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Determinants of Caesarean Deliveries and its Major Indications in Adigrat Hospital, Northern Ethiopia: A Case Control Study

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Abstract

Objectives: Ethiopia is among the few countries that have the highest maternal death. The aim of obstetricians is to achieve a healthy mother and healthy baby. To achieve this goal, caesarean section plays a vital role. But there was no adequate evidence on determinants and indications for caesarean delivers in Adigrat hospital. Therefore, the study was conducted to assess the determinant factors of caesarean deliveries and its indications in Adigrat hospital, Tigray region, North Ethiopia.

Design: Unmatched case control study

Setting: Adigrat general hospital, Tigray, Ethiopia

Methods: A retrospective one year (July 2013 to June 2014) medical record review was conducted to select the cases and controls. The cases (152 caesarean deliveries) were all mothers delivered by caesarean section on the study period. Controls were vaginal deliveries in the same time period at Adigrat hospital selected by systematic random sampling. The case to control ratio was 1 to 2. Data was collected using data extraction form. Data was analyzed using SPSS version 16. Multivariable logistic regression analysis was used to identify the independent effect of each variable on caesarean delivery.

Results: The institutional caesarean delivery rate was 14.23%. The commonest indication for caesarean section was cephalo-pelvic disproportion (29.6%) followed by non-reassuring foetal heart rate (21.1%) and failed vaginal delivery (12.5%). Independent risk factors found to be statistically associated with caesarean delivery were labor monitored without parthograph (AOR=15.6, 95%CI: 6.12, 40.0), un-booked ANC (AOR=3.5, 95%CI: 1.24, 10.33) and maternal age 35 years and above (AOR=3.2, 95%CI: 1.47, 6.85).

Conclusions: The caesarean delivery rate of the institution is comparable with the national institutional caesarean delivery rate of public hospitals. It is possible to decrease the caesarean delivery rate by increasing the ANC coverage and universal use of parthograph for all labors.

Keywords: Caesarean delivery; Caesarean section indications; Adigrat hospital; Ethiopia

Abbreviations:

ANC: Antenatal Care; APH: Ante Partum Haemorrhage; CDMR: Caesarean Delivery on Maternal Request; CPD: Cephalo-Pelvic Disproportion; CS: Caesarean Section; CTG: Cardio TocoGraphy; EDHS: Ethiopian Demographic and Health Survey; MDG: Millennium Development Goals; MRN: Medical Record Number; NRFHR: Non Reassuring Foetal Heart Rate; PIH: Pregnancy Induced Hypertension; SPSS: Statistical Package for the Social Sciences; WHO: World Health Organization; VBAC: Vaginal Birth after Caesarean Section

Background

Caesarean delivery is a surgical procedure in which, birth of a fetus occurs through incisions in the abdominal wall (laparotomy) and the uterine wall (hysterotomy). This definition does not include removal of the fetus from the abdominal cavity in the case of rupture of the uterus or in the case of an abdominal pregnancy [1,2]. It is the most common major surgical procedure used and it has helped to decrease maternal and fetal mortality and morbidity [3,4]. A Caesarean section (CS) is usually performed when a vaginal delivery would put the baby's or mother's life or health at risk. However, in recent times it has been also performed upon request for childbirths that could otherwise have been delivered vaginally. As other procedures of some complexity, its use follows the health care inequity pattern of the world: underuse in low income settings, and adequate or even unnecessary use in middle and high income settings [5].

High maternal mortality is associated with inadequate and poor-quality maternal health care. Delivery assisted by skilled providers is the most important proven intervention in reducing maternal mortality [6,7]. Caesarean section is one form of delivery by skilled provider which plays a vital role [8]. There is a strong ecologic association between increasing CS rates and decreasing mortality. Cesarean delivery rates are highly correlated with the proportion of births attended by trained health personnel. It is proposed as a proxy indicator for measuring access, availability or appropriateness of medical care, as well as for monitoring changes in maternal mortality in developing countries [9,10].

