COLLEGE OF HEALTH SCIENCE

SCHOOL OF NURSING AND MIDWIFERY

DEPARTMENT OF MIDWIFERY

MATERNAL AND FETAL HEALTH OUTCOME OF CESAREAN SECTION AND ITS ASSOCIATED FACTORS IN GURAGE ZONE GOVERNMENTAL HOSPITALS, SNNPR, ETHIOPIA, 2021 G.C

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A THESIS RESEARCH SUBMITED TO ADDIS ABABA UNIVERSITY, COLLEGE OF HEALTH SCIENCES, SCHOOL OF NURSING AND MIDWIFERY, DEPARTMENT OF MIDWIFERY IN PARTIAL FULFILLMENT OF THE REQUIREMENTS FOR THE DEGREE OF MASTERS OF SCIENCE IN MATERNITY AND REPRODUCTIVE HEALTH NURSING

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ACRONYMS AND ABBREVIATIONS

AAU - Addis Ababa University

ACOG - American College of Obstetricians and Gynecologist

ANC - Ante Natal Care

APGAR - Appearance, Pulse, Grimace, Activity, Respiration

CS - Cesarean Section

DVT - Deep Vein Thrombosis

EDHS - Ethiopia Demographic Health Survey

EMDHS - Ethiopia Mini Demographic Health Survey

GA - Gestational Age

GC - Gregorian calendar

NICU - Neonatal Intensive Care Unit

PPH - Post-Partum Hemorrhage

PI - Principal Investigator

SDG - Sustainable Development Goal

TOLAC - Trial of Labor after Cesarean Delivery

UTI - Urinary Tract Infection

VD - Vaginal Delivery

WKU - Wolkite University

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ABSTRACT

Background: A cesarean section is the most common obstetric surgery performed today. Even though cesarean delivery is the safest mode of delivery for high risk situation, it also appears to have higher risk of maternal and neonatal morbidity and mortality than vaginal delivery in low risk cases.

Objectives: To determine the maternal and fetal health outcome after cesarean section and its associated factors in Gurage Zone governmental hospitals, SNNPR, Ethiopia 2021 G.C.

Methods: Institutional based retrospective cross-sectional study was conducted in Gurage Zone governmental hospitals from February 21/2021- March 13/2021on cards of mother who delivered by cesarean section from February 2019 to January 2021. The total sample size was 398 and collected from five governmental hospitals. The collected data was entered and analyzed using STATA version 15. Binary and Multiple Logistic regressions were used to identify associated factors for maternal outcome and fetal outcome.

Result: Out of mothers included in the study 23.4% of them had poor maternal outcome. The prevalence of poor fetal outcome was 19.74%. Obstetric complication [AOR of 2.65, 95% CI, (1.17, 6.01)], Medical disease [AOR of 3.39, 95% CI (1.13, 10.16)], General Anesthesia [AOR of 16.8, 95% CI (1.32, 212.54)] and Ante Partum Hemorrhage as indication for Cesarean Section [AOR of 3.73, 95% CI, (1.08, 12.83)] are found to be statistically significant factors for poor maternal outcome. Also Medical disease [AOR of 5.78, 95% CI (1.17, 28.54)] and Cephalic Pelvic Disproportion as an indication for Cesarean Section [AOR of 5.57, 95% CI (1.74, 17.78)] are statistically significant factors for poor fetal outcome.

Conclusion & Recommendation: The prevalence of poor maternal and fetal outcome is 23.37% and 19.74% respectively. The most common maternal complications post CS were infection (5.98%), Blood transfusion (5.71%), Hemorrhage (5.43%). Although much emphasis has been placed on reducing maternal mortality associated with pregnancy, mothers who escape pregnancy-related mortality but suffer health consequences should also be given special attention.

Key Words: Cesarean section, maternal outcome, fetal outcome, Maternal Complication,

1. INTRODUCTION

1.1. Back ground

Cesarean section (CS) is an obstetric surgery performed to deliver a baby by an abdominal incision proceeding by uterine incision to conduct safe delivery for both fetal and maternal reasons. Cesarean section could be either elective or an emergency (1,2). The continual progress in anesthesia and different techniques result improved outcome and safety of cesarean deliveries because of that its rate has been increasing. Cesarean deliveries have increased dramatically in recent years in both developed and developing countries. The figure of global CD rate from 1990 to 2014 was approximately 18.6% (3). WHO stated CS rates shouldn't be above 10%, beyond this threshold doesn't shows an association in reducing in maternal and newborn mortality rates (4).

Globally estimation around 22.9 million cesarean procedures performed each year. CS is one of the most effective procedures for preventing maternal and perinatal mortality and morbidity, but it is associated with a higher risk of maternal morbidity and mortality than vaginal delivery (5,6). ACOG revealed that CS significantly increase the women's risk of vulnerability of pregnancy related morbidity and mortality as compared to a women delivered by vaginal deliveries(5). In facilities that have a deficient in capacity to perform safe operation and manage surgical complications may have a great deal for the emergence of different complications (4,6). In the previous decade, the rate of unfavorable maternal outcomes has increased. As the number of women who have had CS rises, so does the likelihood of major maternal problems (3).

Maternal complications is not limited to physical health, it also affect the wellbeing of mothers emotion and perception that may also affect the mothers capability to give care for her newborn (7). Maternal complications could be affected by associating factors such as Ante natal care status, severe blood loss, route of anesthesia, medical condition of the mother and others(8). Also history of previous CS, Surgeon's experience, type of CS performed, fetal presentation could affect the outcome of CS by involving in roles for the occurrence of complications. To reduce the risk of complication that is related to CD, great focus has been given for Trial Of Labor After Cesarean Delivery (TOLAC) (7,9).

Treatment and enforced separation are frequently required for newborn problems, impairing early mother–infant attachment (10). some factors that are associated with adverse neonatal outcome is indication for cesarean section such as preeclampsia, eclampsia, obstructed labor, breech, fetal distress, cord presentation, cord prolapse, fetal mal-presentation and multiple gestation were significant factors (9,11,12). Stillbirth, neonatal morbidity, and newborn death are all associated with the type of cesarean section performed (elective CS vs. emergency CS) (13).

1.2. Problem Statement

Maternal mortality and morbidity can be reduced by increasing the access to cesarean delivery. Whereas overuse of cesarean section can be harmful to both mother and neonate (4). A cesarean section carries the risk of complications, which can lead to morbidity and even death. Although the operation continues in its progress to become safer, the overall post cesarean section complications decreased (5).

The chances of sepsis, hemorrhage, thromboembolism, and amniotic fluid embolism are almost five times higher after a cesarean section than they are following a vaginal delivery (2). In addition, newborn mortality after cesarean section is three times greater than mortality after vaginal births worldwide (14,15). Following CS, the chance of placenta previa and attached placenta rises, potentially increasing the risk of per partum hysterectomy and bleeding. Post-partum hemorrhage, complications of anesthesia, thromboembolism and post-partum infections are the main reasons for raised mortality after cesarean section (2).

In Asia 27% of women develop complication related to cesarean section. Cesarean section raises the risk of maternal morbidity and death. Complications ascend in delivery from vaginal delivery to elective cesarean section and highest at emergency CS. emergency CS had a higher rate of complication compared to elective CS. Hemorrhage, blood transfusion, minor wound infection, postpartum fever, peritonitis, hysterectomy, internal iliac artery ligation and anesthetic complications are found to be complications after cesarean section. The frequency of maternal complications reported in various research varies according to how complications are defined, the technique of data collection, and the time of follow-up following caesarean section (16–18). Also in related to neonatal morbidity and NICU admission birth asphyxia takes the commonest role (5). early neonatal mortality rate is lower in elective CS as compared to vaginal delivery and emergency CS. Severe asphyxia of APGAR score at five minute 4 or lower is lowest in elective CS (17).

In Africa 62.5% of women who delivered by CS experience severe maternal outcome. Maternal morbidity and mortality is higher in women with intra-partum CS as compared to women with operative vaginal delivery. When compared to vaginal birth, maternal mortality following CS is about three times higher. The CS case fatality rates were from 10.1- 31.9 deaths per 10,000 CS.

Common Causes of maternal mortality in intra-partum CS are postpartum hemorrhage 61(39.4%), hypertensive complications 39(25.2%), puerperal infection 25 (16.1%) and other indirect obstetric causes are 15(9.7%)(19–21). In sub- Saharan Africa intra-partum neonatal mortality accounts for about 73% of global neonatal intra-partum deaths and neonatal mortality post cesarean delivery in sub-Saharan Africa is higher than the global average (14,15).

In Tigray Regional State, North Ethiopia revealed that among the women who underwent CS, 19.3% had an adverse maternal outcome. The major short- term complications found were wound infection 7%, endometritis 3.6% and bleedings requiring blood transfusion 2.8%, whereas hysterectomy 1.7%, uterine rupture 0.6% and maternal death 0.28% were the major long term and serious maternal complications found (22). Also in other study complications found after cesarean section were infections, puerperal sepsis, maternal mortality and others. Although the most common cause for maternal morbidity in Ethiopia is puerperal fever (23).

