

Post-Cesarean Section Maternal Health Outcome and its Determinants in Tigray Regional State, North Ethiopia.

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Abstract

Background Cesarean section rate is increasing worldwide. However, the World Health Organization has declared that there is insufficient information on maternal outcome following cesarean section for decision making.

Objective The aim of this study was to assess post cesarean section maternal outcome and its associated factors availing evidence for practice and policy.

Methods Institution based cross-sectional study was conducted among 357 mothers who underwent cesarean section in six selected public general hospitals of Tigray regional State, Ethiopia. Mothers were followed for the duration of post-operative period until they became safe for discharge. The maternal outcomes were categorized into either adverse or good outcomes depending on whether mothers develop any cesarean section related morbidity or not. Logistic regression model was constructed to determine the AOR and 95% CI of independent factors associated with maternal outcome following cesarean section.

Results The proportion of adverse maternal outcome was 19.3% with 95% CI of (15.7% -23.8%). Route of anesthesia administration (AOR = 0.296, 95% CI: 0.126 - 0.695) and referral status (AOR = 0.371, 95%CI: 0.214 - 0.641) were statistically significant factors associated with maternal outcome following cesarean section.

Conclusion There was high proportion of adverse maternal outcome. General anesthesia and referral from lower health facilities were associated with higher risk of post-CS adverse maternal outcome. Equipping lower level health facilities with the human and material capacity for timely detection of CS indications and provision of cesarean section services could decrease the number of referrals and subsequent delays that lead to adverse maternal outcome.

Background

Cesarean section (CS) is a type of surgery performed when vaginal delivery would put the life of the mother or the baby at risk. Sometimes, it is also performed upon pregnant mother's request without any medical indication.

According to the 2010 WHO report, approximately 18.5 million cesarean sections are performed annually worldwide [1]. Nowadays, CS rate is increasing across the world [3]. According to the 2012 national vital statistics report the rate of cesarean section was 32.8% in the United States of America[4]. Similar surveys conducted in 2007 and 2008 among leading Asian countries found out that the CS rates were 46% (China), 36% (Vietnam) and 34% (Thailand). Similarly, a study conducted in a private clinic in South Africa showed a cesarean section rate of 60.4%[5] while the rate in Nigeria was found to be 11.3%[6].

Likewise in the rest of the world, cesarean section rate is increasing in Ethiopia. Some studies addressing the rates of cesarean sections were conducted in Gurage zone (27.6%), Bahir-Dar (25.4%) and Mizan Aman general hospital (21.2%) [7–9].

Indications and reasons for cesarean section are widely different across countries and institutions [10]. However, most commonly noted risk factors and indications are increased maternal age, increased parity, preterm labor, extremes of neonatal birth weight, previous cesarean section, being educated, using private clinic, attending antenatal care (ANC) with the same physician and getting richer economically [11–14].

The rate of cesarean section and its outcome are under an ongoing argument. In medium and high income countries, association was not found between cesarean section rates and maternal outcomes[15]. On the other hand, cesarean section rates of up to 15% showed good maternal health outcome [16] although cesarean section rate of more than 10% was not associated with decreasing maternal mortality [17].

The outcome of multiple cesarean sections is also unclear. A woman having multiple cesarean sections is highly exposed to uterine rupture, hysterectomy and bleeding [18]. However, a study conducted in Thailand showed that one previous cesarean section and two or more previous cesarean sections had no difference on maternal complications [19].

In general, the rate of cesarean section is increasing worldwide. However, according to the 2015 WHO statement, the effects of cesarean section rates on maternal morbidity, psychological or social wellbeing remained unclear [2]. In addition, the level of adverse maternal outcome following CS remains unclear [20–22]. Therefore, this study aimed at addressing the information gap on

maternal outcome following cesarean section in public hospitals of Tigray Regional State, North Ethiopia. Findings of the study will guide health care practice and policy making.

