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College of Health Sciences

School of Nursing and Midwifery

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Incidence of surgical site infection and factors associated among cesarean deliveries in selected government hospitals in Addis Ababa, Ethiopia, 2019 G.C.

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LIST OF ACRONYMS AND ABBREVIATIONS

BMI - Body Mass Index

CD - Cesarean Delivery

CDC - Center for Disease Control and prevention

DM - Diabetes Mellitus

GP - General Practitioner

HAI – Health-care Associated Infection

NNIS - National Nosocomial Infection Surveillance

PIH – Pregnancy Induced Hypertension

PROM - Premature Rupture of Membrane

SSI - Surgical Site Infection

STI – Sexually Transmitted Infection

USA - United States of America

TABLE OF CONTENT

Contents

LIST OF TABLES

LIST OF FIGURES

ABSTRACT

Background: One to two third of operated patients in low-income countries acquire surgical site infections, which is nine times higher when it is compared to high – resource countries. Identifying the incidence and risk factors that contribute for surgical site infection following cesarean delivery is a step ahead for preventing and reducing the problem. Nonetheless, the distribution of the problem in Addis Ababa, where the rate of cesarean delivery is relatively high compared to other parts of the country, is under investigated. **Objective:** The aim of this study is to assess the incidence of surgical site infection among CDs and factors associated with it in selected government hospitals in Addis Ababa, Ethiopia, in 2019. **Method:** A hospital-based prospective cohort study design was employed to follow 175 women, who gave birth by CD in selected government hospitals in Addis Ababa, from March 11 – April 19, 2019. Convenience sampling method was used to select study units from the randomly selected hospitals. Descriptive statistics were run for determining rate of CD SSI. Presence and degree of association between outcome and independent variables was computed through bivariate logistic regression analysis. Factors that had ≤ 0.2 significance level in the bivariate logistic regression analysis was considered in the multivariable logistic regression analysis. **Result:** From 166 participants who completed 30 day follow-up, 25 (15%) of the participants developed SSI. Age, gestational age, and duration of operation showed a significant association with the outcome variable with AOR (95%CI) of [(AOR = 1.504, 95% CI: (1.170 – 1.933))], [(AOR = 0.019, 95% CI: (0.001 – 0.291))], and [(AOR = 1.108, 95% CI: (1.025 – 1.197))] respectively. **Conclusion and recommendation**: SSI rate is higher in this study. Certain associations may be lost due to small sample size. Further interventional studies with vast sample size are recommended. Enhanced regulation of infection control policy, implementation of improved surgical techniques, and persistent hand hygiene among respective stakeholders can avert the condition.

Key words: Incidence, Cesarean delivery, Surgical Site Infection

1. INTRODUCTION

1.1. Background

Cesarean delivery, often known as C – section, is an operative delivery of a fetus via maternal abdominal and uterine wall incision (1). It should ideally be performed, if and only if, a vaginal birth poses a problem to the mother or the baby. Hence in some circumstances such as; severe uncontrolled antepartum hemorrhage, foeto – pelvic disproportion, uterine rupture, 3 or more previous Cesarean Deliveries (CD), mal-presentations and other conditions that endanger maternal or neonatal life, CD becomes mandatory to prevent potential maternal and neonatal morbidity and mortality(2).

Medically necessitated cesarean section has a pronounced influence to prevent life threatening conditions, like obstetric fistula and birth asphyxia, and save maternal and child life (3). However, CD also accompanies the risk of infection, hemorrhage, and uterine rupture and placentation problems in current and future pregnancies (3-6).

Hence, in 1985 World Health Organization (WHO) declared that, the optimal threshold for cesarean section rate should be 10 -15% based on the data available especially from Northern Europe, where perinatal morbidities and mortalities were low with the above rate (7). This declaration aims to enhance the practice of performing CD for those who need it and avoid the procedure for medically ineligible clients. Even though, this declaration is debatable to date, CD rate exceeding 15 – 20% is not yet associated with improved perinatal conditions (8).

Nonetheless, recent studies revealed that the rate of cesarean delivery is rising unpredictably leading to actual, potential, and life-long maternal and neonatal complications. Half of cesarean section procedures exceeding the WHO maximum CD rate threshold are performed in Brazil and China (8). This can be evidenced by a 40.5% CD rate exhibited in Latin America and the Caribbean region (9). To the contrary, the poor perinatal maternal, neonatal and infant outcomes in low resource countries with less than 5% CD rate may attribute to the socio-economic situation in the countries (10).

One of the short term morbidities which take place after cesarean section is Surgical Site Infection (SSI). It is a post-surgery infection in parts of the body where it is performed. The Center for Disease Control and prevention (CDC)'s National Nosocomial Infection Surveillance System serves as a de facto standard for defining and classifying SSI. It classifies SSI as incisional and organ/space SSI. Incisional SSI, in turn, has two divisions: superficial and deep SSI. The infection on both types of incisional SSIs is restrained to the incision site only. Superficial SSI involves skin and subcutaneous tissue of the incisional site; while deep SSI distributes to the muscle and fascia of the incisional site. If the infection spreads to body wall layers that are not manipulated during the surgical procedure, it is named as organ (space) SSI (11).

The leading healthcare associated infection (HAI) in low-income countries is SSI affecting one to two third of operated patients, which is nine times higher when it is compared to high – resource countries (12). A study conducted in 25 low and middle income African countries also witnessed most complications following surgery, 10.2%, were due to surgical site infection (13). It is also undeniable that SSI is the second most frequently reported HAI in even high-income countries such as; USA and Europe (14).

Majority of the conditions leading to HAIs including SSIs, are at ease of intervention. Factors like; poor waste disposal and environmental hygiene practice, reduced standard precautions implementation trend, and development of local procedures and guidelines for each clinical activity are feasible to be intervened by intra-institution and national health organization divisions (12, 14). Governmental involvement might be necessary in fulfilling infrastructure and essential equipment for the procedure, and recruiting adequate number of staffs with an appropriate knowledge and skill (12).

1.2. Statement of the Problem

Infection of an incision site within 30 days of an invasive procedure is known as surgical site infection (14-16). It is the most common complication following CD and accounts for 3% of maternal mortality cases(17). Global reported rate of surgical site infection following cesarean delivery ranges from 3 – 15% (18). The reported rate is lower in high income countries, 0.5% – 6.5%, (6, 19-23) as compared to that of low and middle income countries which is 2.6 % - 14.5% (24-33).

Surgical site infection is known to bring up several direct and indirect influences in individual, familial and health care system level (14). Some of the direct burdens of SSI includes and is not restricted to postponed hospital stay, raised risk for readmission, prolonged antibiotic use, long term disability, and increased predisposition for depression and additional service charge and even death (12, 34). It also indirectly influences client's functional and mental capacity and health-care service satisfaction leading to unproductivity.

Surgical site infection can serve as a measure of quality of hospital service (14). Identifying risk factors that contribute for SSI following CD is a step ahead for preventing and reducing the problem. Minimizing modifiable risk factors of SSI also plays an important role in dropping the rate of post cesarean SSI (15).

Plus to this, general and simple actions like hand hygiene, administration of prophylactic antibiotic medications, clipping of hair that might interfere in incision site rather than shaving it, maintenance of homeostasis, preparation of client's skin by any antiseptic product and prevention of hypothermia can prevent and control the problem (1, 15, 35). Identification and treatment of maternal intrinsic comorbidities like chorioamnioitis and applying peri-operative techniques specific to CD like administering prophylactic antibiotics 15 -60 minutes ahead of the incision can also supplement the prevention of SSI following CD (1, 15, 35).

The national cesarean delivery rate in Ethiopia rises from 0.7% in 2000 to 1.9% in 2016 (36). However, in the capital city, Addis Ababa, the rate is more pronounced and was 21.4% in 2016 (36). As the rate of cesarean delivery escalates, the number of cesarean section related SSI is expected to rise. But no studies can be retrieved in the capital city that shows the distribution of the problem. Recent studies performed in other parts of the country visibly exhibits SSI is wide spread, showing 6.8% - 11.7% incidence, compared to the low cesarean delivery rate in the country (24, 26, 29). Therefore this study targets to detect CD SSI in Addis Ababa, where the rate of CD is relatively high, and act as information for action.

Unlike previous studies performed in the country which utilized cross-sectional and retrospective study designs, this study aims to investigate the incidence of cesarean section surgical site infection and factors associated with it through a 30 day prospective follow up of clients who give birth by CD in the study period. This enabled to reach clients who do not return to the same institution with complaints of post cesarean delivery SSI.

2. LITERATURE REVIEW

2.1. Rate of Cesarean Section Surgical Site Infection

Global reported rate of surgical site infection following cesarean delivery ranges from 3 – 15% (18). The data for the incidence and determinants of SSIs in developed countries can be readily traced from national nosocomial infection surveillance (NNIS) systems or other high-quality studies performed in the area. This initial step can aid to identify factors associated with SSI following CD and devise a specific and targeted prevention strategy in the study area and for the target population (1, 28).

Review of concurrent available literatures on the rate of SSI following CD shows, the rate is lower in developed countries. One of these evidences is a retrospective document review of 7,664 CDs that took place in five Polish hospitals between 2013 and 2015 that reported the incidence of SSI following CD to be 0.5%, varying with the range of 0.1% and 1.8% between hospitals (6). In the same study most SSIs, 61.5%, were deep SSIs followed by superficial and organ/space SSI which account for 28.2% and 7.7% of cases respectively.

A study conducted in 2013 in an academic institution in United States of America (USA), Cleveland Clinic Foundation, also revealed that there were 4.9%, 0.6%, and 0.3% superficial, deep and organ/space SSI respectively making the total incidence rate 5.5% (19). The incidence of post CD SSI was also 3.7% in a population based retrospective study that revised the trend for more than three decades in a health institution in Israel (20).

To the contrary, in developing countries, there is no organized system for documenting HAIs as a whole. Furthermore, there are limited number of researches that investigate the condition, most of which are performed in single teaching hospitals on which the intensity of the problem might reduce. Reported rate of SSIs escalates with increasing quality of studies. Even though most studies conducted in developing countries are of low quality, may be due to scarcity of resources or poor documentation practice, the reported rate of the situation is high (28, 37).