According to the World Health Organization (WHO), studies are needed to determine the short and long-term health effects of CS, which are yet unknown (4). No clear evidence has been found that explains the rapid increase in the number of cesarean deliveries has led to improvements in the rated of maternal or neonatal morbidity (3).

Despite different studies carried on to assess the rate of CS in Ethiopia, there is limited information regarding the outcome of CS in hospitals. So far great attention has been given to decrease MM that is related to pregnancy whereas less focus has been given for mothers who survived pregnancy related mortality but ends with health effect. The impact of a cesarean section on a mother's health is still unknown. The aim of this study is to address the information gap on the outcome of CS on maternal and newborn health following cesarean section in Gurage zone governmental hospitals. Also the results of this study will benefit hospitals, clinicians and researchers in anticipating management of the mother.

1.3. Significance of the study

The issue of maternal and newborn mortality and morbidity is still a problem throughout Sub-Saharan Africa, particularly Ethiopia. Hospitals should have base line study on the outcomes of cesarean deliveries in order to assess the progress through time for further study and intervention. Understanding the health effect of CS will help in prevention and management of complication. It will also assist clinicians in making decisions and implementing evidence-based practices in order to minimize maternal and newborn mortality and morbidity. The results of this study will also bring some insight for health care practice. As WHO recommended more research is required to address the need for understanding the effect of caesarean section, this research will be one of the input that feel the gap on the understanding of cesarean section effect on maternal and fetal health outcome. And also it will be useful for further investigations.

2. LITERATURE REVIEW

2.1. Maternal Health Outcome

Maternal mortality and morbidity remain a major global problem, particularly in developing nations such as Ethiopia. The impact of cesarean section on maternal health outcomes in terms of morbidity and death remains unknown (4).

A systematic review on "maternal and perinatal mortality and complication associated with cesarean delivery in low income and middle income countries" that used a database from 1990 to 2017, In low and medium income nations, the major result for women who had a cesarean birth was maternal mortality and the common cause for maternal death is postpartum hemorrhage. In sub Saharan Africa the maternal mortality after cesarean section is high as 10.9 per 1000 procedures. The maternal and perinatal mortality rate after CS is 100 times greater in poor and medium income countries than in high income ones (24).

In a study conducted in Thailand, CS significantly increased the risk of severe adverse maternal outcomes compared to mothers who gave birth vaginally. Women who gave birth with a cesarean section had a higher risk of serious postpartum hemorrhage than women who gave birth vaginally (3). Although in other study conducted in Turk, During hospital stay Intraoperative or post-operative complications were 27% of women who had CS; 10% of women had severe complications and who had life threatening complications are 0.76% (16).

In Africa, people who have undergone surgery are more likely to die as a result of the procedure than in the rest of the world (25). However, according to another study, maternal death after caesarean surgery is 50 times greater in low-income countries, with per partum hemorrhage and anesthetic complications being the leading causes. The perioperative complications were severe infections, severe cardiac complications, severe obstetric hemorrhage and anesthesia complications (13). Short and long term complication raise with additional CS which includes infection and postoperative bleeding, abdominal adhesions, placenta accrete and surgical injury. Although future pregnancy may be complicated by uterine scar rupture with potential serious maternal and fetal consequences (26) .

According to a research done in Tigray, 19.3 percent of mothers experience complications following a cesarean section. The major short term complications was wound infection (7%),

endometritis (3.6%), and bleedings requiring blood transfusion (2.8%), whereas hysterectomy (1.7%), uterine rupture (0.6%) and maternal death (0.28%) were the serious maternal complications observed (22). Adhesion (8.3%), severe blood loss and blood transfusion(5.6%), cesarean hysterectomy(3%), relaparotomy(1.5%), wound infection and wound dehiscence(6.8%) were all documented in another study in the same region (9).

SSI, PPH, Puerperal fever, maternal death, Puerperal sepsis, and severe anemia were reported to be common unfavorable maternal complications preceding CS in an Ethiopian study. In Ethiopia, puerperal fever, followed by PPH, was the leading cause of maternal morbidity after CS (23). In a recent study, Arbaminch generalized hospital found that complication after cesarean section is around 38.2%. The major operative complications found were surgical wound infection (12%), febrile morbidity among (4.6%), PPH among (2.2%), DVT among (0.5%) and UTI in (0.2%) of the mothers (27). Also a study conducted in Finoteselam hospital One-third (28%) of the mothers would develop one or more complication following CS delivery, the most causes for these complications were wound site infection, PPH, anesthesia complication and puerperal sepsis(8).

2.2. Fetal health outcome

In Africa neonatal mortality is twice as compared to global average (13). In sub- Saharan Africa intra partum neonatal mortality accounts for about 73% of global neonatal intra partum deaths and neonatal mortality post cesarean delivery in Africa's Sub-Saharan higher than the global average (14,15). The overall still birth rate in Africa is around 36.6 per 1000 births. Still birth rates ranged from 25.4 in Algeria and 70.7 in Nigeria (13). In the study conducted in Rwanda the poor neonatal outcome were 9% (15).

In Ethiopia neonatal complication following CS are stillbirth, early neonatal death, low birth weight,_ Perinatal asphyxia, low APGAR score meconium aspiration syndrome and prematurity are common (9,12,14,23). Among the complications Low APGAR score followed by perinatal asphyxia and neonatal sepsis are the commonest in Ethiopia (23). In a research done at the Ayder Hospital, it was discovered that fetal outcome majorly still birth (2.6%), early neonatal death (2.4%), low birth weight (17.2%) and low APGAR score around 20.4% (9). Also in another study done on outcome of emergency cesarean section in St Paul’s hospital, neonatal outcomes

include stillborn (4%) and around 18,6% were admitted to NICU (12). In a national study stillbirth was unfavorable neonatal outcome which accounts around 14% (11).

2.3. Associated factors of maternal and fetal health outcome

2.3.1. Socio demographic Factors

There are a variety of factors that have been associated with cesarean section outcome. Socio demographic variables such as Age and educational status of the mother, marital status, income and others are among those factors. Most of studies found that maternal age above 35 as a risk factor in maternal outcome after cesarean section(16,28–31). Advanced maternal age is considered as an associate with risky pregnancies. The risk of post-operative complication such as hemorrhage and thromboembolic events related to deliveries increases in older mothers that are above > 35 years (16). Some studies identified variables such as such as educational status including partner educational status and residence as an associate factor for health outcome in cesarean section (9,22,32).

2.3.2. Obstetrics and Medical related Factors

Obstetrics and surgical factors affect health outcome in a big deal. Also preoperative risk factors such as pre-eclampsia or eclampsia, major bleeding risk, any chronic medical condition and preoperative sepsis affect the outcome (13). Maternal morbidity increases when the number of previous cesarean deliveries and multiparty increases (26,33,34). Women with previous cesarean deliveries have an increasing occurrence of short term and long term complications. Decrement of number of cesarean section had better be thought to decrease the risk of complications that is related to it (32). In Ayder, a research was carried out that found that ANC booking status and presence of previous CS were substantially linked to management outcome of CS (9). Also a study conducted in north Tigray found two determinant factors. Those are; women who were referred from lower setup institutions (AOR 2.71, 95% CI 1.34- 5.47) and route of anesthesia (AOR 3.14, 95% CI 1.24- 8.01) were the determinant factors found (22).

In Ethiopia factors that are associated with adverse neonatal outcome are indication for cesarean section such as preeclampsia and eclampsia and obstructed labor (9). Also indications for CS such as breech or fetal distress results poorer fetal outcome (11). In another study common

indication for emergency cesarean section such as cord presentation, cord prolapse, fetal mal presentation and multiple gestation were found significant factors among from un survived neonates (12). In a national study fetal outcome were poorer among women who underwent CS as compared to elective cesarean section (11). Although in the study conducted in Attat hospital found that statistically, there isn't any significance between type of CS and neonatal outcome (14).

2.3.3. Surgical related Factors

most studies found also emergency cesarean section specially intra partum cesarean section has higher chance of acquiring intraoperative and post-operative complications as compared to elective cesarean section and as compared to vaginal delivery(16,33,35,36). Also the surgeon experience affect the health outcome(29). The other determinant factors are route of anesthesia administration. women who receive general anesthesia are more prone to develop any adverse maternal outcome as compared to those who received spinal anesthesia(22).

Factors such as emergency cesarean delivery rates associate with fresh stillbirths, neonatal deaths and a high rate of newborn morbidity. Whereas elective cesarean delivery rates were associated with fewer fresh stillbirths and neonatal deaths (13). In another study, neonates whose moms had four or more children previous pregnancies were found to have a higher risk of bad outcomes. Also mothers presented with severe indications for CS had twice odds of having poor outcomes (15).

2.4. Conceptual Framework

This conceptual Framework was developed by reviewing different literatures on the associating factors for maternal and fetal health outcome following cesarean section (3,9,22,28,37).