World health organization (WHO) has proposed that in a country a rate of 5-15% of births undergoing a CS is optimal and has medical indications for caesarean section [11], and rates above this are unsuitable and unnecessary, imposing financial burden and clinical risks on patients and healthcare systems [7,11]. Caesarean delivery rate less than 5% also indicates unmet need of skilled delivery service [7]. Therefore, extremely high or low caesarean delivery rate is a significant quality of care issue, and it may also indicate the mismatch between evidence and practice in obstetrics and all [10,12]. The caesarean section rate has risen considerably over the past few decades [11]. Although very unevenly distributed, 15% of births worldwide occur by CS. Latin America and the Caribbean shows the highest rate (29.2%). In the least developed countries, uniformly low CS rates and high levels of maternal, infant and neonatal mortality are observed. Almost all African countries are below the recommended range including Ethiopia, indicating a clear need to improve access to surgical obstetric care [10].

Ethiopia is the second most populous country. Eighty-four percent of its 81 million people live in rural areas [13]. Almost 85% of all deliveries occur at home [14]. Based on the Ethiopian demographic health survey (DHS) 2011, there is no evidence to suggest that the maternal mortality ratio changed decreased in Ethiopia between 2000 and 2011 [6]. Studies reveal that hemorrhage, hypertensive disorders, and ruptured uterus are among the primary causes of maternal death. Obstructed labor also takes a heavy toll on Ethiopian women, with an estimated 1%–2% of women experiencing obstetric fistula. Skilled birth attendance is only 15% and access to emergency obstetric care is very limited [14]. Even though progress has been made, disparities still persist in terms of access to health care for people living in remote areas [9,13].

In Ethiopia, caesarean delivery is extremely low with a coverage rate as low as 1.5% according to the 2011 DHS. In seven out of the 11 regions the rate of caesarean section was below 2% [7]. Access to obstetric surgery in Ethiopia is hampered by the relatively few appropriate facilities being concentrated in urban centers. There is a scarcity of surgeons and anesthetists, and a largely rural population with limited access to roads. There is a shortage of skilled attendants; poor quality of care is an issue, costs associated with transport and the services themselves present barriers, and norms promote home births. Where maternal mortality and the incidence of fistula are high, the rate of cesarean deliveries tends to be low, especially in rural areas [6]. Studies confirmed that the proportion of antenatal care, institutional delivery and skilled birth attendant utilization are very low in Ethiopia and also in Tigray [15].

Adigrat hospital has been providing caesarean delivery service for multitudes of mothers for long time. However, there is little evidence about magnitude, determinants and indications of cesarean deliveries in the hospital. Therefore, this study has assessed the determinants of caesarean deliveries and its indications in Adigrat hospital. This will help policy makers, program managers and clinicians for appropriate intervention strategies toward ensuring the availability of obstetric care and hence reducing maternal mortality. The finding of this study can also serve as baseline information for other studies with similar interest.

Methods

Study design

A facility based case control study was conducted in Adigrat general hospital.

Study setting

The study was conducted in Adigrat general hospital, situated in Adigrat town administration, from August to September 2014. Adigrat town is found in the Eastern zone of Tigray region, which is located about 903 Kilo meters to the North of Addis Ababa, the capital city of Ethiopia, and 120 kilo meters away from the regional capital city, Mekelle. This town is the zonal city of districts of Eastern Zone of Tigray. The hospital is general hospital which serves as referral for surrounding health centres and primary hospitals, and teaching centre for medical and health science students. The hospital gives different services including comprehensive maternal and neonatal care. During the study period; one gynaecologist obstetrician, one surgeon and one internist were working full time in the hospital [16].

Participants

The source population was all women who delivered foetus by CS or vaginally from July1, 2013 to June 30, 2014 in Adigrat hospital. Cases were all women delivered by caesarean section from July1, 2013 to June 30, 2014 in Adigrat hospital. Controls were all systematically selected women delivered vaginally from July1, 2013 to June 30, 2014 in Adigrat hospital. Women in which laparotomy was done for complete uterine rupture irrespective of the fetal outcome, women in which hysterectomy was done before 28 weeks of gestational age, women delivered multiple fetuses (twin, or more), and whose cards was incomplete were excluded from the study.

