for the mother and the fetus(1).

In 1985, under specific recommendation of World health organization (Who) 1985, stated that; there is no justification for any region to have a rate higher of cesarean section than 10-15%(2).

Emergency caesarean section play a main role in obstetrics care particularly when the delivery can lessen the risk to the life of the mother or fetus(3). It is a vital part of global maternal health care and the modern evidence point out that the goal of the World Health Organization (WHO) for secure access and quality of care for pregnant women and newborns in Africa has not yet been achieve(4).

In keeping with the recommendations of the National Confidential Enquiry into Patient Outcome and Death (NCEPOD), a four-step classification system for the urgency of caesarean sections has been adopted in many UK obstetric units and many countries, which are as follow grade 1 caesareans are performed when there is an immediate threat to the life of the woman or fetus, grade 2 when there is evidence of maternal or fetal compromise which is not immediately life threatening, and grade 3 when there is no maternal or fetal concern but early delivery is required. Grade 4 caesareans are elective cases(5). The American College of Obstetricians and Gynecologists committee on professional standards declared in 1989 that hospitals with obstetric services should have the capacity to begin a cesarean delivery within 30 min of the time that the decision is made to perform the procedure(6).

The latest RCOG and National Institute for Health and Clinical Excellence (NICE guideline has commended that category 1 (immediate threat to the life of the woman or fetus) and category 2 (maternal or fetal compromise that is not immediately life-threatening) caesarean sections should be carried out within 30 minutes and 75 minutes after the decision, respectively(7).

But in actual clinical practice, 30-minute success rates of roughly 40–65% were reported from studies in developed countries, while an extreme lower success rate of 0–20% was reported from developing countries(7).

Several factors have been identified to contribute to the inability to achieve delivery within 30minutes of taking decision and these reasons which attributed to prolongation of the DDI include delay in giving consent by patients and relatives, inadequate staff strength and poor staff training, lack of appropriate/adequate facilities, type of anesthesia, laboratory delay, lack of harmonious working relationship between different disciplines involved and poor financial standing of patient(8). Another some of the major factors which negatively influence this 30 minutes' target of "Decision to Delivery Interval" (DDI) are Increase in patients' load leading to a long waiting list for surgery and transportation delay while shifting the patient from labor rooms to operation theatre(9).

Non-reassuring fetal status (NRFS) also known as fetal distress is among the main indications for caesarean delivery in obstetrics. Once identified, it has been encouraged that delivery should be expedited as fast as possible to reduce the duration of in-utero fetal hypoxia(7) Auditable usual of delivering fetuses within 30 minutes after a diagnosis of fetal distress remains one of the most controversial issues in obstetrics(10).

As per the International Classification of Diseases, acute fetal distress was defined as an abnormal fetal heart rate pattern on cardiotocography (CTG) such as persistent bradycardia, late decelerations, complicated tachycardia or persistent poor variability either with or without the presence of meconium-stained amniotic fluid(11).Antenatal care (ANC) and good communication among health care providers are vital for better maternal and fetal outcome during  emergency C/S delivery(12).

 Intrapartum fetal heart monitoring, by intermittent fetal heart monitoring or continuous electronic cardiotocography (CTG) tracing are the only methods to diagnose NRFS during labor(13). Besides bradycardia and tachycardia , lack of variability, flat/smooth fetal heart rate (FHR) baseline and decelerations are also suggestive of hypoxic injury.3 Meconium stained liquor (MSL) may also indicate fetal distress in 12 -16% of primigravida(13).

In most centers in sub-Saharan Africa, intra-partum assessment of fetal condition is based on intermittent counting of the fetal heart rate (FHR) and checking for the presence of meconium-stained liquor with the assumption that an abnormal FHR pattern, especially in the presence of meconium -stained liquor, signifies fetal hypoxia and acidosis(14).

In Ethiopia, in general, the institutional rate of CS was 18%, which varied between 46% in the private sector and 15% in the public sector(15). Non-reassuring fetal heart rate patterns, cephalopelvic disproportion, and obstructed labor are the most common indication of Caesarean section. Low Apgar score, perinatal asphyxia and neonatal sepsis are the most common complication of neonates(16).

Factors within labor are complex but processes such as uteroplacental vascular disease, reduced uterine perfusion, fetal sepsis, reduced fetal reserves and cord compression can be involved alone or in combination. Gestational and antepartum factors can modify the fetal response to them(17). DDI if pushed over 75 min a significant maternal and neonatal morbidities and mortalities are likely to occur(18).

## 1.2: STATEMENT OF THE PROBLEM

Multiple studies have highlighted difficulties in achieving the proposed standards DDI of 30minutes(19).

In the United Kingdom, the department of health has allocated £1.5bn ($2.7bn; €2.3bn) to cover obstetric care process and to help improve intrapartum fetal care and the National Institute for Clinical Excellence clinical guideline on electronic fetal monitoring recommends that "in cases of suspected or confirmed acute fetal compromise, delivery should be accomplished as soon as possible(20).

Due to overloaded and fragile health systems that characterize low income countries every so often mean the DDI is overextended to 75 min without any major morbidities, however if the DDI if pushed over 75 min a significant maternal and neonatal morbidities and mortalities are likely to occur(20). In India study shows that DDI of 30 minutes is difficult to achieve even for urgent caesarean sections in government based set up of a developing nation(9).

In a retrospective study done in Sagamu Nigeria stated that; the decision-delivery interval of 30minutes is difficult to achieve in low resource settings; even in the face of emergency, due to prevailing factors which include poor human capital development, poor standard of living, bad attitude of health workers and infrastructural challenges(8).

In study done at UOGCSH for category-1 emergency C/S Only 19.6% of women were delivered within the recommended DDI below 30 min. Time taken to collect materials, time taken for client preparation and transfer to the Operation Theater and time taken to deliver anesthesia were associated with prolonged DDI(12).

Intrapartum-associated hypoxia (birth asphyxia) is the third leading cause of neonatal mortality worldwide. Worldwide, there were an estimated 2.9 million newborn deaths in 2012, and 1.3 million fresh stillbirths, representing an intrapartum demise. A comparable number of long-term survivors suffer disabilities as a result of intrapartum-associated hypoxia. Almost all these survivors are from low-resource settings(21). In various low and medium human development indexes (LM-HDI nations, the rate of maternal and neonatal morbidity and mortality is high. Preventing adverse perinatal outcomes is often critically time dependent, however, the mandate can go beyond the ability for rapid intervention in these settings wall. Although global initiatives are in progress, there is still significant difficulty in increasing obstetrics resource availability in LM-HDI settings(22).

99% of the perinatal death deaths occur in low and middle-income countries especially in sub-Saharan Africa, the region with the highest MMR, the perinatal mortality rate is 56/ 1,000 births. In 2006 the PMR estimated by WHO was 57/1000 total births with about 2:1 ENNDs to stillbirths ratio and 46/1000 total births (23).

In a retrospective study done in Sagamu Nigeria has showed that perinatal mortality rate among prolonged DDI was 7.3%(8).

A retrospective cohort study done in Uganda have revealed that the risk of adverse perinatal outcomes is linked with service delivery factors such as obstetric staff working patterns. This has been studied widely in well-resourced countries and so there is a need to investigate the variable patterns of service provision in low and medium human development index obstetric settings(22).

With a rate of 33 per 1000 births, Ethiopia has the highest level of perinatal mortality in the world(24).

In a community-based longitudinal study, which was conducted in Southwest Ethiopia by the Department of Population and Family Health, Faculty of Public Health, Institute of Health, Jimma University Jimma, among 3474 pregnant women to estimate the magnitude of perinatal mortality using case-control study among 120 cases and 360 controls was conducted to identify the determinants of perinatal mortality. The perinatal mortality rate was 34.5 deaths per 1000 birth which was high as compared to the national target for 2020(25).

The general objective of this study is to determine the decision to the delivery time interval, its effect on fetal outcomes in women undergoing emergency caesarean section at Jimma Medical Center.