Methods

Study setting and design

A cross-sectional study was conducted in Tigray Regional State, North Ethiopia. The State has seven administrative Zones. There are fourteen public general hospitals, two specialized teaching and referral hospitals, twenty primary hospitals and two hundred and four health centers in the State.

The study was conducted on women who underwent cesarean section in the six randomly selected public general hospitals of Tigray Regional State from August, 10 to September, 20 2016.

Sample size determination and sampling

A single population proportion estimation formula was used to determine the sample size by assuming a previous adverse maternal outcome proportion of 33.3% [23], 5% level of significance and 5% assumption of non-response rate yielding a total of 359 study participants. Sample size was allocated to six randomly selected public general hospitals proportional to their previous number of cesarean section reports. Finally, the study participants were selected consecutively until the required sample is reached. Data were collected from mothers who underwent cesarean section and fulfilled the inclusion criteria. All mothers who had given birth through cesarean section at a gestational age of 28 weeks or above were included in the study.

Data collection tools and analysis

Structured questionnaire was used to collect the data from the patients. A structured checklist was used to collect secondary data from medical records and patient registration books. First data addressing socio-demographic factors, and reproductive and obstetric history were collected from the mothers through face-to-face interview. Then data on maternal outcomes, indications for cesarean section, medications given, number of cesarean sections, route of anesthesia administered, professional level of the surgeon and other associated risk factors were collected from patient medical records. Midwives and nurses were selected and trained for two days on the objective of the research and data collection procedures. Data on post-CS maternal outcome were collected from the start of the surgery until the time of discharge from the respective hospitals.

Data were entered into computer using SPSS version 22.0 software. Bivariable and multivariable logistic regression analysis models were used. The maternal outcomes were classified as either adverse or good outcome. A woman was said to have adverse maternal outcome when serious complications including uterine rupture, intrapartum or post partum hemorrhage, endometritis, wound infection, maternal death or others were observed following cesarean section. On the other hand, women without any of the above complications until discharged from the hospital were classified as having a good maternal outcome.

AOR with 95% confidence interval (CI) and P-value of less than 0.05 were used to identify factors associated with maternal outcome. Goodness-of-fit of the model was measured using Hosmer and Lemeshow test (p-value = 0.887). Variables that had statistically significant association in the bi-variable logistic regression model were entered into multivariable logistic regression. A forward method was applied in the multivariable logistic regression model to identify the independent determinant factors of maternal outcome following CS. Multicollinearity among variables were also checked using Variance Inflation Factor (VIF), and found that there is no multicollinearity (the minimum VIF value was 12.46).

Results

A total of 357 mothers who underwent cesarean section were included in the study, with a 99.4% response rate.

Socio-demographic characteristics of the mothers

The mean age of the mothers was 21.5 years with a (SD) standard deviation of 3.9 years. About two-third (69.2%) and (63.0%) of the respondents were urban residents and married, respectively. Majority (92.2%) of the mothers were Orthodox Christian followers. Less than half (42.9%) of the total respondents were farmers by occupation. Only 78(21.8%) were unable to read or write. About 45% of the respondents had their own house while 43% of the respondents were living in rental houses. The mean family size of the household of the mothers was 3.9 family members SD of 1.9 family members (**Table 1**).

Table 1: Socio-demographic, obstetric characteristics of women who underwent CS, Tigray Regional State, Ethiopia, 2016.