Sample size calculation

Sample size was first calculated using two population proportion formula considering 86.9 % (P1), proportion of mothers who delivered by CS at gestational age of less than 38 weeks; and 65.0% (P2), proportion of mothers who delivered by CS at gestational age of greater than 38 weeks (17). With the above using α=0.05, 80% power, and control to case ratio of 2; the total sample size calculated was 147. But for incorporating the sample size which answers the rate of CS, we took all cases occurred in the study year. Controls were twice of the cases occurred in that year.

Sampling methods and procedure

The cases were all mothers delivered by caesarean delivery during the study period which were 152. Similarly, there were a total of 1, 977 vaginal deliveries during the study year (Table 1). The controls were vaginal deliveries selected using systematic random sampling method. After identifying the total vaginal deliveries in the study year (N=1,977), sampling interval was calculated by dividing the total

number of vaginal delivery by the number of controls. i.e 1977/304=6 (K=6th). The first control was selected by random sampling method from the six subjects and then the rest were selected by systematic random sampling method.

Mode of delivery	2013/14												
	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Total
Number of Caesarean deliveries	24	24	25	24	22	24	22	23	29	32	35	44	328
Number of Vaginal deliveries	134	160	154	139	146	191	166	163	183	170	151	181	1977
CS rate	15.7	13	13.9	14.7	13.1	11.1	11.7	12.4	13.7	15.8	19	21.5	14.2

Table 1: Mode of deliveries in Adigrat hospital from July1, 2013 to June 30, 2014, Adigrat, Tigray, Ethiopia 2014.

Data collection procedure and instruments

Data extraction form was used to extract the data from the individual patients chart. The Data extraction form was developed in English based on objectives to be addressed after review of relevant literature and the items included in the chart of the hospital. Variables included in the data extraction form were maternal age, ethnicity, address, gravidity, parity, gestational age at delivery in weeks, pre and post-delivery hematocrit, use of parthograph, ANC follow up, onset of labor, fetal weight, sex of the new born, maternal outcome, mode of delivery, indication of caesarean section, number and type of caesarean section, type of anesthesia used and length of hospital stay in days after the procedure. Three data collectors who had bachelors of Science in midwifery were recruited. In addition to these data collectors, two runners working in the card room were also recruited to collect the individual charts using the medical record number (MRN) and replace it to the card room.

One day theoretical and practical training was given to the data collectors and runners. In the training the data collectors were briefed on how to collect the charts and fill the checklist. Later, after one day training, the midwives used operation room and delivery room registration books to get the MRN of all the caesarean deliveries and selected vaginal deliveries, respectively. By the MRN the runners collected individual charts from the chart room. Then, the midwives filled the checklist from the patients' individual chart. The principal investigator has strictly followed for each activity on daily base to ensure the completeness of the checklist, to give further clarification and support for data collectors. Since the individual chart is not allowed to be brought out of the hospital; data collectors were health professionals, and they have worn a white coat to blend in to the service delivery. Although data was not collected directly from the patient, the cards were not exposed to other than the members of data collecting group.

Term and operational definitions

- Antenatal care (ANC): mothers are said to have ANC if they visited health institution at least once during pregnancy.
- Parthograph: parthograph is said to be used if active and second stage labour is monitored using parthograph, and latent phase of labour is monitored using Pregnancy Induced Hypertension (PIH) chart, induction chart, vital sign chart or Vaginal Birth after Caesarean Section (VBAC) chart.
- Elective caesarean delivery: caesarean delivery done before the onset of labour in the absence of emergent situations that mandates urgent delivery.
- Emergency caesarean delivery: caesarean delivery done after the onset of labour or for the indications of emergent situations that mandates urgent delivery.
- Caesarean delivery on maternal request (CDMR): is the caesarean delivery requested by mothers in the absence of any medical or obstetric indications.
- Vaginal birth after caesarean section (VBAC): is a trial of vaginal birth to a woman who has had a previous caesarean delivery.