## 1.3. Justification of the Study

Jimma Medical Center has no information on locally adjusted evidence-based DDI and its effects on maternal and fetal outcomes for women undergoing emergency caesarean section for various indications to guide the recommendations or protocols for an optimal decision to the delivery time interval and appropriate categorization of emergency cesarean sections according to their clinical definitions and urgency.

There is limited data on this study in Ethiopia at large with only one study done at UOGCSH which shows Only 19.6% of women were delivered within the recommended DDI below 30 min(12). This study is designed to determine the average time interval between decision and delivery of the baby by Emergency CS, to document fetal outcomes as well as recommend an optimum, realistic and, achievable time frame within which caesarean sections should be conducted after a decision has been made for emergency caesarean section.

**CHAPTER TWO: LITERATURE REVIEW**

In a national cross sectional done by Thomas`s has revealed that a decision to delivery interval of 30 minutes is not an absolute threshold for influencing baby outcome. But decision to delivery intervals of more than 75 minutes are associated with poorer maternal and baby outcomes and should be avoided(20).

In a paper published by Northwick Park Hospital, UK  stated; the principle aim of the 30-min DDI is to reduce neonatal hypoxic ischaemic morbidity and mortality and evidence suggests that 90% of all cases of cerebral palsy cannot be attributed to intrapartum events and that even in the remaining 10% of cases, it is not clear whether the signs of hypoxia identified during the intrapartum period were associated with intrapartum or antenatal events, but it remains vital for the labor ward team to strive to minimize the effect of intrapartum events on short- and long-term neonatal outcomes(3).

In study done in Delhi, India showed that DDI of 30 minutes is difficult to achieve even for urgent caesarean sections in government based set up of a developing nation, therefore a more reasonable time frame of 60-75 min may be justified for emergency caesarean sections under similar set up(9). In another retrospective cohort study done in Singapore has shown that crash' CS protocol achieved 100% of deliveries within 30 min. The majority (88.9%) of the patients had GA for category-one CS. GA was found to be associated with shorter anesthesia and operation times, but poorer perinatal outcomes compared to RA(26). In another study done in Bangkok, Thailand only 3.5% of emergency cesarean delivery had a DDI ≤30 minutes (median 82 minutes). Significant shorter time intervals were observed in those with non-reassuring FHR during after office hours(27).

In a repeated cross sectional done in Oman where in the initial cycle, a DDI of ≤30 minutes was achieved in 23.8% of 84 cases in comparison to 44.6% of 83 cases in the second cycle. In the third cycle, 60.8% of 79 women had a DDI of ≤30 minutes (P <0.001). No significant differences in perinatal outcomes for cases with a DDI of ≤30 minutes versus 31–60 minutes were observed; however, a DDI of >60 minutes was significantly associated with poor neonatal outcomes in

terms of increased SCBU admissions and low Apgar scores concluded that the identification of factors causing DDI delays may provide opportunities to improve perinatal outcomes(11).

In a cross sectional study done in Tanzania revealed that a contrary to the recommended DDI by ACOG & AAP of 30 min is not feasible in their setting, time frame of 75 min could be acceptable but clinical judgment is required to assess on the urgency of caesarean section in order to prevent maternal and neonatal morbidity and mortality(18).

In retrospective done in Southern Gondar zone hospitals concluded that Only 17.5% of parturient attained a decision-to-delivery interval ≤30 minutes(28).

## 2.1. FACTORS INFULENCE   THE DECISION TO DELIVERY INTERVAL TIME

In prospective audit of clinical practice carried out on the delivery suite of a tertiary referral in UK which focuses on grade 1 and 2 procedures, they have found that for both grade 1 and grade 2 caesareans, delivery is most likely to be achieved within 30 minutes if the complement of qualified midwives on a delivery suite is sufficient to allow one-to one care to be provided to women in active labor and provision of anesthesia; time span from arrival in theatre to commencement of the operation and then delivery of the baby. For women having a grade 1 caesarean, the mean time span from arrival in theatre to the start of the operation was 19.1 minutes (SD 9.6) but this time varied with the form of anesthesia employed. The time taken from skin incision to the delivery of the baby was 3.3 minutes (SD 1.9) for grade 1 caesareans and 4.7 minutes (SD 3.1) for grade 2 caesareans, giving an average saving of 1 minute and 24 seconds for the more urgent procedures(5).

In another prospective study done in India, they were capable to attain the international standard DDI of 30 min in all category-1 CS deliveries. The patient transfer was the main paying factor for DDI. Among the parturients who arrived in the OT with epidural catheters in situ, 25.6% of them had an effective extension of the epidural block. Compared to regional anesthetic techniques, GA was found to be linked with shorter anesthesia and operation times (26).

In study conducted in the Department of Obstetrics & Gynecology at UCMS and GTB Hospital, of 275 emergency caesarean section and results shows the major cause of delay was non

availability of operation theatres due to long list of waiting caesareans sections. When the mean DDI exceeded 75 minutes, there was a 4.6 fold increase in the risk to the life of neonate while the maternal outcome was not significantly affected(17).

The result of a cross-sectional retrospective study done at Siriraj Hospital, Mahidol University, Bangkok, Thailand shows that only 6.6% of women with non-reassuring FHR achieved the 30minute goal for caesarean delivery (median 56 minutes) where the better performance was observed among patients in FHR category 3 regardless of diagnosis time, with 41.2% of these patients having a DDI of <30 minutes. This was similar to the studies that reported that the achievement of a 30-minute DDI goal was often impracticable in Africa(7)

A study done in tertiary care hospitals in Thailand concluded that Median decision-to-operating room interval, decision-to-incision interval, and DDIs were 45, 70, and 82 minutes, respectively. Only 3.5% of patients had DDI ≤30 minutes, while 52.0% had DDI >75 minutes. During after office hours, every time interval was significantly shorter and 4.9% had DDI ≤30 minutes compared to 0.7% in normal office hours (P=0.001). Compared to other indications, time intervals were significantly shorter in those with non-reassuring fetal heart rate (FHR), and DDI ≤30 minutes was achieved in 18.8% vs. 0.8% (10).

The repeated cross-sectional study done in Oman revealed that, factors causing DDI delays included obtaining consent for the CS procedure, a lack of operating theatre availability and moving patients to the operating theatre. And conclusion it was the identification of factors causing DDI delays may provide opportunities to improve perinatal outcomes(11).

In study done in Nigeria has shown that main factors which adversely influence this 30 minutes' target of "Decision to Delivery Interval" (DDI) are: Increase in patients' load leading to a long waiting list for surgery, limited number of operation theatres, limited surgical staff including surgeons, anesthetists, scrub nurses and theatre technical staff in emergency hours lack of coordination among above teams and transportation delay while shifting the patient from labor rooms to operation theatre(3).

A cross sectional study done in one referral hospital in northern Tanzania shows that the delivery decision interval for caesarean section at KCMC is 60 min, which is longer than the recommended standard interval. The DDI was influenced by the decision to anesthesia time, anesthesia to delivery of baby, prolonged labor and hypertension disorders. A time frame of 75 min can be acceptable after triage and the need for urgency have been evaluated(18).

A prospective observational cohort study was done at the University of Gondar Comprehensive Specialized Hospital, which concluded that time used to gather materials, time used for client preparation and relocation to the Operation Theater and time used to provide anesthesia was related to prolonged DDI(12).

## 2.2. EFFECT OF DDI ON FETAL OUTCOMES DURING EMERGENCY CS

In a prospective cohort study done in teaching hospital in UK has suggested that clinical triage is effective, with the more compromised fetus delivered more rapidly using general anesthesia. For Category 1 deliveries a 30 min target DDI is appropriate, although those born after longer DDI did not show developmental impairment. For Category 2 caesarean sections performed for acute fetal distress or concerns, failed instrumental delivery, failure to progress or placental bleeding, a 75 min DDI may be an appropriate target but did not protect against acidosis, asphyxia or developmental impairment. Longer DDIs did not result in unfavorable outcomes for other Category 2 indication(19). Retrospective cohort study done in France has stated that; the decision-to-delivery interval was not an independent risk factor of Apgar score < 7 at 5 minutes. This result is not fully surprising, since decision-to-delivery intervals were ≤ 15 min in almost all women, but in their study they have concluded that general anesthesia was independently associated with worse neonatal outcomes(29). Also the above study was comparable with retrospective cohort study done in Singapore that showed crash' CS protocol achieved 100% of deliveries within 30 min. The majority (88.9%) of the patients had GA for category-one CS. GA was found to be associated with shorter anesthesia and operation times, but poorer perinatal outcomes compared to RA(26). Also the same result was shown by prospective study done in India that concluded GA for category 1 CS was associated with increased incidence of adverse neonatal outcome(30).