| Variables | Categories | Number | Percent |
|---|---------------------|--------|---------|
| Age (in years) | 15-19 | 21 | 5.9 |
| | 20-24 | 98 | 27.5 |
| | 25-29 | 118 | 33.1 |
| | 30-34 | 69 | 19.3 |
| | 35-39 | 34 | 9.5 |
| | 40-44 | 17 | 4.8 |
| Educational status | No formal education | 78 | 21.8 |
| | Primary school | 100 | 28.0 |
| | Secondary school | 104 | 29.1 |
| | Diploma and above | 75 | 21.0 |
| Residence | Rural | 110 | 30.8 |
| | Urban | 247 | 69.2 |
| Home ownership status | Own | 162 | 45.4 |
| | Rent | 153 | 42.9 |
| | Family | 42 | 11.8 |
| Occupational status of the husband | Farmer | 94 | 26.3 |
| | Trader | 93 | 26.1 |
| | Employed | 132 | 40.0 |
| | Daily laborers | 14 | 3.9 |
| | Has no work | 24 | 6.7 |
| Family size of the house hold | ≤ 2 family members | 78 | 21.9 |
| | 3 family members | 116 | 32.5 |
| | 4 family members | 64 | 17.9 |
| | ≥ 5 family members | 99 | 27.7 |

Past obstetric and reproductive characteristics of the mothers

Analysis of past obstetric and reproductive history showed that two hundred thirty two (65%) mothers were multiparous. Forty one (11.5%) of the total respondents had history of at least one abortion and 9 (2.5%) of them had history of at least one stillbirth. Majority (72%) of the respondents used modern family planning methods to prevent unwanted pregnancy. Eighty nine 89(24.9%) mothers had at least one morbidity during pregnancy period. Elective cesarean section constituted 11.2% of the total CS deliveries. Majority (331, 92.7%) of the cesarean sections were done under spinal anesthesia. Prophylactic antibiotics were given to almost all (99.4%) women who underwent cesarean section. (**Table 2**).

Table 2: Past obstetric and reproductive characteristics of women who underwent CS, Tigray Regional state, Ethiopia, 2016.

| Variables | Categories | Number | Percent |
|--|--------------------------------|--------|---------|
| Outcome of last pregnancy | No history of pregnancy | 127 | 35.6 |
| | Child alive | 170 | 47.6 |
| | Abortion | 41 | 11.5 |
| | Still birth | 9 | 2.5 |
| | Child died | 10 | 2.8 |
| Referred from lower health facility | Yes | 156 | 43.7 |
| | No | 201 | 56.3 |
| Gestational age in completed weeks | 28-36 | 36 | 10.1 |
| | 37-39 | 308 | 86.3 |
| | ≥ 40 | 13 | 3.6 |
| History of family planning use | Yes | 257 | 72.0 |
| | No | 100 | 28.0 |
| History of ANC visit during last pregnancy | Yes | 352 | 98.6 |
| | No | 5 | 1.4 |
| Timing of C/S | First stage of labor | 280 | 78.4 |
| | 2 nd stage of labor | 37 | 10.4 |
| | Elective | 40 | 11.2 |
| Type of anesthesia administered during C/S | General anesthesia | 26 | 7.3 |
| | Spinal anesthesia | 331 | 92.7 |

Post-CS Maternal outcome

Among the women who underwent CS, 69 ((19.3%, 95% CI (15.7% – 23.8%)) had one or another form of adverse maternal outcome. The major short-term complications observed were wound infection 25(7.0%), endometritis 13(3.6%) and bleedings requiring blood transfusion 10 (2.8%); whereas hysterectomy 6 (1.7%), uterine rupture 2(0.6%) and maternal death 1(0.28%) were the major long term and serious maternal complications observed. Mothers stayed in hospitals for an average of 4.91±2.34 days.

Determinants of post-CS Maternal outcome: Educational level of partners, outcome of last pregnancy, stage of labor while CS is performed, referral status and residence showed statistically significant association with the development of an adverse maternal outcome in a bi-variable logistic regression analysis. After multivariable binary logistic regression was applied, only two variables were significantly associated with adverse maternal outcome. Mothers who were referred from lower setup institutions were 2.71 times more likely to develop adverse maternal outcome than those who came to the general hospitals directly with AOR of 2.71(95% CI (1.34, 5.47)). The route of anesthesia administration was the second variable that significantly affected maternal health outcome. Mothers who received general anesthesia were 3.14 times more likely to develop any adverse maternal health outcome as compared to those who received spinal anesthesia with AOR of 3.14 (95% CI (1.24, 8.01)) (**Table 3**).