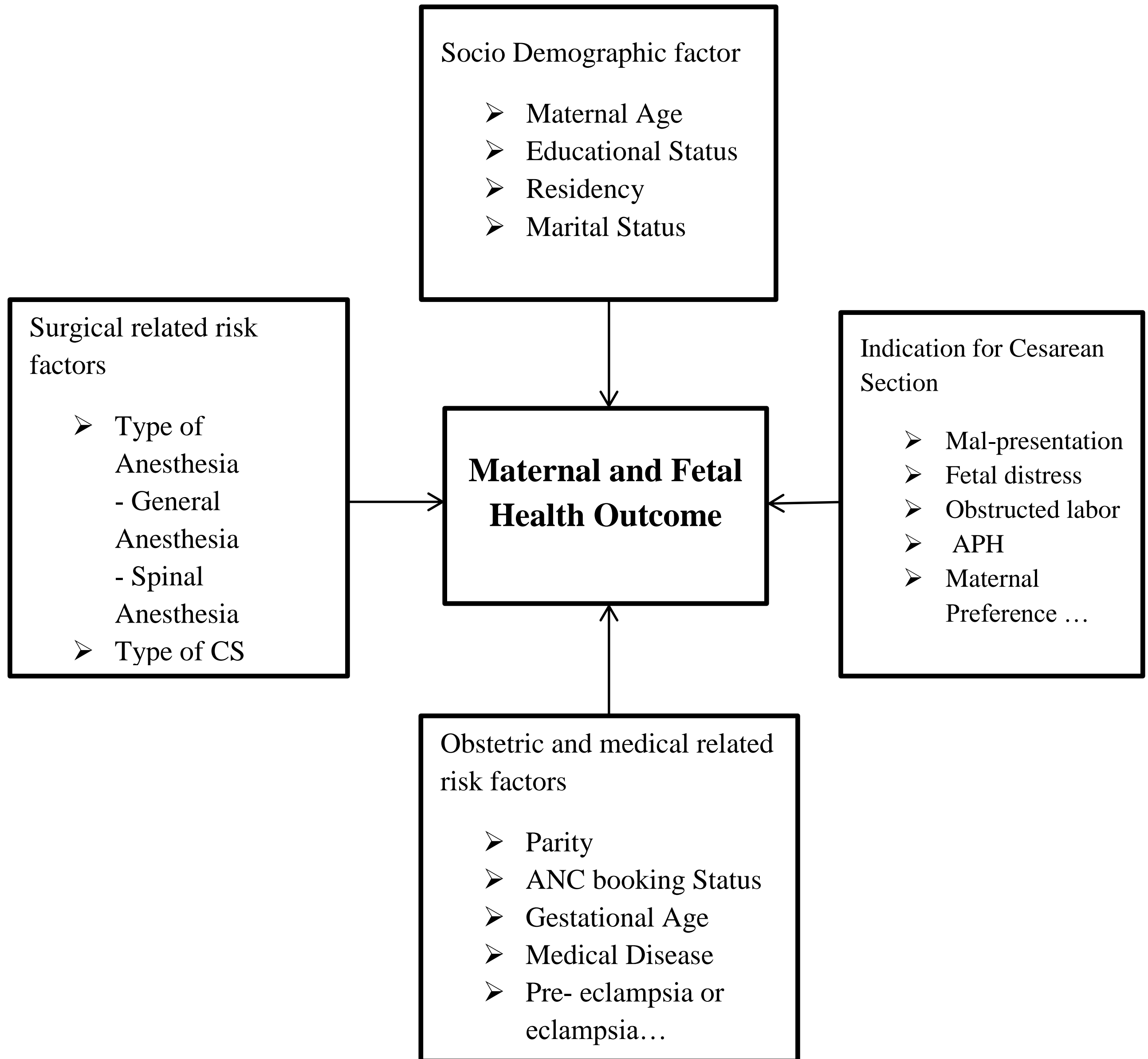

Figure 1: Conceptual Framework developed to determine factors associated with maternal and fetal health outcome of cesarean section among women who gave birth in Gurage Zone, SNNPR, Ethiopia.

3. OBJECTIVE OF THE STUDY

3.1. General Objectives

To determine the maternal and fetal health outcome of cesarean section and its associated factors in Gurage Zone Governmental Hospitals, SNNPR, Ethiopia

3.2. Specific Objectives

- To assess maternal health outcomes of cesarean section in Gurage Zone Governmental Hospitals.
- To assess fetal health outcomes of cesarean section in Gurage Zone Governmental Hospitals.
- To identify the associated factors of cesarean section outcome in Gurage Zone Governmental Hospitals.

4. METHODS AND MATEREIALS

4.1. Study period and area

The study was carried out in Gurage zone Governmental hospitals from February 21/2021-March 13/2021 G.C. Gurage zone has 21 woreda, 5 administrative city with a total population of 1,807,892. There are seven governmental hospital found in the zone, those are Butajira General Hospital, Wolkite University Specialized Teaching Hospital, Gunchere Primary Hospital, Quante Primary Hospital, Buee Primary Hospital, Gedebano Gutazer Wolene Hospital and Agena Primary Hospital. Gedebano Gutazer Wolene hospital and Agena hospital doesn't provide CS service. As a result this study was conducted with the rest hospital which does give CS intervention. These hospitals are described as follows;

Butajira General Hospital is located in Butajira town one of the largest town in Gurage zone located 135km south of Addis Ababa. The hospital was established in 2002 G.C and started giving CS service in the same year. The second hospital included in this study was Wolkite University Specialized Teaching Hospital (WUSTH), which is affiliated with Wolkite University located in Gubere town near Wolkite. It was launched in 2019 G.C and start CS service in the same year.

Gunchere Primary Hospital was the third hospital included in this study which is found 42km away from Wolkite, the administrative city of Gurage zone, was established in 2007 G.C and started giving CS service in 2008 G.C. Quante Primary Hospital was the fourth hospital from Gurage zone which is included in this study. It is located 90km away from Wolkite, which was established in 2016 G.C. It started CS service in 2018 G.C. The last hospital included was Buee Primary Hospital, which was a health center in the beginning and later on upgraded itself into a primary hospital in 2015 G.C.

4.2. Study design

An Institutional based retrospective cross sectional study was conducted in five governmental hospitals located in Gurage zone, SNNP, Ethiopia.

4.3. Source and study population

4.3.1. Source population

All mothers who gave birth by cesarean section in governmental hospitals located in Gurage Zone for the past two year (February 2019 to January 2021 G.C).

4.3.2. Study population

All randomly selected mothers who gave birth by cesarean section in governmental hospitals located in Gurage Zone for the past two year (February 2019 to January 2021 G.C).

4.4. Inclusion and exclusion criteria

4.4.1. Inclusion Criteria

All mothers who gave birth by cesarean section during the study period.

4.4.2. Exclusion Criteria:

Medical records with incomplete information were excluded.

4.5. Sample size determination

The final sample size was calculated by using Epi info Statistical software. A single population proportion formula was used to estimate the sample size and accordingly proportion was taken from previous similar studies based on the specific objectives of this study. The proportion which gives the higher sample size was finally used to determine the final sample size. The following parameters were considered to determine the sample. So this study used this value to obtain the minimum sample size at 95% certainty and maximum discrepancy of 5% between the sample and the population. In addition, 10% was added as a contingency to compensate for the possible incomplete data.

Table 1: Sample size determination

Indicator	Proportion	Sample size
Poor Maternal Outcome	19.3% (Tigray)	239
	38.2% (Arbaminch)	362
Poor Fetal Outcome	1.76% (Harar)	27
	32.9% (Mettu)	339

The sample size with great value was chosen which is 362. After adding 10% contingency the final sample size was 398.