In repeated cross sectional study done in Oman has concluded that the identification of factors causing DDI delays may provide opportunities to improve perinatal outcomes(11).In cross sectional study done in teaching hospital, Lusaka Zambia concluded that general anesthesia and delay from decision to delivery by caesarean were important determinants of poor fetal outcome in caesarean section done for fetal distress(17).

In retrospective cross sectional study done in Tanzania their results showed that; there was no significant association between DDI and neonatal transfer,1st and 5thminute Apgar score, but they have concluded that me frame of 75 min could be acceptable but clinical judgment is required to assess on the urgency of caesarean section in order to prevent maternal and neonatal morbidity and mortality(18).

In another retrospective cohort study done in Uganda their results showed that there was no association between decision-to-delivery interval and adverse perinatal outcomes, but concluded that decisions and deliveries made at night carrying a higher risk of adverse perinatal outcomes. This suggests a need for targeting the improvement of service provision overnight(22).

In prospective observational study done at the Gondar specialized hospital has revealed that the average decision to delivery time interval was longer than the recommended time but it did not affect feto-maternal outcomes(12).

## 2.2 Conceptual Frame Work
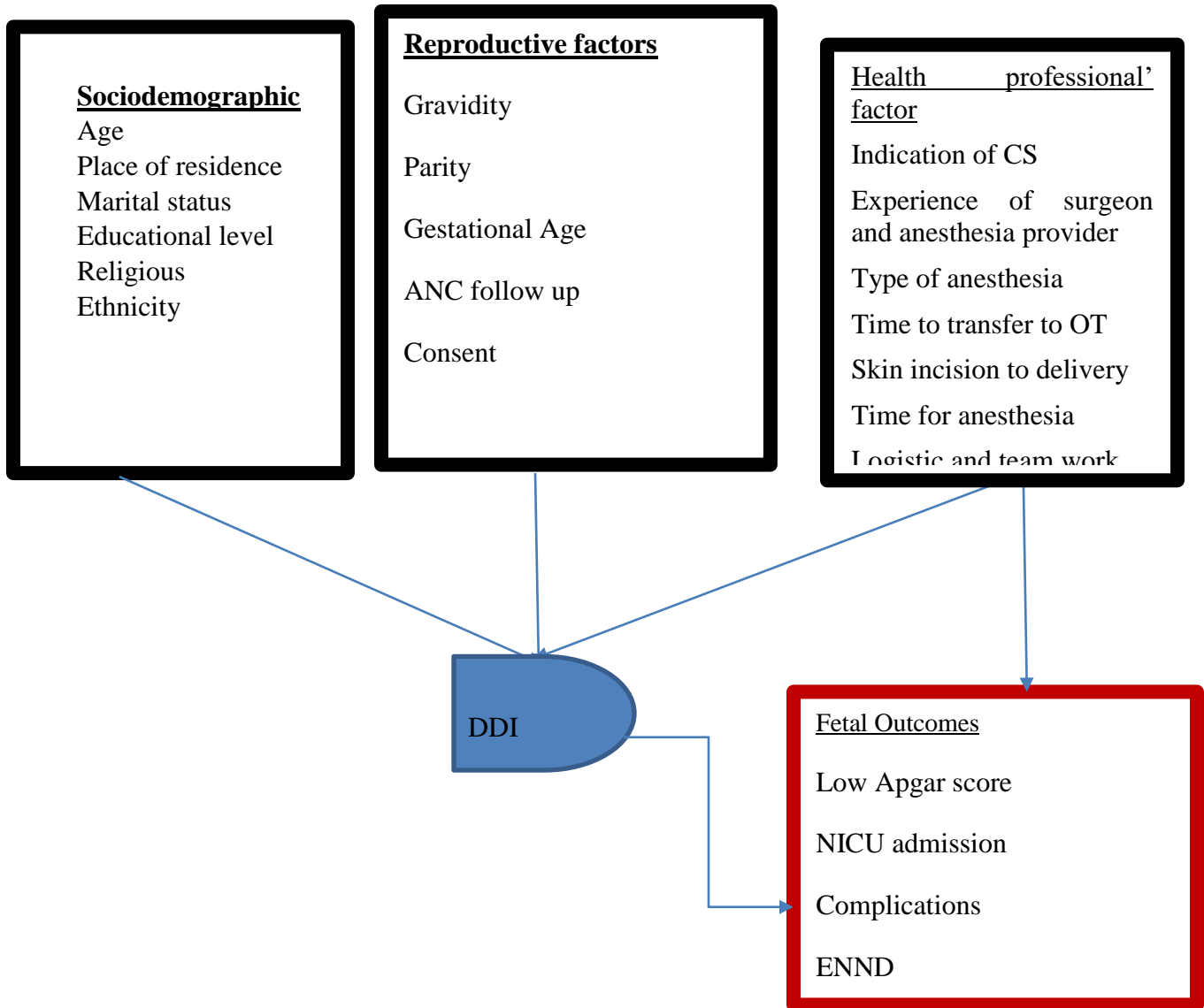


Figure I: **conceptual framework of the decision to the delivery time and fetal outcome adapted and modified from different scientific paper.**(12)

# CHAPTER THREE: OBJECTIVES OF THE STUDY

## 3.1 General objective.

To determine the average decision to delivery time interval for an emergency caesarean section in pregnant women and its effect on fetal outcomes, at JMC- Jimma, Southwest Ethiopia 2021.

## 3.2 Specific Objectives:

1. To determine the average DDI in Emergency CS.
2. To determine factors affecting the DDI in Emergency CS.
3. To determine fetal outcomes in relation to DDI in Emergency CS.

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# CHAPTER FOUR: METHODS

## 4.1 Study area

This study was conducted in Jimma Medical Center, one of the oldest public hospitals in the country. It's located in Jimma town of Oromia Regional State, Ethiopia. It is located 357 km away from the capital Addis Ababa and it is the only specialized teaching and referral hospital in the southwestern part of the country. The hospital has a largely rural catchment population of 15 million people for tertiary level care. The medical center serves both undergraduate and postgraduate studies in different departments under the Institute of Health, Jimma University. Department of Obstetrics and Gynecology is one of the departments having service delivery units of GYN OPD, ANC clinic, labor and delivery unit, maternity ward, and gynecology ward. Nurses, midwives, medical interns, residents, and senior are working at each unit. The study was conducted at the labor ward theatre room and maternity ward and NICU.

## 4.2 Study period

The study was conducted from May 2021 to 20th October 2021 for five and half consecutive months.

## 4.3 Study design

A prospective observational cohort study was conducted.

## 4.4 Population

### 4.4.1 Source population

All pregnant mothers who underwent C/S at JMC

### 4.4.2 Study population

Women with a singleton pregnancy who underwent emergency cesarean sections under both general and regional anesthesia at JMC during the study period.

**4.4.2.1 Inclusion and Exclusion criteria**

**Inclusion criteria**

All women with a singleton term pregnancy who underwent emergency C/S delivery under both general and regional anesthesia were included.

**Exclusion criteria**

All women underwent emergency C/S with preterm pregnancy, twins pregnancy, OL, fetal with gross congenital anomaly and those with not in a condition to give consent will be excluded.