Table 3: Factors associated with maternal health outcomes following cesarean section in public general hospitals of Tigray Regional State, Ethiopia, 2016.

| Variables | Categories | Maternal outcome | | COR (95% CI) | AOR (95% CI) |
|------------------------------|---------------------|------------------|-------------|-------------------|--------------------------|
| | | Good MHO | Adverse MHO | | |
| Referral status | Not referred | 176(87.6%) | 25(12.4%) | 1 | 1 |
| | Referred | 112(71.8%) | 44(28.2%) | 2.77 (1.60, 4.77) | 2.71(1.34, 5.47)* |
| Maternal educational status | No formal education | 59(75.6%) | 19(24.4%) | 1 | 1 |
| | Primary school | 81(81.0%) | 19(19.0%) | 0.73(0.36,1.49) | 1.03(0.45, 2.36) |
| | Secondary school | 92(88.5%) | 12(11.5%) | 0.40(0.18, 0.89) | 0.95(0.35, 2.57) |
| | Diploma and above | 56(74.7%) | 19(25.3%) | 1.05(0.51, 2.19) | 3.45(0.16, 10.39) |
| Husband's educational status | No formal education | 40(70.2%) | 17(29.8%) | 1 | 1 |
| | Primary school | 78(78.0%) | 22(22.0%) | 0.66(0.17,1.38) | 0.80(0.34, 1.87) |
| | Secondary school | 65(83.3%) | 13(16.7%) | 0.47(0.21, 1.07) | 0.50(0.17, 1.46) |
| | Diploma and above | 105(86.1%) | 17(13.9%) | 0.38(0.18, 0.81) | 0.38(0.12, 1.26) |
| Husband's occupation | Farmer | 67(71.3%) | 27(28.7%) | 1 | 1 |
| | Trader | 74(79.6%) | 19(20.4%) | 0.64(0.33, 1.25) | 1.45(0.57, 3.69) |
| | Employed | 112(84.8%) | 20(15.2%) | 0.44(0.23, 0.85) | 0.99(0.36, 2.71) |
| | Others | 35(92.1%) | 3(7.9%) | 0.21(0.06, 0.75) | 0.36(0.09, 1.52) |
| Residence | Rural | 78(70.9%) | 32(29.1%) | 2.33 (1.38, 3.99) | 1.37(0.61, 3.05) |
| | Urban | 210(85.0%) | 37(15.0%) | 1 | 1 |
| Type of C/S | Emergency C/S | 260(80.5%) | 63(19.5%) | 1.13(0.45, 2.85) | 1.48(0.54, 4.04) |
| | Elective | 28(82.4%) | 6(17.6%) | 1 | 1 |
| Type of Anesthesia | General anesthesia | 15(57.7%) | 11(42.3%) | 3.45(1.51, 7.90) | 3.14(1.24, 8.01)* |
| | Spinal anesthesia | 273(82.5%) | 58(17.5%) | 1 | 1 |
| Family size | Family size ≤ 2 | 58(74.4%) | 20(23.6%) | 1 | 1 |
| | Family size 3 | 101(87.1%) | 15(12.9%) | 0.43(0.21, 0.91) | 0.44(0.19, 1.98) |
| | Family size 4 | 52(81.3%) | 12(18.7%) | 0.67(0.30,1.50) | 0.70(0.29, 1.70) |
| | Family size ≥ 5 | 77(77.8%) | 22(22.2%) | 0.83(0.41,1.66) | 0.59(0.25, 1.37) |

AOR: Adjusted Odds Ratio, COR: Crude Odds Ratio, CI: Confidence Interval, C/S: Cesarean Section, MHO: Maternal Health Outcome, *Significant at p-value < 0.05.