Data quality assurance

The checklist was pre-tested in the hospital, and checked for its clarity and understands ability by the data collectors, completeness, plus consistency and then correction was made accordingly before the actual data collection. Training was given for data collectors. They were instructed to check the completeness of each checklist at the end of each data abstraction. The principal investigator has rechecked completeness of the checklist during submission. For better data quality, patients' individual chart was cross checked with operation room and delivery room registration book, if there was missed data.

Data management and analysis

Data entry and clearing was done by Epi info version 3.5.1. Analysis was done using statistical packages for social sciences (SPSS) version 16. During analysis frequencies of the different variables was determined and results were presented in texts, tables and graphs using summery measures such as percentages, mean and median. Multivariable logistic regression analysis was done to see the independent effect of each variable on the outcome variable. Results of multivariable logistic regression analysis were presented in crude and adjusted odds ratio (OR) with their corresponding 95% confidence intervals.

Ethical clearance

Ethical clearance was obtained from institutional review board of Mekelle University Collage of Health Sciences and Tigray Regional Health Bureau. Permission from Adigrat hospital was obtained before field activities started. No names were recorded on the data collection instruments. Permission to enter the facility, to consult with employees, and to review registers and patient records was requested at the beginning of data collection. Data collectors were accompanied by an official letter from the Regional Health Bureau and Adigrat hospital.

Results

Socio-demographic characteristics

Total number of mothers included in the study was 456. This number included 152 cases who delivered by caesarean section and 304 controls who delivered vaginally. The mean age of cases and controls were 27 and 29, respectively. Majority of the study subjects were Tigrians by ethnicity. More than half (52.9 %) of the study subjects were from rural area (Table 2).

Variable		Case, n(%)	Control, n(%)	Total, n(%)
Ethnicity	Tigray	148 (97.4)	300 (96.7)	448 (98.2)
	Afar	3 (0.2)	1(0.3)	4 (0.9)
	Amhara	1 (0.7)	2 (0.7)	3 (0.7)
	Oromo	0 (0)	1(0.3)	1 (0.2)
Age of mother	15-19	8(5.3)	17(5.6)	25 (5.5)
	20-24	34(22.4)	103(33.9)	249 (54.6)
	25-34	66(43.4)	124(40.8)	148 (32.5)
	>=35	44(28.9)	60(19.7)	34 (7.5)
Residence	Rural	78 (51.3)	163 (53.6)	241(52.9%)
	Urban	74 (48.7)	141 (46.4)	215(47.1%)

Table 2: Socio-demographic characteristics of mothers who delivered babies from July1, 2013 to June 30, 2014 in Adigrat Hospital, Tigray, Ethiopia, 2014 (n=456).

Reproductive history

Four out of ten (40.1%) of the study subjects were in their first pregnancy (36.8% of cases and 41.8% of controls) followed by gravid 2 (18.6%) and gravid 3 (14.5%). Among the study subjects, 95.6% had ANC follow up (91.4% of cases and 97.7% of controls). Parthograph was documented in 91.2% of the study subjects (76.4% of cases and 98% of controls) (Table 3).

Variable		Case, n (%)	Control, n (%)	Total, n (%)
Gravidity (n=456)	1	56 (36.8)	127(41.8)	183 (40.1)
	2 and 3	49 (32.2)	102 (33.5)	151 (33.1)
	4 and above	47(31.0)	75(24.7)	122 (26.8)
Labour onset (n=456)	Spontaneous	125 (82.2)	282 (92.8)	407(89)
	Induced	15 (9.9)	22 (4.2)	37(8.1)
	Elective CS	12 (7.9)	0	12 (4.4)
Parthograph (n=444)	Documented	107 (76.4)	298 (98.0)	405 (91.2)
	Not documented	33 (23.6)	6 (2.0)	39 (8.8)
ANC (n=456)	Booked	139 (91.4)	297 (97.7)	436 (95.5)
	Un booked	13 (8.6)	7 (2.3)	20 (4.4)
Sex of the New born (n=456)	Male	97 (63.8)	170 (55.9)	267(58.6)
	Female	55 (36.2)	134 (44.1)	189(41.4)

Table 3: Reproductive history of mothers who delivered babies from July1, 2013 to June 30, 2014 in Adigrat hospital, Tigray, Ethiopia, 2014.