4.6. Sampling technique

All governmental hospitals that provide Caesarean Section service in Gurage zone were selected. All records of caesarean deliveries done at Gurage zone governmental hospitals during the study period were found from the Gurage zone health bureau. After finding the numbers of Caesarean Delivery in each hospital, proportional sample allocation was done for each hospital. The list of all women who gave birth by caesarean section were traced using operation room log book and selected by simple random sampling technique by using R software (42).

$$n_h = \frac{N_h * n}{N}$$

- n_h is the sample size allocated in the hospital
- N_h is the number CS performed in selected hospital in the past two year
- N is the number CS performed in all selected hospital
- Where n is the total sample size
- h runs from 1 to 5

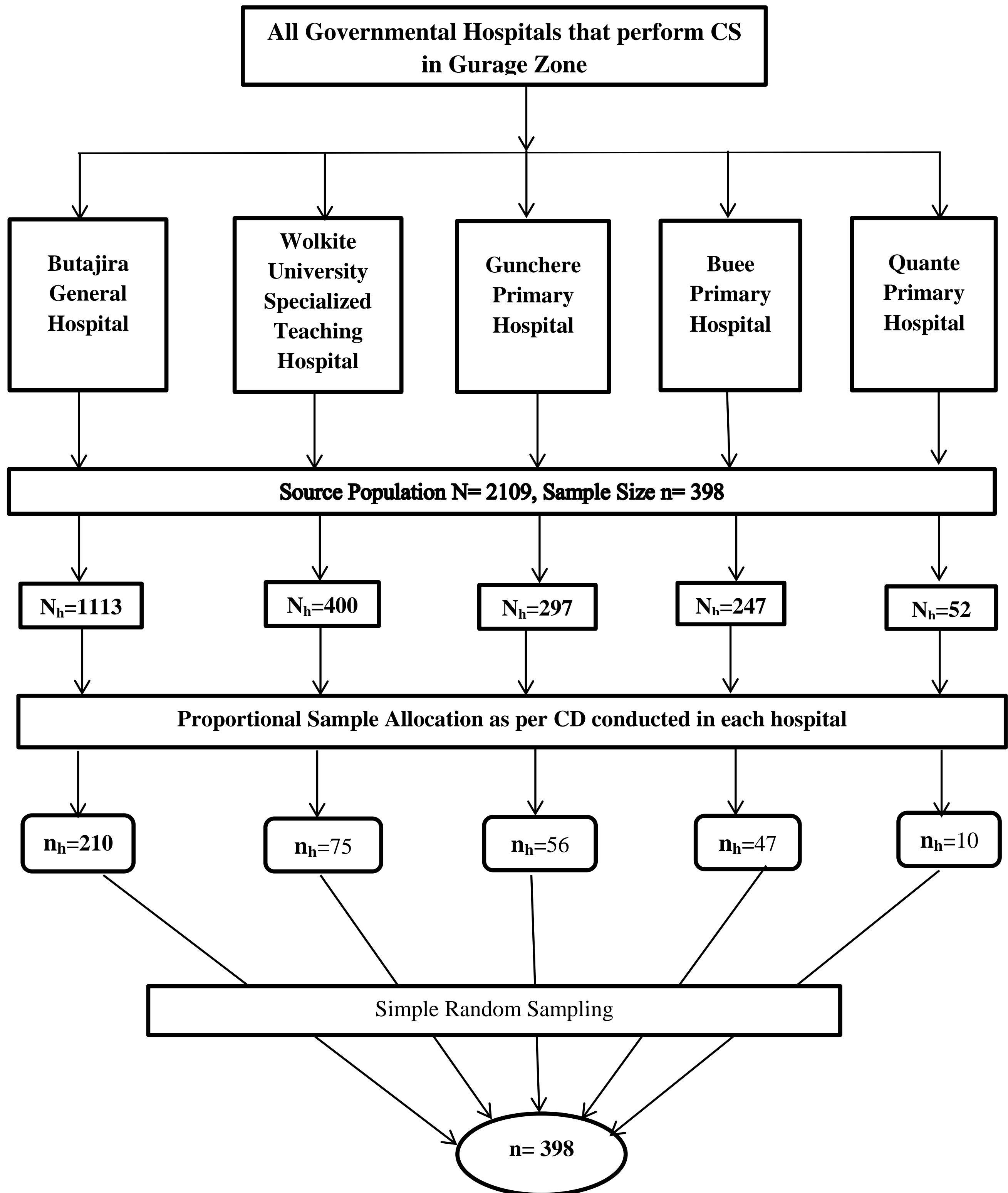

Figure 2: thematic presentation of sampling technique for the selection of study units in the five Gurage zone governmental hospitals.

4.7. Variables

4.7.1. Dependent variable

- Maternal health Outcome of cesarean section
- Fetal health Outcome of cesarean section

4.7.2. Independent variables

- **Socio demographic factors:-** Age, Marital Status, Educational status, Occupation,
- **Obstetrics and surgical factors:-** Gravidity, Parity, Gestational Age, Duration of labor, Fetal lie, Medical illness, Stage of labor, Indications, Prophylaxis antibiotics…
- **Type of anesthesia**: General Anesthesia, Spinal Anesthesia
- **Type of cesarean delivery:** Elective CS, Emergency CS

4.8. Operational definitions

Maternal Outcome: was measured based on maternal mortality and complications in the hospital before discharge. It was classified as either good or poor outcome. Woman classified as poor maternal outcomes either maternal mortality occurred or one/more maternal complications identified during or after cesarean section. On the other hand women without any maternal complications are categorized in good maternal outcome.

Maternal complication: Includes the presence of one or more intra/ post-operative complications that includes: Hemorrhage, Infections, per partum hysterectomy, blood transfusion, adjacent internal organ injury, admission to ICU, thromboembolic event, Amniotic fluid embolism, reoperation, wound hematoma, anesthetic complication and others.

Maternal Mortality: "the death of a woman during or after cesarean section in the hospital before discharge"

Fetal Outcome: Classified as either good or poor outcome. Poor fetal outcome is classified in the presence of at least one of them (Low APGAR score, Admission to NICU, Low Birth Weight, death (stillbirth or early neonatal death)) otherwise classified as Good fetal outcome.

Obstetric Complications: The Presence of one of the following PROM/chorioamniotis, preeclampsia or eclampsia, obstructed labor, mal-presentation, suspected uterine rupture and others.

4.9. Data collection instrument

Data was collected using data abstraction tool which was prepared after reviewing of different previous literature and customized based on the objectives of this study (8,9,22,27). The tool was prepared in English language and involves socio demographic factors, obstetric history, medical history, operation profile history and outcome of cesarean section.

4.10. Data collection process

Data was collected by seven data collectors who are professional midwives who work in the hospitals. And five experienced supervisor with a master's degree in health related fields was allocated. Detail Training was given for data collectors and supervisor on the contents of the data abstraction tool and how to collect data from selected records for two days prior to data collection period by the principal investigator.

4.11. Data Quality Control

To assure the quality of data, close supervision was maintained by the principal investigator. Any ambiguities or unclear ideas during the data collection process were resolved by having a discussion with data collectors, supervisors and principal investigator. Day to day activities during data collection was supervised and evaluated and errors was corrected by the investigator before the following day activity. Pretest was done one week prior to the actual data collection period with 15% of the total sample size in Attat Hospital that's found in the same study area in order to assure clarity, logical sequence and feasibility of measuring important variables. By considering the data collection process during the pretest, some modification in variable measurement, such as adding a new variable and deleting the existing variable was done when a threat in measurement feasibility (difficulty of measuring) or consistency was noticed.

4.12. Data Entry and Analysis

The data was checked for completeness, cleaned for inconsistencies and missing values, it was entered and analyzed by using STATA version 15. A binary logistic regression was performed separately to identify factors associated with maternal and fetal outcome. The observations were assumed to be independent. first a binary logistic regression was done by assuming clinically important variables and variables which were found to be associated with maternal outcome and fetal outcome from previous study and accordingly those variables which are significant at a p-value of $P < 0.2$ were entered into the multivariable logistic regression model and adjusted odds ratio (AOR) with 95% confidence interval at a p-value of $p < 0.05$ was used to describe the variable that is independent predictor of the outcome variable.

The relationship between the Dependent Variables and continuous predicator variable was checked for linearity graphically. Multi collinerity was assessed using variance inflation factors. Simultaneous approach was done for model building. The likelihood ratio test was used to compare between candidate models. The model specification was tested by using link test that check whether any relevant variables omitted or the link function is correctly specified. Goodness of fit was checked by Hosmer- Lemshow goodness of fit statistic that showed the model reasonably fit the data (P-value 0.93) and ROC curve that lied above the 45 degree line (Area under the ROC curve = 0.7598). All the assumptions were assumed to be met and finally those variables which are significant in binary logistic regression analysis were regressed together.

4.13. Ethical consideration

Ethical clearance was obtained from department of Midwifery, College of health sciences, Addis Ababa University. Ethical clearance was obtained from Gurage zone health department. Letter of permission was obtained from Administration Office, Obstetrics and Gynecology department of each hospital. The data from medical records was treated with strict secrecy, neither the case records nor the data retrieved were utilized for any other reason, and all information gathered was kept anonymous.

4.14. Dissemination of result

The finding of the study will be disseminated to Addis Ababa University, College of health sciences, School of nursing and midwifery, Department of nursing and midwifery, Gurage Zone Health bureau and for each Gurage Zone governmental hospitals.

5. RESULT

5.1. Socio-demographic Characteristics of the mothers

In the past two year (February 2019 to January 2021 G.C) 2109 Cesarean Delivery was conducted in the selected five hospitals. Three hundred sixty eight mothers were included in the study and 7.6% of records were excluded due to lack of completeness. As shown in the table 2 below, Majority of women was in the age range of 25 – 29 years and the mean age is 26.8 year with standard deviation 5.1. Most of woman's were married 353(95.92%) and rural resident 193(52.32%).

Table 2: Socio-demographic Characteristics of mothers who had Cesarean Delivery in Gurage zone governmental hospitals from February 2019 to January 2021.