4.5 Sample Size and Sampling Procedure

**4.5.1 Sample Size**

The sample size is by taking the DDI of <30minutes of 38.6% of emergency C/ S in study done in Rwanda with the assumptions of single population proportion at 5% margin of error, and at 95% of confidence interval(31). So, it was calculated as:

$$\frac{Z\alpha^2 \times_p (1-_p)}{(d)^2} = n$$

$$\frac{1.96^2 \times 0.386(1-0.386)}{(0.05)^2} = 364$$

Where;

n = the required sample size

p = the proportion of DDI of <30minutes of emergency C/ S (38.6%)

Zα/2 = the critical value at 95% confidence level of certainty (1.96)

d = the margin of error between the sample and the population (5%).

A total of 396 women will be sampled for the study after adjustment of 10% nonresponse rate.

**4.5.2 SAMPLING PROCEDURE**

All study populations coming to the study area during the study period were selected consecutively until the sample size is achieved.

4.6 Study variables

4.6.1 **Dependent variables**

Time of decision to delivery interval (DDI) and fetal outcomes are dependent variables.

4.6.**2 Independent variables**

Independent variables includes

**Sociodemographic:** Age, place of residence, marital status, educational level, religious & ethnicity.

**Reproductive factors;** gravidity, parity, gestational age, ANC follow up, consent. Refer status of the mother

**Health professionals factors;** Indication of CS, experience of surgeon and anesthesia providers type of anesthesia, time to transfer to OT, skin incision to delivery, time for anesthesia, logistic and team work.

**4.7 Data collection tool and structured technique**

The data collection method was done through face to face interviews by scrub nurses using structured questionnaire on Kobo tool collect. Socio-demographic variables, the time of the decision of C/ S, time of OT transfer, time taken to deliver anesthesia, the total time taken from decision to delivery of the fetus and the time of anesthesia team information was collected from patients' chart and direct observation. The time of decision for emergency C/S was recorded at the time the surgeon decided to do a caesarean section. Subsequently the time of transfer to the operation theatre, type of anesthesia, time taken for administration of anesthesia and time taken

for the operation. Neonatal outcomes were evaluated at the 1st and 5th minutes by using the Apgar score, need of intubation, cardiopulmonary resuscitation, need of admission to neonatal intensive care unit (NICU) and neonatal death. All admitted neonates to NICU were followed until the early neonatal period or discharged.

## 4.8 Data processing and analysis plan

All data were electronically captured on-site and uploaded daily to the kobo server database using Kobo toolbox version 1.25.1 (kobotoolbox.org). Database content was checked for missing answers, duplications, and inconsistencies. Then data were then exported to SPSS 26 version for further analysis.

Categorical variables were presented in frequency and percentage. Continuous variables were presented in mean ± SD or median (IQR) according to the results of the Shapiro-Wilk normality test. Descriptive statistics like frequency, proportion, mean, and median of variables were used for reporting the descriptive results. A reliability estimate was conducted and Cronbach's alpha was 0.715 for measurement tools. Hosmer and Lemeshow goodness of fit test and variance inflation factor were done to check model fitness and problem of multicollinearity.

Bivariate and multivariate binary logistic regression analyses were carried out to identify predictors. The strength of the association was assessed using odds ratio and 95% confidence intervals. All the variables having a p-value less than 0.25 was considered as the final multivariable binary logistic regression model. Finally, the results were presented in tables, figures, and...

## 4.9 Data Quality Assurances

To maintain the data quality, training was given to the data collectors and supervisors on the methods, especially study population, sampling, data collection approach and tool, before data collection commences.

The questionnaire was first prepared in English, translated into the local language (Afanoromo and Amharic), and then translated back to English to check the consistency of translation. The questionnaire was pretested in 5 percent of the sample size before the beginning of the main research at Agro general hospital. Each filled questionnaire was checked for completeness onsite by the supervisor.

4.10 Ethical consideration

A formal letter of approval for this study was obtained from the Ethical Review Board(IRB) of the institute of health. Information was obtained from the medical charts of the patients and neonatal charts at the NICU. Privacy and confidentiality of collected information were kept.

**4.11 Operational and term definitions**

**The decision to a delivery time interval;** is the timeline between a decision being made and the delivery of the baby(32).

**Transfer time:** the time taken from decision for C/S to arrival in the operation theatre(33)

**Anesthesia time:** the time taken from transfer and immediate start of anesthesia to skin incision(33).

**Operation time:** the time taken from skin incision to delivery of the fetus(34).

**Emergency Caesarean Section: Is** defined as when surgical delivery is performed in situations that are extremely life-threatening for the mother or fetus or both(35).

**Non-reassuring fetal heart rate patterns:** defined as an abnormal fetal heart rate pattern on cardiotocography (CTG) such as persistent bradycardia, late decelerations, complicated tachycardia or persistent poor variability either with or without the presence of meconium-stained amniotic fluid(11).

> **DDI**: The time from a decision of C/S to fetal delivery(36).

**Perinatal outcome:** neonatal mortality and morbidity or birth without complications(12).

**CHAPTER FIVE: RESULT**

**5.1 Maternal socio-demographic characteristics**

The eighty nine percentages was response rate.

A total of 360 participants were enrolled in the study and with mean age of the participants was 25.9(±4.74 years) and majority 132 (39.4%) age ranges 25_29 years. All participants were married and 305(84.7%) more than two third were housewives, 51(14.2%) government employed and 4(1.1%) daily labors, merchants and own businesses.

251 (69.7%) two third were urban. In the term of educational background 128(35.6%) were primary school. Most of the particpants 215(59.7%) were Muslim, 24.2% followed by the Orthodox. 164(45.6%) mother were referred from different health facilities. Table1.

Table 1: Maternal socio-demographic characteristics at Jimma Medical Centre, Southwest Ethiopia, October 2021.

| Variables | Categories | Frequency | Percentage |
|---|---|---|---|
| Age category | < 20 years | 18 | 5% |
| | 20_24 years | 125 | 34.7% |
| | 25_29 years | 142 | 39.4% |
| | 30_34 years | 48 | 13.3% |
| | 35_39 years | 22 | 6.1% |
| | ≥ 40 years | 5 | 1.4% |
| Marital status | Married | 360 | 100% |
| Occupation | House wife | 305 | 84.7% |
| | Government/private employee | 51 | 14.2% |
| | Others | 4 | 1.1% |
| Educational status | Can't read and write | 37 | 10.3% |
| | Primary school | 128 | 35.6% |
| | Secondary school | 125 | 34.7% |
| | Collage/university | 70 | 19.4% |
| Residence | Urban | 251 | 69.7% |
| | Rural | 109 | 30.3% |
| Religion | Orthodox | 87 | 24.2% |

| | Muslim | 215 | 59.7% |
|---|---|---|---|
| | Protestants | 58 | 16.1% |
| Women refer status | Yes | 164 | 45.6% |
| | NO | 196 | 54.4% |

## 5.2 Maternal Reproductive and Obstetric History

Majority of the participants 164(45.6%) were primigravida and 356(98.9%) had ANC follow-up, among half 179(50.3%) had four and above contacts. Regarding the stage of labor at admission to the labor ward, more than a half was 189( 52.5%) were LFSOL 6(3.1% ) had chorioamnionitis. Almost all mothers give consent timely except one mother delay the decision by 10 minutes. All the families afford to prepare consumables for surgery in a timely and the operation theatre team and the scrub were informed about the case ahead before transferring the patient to the operation room. The majority 268(74.4%) of the operation was done by senior residents and 181(50.3%) of the anesthesia provider were BSc holders. Around 302(83.9%) had 12 hours of duration of labor and 305(84.7%) had less than 12 hours of rupture of membrane. Most of 214(59.4%) mothers had a Full-term gestational age of 39-40 weeks. Table2.