Discussion

This study assessed maternal health outcomes following cesarean section among mothers who gave birth at public general hospitals of Tigray regional State, Ethiopia. Cephalo-pelvic disproportion/CPD (18.5%, 95% CI (14.71%, 22.77%)), non-reassuring fetal distress (18.2%), 95% CI (14.46%, 22.47%)) and malpresentation and malposition (15.4%, 95% CI (11.94%, 19.43%)) were the most common indications for cesarean section. This result was consistent with studies conducted in other parts of Ethiopia [8] and Nigeria [24].

About 19.32% [95% CI (15.48%, 23.67%)] of the mothers who underwent CS developed one or another form of adverse maternal health outcome. A study conducted in Jimma also reported a 20% adverse maternal health outcome in mothers who underwent cesarean section [23]. However, the rate is much lower than the findings in Karachi, Pakistan (36.7%) [25] or Finland (27%) [26]. These differences could be attributed to nursing care differences.

Wound infection was the commonest short term maternal adverse outcome diagnosed in this study (7.0%) (95% CI (4.69%, 10.02%)) similar to the findings from a study in Nigeria [27] but less than all institution based findings in Ethiopia [25, 28]. This difference could be due to the different types of facilities in the different studies. The rate of post-partum hemorrhage in this study was 1.68% (95% CI (0.684%, 3.46%)) which was similar to what was found in Australia and central Saudi Arabia [29, 30] but much lower than the finding from Pakistan (22%) [25]. Endometritis, uterine rupture, hysterectomy and transfusion requiring bleedings occurred in 3.36%, 0.6%, 1.7% and 2.8% of the women respectively comparable with complication rates among mothers with prior CS scar [18]. There was one (0.28% (95% CI 0.27–0.87)) maternal death similar to findings in Sub Saharan Africa and other parts of Ethiopia [7, 9, 31] but less than the findings from Nigeria or India [32, 33]. This variations might be due to differences in sample size.

Mothers who were referred from lower health care institutions were more likely to develop adverse maternal health outcome than those who had un-referred access to the general hospitals. This result was consistent with studies done in Ethiopia [34] and Nigeria [35]. This could partly be because more severe obstetric complications are more likely to be referred from lower healthcare facilities. Any delay model could also be responsible for the relatively higher risk of adverse maternal outcome observed among mothers who were referred to the general hospitals.

Mothers who underwent cesarean section under general anesthesia were more likely to develop adverse maternal health outcome compared to those who had cesarean section under spinal anesthesia. Conversely, mothers who underwent CS under spinal anesthesia had fewer less risk of adverse maternal outcome. This was similar to findings from Turkey [36], southern [37] and central [35] parts of Ethiopia. The reasons could be the increased risk of uterine atony leading to bleeding and incidental organ injuries that were higher in mothers who underwent CS under general anesthesia [39, 40].

Adverse maternal outcome rates were different among hospitals possibly because of differences in post-operative care of the hospitals or differences in the number of late stage referrals to better serving hospitals.

Conclusion

The rate of adverse maternal outcome following cesarean sections was high. Mothers' referred from lower setup institutions and administration of general anesthesia during C/S was factors significantly associated with adverse maternal health outcomes following cesarean sections. Lower health facilities setup should better be equipped with essential equipment, materials and human resources to perform cesarean sections and hence decrease maternal referrals.

Declarations

Ethical approval and consent to participate

Ethical clearance was obtained from the Institutional Review Board of Aksum University, Ethiopia. Letter of support was obtained from the regional health bureau to respective health facilities. Further, all study participants were informed about the purpose of the study and written or verbal consent was obtained, as appropriate, from each study participants before data collection. Confidentiality was ensured by avoiding any identifiers of the study participants.

Consent to publish

Not applicable.

Availability of data and materials

All the data supporting the findings is contained within the manuscript, no additional data is needed.

Competing interests

The authors declare that they have no competing interests.

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Authors' contributions

WG conceived and designed the study. WG, HB, AM and MA analyzed the data. HB, WG, MA, MT and AM wrote the paper and drafted the first version of the manuscript. HB, WG, MA, MT and AM: reviewed and approved the final version of the manuscript.

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