Variables		Frequency	Percentage (%)
Age	15-19	15	4.08%
	20-24	109	29.62%
	25-29	137	37.22%
	30-34	66	17.94%
	35-39	36	9.78%
	>40	5	1.36%
Marital Status	Single	15	4.08%
	Married	353	95.92%
Residence	Urban	175	47.68%
	Rural	193	52.32%

5.2. Obstetrics History and Medical History of the mother

As described in the table 3 around 222(60.22%) of the mothers were referred from other health institution. Most of the mothers 172 (46.74%) were multi-para. From the total mothers who had cesarean delivery only 28(7.61%) of them had medical history and the common medical illness was hypertension. Three hundred eight 308(83.7%) had a term pregnancy which is categorized in gestational age of 37-42 wks. Most of the women 318(86.41%) had ANC follow up, out of

which 189(58%) of them had four and above ANC follow up. About 349(95.62%) of the pregnancy was singleton gestation whereas the rest 16(4.38%) were twin /gestation.

Obstetric complication has occurred in 204 (56.2%) cases. Common obstetric complications were mal-presentation, antepartum hemorrhage followed by PROM (Premature/preterm rupture of membrane) and chorioamniotis. Labor has started in 255 (70.64%) mothers and membrane has ruptured before labor starts in 126 women's. Among mothers whose membrane ruptured, amniotic fluid status were clear in most of the cases 72(64.55%) followed by meconium stained 36(32.73%) and blood stained in around 3(2.73%) cases. Most of the mothers 68(37.82%) were operated in active first stage of labor, while around 69(22.12%) mothers operated in second stage of labor with fully dilated cervix and most of them were operated on high station (Table 3).

Table 3: Obstetric and Medical history of mothers who had Cesarean Section in Gurage zone governmental hospitals from February 2019 to January 2021.

Variables		**Frequency**	**Percentage (%)**
Referral Status	Yes	222	60.33%
	No	146	39.67%
Parity	0	100	27.17%
	I	96	26.09%
	II	86	23.37%
	III	53	14.40%
	>=IV	33	8.97%
Gestational Age	<37	36	9.78%
	37-42	308	83.7%
	>42	13	3.53%
	Unknown	11	2.99%
Medical Illness	Yes	28	7.61%
	No	340	92.39%
ANC follow up	Yes	319	86.68%
	No	49	13.32%

Table 4: Obstetric and Medical history of mothers who had CS in Gurage zone governmental hospitals from February 2019 to January 2021 (Continued)

ANC visit(n=321)	One times	19	5.92%
	Two times	16	4.98%
	Three times	97	30.22%
	Four and above	189	58.88
Obstetric complication (n=363)	Yes	204	56.20%
	No	159	43.8%
Labor (n=361)	Yes	255	70.64%
	No	106	29.36%
Membrane ruptured (n=353)	Yes	125	35.69%
	No	227	64.31
Amniotic fluid status(n=111)	Clear	72	64.86%
	Meconium stained	36	32.43%
	Blood Stained	3	2.7%
Cervical Status(n=312)	Closed	57	18.27%
	<4cm	68	21.79%
	4-9cm	118	37.82%
	10cm	69	22.12
Preoperative Hemoglobin (n=340)	Normal (≥11)	280	76.09%
	Mild (10-11)	29	7.88%
	Moderate (7-10)	30	8.15%
	Severe (≤7)	1	0.27%

5.3. Indications for Cesarean Section

As shown in Figure 3, Mal-presentation 93(25.27%), Fetal distress 87(23.42%), Previous CS 85(23.16%), followed by CPD 65(17.66%) are the main leading indication of cesarean section. The least CS indication was maternal preference that accounts about 1.9%.

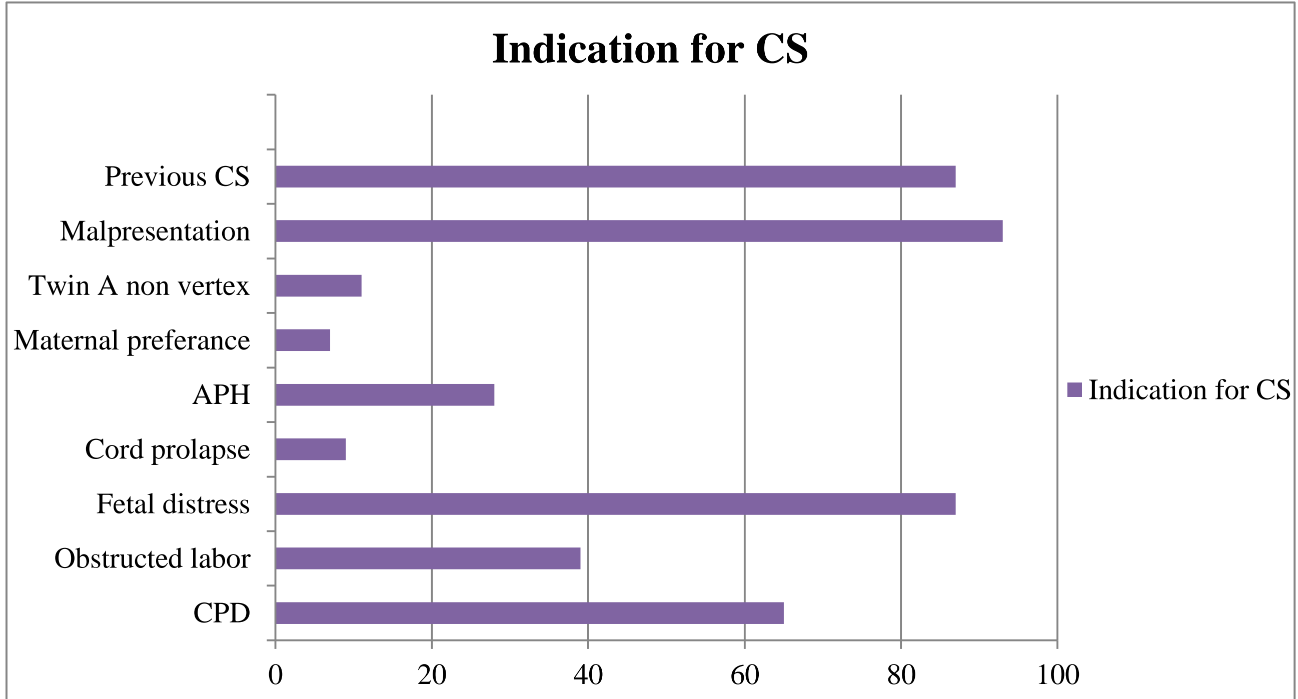

Figure: 3 Indication for Cesarean section in women who had CS in Gurage zone governmental hospitals from February 2019 to January 2021.

5.4. Operation profile

Three hundred thirty two (90.22%) emergency CS has been performed. Prophylaxis antibiotic has been given in most cases (98.64%). Spinal anesthesia (97%) was the most common anesthesia given for the mothers followed by general anesthesia (3%). Overall majority of the surgeries (49.46 percent) were completed in less than 30 minutes. Lower uterine transverse CS was done in three hundred sixty (98%) mothers. Cesarean Delivery was performed for the first time for two hundred sixty three (72.05%) and for the second time in seventy women (19.73%) (Table 4).

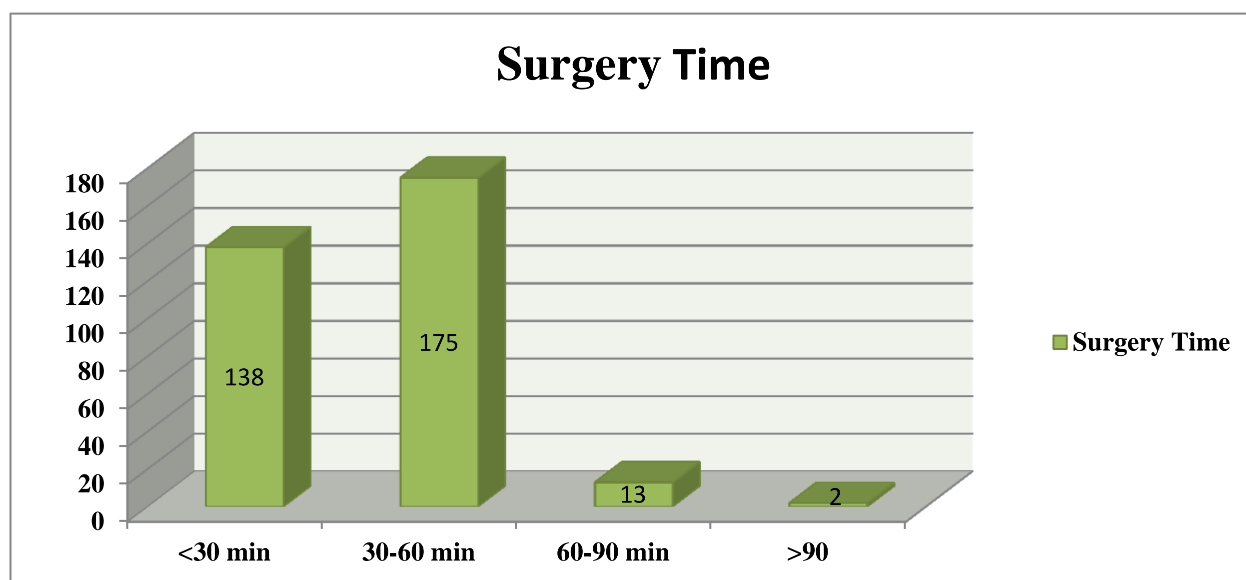

Figure 4: Time of Surgery in minutes who had Cesarean Delivery in Gurage zone governmental hospitals from February 2019 to January 2021.