Clinical and laboratory findings

The mean gestation age of the study participants at labour was 38.7 + (2.18 SD) weeks for both cases and controls. The mean weight of the newborns was 3167 + (575 SD) grams. The mean foetal weight for cases and controls was 3264 grams and 3118 grams, respectively. There was no difference among the cases and controls in the mean of pre-delivery hematocrit (39%). The mean post-operative hematocrit was 34.3% + (5.15 SD). The mean post-operative hematocrit drop was 4.82%. Majority of the caesarean deliveries (78.3%) were done for the first time. The rest, 19.7% and 2%, were for the second time, and third and above, respectively. From 152 cases, 90.1% were emergency caesarean deliveries (Table 4). From these emergency caesarean deliveries, parthograph was documented in 77% of them. Bilateral tubal ligation was done in 23% of the cases (15.3% of emergency CS and 13.3% of elective CS). The mean length of hospital stay after operation for mothers delivered with caesarean delivery was 4.8+ (2.66 SD) days. The earliest discharge was after two days while the longest discharge was after 25 days.

Variable		Frequency	Percentage (%)
Number of CS (n=152)	First	119	78.3
	Repeat	30	19.7
	>2	3	2
Type of CS (n=152)	Elective	15	9.9
	Emergency	137	90.1
Labor onset (n=137)	Spontaneous	116	84.7
	Induced	21	15.3
Type of anesthesia Used (n=152)	General	9	5.9
	Spinal	143	94.1

Table 4: Clinical findings of mothers who gave birth by CS in Adigrat Hospital, Tigray, Ethiopia, 2014.

Caesarean delivery rate and Indications of caesarean deliveries

The institutional caesarean delivery rate of Adigrat hospital from July 2013 to June 2014 was 14.23%. The minimum monthly rate was 11.16% while maximum monthly rate was 21.46% (Table 1). The commonest indication of the caesarean deliveries was cephalo-pelvic disproportion (29.6%) followed by NRFHR (21.1%) and failed VBAC (12.5%) (Table 5).

Indication	Frequency	Percentage (%)
Cephalo-pelvic disproportion	45	29.6
Non Reassuring Fetal Heart Rate	32	21.1
Failed VBAC	19	12.5
Ante Partum Haemorrhage	13	8.6
Failed induction	8	5.3
Non candidate for Vaginal Birth After Caesarean Section	7	4.6
Breech with x – factor	7	4.6
Obstructed labour	5	3.3
Failed instrumentation	4	2.6
Transverse lay	4	2.6
Cord prolapsed	3	2.0
Big Baby	2	1.3
Two previous CS	2	1.3

Genital Wart	1	0.6

Table 5: Indications of caesarean deliveries in Adigrat Hospital, Tigray, Ethiopia, 2014.

Determinant factors of CS

The multivariable logistic regression analysis result showed that compared to mothers who have documented parthograph, mothers' who have not documented parthograph were 15.6 times more likely to deliver by CS (AOR=15.6, 95% CI: 6.12, 40.0). Mothers who had not ANC follow up has 3.5 times more likely to deliver by caesarean section (AOR=3.5, 95% CI: 1.24, 10.33). Mothers aged 35 years and above were 3 times more likely to deliver by CS (AOR=3.2, 95% CI: 1.47, 6.85) compared to those aged less than or equal to 24 years old. The other variables like residence, gravidity, hematocrit level, labour onset, foetal weight and sex were not found to have association with mode of delivery (Table 6).