However, the rate of SSI following CD in some developing countries in Asia and Arab Peninsula is comparable with that of the developed countries, with the exception of the study conducted in Jordan which shows a 14.4% incidence rate (28). A five years prospective study performed in Thai-Myanmar border hospital showed an incidence of 5.9%, from which 82.9%, 10.9%, and 6.2% are occupied by organ/space, superficial, and deep SSIs respectively (31). A 2.66% SSI rate following CD was noted in a retrospective card review, which revised medical records of more than a decade, in Nizwa Hospital, Oman, from which 93% of the cases are superficial SSIs (33).

From the review of current literature, Libya has reduced rate of CD SSI compared to other African countries. In a one year prospective study conducted in two hospitals in two different cities of Libya, incidence was found to range from 2.53% – 3.07% (27). The pooled incidence of SSI following CD, which is 7.3%, in three Sub-Saharan African countries, showed the rate is getting relatively higher as resource of the country deteriorates (38). Similarly, in Bugando Medical Centre, Tanzania, the incidence was reported to be 10.9%, from which around 62% was superficial SSI (32).

In Ethiopia three recent studies are performed on the subject matter in different parts of the country, all of them proofing that, the condition is more pronounced compared to the low CD rate in the country. The incidence of post CD SSI was 6.8%, 11%, and 11.7% at Lemlem Carl Hospital (Maichew), Hawassa Teaching and Referral Hospital (Hawassa), and Ayder Hospital (Mekelle) respectively (24-26, 29). But the magnitude of the problem in the capital city, where the CD rate is very high, is still undiscovered.

2.2. Risk Factors for SSI Following CD

Various situations are reported to associate with surgical site infections following CD in different studies. These situations can generally be classified as endogenous (intrinsic), that arise from the body on which surgical procedure is performed, and exogenous (extrinsic) risk factors, which are external in origin (1). The intrinsic risk factors can further be categorized in to patient related and pregnancy/intrapartum risk factors (17). The exogenous ones are usually surgical procedure related factors (17).

2.2.1. Patient related risk factors

Maternal age, body mass index (BMI), residence, earlier cesarean delivery, preoperative condition, pre-existing Diabetes Mellitus (DM), Human Immuno-Deficiency Virus (HIV), anemia, asthma, and recurrent pregnancy loss can be listed as some of client related risk factors (17, 20, 26).

Towards maternal age there is a controversial data, some studies show advanced maternal age is a risk factor for post CD SSI, while others found younger maternal age is a risk factor for the condition. A retrospective population based study conducted in Israel, Seroka University Medical Centre, from 1988 to 2012, exhibited most women who develop SSI after CD were older than those of whom who did not develop the problem (20). A study done by Osela M.M. et. al in Libya described that women who are 30 – 40 years old were more prone to develop the condition than their younger counterparts (27). To the contrary a study performed in three sub-Saharan African countries demonstrated younger age (adjusted odds ratio (aOR) = 2.1, 95 % confidence interval (CI) 1.2–3.6) was associated with SSI after CD (38).

Different studies showed different associations between pre-existing maternal medical conditions, such as DM, HIV, anemia, asthma, and SSI following CD. A retrospective cohort study done in 2013 in Cleveland Clinic Foundation, a multicenter health care academic institution in USA, proofed that both preexisting and gestational DM has association with higher SSI rate, but only preexisting DM had statistical significance. The same study also showed that maternal asthma ($p<0.001$), and sexually transmitted infection ($p=0.02$) during pregnancy were also associated with increased rate of SSI after CD (19).

A study by Yuval et.al in Israel in 2016 had found chronic hypertension (OD -1.52; CI - 1.21–1.91, $p < 0.001$) had an association with SSI following CD (20), while the study in Ayder Referral Hospital, Mekelle discussed an association of the condition with HIV (AOR - 6.9829;95% CI: 1.382-35.269, $p <0.05$) (24) .

Having previous CD (OD -1.85; CI - 1.66–2.05, $p < 0.001$) was associated with SSI following CD in a study done in Israel (20), while it was statistically insignificant in USA's academic institution study ($p=0.13$) (19). Likewise, women with recurrent pregnancy loss (OD -1.34; CI - 1.13–1.60, $p < 0.001$) were found to be prone to SSI following CD in a study done in Israel (20).

Finally, rural residence or living outside the city where the study was conducted was found to have association with CD SSI a study done in Ayder Referral Hospital, Mekelle [AOR = 5.666, 95%CI: (1.568–20.483, $p = 0.008$)] (24).

2.2.2. Pregnancy/Intrapartum related factors

Conditions that accompany the present pregnancy and labour can be a risk factor for SSI after CD. Some of those situations that hasten SSI during pregnancy and delivery include hypertensive disorders of pregnancy, gestational DM, premature rupture of membrane (PROM), repeated number of vaginal examinations during pregnancy, length of labour trial before CD and chorioamnioitis (17, 19, 24).

Premature rupture of membranes (PROM) was agreed by most studies as high risk condition for developing SSI following CD. Its risk was found to be (OR 1.32; 95% CI: 1.11–1.56; p =0.022), (OR= 2.7; 95% CI = 1.3-5.8; p=0.011), (OR - 5.83; 95% CI: 2.14-15.89), (AOR - 8.818; 95% CI: 2.171-35.816; p <0.05) in studies performed in Israel, Tanzania, Hawassa, and Mekelle respectively (20, 24, 26, 32).

Pregnancies complicated by preterm labor were also associated with higher rates of postpartum SSI with (OR 2.75; 95% CI 1.26-6.00; p = 0.01), and (OR 1.67; 95% CI: 1.49–1.86; p < 0.001) in a study done in an academic institution in USA and Israel respectively (19, 20). Prolonged labour was also found to affect the chance of developing SSI following CD in two studies in Ethiopia, with an odds ratio of 6.78(95% CI: 2.54-18.00) in Hawassa (26) and an adjusted odds ratio of 6.064 (95% CI: 1.676-21.949; p = 0.006) in Mekelle (24).

Maternal medical conditions during pregnancy are found to have different associations in different studies. A study in Israel found that hypertensive disorders of pregnancy (OR 1.33; 95% CI: 1.15–1.54; p = 0.001) and gestational DM greatly affect the risk of encountering SSI after CD (20). In the same way, a multivariate cox regression analysis of hypertensive disorders of pregnancy (HDP) had found have higher association of HDP with the condition (HR = 2.9; 95% CI, 1.4-6.4; p= 0.006) in a study in Tanzania (32).

Two African studies also demonstrated that repeated vaginal examination and chorioamnioitis has a risk for CD SSI. A study in Tanzania assures 3 or more vaginal examinations (HR = 3.3; 95% CI = 1.7-6.5; p=0.001) had an increased risk for causing SSI (32). The study in Hawassa University Hospital, Ethiopia also expressed, compared to mothers who had no digital vaginal examination, those who had 1-4 and 5 or more examinations were at higher risk with odds ratio of 2.91(95% CI: 1.21- 6.99) and 8.59 (95% CI: 1.74-42.23), respectively (26).

Chorioamnioitis (AOR - 16.17; 95% CI: 2.850-91.819; p <0.05) was also found to associate with SSI following CD by Wondmagegn et.al in Ayder Hospital, Ethiopia (24). At last, one study in Tanzania found higher wound class prior to surgery (HR = 2.7; 95% CI = 1.4-5.5; P=0.005) was a risk for developing SSI after CD (32).

2.2.3. Procedure related risk factors

Preoperative preparation, such as hair removal/clipping, anti-septic skin preparation, is one component of factors that affect post cesarean SSI. Conditions surrounding the surgery including experience of the surgeon, duration of the surgery, blood loss during surgery, timing of antibiotic prophylaxis and type of surgery also affect the tendency to encounter SSI (17, 39, 40).

Among indications of CD, arrest of labor (37.6% vs 21.1%, p<0.001) and fetal distress (27.1% vs 17.8%, p=0.007) were highly associated with SSI following CD in a study in an academic institution in USA (19). Most studies agreed emergency CD is more prone to SSI compared to that of the elective one. The above study also demonstrated that, emergent and unscheduled CDs account for a significantly higher portion of women among the patients who developed SSI. A study in Tanzania also experienced that all of the mothers who developed SSI were mothers who were enforced to have the procedure due to life threatening condition to the mother or fetus (32).

There is a controversial finding regarding the type of anesthesia used and the incidence of SSI following CD. Moulton et.al found rates of SSI were significantly higher among patients who underwent CD under general anesthesia compared to local anesthesia (OR 4.4; 95% CI 1.98-9.8; p = 0.0003) (19). To the contrary, one study showed utilization of local anesthesia was associated with high incidence of SSIs following CD.

Prolonged duration of surgery (more than an hour) was associated with SSI with OR of 2.32 (95% CI: 5.46-27.77) by a study done in Karl Hospital, Ethiopia (26). This same study also stated that, women with wound contamination class III had 9.61(95% CI: 1.84- 50.06) times increased odds than those with class II level of contamination. It also found out CS conducted by junior professionals (general practitioners or MSc students) had increased odds of developing SSI as compared with procedures done by seniors. Women with postoperative anemia (hemoglobin <11mg/dl) were also found to had 2.62 (95% CI: 1.21-5.69) times increased odds of SSI in the same study.

CONCEPTUAL FRAMEWORK

A conceptual framework prepared based on literature review. (17, 19, 39) The figure below reveals host related characteristics such as; advanced maternal age, raised BMI and co-existing maternal disease might influence CD SSI. Likewise, adverse conditions surrounding pregnancy and CD would have an effect on maternal CD SSI status.