Table 5: Operation Profile of mothers who had Cesarean Delivery in Gurage zone governmental hospitals from February 2019 to January 2021.

Variables		Frequency	Percentage
Type of CS	Emergency	332	90.22%
	Elective	36	9.78%
Prophylaxis Antibiotics	Given	362	98.64%
	Not Given	6	1.36%
Characteristics of CS (n= 365)	Primary	263	72.05%
	Previous one CS	72	19.73%
	Previous two and above CS	30	8.22%
Anesthesia	Spinal Anesthesia	357	97.01%
	General Anesthesia	11	2.99%
Type of Uterine incision	Lower Uterine Transverse	361	98.1%
	Inverted T	2	0.54%
	Classical	4	1.09%
	Other	1	0.27%

5.5. Maternal Outcome following cesarean section

During the research period no maternal death was reported. Out of the total mother (368), nearly quarter (23.4%) were found to have poor maternal outcome which had one or more intra/post-operative complication. Out of the eighty six mothers who developed complication, the most frequently observed complications were infection (5.98%), Blood transfusion (5.71%), Hemorrhage (5.43%), Drop in Hct/Hgb (3.8%), anesthesia complication (2.72%) and others (0.54%) (Figure 5).

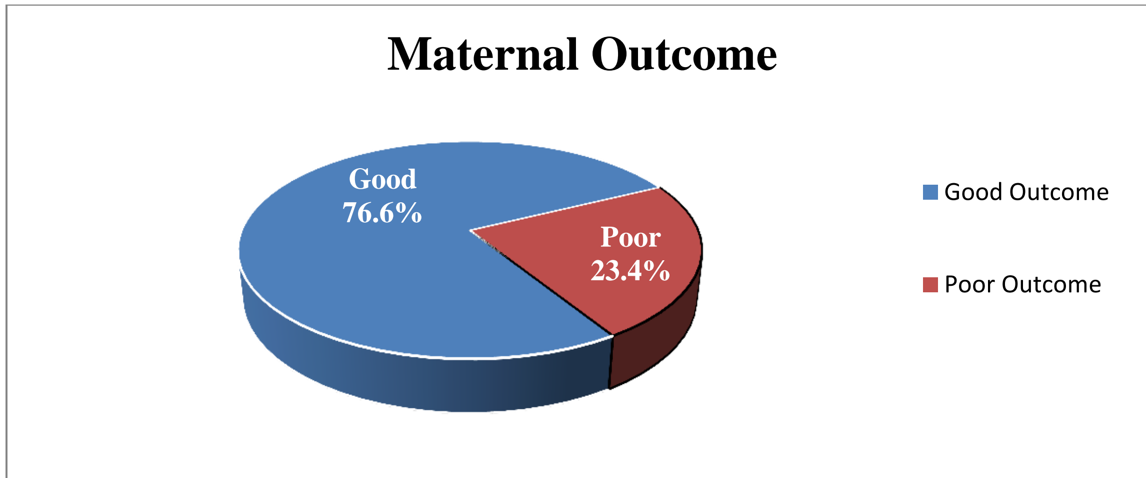

Figure 5: Maternal Outcome following CS in Gurage zone governmental hospitals from February 2019 to January 2021.

Table 6: Intra and Post- Operative maternal complication in women who had CD in Gurage zone governmental hospitals from February 2019 to January 2021.

Variables	Frequency	Percentage (%)
Infection	22	5.98%
Blood Transfusion	21	5.71%
Hemorrhage	20	5.43%
Drop in Hct/ Hgb	14	3.8%
Anesthesia Complication	10	2.72%
Hysterectomy	6	1.63%
Reoperation	2	0.54%
Others(DIC, Organ injury)	2	0.54%

5.6. Fetal Outcome following cesarean section

During the research period 380 babies were delivered by CS from which 12 of them were twins. Out of which 17 of them died. Around 19.74% poor fetal outcomes have encountered. Most of the newborns were male (53.68%). About 15.78% and 9.9% of the newborn had poor first and fifth minute Apgar score respectively. Low birth weight has seen in fifty four newborns. 25 (6.58%) of the newborns were admitted to NICU. The reason for NICU admission were Low birth weight (3.68%), Asphyxia (2.36%), Sepsis (1.31%) and Meconium Aspiration Syndrome (0.78%). No newborn has been sent to other facility for further treatment.

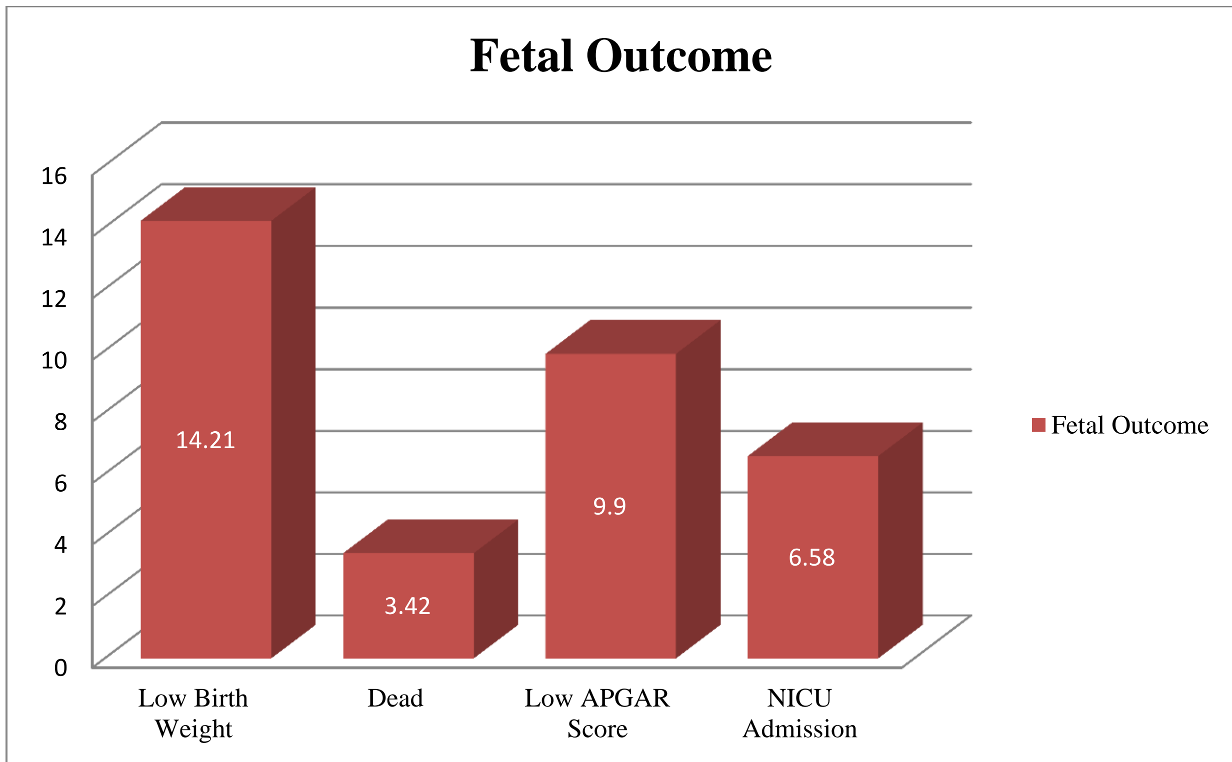

Figure 6: Fetal outcome following Cesarean Section in Gurage zone governmental hospitals from February 2019 to January 2021 G.C.

5.7. Factors associated with maternal Outcome

Based on binary logistic regression medical disease, parity, gestational age, obstetric complication, cervix status, indication of CS (CPD, APH), surgery time, maternal age and preoperative hemoglobin, membrane rupture showed statistically significant. In multivariable analysis five variables namely medical disease, obstetric complication, membrane rupture, anesthesia and APH as indication of CS status found to be statistically significant. After comparing the models by log likelihood ratio test, the final statistically significant variables are Obstetric complication, Medical disease, Anesthesia and APH as indication of CS status.

There's a 3.39-fold increased chance of Mothers who have medical disease to have poor outcome as compared to mothers who hadn't have any medical disease with AOR of 3.39 [95% CI, (1.13, 10.16)]. The second significant factor is obstetric complication, in which there's a 2.65-fold increase in the likelihood of mothers who had obstetric complication to have poor outcome as compared to mothers who hadn't have obstetric complication with AOR of 2.65 [95% CI, (1.17, 6.01)].