Variables	Cases, n (%)	Controls, n (%)	COR (95%CI)	AOR (95%CI)
Age				
< =24	42(27.6)	120(39.5)	1	1
25-34	66(43.4)	124(40.8)	1.5(0.96, 2.41)	1.6(0.93, 2.98)
35 and above	44(28.9)	60(19.7)	2.1(1.24, 3.54)	3.2(1.47, 6.85)**
Address				
Rural	78(51.3%)	163(53.6%)	1	1
Urban	74(48.7%)	141(46.4%)	1.1(0.74, 1.62)	1.3(0.83, 2.11)
ANC				
Booked	139(91.4%)	297(97.7%)	1	1
Un booked	13(8.6)	7(2.3)	3.9(1.55, 10.16)	3.5(1.24, 10.33)*
Gravidity				
1	56 (36.8)	127(41.8)	1	1
2-3	49(32.2)	102(33.6)	1.1(0.68, 1.73)	0.7(0.41, 1.32)
4 and above	47(30.9)	75(24.7)	1.4(0.87, 2.30)	0.6(0.31, 1.32)
Gestational age at labor				
<38 weeks	19 (12.5)	34(11.2)	1	1
38-40 weeks	104(68.4)	226(74.3)	0.8(0.45, 1.51)	0.9(0.44, 1.95)
>40 weeks	29(19.1)	44(14.5)	1.2(0.56, 2.45)	1.5(0.64, 3.68)
Pre-delivery hematocrit	152(33.3%)	304(66.7%)	1.0(0.96, 1.06)	1.0(0.96, 1.07)
Labor onset				
Spontaneous	125(82.2%)	282(92.8%)	1	1
Induced	15(17.8%)	22(7.2%)	1.5(0.77, 3.06)	1.8(0.85, 3.78)
Parthograph Status				
Documented	107(70.4)	298(98.0%)	1	1
Not documented	33(29.6)	6(2.0%)	15.3(6.24, 37.58)	15.6(6.12, 40.0)***
Foetal weight				
<2500 gram	10(6.6)	19(6.3)	1	1
250-3500 gram	96(63.2)	224(73.7)	0.8(0.36, 1.82)	0.8(0.31, 2.24)

>=3501 gram	46(30.3)	61(20.1)	1.4(0.61, 3.37)	1.7(0.60, 4.97)
Newborn sex				
Male	97(93.8%)	170(55.9%)	1	1
Female	55(6.2%)	134(49.1%)	0.7(0.48, 1.07)	0.8(0.50, 1.29)
*Significant at P < 0.05, **Significant at P < 0.01, ***Significant at P < 0.001				

Table 6: Multivariate analysis of selected variables with CS, among mothers delivered in Adigrat Hospital, Tigray, Ethiopia, 2014.

Discussions

The institutional caesarean delivery rate was 14.23% in 2014. This institutional rate did not include vaginal deliveries attended in home, health post and health centre of the catchment area. So in our community with a very lower institutional delivery rate (12.1%) [7], the community caesarean rate will be too much lower than this level which is too far from WHO recommended level. A national survey in Ethiopia is also comparable with this study showing that the overall institutional caesarean rate in public sectors was 15% [9]. The result in this study was lower than the finding in Mizan Aman hospital, Southwest Ethiopia (21%) and Addis Ababa (21.5%) [17,18]. This discrepancy could be explained by the difference in the study areas, and access to the services.

Study done in Tikur Anbesa hospital showed that, the leading indications of caesarean delivery were: repeat caesarean section followed by cephalo-pelvic disproportion (CPD) and APH [19]. But in this study, the leading indications were; CPD followed by non-reassuring fetal heart rate (NRFHR) and failed VBAC. This difference could be due to high rate of primary caesarean deliveries in private hospitals of Addis Ababa. Similar to this study in Jimma hospital the leading indications were CPD (44%), repeat caesarean section (16%) and APH (8%) [20]. Unlike in Jimma and Tikur Anbesa, NRFHR is one of the leading causes in this study; this could be due to clinician factor or effect of Cardio Topography (CTG). Ideally in a community with optimal maternal health service, obstructed labor should never be happened. But from all of the cases in this study, 3.3% were for the indication of obstructed labor. This number shows that, still in 21st century obstructed labour is our problem.