Table 2: Maternal reproductive and obstetric History with crosstabs (Chi-Square) at Jimma Medical Center, Southwest Ethiopia, October 2021.

| Variables | Categories | Frequency | % |
|---|---|---|---|
| Gravidity | I | 164 | 45.6% |
| | III -IV | 162 | 45% |
| | ≥V | 34 | 9.4% |
| Parity | I | 168 | 46.7% |
| | III -IV | 162 | 45% |
| | ≥V | 30 | 8.3% |

| | | | |
|---|---|---|---|
| ANC follow up | Yes | 356 | 98.9% |
| | No | 4 | 1.1% |
| Number of ANC visit | < 4 visits | 177 | 49.7% |
| | 4 and above visit | 179 | 50.3% |
| Number of previous CS | No | 323 | 89.72% |
| | 1 | 34 | 9.44% |
| | ≥2 | 3 | 0.833% |
| Gestational age | 37-38 weeks | 94 | 26.1% |
| | 39-40 weeks | 214 | 59.4% |
| | 41-42 weeks | 52 | 59.4% |
| Stage of labor at admission | LFSOL | 189 | 52.5% |
| | AFSOL | 137 | 38.1% |
| | SSOL | 25 | 6.9% |
| | NO LABOR | 9 | 2.5% |
| Fetal heart beat at admission | <100 BPM | 77 | 21.4% |
| | 100-110 BPM | 46 | 12.8% |
| | 110-160(Normal) | 177 | 49.2% |
| | 160-180 BPM | 17 | 4.7% |
| | ≥ 180 BPM | 43 | 11.9% |
| Duration of labor | <12 hours | 58 | 16.1% |
| | ≥ 12 hours | 302 | 83.9% |
| Cervical dilatation | ≤ 3cm | 163 | 45.3% |
| | 4-9 cm | 173 | 48.1% |
| | 10cm(fully dilated) | 24 | 6.7% |

| | | | |
|---|---|---|---|
| Rupture of membrane | < 12 hours | 305 | 84.7% |
| | ≥ 12 hours | 55 | 15.3% |
| Chorioamnionitis | No | 349 | 96.9% |
| | Yes | 11 | 3.1% |
| Mother give consent timely | yes | 359 | 99.7% |
| | No | 1 | 0.3% |
| Sterile materials available at the Operation theatre | Easily available | 352 | 97.8% |
| | Took time to collect | 8 | 2.2% |
| Experience of the surgeons | Junior residents | 73 | 20.3% |
| | Senior residents | 268 | 74.4% |
| | Obstetrician and gynecologist | 19 | 5.3% |
| Anesthesia provider | BSC holder | 181 | 50.3% |
| | MSc student | 124 | 34.4% |
| | MSc holder | 27 | 7.5% |
| | Anesthesiology resident | 28 | 7.8% |

Chi-square


## 5.3 Leading Indication for Emergency cesarean delivery.

The leading indication for emergency caesarean delivery was NFRHRP 180(50%) 0f the cases followed by CPD 133(36.4%). Pio chart.

**Indication for Emergency CS in Jimma Medical Center, Ethiopia 2021**

Legend:
- NRFHRP
- CPD
- Failed TOLAC
- Prolonged LFSOL and G3MS
- APH 2 to PPT in Labor
- Breech with prolonged labor
- AFSOL + Transverse lie
- Two prevous CS and more
- Brecch with other (Big baby, Footling, PE)

Values shown on pie: 180, 133, 20, 16, 3, 2
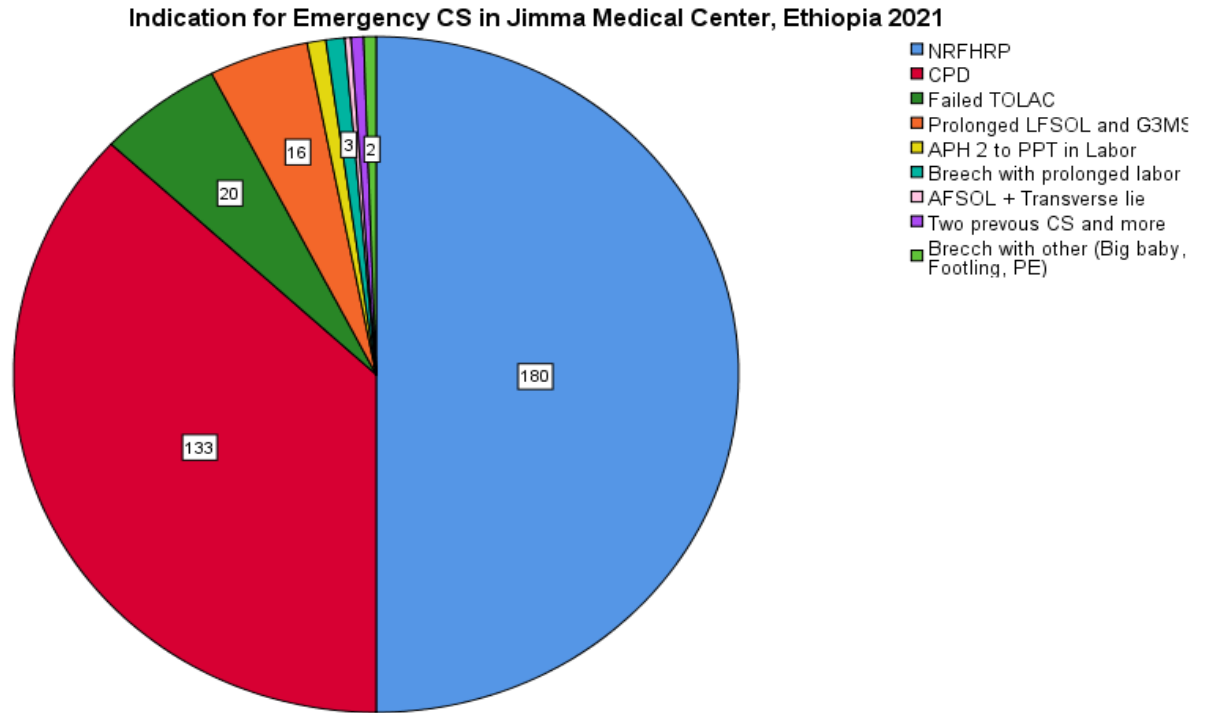
Figure 2: Indication for cesarean section delivery at Jimma Medical Center, Southwest Ethiopia, October 2021.

## 5.4 Time of Decision to Delivery Interval (DDI) and other intervals

The mean decision to the delivery time for the emergency cesarean section in our study was 40SD±5min. While mean decision to the delivery time of non-reassuring fetal heart rate patterns was 38.5±3.7 min and for CPD was 43.90min. The recommended decision to a delivery time interval (DDI below 30 min) was achieved only in 10 (2.8%) with [95% CI = 1.4–4.8] of the emergency caesarean section. Half of the participnats had surgery during the night. Most of the them 322(89.4%) operated with spinal anesthesia, 32 (8.9%) with general, and 6 (1.7%) with both general and spinal anesthesia There were no complications of anesthesia. Table 4.

Table 3: Decision to Delivery Time Intervals in Emergency CS with Crosstabs (Chi_Square). at Jimma Medical Centre, Southwest Ethiopia, October 2021.

| Variables | | Frequency | % | p.Value |
|---|---|---|---|---|
| Time taken from decision to operation theater (in minute) <br><br> 19.6(±4.5)** (Mean) | < 15 min | 18 | 5% | 0.000 |
| | ≥ 15 min | 342 | 95% | |
| Time taken for giving anesthesia in (minute) <br><br> 13(12-15)* | ≤10min | 75 | 100% | 0.000 |
| | ≥ 10 | 285 | | |
| Decision to delivery time interval (in minute) <br><br> 40(37-42)* (Median) | ≤ 30 min | 10 | 2.8% | - |
| | > 30 min | 350 | 97.2% | - |
| Skin Incision to delivery time interval (in minutes) <br><br> 7.2(±1.75)** (Mean) | ≤ 5 min | 27 | 7.5% | 0.000 |
| | > 5min | 333 | 92.5% | |
| Time of the surgery | Day | 180 | 50% | 0.200 |
| | Night | 180 | 50% | |
| Type of anesthesia | Spinal | 322 | 89.4 | 0.056 |
| | General | 32 | 8.9% | |
| | Both | 6 | 1.7% | |
| Complication of anesthesia | No | 360 | 100% | - |
| DDI for Obstetrics Variables | Mean, Median & SD | Frequency | P. Vaule | |

|  |  |  |  |
|---|---|---|---|
| NRFHRP | Mean | 38.53 | 0.846 |
|  | Median | 40.00 |  |
|  | Std. Deviation | 3.653 |  |
| CPD | Mean | 43.90 |  |
|  | Median | 43.00 |  |
|  | Std. Deviation | 6.699 |  |
| Failed TOLAC | Mean | 40.45 |  |
|  | Median | 39.50 |  |
|  | Std. Deviation | 4.261 |  |
| Prolonged LFSOL and G3MSAF | Mean | 41.06 |  |
|  | Median | 40.50 |  |
|  | Std. Deviation | 2.977 |  |
| APH 2 to PPT in Labor | Mean | 40.67 |  |
|  | Median | 42.00 |  |
|  | Std. Deviation | 3.215 |  |