APH as an indication for CS was the other significant factor. Women whose indication for CS were APH are 3.73 times more likely to have poor outcome as compared to women whose indication for CS weren't APH with AOR of 3.73 [95% CI, (1.08, 12.83)]. The last significant factor is general anesthesia: Mothers who has given general anesthesia are 16.8-fold increased likelihood to have poor outcome as compared to mothers who have taken spinal anesthesia with AOR of 16.8 [95% CI (1.32, 212.54)].

Table 7: Binary and Multivariable analysis of independent variable for maternal outcome

Variables		**Maternal Outcome**		**COR 95% CI**	**AOR 95% CI**
		Poor	**Good**		
Parity	**0**	17	83	0.24(0.1, 0.58)	0.25(0.06, 1.08)
	I	22	74	0.35(0.15, 0.82)	0.24(0.06, 0.92)
	II	15	71	0.25(0.1, 0.61)	0.29(0.07, 1.17)
	III	17	36	0.56(0.23, 1.38)	0.46(0.11, 1.86)
	≥ IV	15	18	1	1
Medical	**Yes**	12	16	2.69(1.22, 5.94)	3.39(1.13, 10.16)*

Disease	**No**	74	266	1	1
Gestational Age	**<37**	10	26	4.61(0.52, 40.27)	0.43(0.03, 5.55)
	37-42	73	235	3.72(0.47, 29.15)	1.35(0.13, 13.66)
	≥42	1	12	1	1
Obstetric complication	**Yes**	62	142	2.71(1.58, 4.66)	2.65(1.17, 6.01)*
	No	22	137	1	1
Membrane Rupture	**Yes**	35	91	1.51(0.91, 2.51)	2.18(1.02, 4.69)
	No	46	181	1	1
Cervix Status	**Closed**	7	50	0.73(0.26, 2.04)	1.73(0.4, 7.4)
	<4cm	21	47	2.35(1.03, 5.37)	2.53(0.83, 7.67)
	4-9cm	30	88	1.79(0.83, 3.86)	2.47(0.91, 6.67)
	>10cm	11	58	1	1
CPD	**Yes**	8	57	0.4(0.18, 0.88)	1.09(0.31, 3.79)
	No	78	225	1	1
APH	**Yes**	12	16	2.69(1.22, 5.94)	3.73(1.08, 12.83)*
	No	74	266	1	1
Surgery time	**< 30 min**	23	115	0.2(0.01, 3.31)	3.06(0.11, 78.8)
	30-60 min	43	132	0.32(0.01, 5.32)	6.06(0.24, 151.6)
	60-90 min	5	8	0.62(0.03, 12.4)	1
	>90 min	1	1	1	1
Age	**< 30 yrs**	54	207	0.61(0.36, 1.09)	0.91(0.4, 2.05)
	≥ 30 yrs	32	75	1	1
Anesthesia	**General Anesthesia**	9	2	16.3 (3.46, 77.3)	16.8 (1.32, 212.5)*
	Spinal Anesthesia	77	280	1	1
Preoperative Hgb	**<11**	25	35	0.34(0.18, 0.61)	0.45(0.19, 1.03)
	>11	55	225	1	1

Variables which are significant in Multivariable analysis at a P- value of <0.05 are marked by "*" sign.

5.8. Factors associated with Fetal Outcome

Based on binary logistic regression medical disease, gestational age, labor status, membrane rupture, cervix status, CS type, indication of CS (CPD, APH) and number of CS performed were found to be statistically significant. On multivariable analysis only two variables were found to be statistically significant. Those are medical disease of the mother and CPD as an indication for CS.

Mothers who have medical disease have a 5.78 times greater chance of result in poor fetal outcome as compared to mothers who have no medical disease with AOR of 5.78 [95% CI (1.17, 28.54)]. The other significant factor is CPD as an indication for CS. Mothers whose indication for CS is CPD a 5.57-fold increase in the likelihood of to result in poor fetal outcome as compared to mothers whose indication for CS is other than CPD with AOR of 5.57 [95% CI (1.74, 17.78)].

Table 8: Binary and Multivariable analysis of variables associated with fetal outcome

Variables		**Fetal Outcome**		**COR 95% CI**	**AOR 95% CI**
		Good Outcome	Poor Outcome		
Medical Disease	**Yes**	27	2	3.54(0.82, 15.25)	5.78(1.17, 28.54)*
	No	278	73	1	1
Gestational Age	**<37**	19	21	0.2(0.03, 1.05)	0.17(0.01, 2.42)
	37-42	265	51	1.15(0.24, 5.5)	1.32 (0.12, 14.41)
	≥42	12	1	1	1
Labor	Yes	209	58	0.64(0.34, 1.17)	0.47(0.11, 1.96)
	No	90	16	1	1
Membrane Rupture	**Yes**	103	32	0.68(0.4, 1.15)	0.75(0.38, 1.49)
	No	190	41	1	1
Cervix Status	**Closed**	49	8	1	1
	<4cm	59	11	0.87(0.32, 2.34)	1.5(0.31, 7.15)
	4-9cm	100	24	0.68(0.28, 1.62)	1.26(0.24, 6.63)
	>10cm	53	18	0.48(0.19, 1.2)	0.56(0.1, 3.03)

CPD	**Yes**	62	71	4.43(1.55, 12.62)	5.57(1.74, 17.78)*
	No	244	4	1	1
APH	**Yes**	19	9	0.48(0.21, 1.12)	1.72(0.43, 6.8)
	No	286	66	1	1
Characteristics of CS (n= 365)	Primary	208	65	1	1
	Previous one CS	65	9	2.25(1.06, 4.78)	1.3(0.35, 4.8)
	Previous two and above CS	29	1	9.06(1.21, 67.82)	3.07(0.24, 0.95)
Type of CS	Emergency	272	72	0.34(0.1, 1.15)	0.69(0.07, 6.62)
	Elective	33	3	1	1

Variables which are significant in Multivariable analysis at a P- value of <0.05 are marked by "*" sign.

6. DISCUSSION

This research looked into the maternal outcome and fetal outcome of cesarean section (CS). In which prevalence of poor maternal outcome is 23.37%. This result is lower as compared to a research conducted in Turk (27%)(16), Arbaminch (38.2%)(27) and Finoteselam (28%)(8). It is also higher as compared to a study carried out in Norway (21.4%)(38) and also in Tigray (19.3%) (22).

The most common complication found after cesarean delivery in this study was infection (5.98%), blood transfusion (5.71%) and hemorrhage (5.43%). The prevalence of infection, hemorrhage is in agreement with the result conducted in Tigray (7%)(22) and Ayder (5.6%)(9) Respectively. Around 98.64% prophylaxis antibiotics were given, which is higher compared to the result from Arbaminch (93.3%)(27) and Ethiopian national CS review (94%)(11). Despite almost full coverage of prophylaxis antibiotics, the leading complication found after cesarean section is infection. This might be due to environmental factors, patient factors and infection prevention system of the facility. Also the least complications were hysterectomy (1.7%) and reoperation (0.54%) was also consistent with the result conducted in Tigray (1.7%)(22) and Ayder (1.5%)(9).

This study revealed that women who had obstetric complication is 2.65 fold likelihood to develop intra and post-operative complication as compared to women who hadn't have obstetric complication with [AOR of 2.65, CI 95% (1.17, 6.01)]. This is in line with a research carried out in Arbaminch [AOR 2.61, CI 95% (1.43, 4.76)](27). Mothers who have taken general anesthesia are 16.8 times more likely to result poor maternal outcome this is higher as compared to the research studied in Tigray [AOR 3.1](22) and Arbaminch [AOR 2.45](27). This deviation might be due to the different type of facilities.

This study also studied the fetal outcome of cesarean delivery. The prevalence of poor fetal outcome is 19.74%. This result is lower than a study carried out in mettu 32.9 % (39) also higher compared to a report in harar (1.76%)(40). This could be most of CS performed were emergency, in line to save the women's life CS could be done without checking the fetal lung maturity. In this study low birth weight accounts around 14.21%. This result is line with a result in Arbaminch(27) and Ayder(9) and lower than a study conducted in harar (41).

7. STRENGH AND LIMITATION

7.1. Strength

Since this study was conducted at zonal level involving multicenter from varies catchment areas it is more likely to be representative. This study has described the maternal and fetal outcome status following CS; this will allow to study more analytic studies by using the findings obtained from this study as a baseline.

7.2. Limitation

- Since the study was retrospective study, there could be documentation biases.

8. CONCLUSION AND RECOMMENDATION

8.1. Conclusion

This study studied the maternal and fetal outcome in women who gave delivery by CS in the five governmental hospitals in Gurage zone from February 2019 to January 2021 which is the past twenty four months. The prevalence of poor maternal and fetal outcome is 23.37% and 19.74% respectively. The risk factors for poor maternal outcome are obstetric complication, general anesthesia, Medical disease and antepartum hemorrhage as an indication for surgery. And the risk factors for poor fetal outcome are Medical disease of the mother and CPD as an indication for surgery.