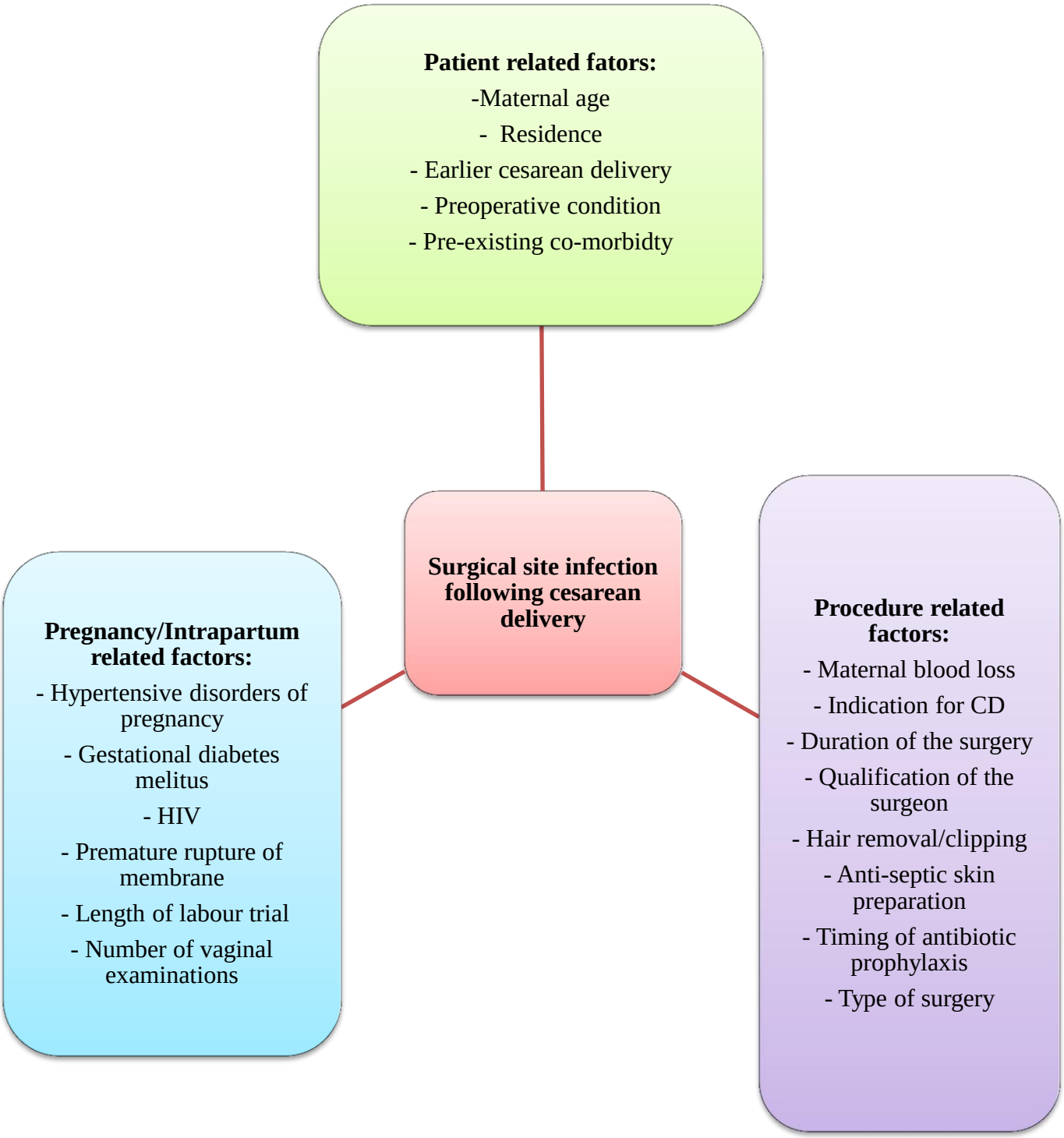

Figure 1: Conceptual framework for surgical site infection following cesarean delivery and factors associated with it.

2.3. SIGNIFICANCE OF THE STUDY

In resource poor countries like, Ethiopia there are no national surveillance strategies to trace the incidence, prevalence and burden of health-care associated infections including surgical site infection. In those areas there presents limited number of studies which is difficult to generalize because most of them collect data from single teaching hospital. The unavailability of data on the burden of health-care associated infection as a whole and SSIs specifically in these resource poor countries reduces the necessary attention to avert the problem.

This study will provide evidence on the incidence of SSI following CD and factors associated with it among clients who deliver by cesarean section in public teaching hospitals in Addis Ababa. Hospital administrators will have the chance to recognize its distribution and identify risk factors that are frequent and at ease of intervention to reduce the problem. Therefore he/she will prepare and enforce local hospital procedures that can minimize incidence of SSI based on the risk factors that will be identified in this study.

The study, together with other studies performed in the country, will also inform policy makers about the distribution of SSI among mothers who deliver by CD and enable them to devise, prioritize, and put in to effect national policies and procedures to combat the problem considering factors that repeatedly associate with the condition.

It also give awareness about the signs and symptoms of CD SSI for the clients, thereby, enabling them to early detect and gain due care timely. All the above listed contributions can in one or other way improve quality of midwifery care. Hence the study will contribute to reduce individual, economical, and health care system associated burden of SSI following CD.

3. OBJECTIVES

3.1. General Objective

To assess the incidence of SSI among cesarean deliveries and associated factors in selected government hospitals in Addis Ababa, 2019.

3.2. Specific Objectives

I. Determine the incidence of SSI among cesarean deliveries in selected government hospitals in Addis Ababa.

II. Assess factors associated with SSI among cesarean deliveries in selected government hospitals in Addis Ababa.

4. MATERIALS AND METHODS

4.1. Study Setting and Period

The study was conducted in Addis Ababa, the capital city of Ethiopia, with a population of 3,384,569 according to the 2007 population census, and with annual growth rate of 3.8%. The city is divided into 10 sub cities and 99 Woredas. It has 14 governmental hospitals in 2019 according to a data from Ethiopian Ministry of Health.

The study was conducted from March 11 – May 24, 2019.

4.2. Study Design

A 30 day hospital-based prospective cohort follow up of women who gave birth by CD in the first month of data collection period was conducted.

4.3. Source Population

Women who delivered by CD in government hospitals in Addis Ababa.

4.4. Study population

The sample population was drawn from women who delivered by CD in the first 30 days of data collection period in the selected four governmental hospitals in Addis Ababa, Ethiopia.

4.5. Inclusion Criteria

- Women who delivered by CD in the study period and were willing to participate in the study.
- Women who had stable contact address for reporting their condition.
- Women who were mentally fit to differentiate and report their status.

4.6. Exclusion Criteria

- Women who are severely ill.
- Maternal death during the first phase of the study period.

4.7. Operational Definition

SSI definition in this study is based on the classification and definition of the term by Centre for Disease Control and Prevention in 1992 (41).

Surgical site infection: infection that occurs within 30 days of the operation and has at least one of the following symptoms:

- Purulent discharge from the incision site
- Localized swelling at the operation site
- Wound dehiscence.
- Tenderness/pain
- Redness
- Hotness
- Fever (>38°C)

4.8. Variables

- Dependent variable:
  - Cesarean delivery SSI.
- Independent variables
  - Age
  - Parity
  - Pre-existing maternal health condition
    - Hypertension
    - Diabetes Mellitus
    - HV
  - Maternal health condition during pregnancy and labour
    - Hypertensive disorders of pregnancy
    - Gestational DM
    - HIV
  - Prolonged labour trial before CD
  - PROM
  - Previous CD
  - Number of vaginal examinations around the procedure
  - PPH
  - Indication for CD (non-reassuring fetal heart beat (NRFHB))
  - Length of the procedure
  - Qualification of the person who performed the CD
  - Maternal pre-operative condition
  - Gestational age
  - Type of operation

4.9. Sampling Methods

4.9.1. Sampling procedure

Among 14 public hospitals in Addis Ababa 4 were selected by simple random sampling method. Then based on the number of cesarean deliveries in the hospital a proportionate number of study units was allocated for each hospital. All CDs that took place during the first phase of data collection time was included as study unit until the allocated sample size was attained (convenience sampling method).

4.9.2. Sample size determination

Single population proportion formula was utilized to calculate the sample size.

$$n = \frac{(Z\alpha/2)^2 \times p\,(1-P)}{d^2} = \frac{(1.96)^2 \times 0.11 \times 0.883}{(0.05)^2} = 150$$

Adding 10% Contingency sample size becomes 165.

Where; n= Sample size

Z=Standard normal deviation (1.96 for 95% CI)

d=Desired degree of accuracy (0.05)

P= Estimation of CD rate (11% in a study done in Hawassa Teaching and Referral Hospital (26))