## 5.5. Fetal Outcomes of the Emergency Caesarean Delivery

Regarding fetal birth weight outcome two third of birth weight 246(69.2%) range between (2500-3499gm) and with the mean weight of 3268.11SD (±396.658gm). Regarding APGAR score at 1st minute 176(48.9%) of newborns had <7, while at 5th minute Apgar score only 6( 1.7%) had <7. Regarding the type of newborn resuscitation advanced resuscitation was done in 85(23.6%) of the newborn. Among these newborns had 74 (87%) required ONPS, Bag Mask Ventilation, chest compression was required in 9 (10.6%) and 2(2.4%) were intubated. Regarding NICU admission 33(9.2%) were admitted and the mean diagnosis at NICU was MAS (19)57.6%, 2(6.1%) of stage 2PNA and stage 3PNA in 2(6.1%). 5 ENND occurred at NICU.

The neonatal outcome on the 7th day of life, were 8ENND among them 3 death occurred upon delivery. Table 4.

Table 3: Fetal outcomes of emergency caesarean section and Crosstab (Chi-Square) at Jimma Medical Center, Southwest Ethiopia, October 2021.

| Variables | | Frequency | % | P.value |
|---|---|---|---|---|
| Birth weight in grams | < 2500 gram | 8 | 2.2% | 0.820 |
| | 2500-3499gram | 249 | 69.2% | |
| | 3500-3999 gram | 86 | 23.9% | |
| | ≥ 4000 gram | 17 | 4.7% | |
| APGAR score at 1st minute | <7 | 176 | 48.9% | 0.475 |
| | ≥ 7 | 184 | 51.1% | |
| APGAR score at 5th minute | <7 | 6 | 1.7% | 0.146 |
| | ≥ 7 | 354 | 98.3% | |
| Types new-born resuscitation | Routine (Drying and rapping) | 275 | 76.4% | 0.639 |
| | Advanced resuscitation | 85 | 23.6% | |
| Types advanced resuscitation (n=85) | ONPS | 74 | 87% | 0.043 |
| | Ventilation &chest compression | 9 | 10.6% | |
| | Intubation | 2 | 2.4% | |
| NICU admission | No | 327 | 90.8% | 0.288 |
| | Yes | 33 | 9.2% | |
| Diagnosis for NICU admission (n=33) | EONS | 4 | 12.1% | 0.842 |

| | | | | |
|---|---|---|---|---|
| | MAS | 19 | 57.6% | |
| | MAS+ Hypothermia | 1 | 3% | |
| | MAS +stage 2 PNA | 1 | 3% | |
| | MAS +stage 3 PNA | 2 | 6.1% | |
| | Stage 2 PNA | 2 | 6.1% | |
| | TTN | 4 | 12.1% | |
| The neonatal outcome refer to NICU | Discharged with improvement | 28 | 84.8% | 0.410 |
| | ENND | 5 | 15.2% | |
| The neonatal outcome on the 7th day of life. | Alive and normal | 352 | 97.8% | 0.206 |
| | ENND | 8 | 2.2% | |

Chi- Square

## 5.6. Factors affecting decision to delivery time interval

In binary logistic regression analysis, the time of surgery, cervical dilatation, stage of labor, time is taken from skin incision to delivery, time of decision to transfer patient to operation room, patient`s referral status and the time taken for given anesthesia were statistically significant influence on DDI at p-value< 0.25. In multivariable logistic regression analysis after modifying certain confounders by using backward likelihood stepwise method; cervical dilatation, AFSOL, time is taken from skin incision to delivery, and time of decision to transfer patient to operation room and  time taken for given anesthesia were significant predictors for DDI.

Women whose operated with the time of skin incision to delivery less than 5 minutes were 17.3 times more likely to have ≤30 min DDI than the time of skin incision to delivery after five minutes [AOR=17.3,95%CI =3.7,80.7], while those with decision to operation time more than 15 minutes was 3.85 times more likely to delay DDI compare with < 15 minutes [AOR=3.85,95%CI=2.7,21.3]. In also the results shows that mother with fully cervical dilatation were 12 times more likely to have shorter DDI than 3cm and less cervical dilatation [AOR=12,95%CI=1.4-105] and those with time taken to give anesthesia <10  were 34 times to

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have DDI <30minutes compared with those with >10minutes [AOR= 8.495%CI(3.8-81.1.],
while those operated at day time were 2.3 time more likely to have DDI >30minutes compared
with those operated at night[AOR= 2.2595%CI 0.568-8.9] and referred patients were 4 times
more likely to have longer DDI compared with not referred patients [AOR= 4.334
)95%CI(0.734-25.584 ]Table5.

Table 4: Bivariate and multivariate logistic regression analyses result: factors associated with the
decision to delivery time interval at Jimma Medical Center, Southwest   Ethiopia, October 2021
(N=360).

| Variables | The decision to delivery Interval | | COR(95%CI) | AOR(95%CI) | P value |
|---|---|---|---|---|---|
| | ≤30 min | >30 min | | | |
| Time of decision to OT | < 15 min | 4 | 14 | 1 | 1 | 0.012* |
| | ≥ 15 min | 6 | 336 | 16(4.05-63.2) | 3.85(2.7-21.3) | |
| Time taken for given anesthesia | <10min | 9 | 66 | 38(4.25-3116.5) | 34(4.4-265.7) | 0.001* |
| | >10min | 1 | 284 | 1 | 1 | |
| Time of skin incision to delivery | <5min | 6 | 21 | 23.5(6.15-89.7) | 17.3(3.7-80.7) | 0.000* |
| | >5min | 4 | 329 | 1 | 1 | |
| Cervical dilation | ≤ 3cm | 2 | 161 | 1 | 1 | 0.017* |
| | 4-9cm | 5 | 168 | 11.5(1.8-72.8) | 3.25(0.513-20.6) | |
| | 10cm | 3 | 24 | 4.8(1.1-21.5) | 12(1.4-105) | |
| Time of surgery | Day | 3 | 177 | 2.3(0.607-9.4) | 2.25(0.568-8.9) | 0.213 |
| | Night | 7 | 173 | 1 | 1 | |
| Stage of labor | LFSOL | 2 | 187 | 0.28(0.054-1.48) | 0.246(0.042-1.429) | 0.118 |

| | | | | | | |
|---|---|---|---|---|---|---|
| | AFSOL | 5 | 132 | 0.078(0.012-0.495) | 0.125(0.016-0.982) | 0.048* |
| | SSOL &NO LABOR | 3 | 31 | 1 | 1 | 1 |
| Patient refer status | Yes | 2 | 162 | 3.447(0.722-16.5) | 4.334(0.734-25.584) | 0.106 |
| | No | 8 | 188 | 0.292 | 1 | |

NDDI, decision to delivery interval * P-value < 0.05

## 5.7. Factors affecting the fetal outcomes of emergency caesarean section

In binary logistic regression analysis, type of newborn resuscitation, duration of labor, duration of rupture membranes and skin incision to delivery were statistically significant influence on fetal admission in to NICU. In multivariable logistic regression analysis after modifying certain confounders by using backward likelihood stepwise method; type of newborn resuscitation, duration of labor, duration of rupture membrane and skin incision to delivery were still had statistically significant influence on fetal admission in to NICU.