8.2. Recommendation

Although much emphasis has been placed on reducing maternal mortality associated with pregnancy, mothers who escape pregnancy-related mortality but suffer health consequences should also be given special attention. So I recommend this

To Policy Makers

- To minimize maternal and newborn mortality as well as morbidity, policy makers, the Ministry of Health, the South Nation Nationality Health People Bureau, Gurage Zone Health Bureau should give on job training for the health professionals.

To Wolkite University

- Educators should give detail training for the health professionals and give updated information.

To health institutions

- The problem requires harmonized clinical attempt to reduce the problem. This includes continuum care and intervention in Antenatal care, intra-partum and immediate postnatal period.
- Approaches to infection prevention mechanisms needs to be done cautiously preceding, during, and following CS interventions.
- Proper monitoring of labor by using partograph should be done so that early detection and management of problem could be possible.
- Unnecessary CS should be avoided and Trial of labor after cesarean delivery (TOLAC) should be encouraged in possible circumstance.
- The usage of general anesthesia should be reduced unless it is mandatory to use it.
- In this study majority of the mothers had an emergency CS; however, majority of them also had an ANC visit and also a greater proportion of them had been referred from other facility. In line with this attempt has to be done for those mothers so as to make early referral procedures and also facilitate the timely identification of risk factors and sharing of ANC profile of those mothers during the referral process.

Researchers

- Future researchers should do qualitative studies to improve the outcome of cesarean section.

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Annex I: Data Collection Tool

Part 1 Socio-demography factors		
1.	Age	
2.	Marital Status	1. Single 4. Widowed 2. Married 5. Others 3. Divorce
3.	Place of residence	1. Urban 2. Rural
4.	Occupation	1. Government Employed 2. Private Work 3. Housewife 4. Unemployed 5. Others
5.	Educational Status	1. No formal Education 2. Primary School 3. Secondary School 4. Diploma and above
Part 2 Medical History		
1.	Maternal medical illness during current pregnancy	1. Yes 2. No
2.	If yes;	1. DM 2. Hypertension 3. Heart failure 4. TB 5. HIV/AIDS 6. Renal Disease 7. Other Specify ----------------------

Part 3 Data on Obstetrics and gynecology		
1.	Referral Status	1. Yes 2. No
2.	Parity	1. I 4. IV 2. II 5. ≥V 3. II
Part 3.1 Current Pregnancy		
1.	Gestational Age	1. <37 3. >42 2. 37-42 4. Unknown
2.	ANC follow up	1. Yes 2. No
3.	If Yes, How many times?	1. One times 3. Three times 2. Two times 4. Four and above
4.	Gestation	1. Singleton 2. Twin 2. Others
Part 3.2 Obstetrics Complication		
1.	Obstetric complication during current pregnancy	1. Yes 2. No
2.	If yes;	1. APH 2. PROM 3. Chorioamniotis 4. Pre eclampsia or eclampsia 5. Obstructed labor 6. Mal presentation 7. Suspected uterine rupture 8. Other specify
Part 3.4 Current status of labor		
1.	Labor started	1. Yes 2. No
2.	If yes, duration of labor	
3.	Membrane ruptured	1. Yes 2. No
4.	If yes, duration of membrane ruptured	

5.	Amniotic fluid status	1. Clear amniotic fluid 2. Meconium stained amniotic fluid 3. Blood stained amniotic fluid
6.	Cervical status	1. Closed 3. 4-9cm 2. <4cm 4. 10cm
7.	Station	1. High(-1 and above) 2. Zero 3. +1 and below
8.	Preoperative hemoglobin/ hematocrit	1. Hct ------- or 2. Hgb---------
9.	Prophylaxes antibiotics	1. Given 2. Not given
Part 4. **Operation profile**		
1.	Types of cesarean section	1. Emergency 2. Elective
2.	Indication for surgery	1. CPD 2. Obstructed labor 3. Fetal distress 4. Cord prolapse 5. Antepartum hemorrhage 6. Maternal preference 7. Twin 1st fetus non vertex 8. Mal presentation 9. Previous two or more C/S 10. Other ------------------------------
3.	Characteristics' of cesarean section	1. Primary 2. Previous one C/S 3. Previous two and above C/S
4.	Anesthesia	1. Spinal Anesthesia 2. General Anesthesia 3. Local Anesthesia

5.	Type of uterine incision	1. Lower uterine transverse 2. Inverted T 3. Classical 4. J- shaped
6.	Surgery Time	
Part 5 Maternal Outcome of cesarean section		
1	Maternal Status	1. Alive 2. Dead
2	Intra-operative/Postoperative complications	1. Yes 2. No
3	If yes	1. Hemorrhage 2. infections 3. Blood Transfusion 4. Internal organ injury 5. Anesthetic complication 6. Drop in Hct/ Hgb 7. Reoperation 8. Per partum hysterectomy 9. Admission to ICU 10. Thromboembolic event 11. Amniotic fluid embolism 12. Others
Part 6. Fetal outcome of cesarean section		
1	Survival status	1. Alive 2. Dead
2	Sex	1. Male 2. Female
3	1 Minute APGAR score	1. <4 2. 4-6 3. 7-10
4	5 Minute APGAR score	1. <4 2) 4-6 3.

		7-10
5	Fetal weight	1. ≤1000gm 2. 1000gm-1499gm 3. 1500gm-2499gm 4. 2500gm – 3999g 5. ≥4000gm
6	Admission to NICU	1. Yes 2. No
7	If yes, reason for admission	
8	Referred to other facility for further treatment	1. Yes 2. No

Date of data collected --------------------- Name and signature of data collector----------------

Annex II: ROC Curve

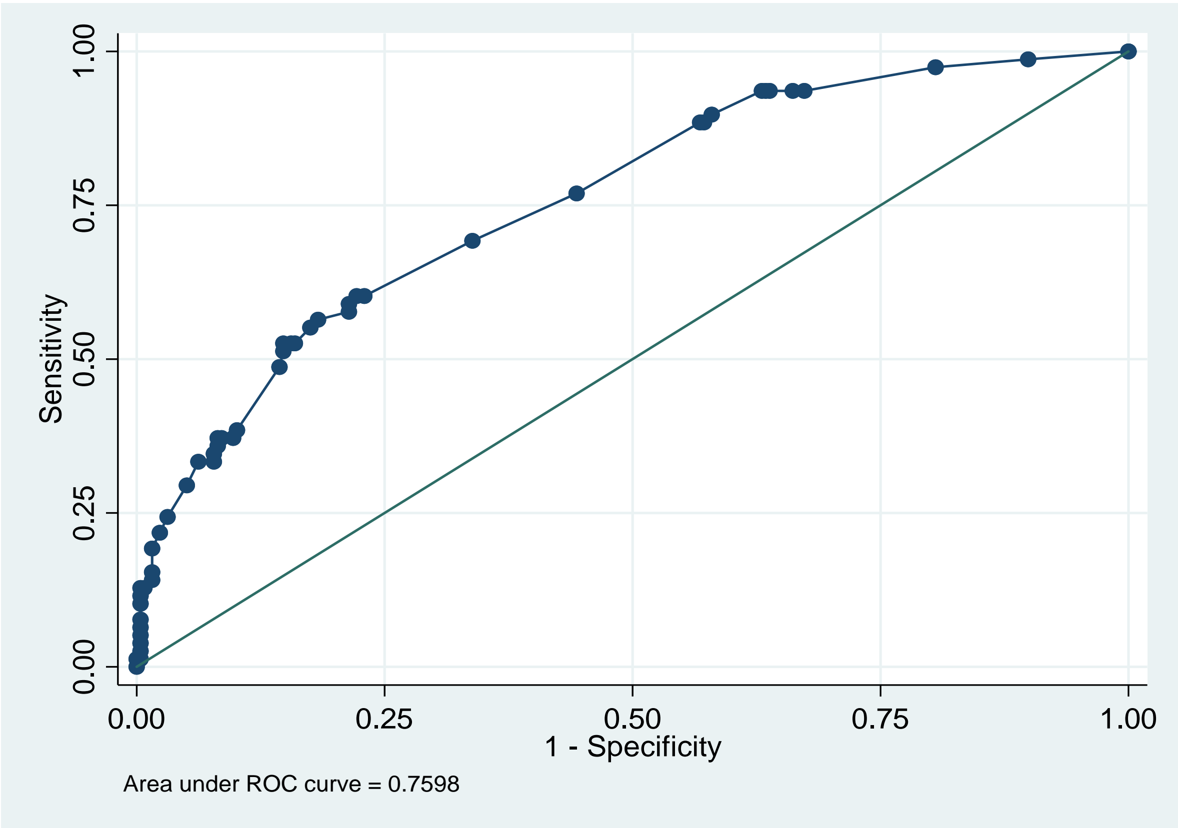

Figure: 7. ROC Graph