Majority of the caesarean deliveries in this study was done under spinal anaesthesia (94.1%). But a study done in Gondor showed that general anaesthesia was more frequent than spinal anaesthesia for caesarean deliveries (65%) [21]. WHO guideline and a study done in yekatit-12 hospital recommends to use spinal anaesthesia because of its safety and better maternal and neonatal outcomes [22,23].

Clinical guidelines recommend using parthograph for labor monitoring, because it reduces likelihood of CS [22]. Similarly, in this study in majority of the study subjects (91.2%); parthograph was used for labour monitoring. This is much higher compared to the national review of CS in Ethiopia; showing only 12% of all emergency caesarean deliveries had their labor monitored by parthograph [24]. Partograph is considered to be a very effective tool to monitor labor and prevent prolonged and obstructed labor. It also provides timely information regarding further intervention in the form of referral to a higher level facility, labor augmentation, and caesarean section depending upon the resources available. At the same time, it facilitates ongoing evaluation of the effects of these interventions [25].

The strongest risk factor for caesarean delivery in this study was parthograph utilization. Compared to mothers who have documented parthograph, mothers who have not documented were 14.6 times more likely to deliver by caesarean section. Similar to this study, clinical guidelines also justify that use of parthograph for labor monitoring reduces the likelihood of delivering by caesarean section [22]. This is because parthograph shows maternal condition, fetal condition and progress of labor at the same time. So it stabilizes the clinician and helps in giving time and preventing premature decisions of caesarean section. Therefore, birth attendants should strictly follow partograph for laboring mothers.

The other important risk factor for caesarean delivery in this study was status of antenatal care follow up. Compared to mothers who had booked ANC, those mothers who had not ANC follow up were 3.45 times more likely to deliver by caesarean section. This could be because ANC helps to early prevention and identification of the causes like PIH, diabetes mellitus and mal-alignment. It also gives time for correcting or treating the abnormality. Similarly, the study done in Mizan Aman hospital also showed that caesarean delivery is higher among mothers with no ANC follow-up [17]. Pregnancy complications are a primary source of maternal and child morbidity and mortality. Therefore, pregnant women should routinely receive information on the signs of complications and be tested for them at all antenatal care visits [6]. The study also showed that mothers aged 35 and above had higher odds of delivering by caesarean section. This finding is supported by the study conducted in Mizan Aman hospital, Southwest Ethiopia [17].

There were some limitations in this study. Since we used secondary data; there were variables which could not get in the patients chart like educational status, income which could have a confounding effect on the outcome variable. Further detailed prospective and community based investigation on caesarean delivery should be conducted.

Conclusions

Based on the findings of the research it is concluded that the caesarean delivery rate of Adigrat hospital is comparable with the national caesarean rate of public hospitals. The commonest indications of caesarean delivery were CPD, NRFHR and APH. Parthograph utilization, ANC follow up, and advanced maternal age are a risk factor for caesarean delivery. Therefore, all centres attending labour and delivery should use parthograph monitoring for every labouring mother. We also recommend Adigrat hospital to have monthly caesarean delivery audit and think on the raising rate of caesarean delivery rate. Administrative bodies, health office and stakeholders should work on ANC follow up so that every pregnant mother gets the care and decrease the likelihood of caesarean delivery.

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Contributors

Samsom Kahsay carried out the conception and designing the study, and performed statistical analysis. Alem Gebremariam performed statistical analysis and wrote the manuscript. Gebretsadik Berhe critically evaluated and made progressive suggestions throughout the study. Betel Birhane commented starting from the proposal writing to this draft of manuscript. All authors were involved in the write up of the manuscript and in the critical review of drafts. All authors read and approved the final manuscript.

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Competing interests

The authors declare that they have no competing interests.

Ethics approval

Ethical clearance was obtained from institutional review board of Mekelle University Collage of Health Sciences and Tigray Regional Health Bureau.

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