Women with duration of labor more than 12 hours were 7.3 times more likely to have newborn admission to NICU compare with those with women duration of labor, 12hours.

Newborns whose required advanced resuscitation were 5.7 times more likely to be admitted in to NICU and babies born after 30miutes were 2.2 times more likely to be admitted into NICU.

Women with duration of rupture of membrane more than 12 hours were 3 times more likely to have newborn admission to NICU compare with those with women duration of rupture of membrane of less than 2hours. Table 6

Table 5: Bivariate logistic regression analyses results: factors associated with fetal outcomes of emergency caesarean section at Jimma medical center, southwest Ethiopia, October 2021.

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| Predictors | | NICU Admission | | COR | AOR | p-value | [95% Conf Interval] | |
|---|---|---|---|---|---|---|---|---|
| | | Yes | No | | | | | |
| Duration of labor | <12 | 2 | 56 | 1.000 | 1.000 | 1 | 1.49-34.68 | |
| | >12 | 31 | 271 | 3.20 | 7.19 | 0.014 | | |
| Type of Newborn resuscitation | Routine | 11 | 264 | 1.000 | 1.000 | 1 | 5.573-31.417 | |
| | Advanced | 22 | 63 | 8.38 | 13.23 | 0.000 | | |
| Skin incision to delivery | <5 minutes | 7 | 20 | 1.000 | 1.000 | | 1.000 | |
| | >5 minutes | 26 | 307 | 0.24 | 0.19 | 0.005 | 0.061-0.617 | |
| Duration of rupture of Membrane | <12hours | 10 | 282 | 1.000 | 1.000 | | 1.000 | 1 |
| | >12 hours | 23 | 45 | 2.72 | 3.102 | 0.021 | 1.182-8.139 | |
| DDI | <30 minute | 2 | 8 | 1.000 | 1.000 | 1.000 | 1.000 | 1 |
| | >30 minute | 31 | 319 | 0.39 | 2.32 | 0.512 | .0790507-1.91142 | |

| Predictor | | APGAR score at 1st minute | | COR | AOR | p-value | [95% Conf Interval] | |
|---|---|---|---|---|---|---|---|---|
| | | <7min | >7min | | | | (0.169-2.819) | |
| DDI | <30min | 4 | 6 | 0.63 | 0.69 | 0.480 | | |
| | >30min | 170 | 180 | 1 | 1 | 1 | | |

| Predictor | | APGAR Score At 5th minute | | COR | AOR | p-value | 95% |
|---|---|---|---|---|---|---|---|
| | | <7min | >7min | | | | |
| DDI | <30min | 1 | 9 | 0.13 | 5.8 | 0.076 | (3.2-10.8) |
| | >30min | 5 | 345 | 1 | 1 | 1 | |
| Predictor | | Type of new born resuscitation | | COR | AOR | p-value | 95%CI |
| | | Routine | Advanced | | | | |
| DDI | <30min | 7 | 3 | 1 | 1 | 0.619 | (1.09-29.8) |
| | >30min | 268 | 82 | 0.337 | 1.4 | 0.619 | |
| Predictor | | Neonatal outcomes at 7th day of life | | COR | AOR | p-value | 95%CI |
| | | Alive | ENND | | | | |
| DDI | <30min | 9 | 1 | | | 1 | (0.036-1.205) |
| | >30min | 343 | 7 | 5.44 | 0.208 | 0.131 | |

## 5.2. Discussion

This study was a prospective cohort study conducted in May 1st to October 20th 2021 with a singleton pregnancy that underwent emergency caesarean section delivery.

The mean decision to the delivery time for the emergency cesarean section in our study was 40SD±5.7 minutes. This could be explained that availability of residents, midwifes and medical interns at labor unit in 24hours services, have result in short mean and median of DDI in our study add to that having two functional operation rooms might contributed too. This finding was with line with the perspective audit done India with the mean of DDI being $37.2 \pm 17.4$ min. is almost in parallel with a study done at GUSH in which the mean was $42 \pm 21.4$ min(12).

Also our study median was 40(37-42)minutes which is in contrast with the retrospective study done in Gondar zone hospitals with median of DDI was 54(48–80minutes)(28). In the study done in Tanzania which showed that the a median DDI was 60 min(18). And also median in study done in Bangkok, Thailand was 80minutes(27).

In our study we have found the mean DDI of 38.5 SD±3.7minutes was achieved when the indication for emergency caesarean section is due to NRFHRP. This can be explained by the fact that, in such a case, immediate action was taken without any hesitation, since these mothers were at greater risk of adverse fetal outcomes. Other explanations might be due treating residents and other staff prioritizes care on the emergency in order to achieve rapid transfer of the woman to theatre, preparation of the woman for surgery in the operating theatre, then actual delivery of the baby. And is also comparable with the study done in UK which show that when LW:MW 1 : 1 care or better was being provided by midwives, for grade 1 caesareans they found that the mean decision-to-delivery interval for women having a grade 1 caesarean was 19.7 minutes (SD 8.5)(19). In another cross sectional study done in India has shown that among 3 babies with cord prolapse 2 were delivered within 30 minute interval(9).

Over all regarding the recommended decision to a delivery time interval below 30 min was achieved only in 10 (2.8%) with [95% CI = 1.4–4.8] of the emergency caesarean section. This delay in achieving, 30min DDI could be explained by our study had a significant number of the emergency caesareans section done on referred patients as we had 164(45.6%) (they were 4 times more likely to delay DDI compared with not referred group), from different health facilities, and with majority of them were from health centers and with lack basic investigations on referral papers and sometime with no IV catheter and which might lead anesthetics providers to hesitate in providing anesthesia before knowing the base line investigations. Another explanations might be due some of operations were performed for category 2 emergency caesarean section were treating residents and other staff were having time to have a preoperative preparation without immediate threat to either life of fetus or mother. However, better performance was observed with Max DDI of 57minutes, in other hand and 100% of participants having DDI <75 minutes, which in line with NICE guideline recommendation using cutoff both 30-75 minutes For DDI(20). DDI in our study was almost similar with the study done in

Bangkok Thailand where only 3.5% of emergency cesarean delivery had a DDI ≤30 minutes (median 82 minutes)(27).

DDI Our study it was relatively higher than cross sectional study done in India which concluded that DDI was achieved only in 5 out of 275 cases (1.8%)(9) .retrospective study done in Uganda were only 2% of babies delivered within an hour of decision-making(22). Also with study done in Lusaka, Zambia which showed that none of the Caesarean sections captured in the study was done within the internationally accepted standard of 30 minutes of making the diagnosis of fetal distress(17).

Our DDI was lower than others various studies done in different countries like the on done in Benin teaching hospital has shown that a DDI below 30 min was achieved in only 5.7% of emergency C/S (12). A study at Mahidol University, Bangkok showed that and only 6.6% had a DDI <30 minutes(27). Also locally our was lower than the studies done in South Gondar Zone hospitals (17.5%) of emergency CS deliveries were achieved a proposed DDI of ≤30 minutes(28). And another prospective observational cohort study was conducted from March to May 2018 at the University of Gondar Comprehensive Specialized Hospital obstetrics Operation Theater and a postnatal ward study showed that only 19.6% of women who underwent category-1 emergency C/S were delivered within the recommended DDI of 30 min(12). Many factors have been identified to play an important role in achieving the 30-minute goal, including the obstetric care unit setting, the clinician's perception of delivery urgency and the communication and transfer processes of the setting(7).

**Factors associated with DDI:**

In this study, complete and component time intervals and factors potentially affecting the DDI were also evaluated, including the decision time and delivery time.

Our results showed that the mean 19.6±SD4.5time from decision to OT was statistically significant associated with DDI. This might be explained by as what we mentioned above more than 45% of mothers were referred and for them to get preoperative preparation it might contributed in decision to operation theater time delay and the urgent of operation might also contributed to this delay in transferring the patient to OT. Our study was similar with study done in UK which concluded that transfer times to theatre related to the number of women in active labor and to the LW:MW ratio. For grade 1 caesareans the time taken to transfer the patient to

theatre was more than 15 minutes in only a minority of cases but a deteriorating LW:MW ratio still had a measurable negative impact on transfer times(5). In parallel with our study, in a retrospective done in Delhi India concluded that the maximum delay occurred in shifting the patient to the operation theatre. This delay was inversely proportional to the urgency of caesarean section(9). And also with in line with one done in South Gondar zone hospitals(28).