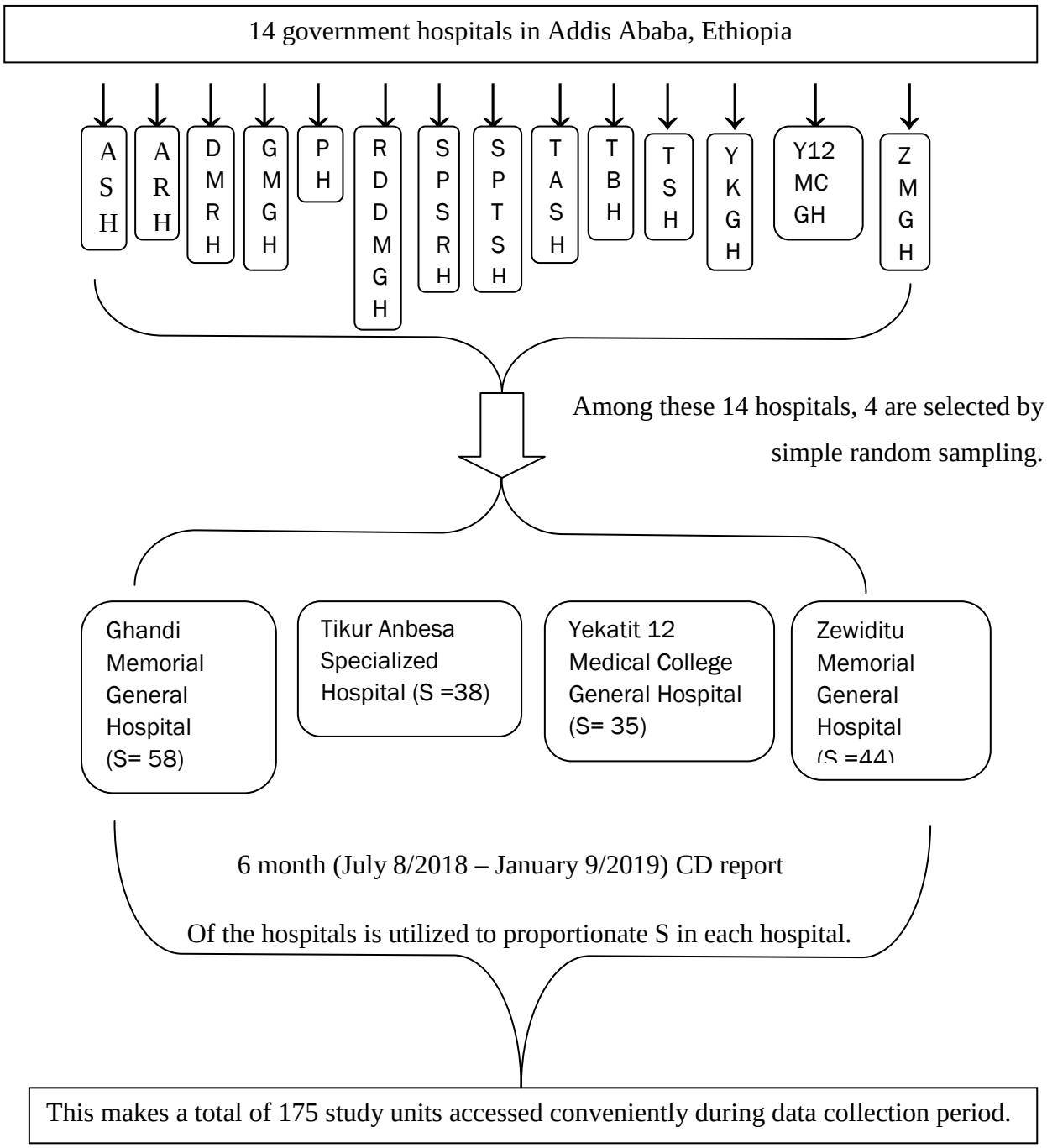

Figure 2: Schematic presentation of sampling procedure for assessing incidence and factors associated with post CD SSI among CDs in selected government hospitals in Addis Ababa, Ethiopia, 2019.

Key:

1. ASH – Alert Specialized Hospital.
2. ARH – Amanuel Referral Hospital.
3. DMRH – Dagmawi Menilik Referral Hospital.
4. GMGH – Ghandi Memorial General Hospital.
5. PH – Police Hospital.
6. RDDMGH – Ras Desta Damtew Memorial Hospital.
7. SPSRF – St. Paul Specialized Referral Hospital.
8. SPTSH – St. Peter TB Specialized Hospital.
9. TASH – Tikur Anbesa Specialized Hospital.
10. TBH – Tirunesh Beijing Hospital.
11. TSH – Torhayloch Specialized Hospital.
12. YKGH – Yeka Kotebe General Hospital.
13. Y12MCGH – Yekatit 12 Medical College General Hospital.
14. ZMGH – Zewditu Memorial General Hospital.

4.10. Data Collection Tool and Procedure

4.10.1. Data collection tool

The data collection tool was adapted from a study done in Zimbabwe and modified based on contextual situation (42). The English version of this questionnaire was translated to Amharic by language experts. It contains questions that assess: maternal characteristics such as; age, gravidity, parity, BMI, co-existing morbidities; peri-partum maternal conditions like; maternal health condition, PROM, number of vaginal examinations, trial of labor before CD; and procedural characteristics like; duration of operation, type of surgery, type of anesthesia, qualification of the surgeon, type and timing of antibiotics administration, pre-operative skin preparation and the likes.

4.10.2. Data collection procedure

All mothers who delivered by CD in selected government hospitals during the study period were asked for their willingness to participate in the study. The medical record of those volunteer women was reviewed for the presence of SSI risk factors. In addition, clarification on the symptoms of SSI was done for all post-operative women aided by diagrammatic presentation of the syndromes. They were then counseled, as per the hospital's policy, to return to their respective hospitals if they had experienced any symptoms of SSI. Then each mother was interviewed through telephone for the development of SSI syndromes within 30 post-operative days. For mothers who returned complaining SSI syndromes, confirmation was done by physicians in the presence of the principal investigator.

Four BSc. midwives with an experience of data collection and four midwife supervisors having MSc. and an experience of data collection, two in each hospital, who can perform the data collection full time, were hired.

4.11. Data Analysis

The collected data was coded, entered, checked, and cleaned by Epi-data version 3.1 and was exported to a statistical software package, SPSS version 20, for data analysis. The proportion of CD SSI was computed by running descriptive statistics, followed by bivariate and multivariable logistic regression to determine statistical association between independent and dependent variables. Factors that had ≤ 0.2 significance level in the bivariate logistic regression analysis was considered in the multivariable logistic regression analysis. Presence and degree of association between outcome and independent variables was computed through odds ratio with 95% confidence interval (CI) and p value < 0.05.

4.12. Data Quality Control

Data collectors were trained on the objective of the study and the data collection procedures, and the data collection tool. The data collection tool was adapted from a study done in Zimbabwe and modified based on contextual situations. The tool was pre-tested in 10% of similar population in St. Paul Specialized Referral Hospital from February 18 – 28, 2019 to assure the validity of it and modify accordingly if necessary. During the data collection period the principal investigator was there to watch over the procedure. Moreover, collected data was reviewed and checked for completeness and consistency by the principal investigator on a daily basis.

4.13. Ethical Consideration

Ethical clearance was obtained from Addis Ababa University College of Health Sciences, School of Nursing and Midwifery, Ethical Review Board, and written permission to support the research was obtained from the Medical Director of hospitals, from which data was collected. Participants were asked for their willingness to participate in the study after explaining all the objective, risks and benefits of involving in the study. All the information obtained from the medical record was held with confidentiality and used only for the intended purpose.

4.14. Dissemination of the Result

The result of the study was first presented in Addis Ababa University School of Nursing and Midwifery and then will be disseminated to hospitals in Addis Ababa, and Ethiopian Ministry of Health. It will also be presented in national as well as international seminars and will be published in reputable journals.

5. RESULT

A 30 day post CD prospective follow-up through telephone for development of syndromes of SSI was conducted from April 22 – May 24, 2019 for 175 mothers who gave birth by CD in four selected government hospitals in Addis Ababa from March 11 - April 19, 2019. Among 175 mothers 166 (approximately 95%) of them completed the 30 day telephone interview, while 9(5 from TASH, 1 from ZMGH and 3 form Y12MCGH) of them were lost before completing the follow-up.

5.1. Socio-Demographic and Obstetrics Characteristics of Participants

From the total of the study participants the majority (approximately 75%) were less than 30 years old. In addition to this, around 95% of the study participants were from urban.

Minimal number of the participants, 28.9%, was found to have previous CD, suggesting most CDs in this study were due to other obstetric emergencies. Most of the women involved in the study had 3 or less parity status (93.4%). Women with prolonged PROM also accounts for only 15.7% of the participants.

Table 1: Socio-demographic and obstetric characteristics of study participants (n = 166) who gave birth through CD from March 11 - May 24 in four selected government hospitals in Addis Ababa, Ethiopia.

Variables	Category	Post CD SSI				Total (%)
		Yes		No		
		N	%	N	%	
Age	< 30 yrs.	4	3.3%	120	96.7%	124(74.7%)
	≥ 30 yrs.	21	50%	21	50%	42(25.3%)
Residence	Urban	24	15.2%	134	84.8%	158(95.2%)
	Rural	1	12.5%	7	87.5%	8(4.8%)
History of previous CD	Yes	13	27.1%	35	72.9%	48 (28.9%)
	No	12	10.2%	106	89.8%	118 (71.1%)
Parity	Para I	11	12.4%	78	87.6%	89 (53.6%)
	Para II	7	17.5%	33	82.5%	40 (24%)
	Para III	5	19.2%	21	80.8%	26 (15.7%)
	Para IV	1	10%	9	90%	10 (6%)
	Para V	1	100%	0	0%	1 (0.6%)
PROM	No rupture	10	11.4%	78	88.6%	88 (53%)
	≤ 12 hrs.	4	7.7%	48	92.3%	52(31.3%)
	≥ 12 hrs.	11	42.3%	15	57.7%	26 (15.7%)

5.2. Operation Related Characteristics of Participants

5.2.1. Indication for CD and related co-morbidities identified

Majority of the participants (86%) in the study were referred from other facility. Among them, the most common indication for CD in the study period was fetal distress (40.4%), followed by CPD (19.9%) and arrest of labour (13.3%); while the rest is accountable for other indications like PIH and oligohydramnious.

Since the sample size is small (n = 166), adequate representatives of the co-morbidities hypertension (30.7%), DM (4.8%) and HIV (3.6%) were not available during the study period.

5.2.2. Pre-operative preparation

Pre-operative antibiotics prophylaxis was provided for around 92% of the participants.

Most of the health professional's hand washing (70.5%) before CD was conducted utilizing plain soap and water, which was available in most set ups. Skin preparation for CD of all participants was done by alcohol, while iodine was utilized in addition to alcohol in approximately 20% of the participants.

Only 59 (35.5%) of the study participants were not shaved. Among the shaved ones, 78 (40%) were shaved at their home, while the rest 28 (17%), and 1 (0.6%) were shaved at pre-operative wards and on the operating table respectively.

Table 2: CD indication, related co-morbidities and pre-operative characteristics of study participants (n = 166) among CDs from March 11 - May 24, 2019 in four selected government hospitals in Addis Ababa, Ethiopia.