 Also median time taken to give anesthesia was 13(12-15) minutes which has contributed in delay DDI and those with taken to provide anesthesia of <10min were 34 times likely to have DD1<30mi compared with those of >10min. This might be explained by anesthesia drugs are not always available in operation room and the anesthesia providers to go get them in the Labor ward pharmacy and also the types of anesthesia compare general anesthesia with regional in our study whose under general anesthesia were 9.4% versus regional anesthesia to get deliver in <30 minutes. This might be explained by the time drug provision to the onset of action and time consumption of regional anesthesia. Also in the same study done in UK showed that comparing general anesthesia, spinal blockade and epidural the choice of anesthetic had a significant influence on the decision-to-delivery interval they found that found that the mean decision-to-delivery interval for women having a grade 1 caesarean was 19.7 minutes (SD 8.5) under general anesthesia, compared to 27.0 minutes (SD 8.2) under spinal blockade(5). And also our study was inconsistent with the study done in GUSH has showed that delays in the preparation and administration of anesthesia were significantly associated with prolongation of DD(12). Mean skin incision to delivery in our study was 7.2±1.75min. This might be explained by the proportional of urgent caesarean section for different indications. This finding was similar to those reported in other studies(7).

 Mother with full cervical dilatation were 12 times more likely to have shorter DDI than 3cm and less cervical. This might be explained by numbers of mothers with 10cm dilated cervix  were less in related to whose 3cm.

AFSOL was predictor for DDI and this might be due to advanced stage of labor which is associated with engaged head and CPD. These finding previous studies didn't evaluate it influence on DDI.

Emergency C/S done in the night time was 2.2 times to have shorter DDI when it compared with the day time. This result was comparable with the study done in Nysamba Hospital, Uganda

which has stated that emergency caesarean section done during the day time had prolonged DDI than those done in the night(17). And could be explained by during day time there might be elective caesareans being done which might led to delay of DDI for emergency CS, also during night due to shortage of staff might could result in urge in doing CS for the lack of follow up of laboring mothers.

The most of participants (90.3%) were operated under spinal anesthesia while general was used in 8.3% and both in 1.4%. This might be explained by anesthesia provider's preference and fear from general anesthesia complications compare with regional. This result was almost similar with cross sectional study done in Gondar zone hospitals(37). Most of operations were done by senior residents 74.4%, junior residents 20.2% and senior obstetricians in 5.3%. in this study majority of operations being conducted by senior residents might explain the nature of the cases upon decision. But experience of surgeons was not significant in relation to DDI. Which the same line with study done at GUCSH(12). And with contrast with the study done in Gondar zone hospitals respectively(28). In our study the experience of anesthetics provider was not statistically significant in relation to DDI. Which is similar with the study done at GUCSH(12). The indication for a half of the emergency C/S was for NRFHRP. This was comparable with a study done at GUCSH(12).

**Effect of DDI on fetal outcomes in emergency cesareans section**

DDI has not revealed a statistically significant influence on fetal outcomes; it takes more than 30 minutes for most newborns with negative adverse outcomes despite most of fetal adverse outcomes occurred in mothers with DDL >30min with P.value of >0.05. The result have been supported by prior explorations showing that higher DDI has not been statistically significant concerning adverse fetal outcomes, which concluded that 30 minute DDI is not an absolute threshold in influencing baby outcome, but a decision to delivery interval of more than 75 minutes is associated with a poorer neonatal outcome(20). In our study; regarding APGAR score at 1st minute 176(48.9%) of newborns had <7 among them 6 had DDI<30min, while at 5th minute Apgar score only 6( 1.7%) one had DDI below 30min, and we had total of 33(9.1%) NICU admission with 2 newborns had DDI <30min. Which lower than retrospective cross sectional study done in Tanzania there they had total of 168(28%) babies were transferred to neonatal unit department(18). We found that the factors associated with newborns admissions

were; those newborns required advanced resuscitation were 5.7 times more likely to be admitted in to NICU. This can be explained by presence of pre-exiting fetal compromise like meconium as majority of babies admitted in NICU were MAS 19(57.6%) and 3(9.1%) of stage 2 PNA and stage 3PNA in 2(6.1%). This in line with the retrospective study done in Nigeria which concluded that birth asphyxia is recorded more on babies of mothers that had fresh meconium stained liquor(14).

Also women with duration of labor more than 12 hours were 7.3 times more likely to have newborn admission to NICU compare with those with women duration of labor <12hours. This also can be explained by associated of prolonged of labor abnormalities. Also our study revealed that women with duration of rupture of membrane more than 12 hours were 3 times more likely to have newborn admission to NICU compare with those with women duration of rupture of membrane of less than 2hour. Also this can be explained by risk for chorioamnionitis and sepsis as about 8(57.1%) of babies were admitted with ENS.

These adverse outcomes might be explained by possible explanation for increased NICU admission and ENND due a crash attitude to shorten the D-D interval that may in fact aggravate increased maternal catecholamine release which may cause reduced perfusion of the placental bed leading to fetal acidosis for already compromise fetus due to underlying uteroplacental insufficiency. It is therefore more important to differentiate between the fetus who requires prompt delivery and the fetus not in acute distress, who could be reflecting recent or remote insults(38). compared with a study done in New Delhi Out of 217 patients of cesarean section for suspected fetal distress, in 33 (15.2%) babies the 5 minute Apgar score was <7, 33 (15.2%) babies required NICU admission. There were 184 (84.7%) neonates who did not show any adverse outcome(38). Also is the same with a prospective study done at GUCSH their result showed that among newborns who were delivered with DDI longer than 30 min, 40 had Apgar score < 7 at the 1stminute, 13 had Apgar score < 7 at the 5thminute, 38 had resuscitation via bag-mask ventilation, 5 had intubation, 6 had chest compression, 3 had NICU admission and 3 had died. On the other hand, when DDI was below 30 min, 12 had Apgar score < 7 at 1stminute, 5

had Apgar score < 7 at fifth 5th minute, 7 had resuscitation via bag- mask ventilation, 2 had intubation, 2 had chest compression, 2 had NICU admission and 1 had died.(12). In

Over all perinatal mortality of our study was 2.2 % which is lower than study done at University Teaching Hospital, Sagamu where their perinatal mortality was 7.3%(8).

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## 5.3 Conclusions

The Overall decision to a delivery time interval (DDI below 30 min) was achieved only in 10 (2.8%).

Factors that were associated with prolonged DDI were time from decision to OT, time taken to give anesthesia, skin incision to delivery, cervical dilatation and stage of labor were statistically significant.

Decision to delivery time interval in emergency caesarean sections has no fetal adverse outcomes.

The factors associated with newborns admissions were; those newborns required advanced resuscitation, women with duration of labor more than 12 hours and women with duration of rupture of membrane more than 12 hours.

We had total of 33(9.1%) NICU admission and perinatal mortality of our study was 2.2 %.

## 5.4. Recommendation

Recommendation to JMC and department of Obstetrics and Gynecology

> ➢ To have audit cycles to assess the gap of delaying DDI and create strategies to address factor associated with DDI delays.
> ➢ DDI is not independent predictor alone for fetal outcomes there for more researches are needed to address other factors related to fetal adverse outcomes.
> ➢ Readiness and effectively triage emergency caesarean deliveries and develop the capability of initiation such cases as fast as possible.

## 5.5. Strengths & Limitation of the study

The strengths of this study is that subjects were homogeneous emergency C/S which could provide representative data and since it was prospective study which could make it appropriate to identify factors. Fetal outcome of newborns were follow for the 1st 7 day of live. .

Limitation the study maternal outcomes were not evaluated in our study.

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