Variables	Category	Post CD SSI				Total (%)
		Yes		NO		
		N	%	N	%	
CD indications						
CPD	Yes	10	30.3%	23	69.7%	33 (19.9%)
	No	15	11.3%	118	88.7%	133 (80.1%)
Fetal distress	Yes	8	11.9%	59	88.1%	67 (40.4%)
	No	17	17.2%	82	82.8%	99 (59.6%)
Arrest of labour	Yes	3	13.6%	19	86.4%	22 (13.3%)
Co-morbidities						
	No	22	15.3%	122	84.7%	144 (86.7%)
Hypertension	Chronic HTN	2	14.3%	12	85.7%	14 (8.4%)
	PIH	10	27%	27	73%	37 (22.3%)
	No HTN	13	11.3%	102	88.7%	115 (69.3%)
DM	Chronic DM	0	0%	2	100%	2 (1.2%)
	Gestational DM	1	16.7%	5	83.3%	6 (3.6%)
	No DM	24	15.2%	134	84.8%	158 (95.2%)
HIV	Detected before Pregnancy	0	0%	3	100%	3 (1.8%)
	Detected during pregnancy	0	0%	3	100%	3 (1.8%)
	No HIV detected	25	15.6	135	84.4%	160 (96.4%)
Pre-operative preparation						
Referral status	Yes	20	14%	123	86%	143 (86.1%)
	No	5	21.7%	18	78.3%	23 (13.9%)
Antibiotics prophylaxis	Yes	23	15%	130	85%	153 (92.2%)
	No	2	15.4%	11	84.6%	13 (7.8%)
Plain soap and water use	Yes	20	14.6%	117	85.4%	137 (82.5%)
	No	5	17.2%	24	82.8%	29 (17.5%)
Anti-microbial soap and water use	Yes	5	17.2%	24	82.8%	29 (17.5%)
	No	20	14.6%	117	85.4%	137 (82.5%)
Client's pubic hair shaved	Yes	16	15%	91	85%	107(64.5%)
	No	9	15.3%	50	84.7%	59 (35.5%)
Place pubic hair shaved	Ward	4	14.3%	24	85.7%	28(16.7%)
	Operating table	0	0%	1	100%	1 (0.6%)
	Home	12	15.4%	66	84.6%	78 (45%)

5.2.3. Operative and post-operative characteristics

Only 36 (21.7%) operations were conducted electively without any medical or other emergence.

Residents perform majority of CDs (94.6%) followed by specialists (4.8%), and General practitioner (GP) (0.6%) during the study period. The most prevalent type of skin incision used throughout this study was transverse incision being performed in about 161 (97%) of the study participant's.

CDs were completed within a range of 4 to 70 minutes; the median time to complete the operation being 26.5 minutes. Skin closure after CD was determined by physician's choice, which was interrupted in 21 (12.7%) of the study participants.

Post CD antibiotics were provided for 156 (94%) of the participants. Besides, all study participants were reported not to develop PPH during the study period.

Table 3: Operative and post-operative characteristics of study participants (n = 166) among CDs from March 11 - May 24, 2019 in four selected government hospitals in Addis Ababa, Ethiopia.

Variables	Category	Post CD SSI				Total (%)
		Yes		No		
		N	%	N	%	
Type of operation	Elective	1	2.8%	35	97.2%	36 (21.7%)
	Emergency	24	18.7%	106	81.5%	130 (78.3%)
CD performed by	GP	0	0%	1	100%	1 (0.6%)
	Resident	23	14.65%	134	85.4%	157 (94.6%)
	Specialist	2	25%	6	75%	8 (4.8%)
Skin incision	Transverse	22	13.7%	139	86.3%	161 (97%)
	Vertical	3	60%	2	40%	5 (3%)
Skin closure	Interrupted	2	9.5%	19	90.5%	21 (12.7%)
	Continuous	23	15.9%	122	84.1%	145 (87.3%)
Post CD antibiotics	Yes	20	12.8%	136	87.2%	156 (94%)
	No	5	50%	5	50%	10 (6%)

5.3. Incidence Rate of Post CD SSI

From 166 participants who completed 30 day follow-up, 25 (15%) of the participants developed SSI. Among them 17 (68%) developed superficial SSI that only required outpatient wound dressing and use of broad spectrum antibiotics. But 8 (32%) developed deep SSI that required prolonged hospital stay.

All mothers (n=166) in this study were followed for 30 days starting from first post-operative day. All post CD SSI was detected during the 30 day telephone interview, i.e. no SSI was detected during in-patient stay. Moreover, fifteen (60%) of the SSI's was detected from day 11 - 17 followed by day 1 -10 which exhibits 9 (36%) of SSIs and day 25 -30 that enables detection of 1 SSI.

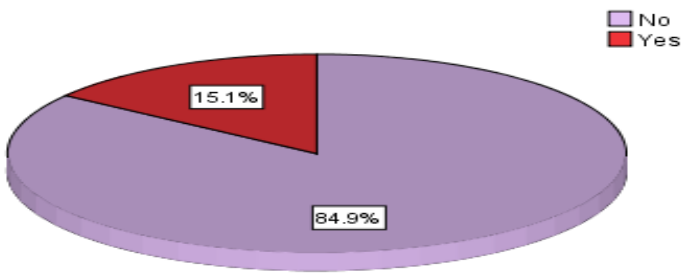

Figure 3: Incidence rate of SSI among women who deliver by CD in four governmental hospitals in Addis Ababa, Ethiopia, 2019.

5.4. Factors Associated with Cesarean Delivery SSI

Bivariate logistic regression was run for 28 variables in this study. Among them 11 of them namely; age, PROM, number of vaginal examinations, length of labour trial before CD, gestational age, type of operation, CPD, duration of operation, type of incision, administration of post-operative antibiotics, and surgical wound class, scored a p-value of less than or equal to 0.2 and were considered in multivariable logistic regression.

In the multivariable analysis three of the variables; age, gestational age, and duration of operation, showed a significant association with a p-value of ≤ 0.05. According to the latter analysis every one year increment in age leads to 1.5 times greater risk [(AOR = 1.504, 95% CI: (1.170 – 1.933))] to develop SSI. Similarly, every one minute increment in duration of operation has 1.1 times higher risk [(AOR = 1.108, 95% CI: (1.025 – 1.197))] for having SSI.

Giving birth by CD at term was also found to be 98.1% protective [(AOR = 0.019, 95% CI: (0.001 – 0.291))], for incidence of SSI compared to that of post-term deliveries.

Table 4: Factors associated with post CD infection among women (n = 166) who gave birth by CD in four selected government hospitals in Addis Ababa, Ethiopia from March 11 - May 24, 2019.

Variable	Category	SSI		COR (95% CI)	AOR (95% CI)
		Yes	No		
Maternal age	-	-	-	1.445 (1.272 - 1.641)	1.504 (1.17 – 1.933)
Duration of operation	-	-	-	1.076 (1.04 – 1.113)	1.108 (1.025 – 1.197)
PROM	No	10	78	1	1
	≤ 12 hrs.	4	48	0.65(0.193 – 2.188)	0.235 (0.02 – 2.808)
	>12 hrs.	11	15	5.72 (2.064 – 15.85)*	3.982 (0.381 - 41.614)
Number of vaginal examination	No	2	54	1	1
	1 -4	5	36	2.454 (0.552 – 10.916)	10.732(0.438 – 263.006)
	≥5	17	52	5.776(1.597-20.89)*	13.076(1.018-168.002)
Length of labour trial before CD	≤24 hrs.	10	108	1	1
	>24 hrs.	15	33	4.909(2.016-11.955)*	3.408(0.402-28.897)
Gestational age	<37 wks.	3	26	0.238(0.063-0.897)*	0.074(0.004 -1.315)
	37 – 40 wks.	5	80	0.129 (0.044-0.376)*	0.019(0.001-0.291)**
	>40wks	17	35	1	1
Type of operation	Elective	1	35	1	1
	Emergency	24	106	7.925(1.034-60.734)*	7.667(0.190-309.384)
CPD	Yes	10	23	3.420(1.368-8.552)*	1.860(0.158-21.857)
	No	15	118	1	1
Type of skin incision	Transverse	22	139	1	1
	Vertical	3	2	9.477(1.498-59.964)*	0.046(0.001-2.408)
Post-operative antibiotics	Yes	20	136	1	1
	No	5	5	6.800(1.807-25.595)*	8.999(0.037-213.220)
Surgical wound class	Class I	10	78	1	1
	Class II	4	48	0.65(0.193 – 2.188)	0.235 (0.02 – 2.808)
	Class III	11	55	5.72 (2.064 – 15.85)*	3.982 (0.381 - 41.614)

Key:

* p-value ≤ 0.2 in bivariate analysis; **p-value <0.05 in multivariable analysis.

6. DISCUSSION

This study aimed to assess incidence and factors associated with post CD surgical site infection among mothers who give birth by CD in selected government hospitals in Addis Ababa.

The finding of this study showed post CD SSI was detected in twenty five (15.1%) of the participants after getting discharged from their respective hospitals completing due follow-up. From this one can appreciate the use of post discharge infection surveillance for immediate evaluation and improvement of CD service, since post CD in-patient stay is decreasing from time to time. The rate, however, might be underestimated due to significant number of lost participants.

The finding was significantly higher compared to the results of studies done in Polish hospital, US academic institution and Israel health institution which showed an incidence rate of 0.5%, 5.5%, and 3.7% respectively (6, 19, 20). This gap might partially be due to the difference in socio-economic status, health care delivery system, and distribution of risk factors among the studied group. The study design used might also have an influence, since, targeted active surveillance method was used by Polish Hospital's study, and retrospective cohort design by the rest studies.

In comparison with studies done in Thai-Myanmar border hospital, a hospital in Oman, two hospitals in Libya, three Sub-Saharan African countries, and Tanzania, that showed an incidence of 6.2%, 2.6%, 2.53 – 3.07%, 7.6%, and 10.9% respectively, the incidence rate of post CD SSI revealed by this study is still high (27, 31-33, 38). This difference might be due to discrepancy in SSI definition, distribution of risk factors among the studied group, sample size, and the study design employed.

Even though most of the studies reviewed in this study utilized the definition of CDC for diagnosing post CD SSI, some, like the study in Libya, utilized more specific criteria to diagnose the issue unlike this study. For example, Libya's study utilized healing progress and the presence of certain bacteria to diagnose the condition in addition to the CDC's criteria. This might contribute to the wide difference in incidence rate of post CD SSI between Libya's and the present study (27). Large sample sizes utilized by studies in Sub-Saharan Africa (n = 1276) and Thai-Myanmar border hospital (n = 4988) might additionally reason out the inconsistency.

It can also be noticed that compared to previous studies conducted in Ethiopia, the incidence rate of post CD SSI in this study is high. This can be exemplified by the rates of 6.8% in Lemlem-Carl Hospital, 11% in Hawassa, and 11.7% in Ayder Hospital (24, 26, 29). This might be due to difference in study design, study place and sample size.

However, the rate is in line with a study conducted in Jordan that finds out a 14.4% incidence of post CD SSI (28). This might be due to similar means of data collection used by both studies.

Some of the variables considered in this study show a strong association with the outcome variable. A one year increment in age exhibits 1.5 times greater risk [(AOR = 1.504, 95% CI: (1.170 – 1.933))] to develop post CD SSI. This result is in line with findings of studies done in Israel and Libya, which showed age increment, is a risk factor for post CD SSI (20, 27). This agreement might be due to reduced ability of cell growth and repair which is inevitable as age increases. Furthermore, gradual changes in endocrine and immune system with aging might also contribute.

The finding, however, contradicts with that of a study performed in three Sub-Saharan African countries that demonstrated younger age was associated with higher incidence of SSI(38). This might be due to over representation of young age population and endemic nature of the condition.

The study also showed giving birth by CD at term was 98.1% protective [(AOR = 0.019, 95% CI: (0.001 – 0.291))] for incidence of SSI compared to that of post-term deliveries. Even though direct association between preterm delivery and post CD SSI could not be found in this study, it agrees with studies in USA and Israel that laboring at term can protect infection by avoiding complications of preterm labour such as hastened labour(19, 20).

Furthermore, this study revealed, a one minute increment in duration of operation has 1.1 times higher risk [(AOR = 1.108, 95% CI: (1.025 – 1.197))] for having SSI. The finding was in line with a study done in Lemelem-Karl Hospital, Ethiopia (29). This might be due to the extended time of operation that might lead to more tissue damage and rise in introduction of various micro-organisms in to peritoneal cavity.

7. STRENGTH AND LIMITATION OF THE STUDY

7.1. Strength of the Study

Since post-surgery in-patient stay is gradually decreasing, this study was capable of demonstrating the distribution of the problem after discharge evidenced by diagnosis of all post CD SSI on the post discharge survey. It also enabled to appreciate incidences of post CD SSI that might be lost due to poor documentation if retrospective cohort design was used.

7.2. Limitation of the Study

Even though the study showed post discharge surveillance is an important tool for the evaluation and improvement of CD service, it also has its own limitations. One of the drawbacks is the probability of losing a study participant before completing follow up. Plus to this, since background data for each study participant was taken from patient's chart, incomplete and inaccurate documentation influences its result.

Since small sample size was studied, inadequate representation of some variables also reduced the number of associated factors established in this study.

8. CONCLUSION AND RECOMMENDATION

8.1. Conclusion

Rate of incidence of post CD SSI was high in this study. The variables PROM, length of labour trial, type of operation, indication of operation, type of incision, and post-operative antibiotics were not significant in this study. However, they should be tested in a study with larger sample size which has adequate representation of the cases.

Maternal age, gestational age, and duration of operation were found to have strong association with the study variable.

8.2. Recommendation

Based on the finding of the study the researcher recommends an interventional prospective study with broad sample size can help researchers as well as health care set-ups with a better detection and improvement of the situation.

The high incidence rate of post CD SSI identified in this study necessitates organized effort of all stakeholders to reverse the situation. Ethiopian Ministry of Health can better regulate infection control policy to avert the condition. Hospital administrators and maternity ward heads are also encouraged to enforce improved surgical techniques and facilitate implementation of infection prevention protocols. In addition to this, consistent personal and hand hygiene among all staffs of labour and delivery unit and strict administration of pre and post-operative antibiotics might reduce the incidence of post CD SSI.

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10. APPENDICES

Appendix A: Information Sheet

Here, I the undersigned student, at Addis Ababa University College of Health Sciences, School of Nursing and Midwifery, graduate studies program, am currently undertaking my thesis. For this study, you will be selected as a participant and before getting your consent of participation, you need to know all necessary information related to the study. Thus, this information will be detailed as:

Title of the Research proposal:

Incidence of surgical site infection and factors associated among cesarean deliveries in selected government hospitals in Addis Ababa, Ethiopia.

Name of the Organization: Addis Ababa University, College of Health Science, School of Nursing and Midwifery.

Name of the Sponsor: Addis Ababa University.

Objective of the study: The aim of this study is to assess the incidence of SSI among cesarean deliveries and its associated factors in selected government hospitals in Addis Ababa, 2019.

Significance of the study: the study will identify predictors of post cesarean delivery surgical site infection and guide stake holders to reduce incidence of SSI, work on prevention strategies, and reduce socio-economic impact. Findings from the study will provide important information for policy makers to develop strategies, guidelines and early prevention approach towards post cesarean delivery surgical site infection.

Participants to be included: all mothers who delivered by cesarean delivery in the selected hospitals and are willing to participate in the study will be included.

Procedure: mothers delivering by CD in the selected government hospitals will be told about the objectives, benefits, and risks of the study. If they are willing to participate in the study, their charts will be reviewed for recorded maternal characteristics. Then they will be followed for the development of SSI signs and symptoms during their hospital stay. After discharge, four phone calls, each every week, will be held to those mothers and development of SSI syndrome will be requested.

Confidentiality: All information you give will be kept confidential and won't be accessible to any third party. Your name won't be registered on the questionnaire sheet so that you will not be identified.

Risks and Benefits of the study

Risks and /or Discomfort: The study will be conducted by taking necessary information from the medical chart and through a phone call. So it will elicit any harm or discomfort on the client. The name and other identifying information will not be recorded and the information taken from the chart and the phone call will be kept strictly in confidential manner. The information retrieved will only be used for the study purpose and you will not be forced to respond to the information you do not need to.

Benefits: the research has no direct benefit or a payment for those participants who provide information about their CD wound condition. However, the study has indirect benefit for the participant and other clients with post cesarean delivery SSI, since, the study will identify potential predictors of SSI and the recommendation based on the finding will help stake holders and policy makers to work on the prevention approaches.

Appendix B: Consent Form

Client consent form to assess post- cesarean delivery surgical site infection and factors associated with it in selected government hospitals in Addis Ababa, Ethiopia.

My name is _____ I am working in research team which is conducted by Addis Ababa University for partial fulfillment of master's degree in Maternity and Reproductive Health Nursing. We are collecting data from mothers giving birth by cesarean delivery in four hospitals. The objective of the study is to assess the incidence of surgical site infection among cesarean deliveries and factors associated with it in selected governmental hospitals found in Addis Ababa.

If you are willing to participate in the study, I am going to provide you brief explanation about post-cesarean delivery surgical site infection syndrome and equip you with graphic and diagrammatic representation of the condition. I then expect you to communicate with me through cell phones for the development of the syndromes based on the guide provided within 30 days after surgery. I also will take notes from your medical records. Nevertheless, your name will not be written in this form and will never be used in connection with any of the information you will tell me. You do not have to participate in the study if you do not want to.

However, your willing participation will help us in determining level of and factors associated with post-cesarean delivery surgical site infection. We would appreciate your keen interests in participating in this study. The interview will take about 20 minutes. Would you be willing to participate [indicate by ticking the appropriate responses]?

Yes _____, No_____.

Signature of the interviewer certifying that the informed consent has been read verbally by respondents-

---

If you have any question with regards to this study, you can ask immediately the interviewer or the principal investigator (Mobile Number: 0911827629).

Appendix C: Data Collection Tool

Post-cesarean delivery surgical site infection data collection tool	
1	Participant code: _____ Age: ____ Weight: ____ Kg. Height: ____cm. Gravidity: _____ Parity: _____
	Hospital: _____ Ward: _____
	Date of admission: _____ Participant contact number: _____ Is the client referred from another facility: ☐ Yes ☐ No
2	Underlying conditions: Diabetes mellitus ☐ Yes before pregnancy ☐ Yes during pregnancy ☐ No Hypertension ☐ Yes before pregnancy ☐ Yes during pregnancy ☐ No Cardiac failure ☐ Yes before pregnancy ☐ Yes during pregnancy ☐ No HIV status ☐ Positive before pregnancy ☐ Positive during pregnancy ☐Negative If HIV positive, is client on ART ☐ Yes before pregnancy ☐ Yes during pregnancy ☐ No Is patient on anti-TB treatment ☐ Yes before pregnancy ☐ Yes during pregnancy ☐ No Other, specify _____
3	Gestational age ☐ <37 weeks ☐ 37 – 40 weeks ☐ > 40 weeks
4	Duration that client was in labour ☐ no labour ☐ < 24 hours ☐ > 24 hours ☐ No record Number of vaginal examinations before CD: ☐ No vaginal examination ☐ 1 – 4 vaginal examinations ☐ ≥ 5 vaginal examinations
5	Length of time membranes ruptured prior to cesarean delivery

	☐ No rupture ☐ >12 hours ☐ < 12 hours ☐ No records
6	Date of operation _____ Time of operation _____ Duration of operation _____ Start time _____ End time _____ Type of operation ☐ Elective ☐ Emergency Type of skin incision ☐ Transverse ☐ Vertical History of previous cesarean section ☐ Yes ☐ No Type of anesthesia provided ☐ General ☐ Local ☐ Spinal ☐ Epidural The operation is performed by ☐ Student ☐ GP ☐ Resident ☐ Specialist
7	Does antibiotic prophylaxis provided ☐ Yes ☐ No If yes, state type and dose of antibiotics given _____ Time prophylactic antibiotics is given ☐ Exact time _____ If exact time is not available, tick the appropriate one : ☐ < 15 min. ☐ 15 – 30 min. ☐ 30 – 45 min. ☐ 45 – 60 min ☐ > 1 hour
8	State solution used for surgeon's hand preparation: ☐ Plain soap and water ☐Antimicrobial soap and water ☐Other specify…… Antiseptic used for peri operative skin preparation ☐Aqueous butadiene ☐2%Chlohexidine/Alcohol ☐Other specify……
9	Was client shaved? ☐ Yes ☐ No; If yes, state where? ☐Ward ☐Anesthetic room ☐ On the operating table ☐ Home
10	Surgical wound classification for caesarean section Please tick one: ☐Class I: Clean ► Caesarean Section, elective, no pre-rupture of membranes or trial of labour

	☐Class II: Clean Contaminated ►Caesarean Section, emergency involving pre-rupture of membranes less than 12hours and /or trial of labour ☐Class III: Contaminated ► Rupture of membranes more than 24hours ☐Class IV: Dirty ►Purulent amniotic fluid						
11	Skin closure: ☐Interrupted sutures ☐ Continuous						
12	Post-partum hemorrhage ☐ Yes ☐ No						
13	**Post op findings**	**Day 0**	**Day 1**	**Day 2**	**Day 3**	**Day 4**	**Day 5**
	Temperature						
	Pulse						
	Day sutures removed						
14	**Antibiotic and dose given**	**Day 0**	**Day 1**	**Day 2**	**Day 3**	**Day 4**	**Day 5**
	15. State presence of any of the following infection symptoms during inpatient stay: Purulent drainage from the incision ☐ Yes ☐ No Wound dehiscence ☐ Yes ☐ No Presence of at least one of the following signs or symptoms of infection - Pain or tenderness at operation site ☐ - Localized swelling ☐ - Redness ☐ - Fever (>38°C) ☐ - Hotness of skin ☐ 16. Date of onset of symptoms: …… Date patient discharged……						

	Results of wound swab, if any: Organisms isolated: …… Antibiotic Susceptibility: Sensitive to: …… Resistant to: ……

17. Post Discharge Surveillance	
Review Week 1: Post Discharge Day 4-10 Is patient experiencing any of the following infection symptoms: Pain/tenderness at operation site: ☐Yes ☐No Purulent discharge at wound site ☐Yes ☐No Wound dehiscence ☐Yes ☐No Localized swelling ☐Yes ☐No Redness ☐Yes ☐No Hotness of skin ☐Yes ☐No Date of onset of symptoms…… Outcome ……	**Review week 2: Post discharge Day 11 – 17** Is patient experiencing any of the following infection symptoms: Pain/tenderness at operation site: ☐Yes ☐No Purulent discharge at wound site ☐Yes ☐No Wound dehiscence ☐Yes ☐No Localized swelling ☐Yes ☐No Redness ☐Yes ☐No Hotness of skin ☐Yes ☐No Date of onset of symptoms…… Outcome ……
Review week 3: Post discharge Day 18 – 24 Is patient experiencing any of the following infection symptoms: Pain/tenderness at operation site: ☐Yes ☐No Purulent discharge at wound site ☐Yes ☐No Wound dehiscence ☐Yes ☐No Localized swelling ☐Yes ☐No Redness ☐Yes ☐No Hotness of skin ☐Yes ☐No Date of onset of symptoms…… Outcome ……	**Review week 4: Post discharge Day 25 - 30** Is patient experiencing any of the following infection symptoms: Pain/tenderness at operation site: ☐Yes ☐No Purulent discharge at wound site ☐Yes ☐No Wound dehiscence ☐Yes ☐No Localized swelling ☐Yes ☐No Redness ☐Yes ☐No Hotness of skin ☐Yes ☐No Date of onset of symptoms…… Outcome ……

18. SSI detected: ☐Yes ☐No

If Yes state when SSI was detected: ☐ During admission ☐Post discharge

Date SSI detected: ……

Type of SSI: ☐ Superficial ☐ Deep ☐ Organ/Space

Comment:

……
……

Form completed by ---------- Signature---------- Date……..

Appendix D/አባሪ 4፡ የፍቃድ መጠየቂያ ቅጽ አማርኛ ቨርሺን

የድህረ-ቀዶ ጥገና ወሊድ የቀዶ ሕክምና ቦታ ኢንፌክሽን እና ተያያዥ ሁኔታዎችን በ አዲስ አበባ ኢትዮጵያ ውስጥ በተመረጡ የመንግስት ሆስፒታሎች ውስጥ በሚያጠና ጥናት ዉስጥ ለመሳተፍ ያለን ፈቃደኝነት መጠየቂያ ቅጽ፡፡

ስሜ _____ ነው። በአዲስ አበባ ዩኒቨርስቲ በወሊድ እና የተዋልዶ ጤና ነርሲንግ ትምህርት ክፍል ዉስጥ የማስተርስ ዲግሪን በከፊል ለማሟላት በሚካሄድ ጥናት የምርምር ቡድን ውስጥ እሰራለሁ፡፡ አራት ሆስፒታሎች ውስጥ በ ቀዶ ጥገና የሚወልዱ እናቶች ላይ መረጃ እየሰበሰብን ነው፡፡ የጥናቱ ዓላማ በ ቀዶ ጥገና የሚወልዱ እናቶች ላይ የቀዶ ሕክምና ቦታ ላይ ስለሚኖር ኢንፌክሽን እና ተያያዥ ሁኔታዎች በ አዲስ አበባ ውስጥ በተመረጡ የመንግስት ሆስፒታሎች ላይ ማጥናት ነው፡፡

በጥናቱ ላይ ለመሳተፍ ፍቃደኛ ከሆኑ ስለ ድህረ-ቀዶ ጥገና ወሊድ ቀዶ ሕክምና ቦታ ኢንፌክሽን ምልክቶች አጭር መግለጫ ለእርስዎ በመስጠት ስለ ሁኔታው ሰእላዊ መግለጫ ለእርስዎ አቀርባለሁ፡፡ ከዚያም በስልክ ስለ ምልክቶቹ እድገት በማቀርበዉ መጠይቅ መሰረት ከቀዶ ሕክምና በኋላ ባሉ 30 ቀኖች ውስጥ በሳምንት አንድ ቀን (ለ 4 ሳምንታት) በሚመችዎት ሰአት ምላሽ እንዲሰጡኝ እጠብቃለሁ፡፡ በተጨማሪም ከሕክምና ሪከርድዎ ማስታወሻ እወስዳለሁ ሆኖም የእርስዎ ስም በዚህ ቅጽ ላይ አይፃፍም በሚነግሩኝ ማንኛውም መረጃ ጋር በተያያዘ ጥቅም ላይ አይውልም ካልፈለጉ በጥናቱ ላይ አለመሳተፍ ይችላሉ፡፡

ሆኖም በፍቃደኝነት መሳተፍዎ በድህረ ቀዶ ጥገና ወሊድ ቀዶ ሕክምና ሳይት ኢንፌክሽን ደረጃዎች እና ተያያዥ ሁኔታዎች ለመገንዘብ ያግዘናል፡፡ በዚህ ጥናት ላይ ለሚኖረው የተሳትፎ ፍላጎት እናመሰግናለን ቃለ መጠይቁ 20 ደቂቃዎች ያህል ይወስዳል፡፡ ለመሳተፍ ፍቃደኛ ከሆኑ ትክክለኛው ምላሽ ላይ ምልክት ያድርጉ፡፡

ለመሳተፍ ፍቃደኛ ነኝ_____ ለመሳተፍ ፍቃደኛ አይደለሁም_____

የቃለመጠይቅ አድራጊ ምላሽ ሰጪዎች ውሳኔያቸውን በቃል ስለማንበባቸው ማረጋገጫ ፊርማ _____

ይህንን ጥናት በተመለከተ ማንኛውም ጥያቄ ካልዎት ወዲያውኑ ቃለ መጠይቅ አድራጊውን ይጠይቁ ወይም ዋና መርማሪ ሞባይል ስልክ 0911827629 ላይ ግንኙነት ያድርጉ

APPENDIX E/አባሪ 5: የመረጃ መሰብሰቢያ አማርኛ ቨርሺን

ድህረ-ቀዶ ጥገና ወሊድ ቀዶ ሕክምና ቦታ ላይ ለሚኖር ኢንፌክሽን መረጃ መሰብሰቢያ ቅጽ

1	ተሳታፊ ኮድ: _____ ዕድሜ: _____ ክብደት: _____ ኪ.ግ. ቁመት: _____ሣ.ሜ. የሁሉም እርግዝና ቁጥር: _____ 28 ሳምንት የደረሰ እና ያለፈ እርግዝና ቁጥር: _____
	ሆስፒታል: _____ ክፍል: _____
	የገቡበት ቀን: _____ ተሳታፊዉን ማግኛ ቁጥር/ስልክ ቁጥር: _____ መኖሪያ: □ከተማ□ገጠር ደንበኛው ከሌላ ተቋም ሪፈር ተደርገዋል: □ አዎ □ አይ
2	ያሉት ሁኔታዎች: የስኳር በሽታ □ አዎ ከእርግዝና በፊት □ አዎ በእርግዝና ወቅት □አይ ደም ግፊት □ አዎ ከእርግዝና በፊት □ አዎ በእርግዝና ወቅት □ አይ የልብ በሽታ □ አዎ ከእርግዝና በፊት □ አዎ በእርግዝና ወቅት □ አይ ኤችአይቪ □ ፖዘቲቭ ከእርግዝና በፊት □ ፖዘቲቭ በእርግዝና ወቅት □ኔጌቲቭ ኤች አይ ቪ ፖዘቲቭ ከሆኑ ደንበኛው ጸረ ኤች አይ ቪ ህክምና ላይ ናቸው □ አዎ ከእርግዝና በፊት □ አዎ በእርግዝና ወቅት □ አይ ታካሚው ጸረ ቲቢ ሕክምና ላይ ናቸው □ አዎ ከእርግዝና በፊት □ አዎ በእርግዝና ወቅት □ አይ ሌላ ካለ ይገለጽ _____
3	የእርግዝና እድሜ □ < 37 ሳምንት □ 37 – 40ሳምንት□ > 40 ሳምንት
4	የደንበኛ የምጥ ጊዜ □ ምጥ የለም □ < 24 ሰዓት □ > 24 ሰዓት □ ሪኮርድ የለም ከቀዶ ጥገና ወሊድ በፊት የብልት/ማህጸን ምርመራ ብዛት፡ □ ብልት/ማህጸን ምርመራ የለም □1 – 4 ብልት/ማህጸን ምርመራ □ ≥ 5 ብልት/ማህጸን ምርመራ
5	ከቀዶ ጥገና ወሊድ በፊት የሜምብሬን መፈንዳት ጊዜ ርዝመት □ መፈንዳት የለም □ >12 ሰዓት □ < 12 ሰዓት □ መረጃ የለም
6	የቀዶ ሕክምና ቀን፡ _____ የቀዶ ሕክምና ሰዓት _____ የቀዶ ሕክምና ርዝመት፡ _____ መጀመሪያ ሰዓት _____ መጨረሻ ሰዓት _____ የቀዶ ሕክምና መነሻ: □የማህጸን በር እና የህፃን ጭንቅላት መጠን አለመመጣጠን □የህፃን መታፈን □የምጥ መቆም □ሌላ ካለ ይገለጽ 50 የቀዶ ሕክምና አይነት፡ □ በምርጫ □ ድንገተኛ

	የቆዳ ቅድ አይነት፡ □ ትራንስቨርስ □ ቨርቲካል የበፊት ቀዶ ጥገና ወሊድ ታሪክ፡ □ አለ □ የለም ማደንዘዣ የተሰጠበት አይነት፡ □ ጠቅላላ □ ሎካል □ ስፓይናል □ ኤፕዱራል ቀዶ ሕክምና ያደረገው፡ □ ተማሪ □ ጄፒ □ ረዚደንት □ ስፔሻሊስት
7	የቅድመ- መከላከል አንቲባዮቲክስ ተሰጥቷል □ አዎ □ አይ አዎ፣ ከሆነ የተሰጠ አንቲባዮቲክስ አይነት እና መጠን_____ የቅድመ- መከላከል አንቲባዮቲክስ የተሰጠበት ሰዓት □ ትክክለኛ ሰዓት _____ ትክክለኛ ሰዓት ከሌለ ተገቢው ሳጥን ምልክት ያድርጉ : □ < 15 ደቂቃ. □ 15 – 30 ደቂቃ 30 – 45 ደቂቃ □ 45 – 60 ደቂቃ. □ > 1 ሰዓት
8	ለቀዶ ሐኪም የእጅ ዝግጅት ጥቅም ላይ የዋለ ውህድ : □ ሳሙና እና ውሃ □አንቲሚክሮማል ሳሙና እና ውሃ □ሌላ ካለ ይገለጽ…… ለቅድመ ቀዶ ሕክምና የቆዳ ዝግጅት የተሰጠ ጸረ ኢንፌክሽን፡ □አኩየስ ቡታዲን □2% ክሎርሄክሳዲን/አልኮል □ሌላ ካለ ይገለጽ……
9	የደንበኛ የብልት ጸጉር ተላጭቷል ? □ አዎ □ አይ; አዎ ከሆነ ቦታው ይገለጽ? □ቅድመ ቀዶ ሕክምና ክፍል □ማደንዘዣ ክፍል □ ቀዶ ሕክምና ጠረጴዛ ላይ □ ቤት የደንበኛው የብልት ጸጉር በክሊፕ ተያይዟል? □ አዎ □ አይ
10	የቀዶ ሕክምና ቁስል ምደባ ለቀዶ ጥገና ወሊድ እባክዎን አንዱ ላይ ምልክት ያድርጉ: □ደረጃ 1 : ንፁህ ► ቀዶ ጥገና ወሊድ፣ በፍላጎት የተደረገ፣ ቀደም ብሎ የመምብሬን መፈንዳት የሌለው ወይም የምጥ ሙከራ የሌለው □ደረጃ 2: በግልጽ የተበከለ ►ቀዶ ጥገና ወሊድ ፣ ደንገተኛ ከ12፡00 ሰዓት ያነሰ የሜንብሬን መፈንዳት እና/ወይም የምጥ ሙከራ □ደረጃ 3: የተበከለ ► ከ24፡00 ሰዓት በላይ የሜንብሬን መፈንዳት □ደረጃ 4: ቆሻሻ ►መግል አዘል የእንሽርት ዉሃ መፍሰስ
11	የቆዳ አሰፋፍ: □ኢንተረፕትድ ስፌት □ ኮንቲኒየስ ስፌት
12	የድህረ-ወሊድ ደም መፍሰስ □ አለ □ የለም: የፈሰሰዉ የደም መጠን ይገለጽ _____.

13	**የድህረ-ቀዶ ሕክምና ግኝቶች**	**ቀን 0**	**ቀን 1**	**ቀን 2**	**ቀን 3**	**ቀን 4**	**ቀን 5**
	ሙቀት						
	ስትንፋስ						
	ስፌት ተነስቷል?						
14	**የተሰጠ አንቲባዮቲክ እና መጠን**	**ቀን 0**	**ቀን 1**	**ቀን 2**	**ቀን 3**	**ቀን 4**	**ቀን 5**

15. ማንኛውም የኢንፌክሽን ምልክት የውስጥ ታካሚ እያሉ የነበር ይገለጽ

ከቀዶ-ጥገና ቦታ የሚወጣ መግል አዘል ፈሳሽ □ አዎ □ አይ

የቁስል መፈታት □ አዎ □ አይ

ቢያንስ የሚከተሉት አንዱ ምልክት ወይም የኢንፌክሽም ምልክ

- ቀዶ-ጥገና ቦታ ላይ ሕመም ወይም የህመም ስሜት □
- ቀዶ-ጥገና ቦታ አካባቢ የሚታይ እብጠት □
- መቅላት □
- ትኩሳት (>38°C) □
- የቆዳ መሞቅ □

የህመም ምልክት የታየበት ቀን: ……

ታካሚው የወጡበት ቀን……

የቁስል ስዋብ ውጤቶች ካሉ: የተለየ አርጋኒዝም……

አንቲ ባዮቲክ አቀባበል: ሰዉነት ሴንሴቲቭ ነዉ ለ: ……

ከሰዉነት የተላመደ መድኅኒት ካለ ይጠቀስ፡

……

16.

17. የድህረ መውጣት ቁጥጥር

የመረጃ ማሰባሰብ ሳምንት 1: ድህረ መውጣት ቀን 4-10	የመረጃ ማሰባሰብ ሳምንት 2: ድህረ መውጣት ቀን 11-17
ታካሚው የሚከተሉት ማንኛቸውም ኢንፌክሽን ምልክቶች አላቸው:	ታካሚው የሚከተሉት ማንኛቸውም ኢንፌክሽን ምልክቶች አላቸው:
ቀዶ ሕክምና ሳይት ላይ ሕመም: □አዎ □አይ	ቀዶ ሕክምና ሳይት ላይ ሕመም: □አዎ □አይ

ከቁሱሉ ሳይት ፈሳሽ □አዎ □አይ የቁስል መፈታት □አዎ □አይ ቀዶ ሕክምና ሳይት ላይ እብጠት □አዎ □አይ መቅላት □አዎ □አይ ሙቅ ቆዳ □አዎ □አይ የምልከቶች ቀን …… ውጤት……	ከቁሱሉ ሳይት ፈሳሽ □አዎ □አይ የቁስል መፈታት □አዎ □አይ ቀዶ ሕክምና ሳይት ላይ እብጠት □አዎ □አይ መቅላት □አዎ □አይ ሙቅ ቆዳ □አዎ □አይ የምልከቶች ቀን …… ውጤት……
የመረጃ ማሰባሰብ 3: ድህረ መውጣት ቀን 18-24 ታካሚው የሚከተሉት ማንኛቸውም ኢንፌክሽን ምልክቶች አላቸው: ቀዶ ሕክምና ሳይት ላይ ሕመም: □አዎ □አይ ከቁሱሉ ሳይት ፈሳሽ □አዎ □አይ የቁስል መፈታት □አዎ □አይ ቀዶ ሕክምና ሳይት ላይ እብጠት □አዎ □አይ መቅላት □አዎ □አይ ሙቅ ቆዳ □አዎ □አይ የምልከቶች ቀን …… ውጤት……	የመረጃ ማሰባሰብ 4: ድህረ መውጣት ቀን 25-30 ታካሚው የሚከተሉት ማንኛቸውም ኢንፌክሽን ምልክቶች አላቸው: ቀዶ ሕክምና ሳይት ላይ ሕመም: □አዎ □አይ ከቁሱሉ ሳይት ፈሳሽ □አዎ □አይ የቁስል መፈታት □አዎ □አይ ቀዶ ሕክምና ሳይት ላይ እብጠት □አዎ □አይ መቅላት □አዎ □አይ ሙቅ ቆዳ □አዎ □አይ የምልከቶች ቀን …… ውጤት……
18. ቀዶ ሕክምና ቦታ ላይ የተፈጠረ ኢንፌክሽን ተለይቷል: □አዎ □አይ አዎ ከሆነ መቼ ታየ: □ በድጋሚ ቅበላ ወቅት □ ከወጡ በኃላ ቀዶ ሕክምና ቦታ ላይ የተፈጠረ ኢንፌክሽን የታየበት ቀን: …… ቀዶ ሕክምና ቦታ ላይ የተፈጠረ ኢንፌክሽን አይነት: □ ሱፐርፊሻል □ የጠለቀ □ ኦርጋን/ስፔስ	

አስተያየት፡_____ ፎርሙን የሞላው ሰው ስም _____

ፊርማ _____ ቀን_____