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Magnitude of Caesarean Section and Associated Factors among Mothers Who Delivered in Nigist Eleni Mohammed Memorial Referral Hospital, Hossana Town, Southern Ethiopia

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ABSTRACT

Even if the cesarean section is one of the most common and lifesaving surgical procedure, there is an increasing concern on the needless cesarean section that causes maternal and perinatal morbidity. In Ethiopia, insufficient studies are conducted about the current rate of the cesarean delivery. As a result, this study aimed to assess the magnitude of the cesarean section and its associated factors among mothers who gave birth in Nigist Eleni Mohammed Memorial Referral Hospital Hossana Town, Southern Ethiopia. An institution-based cross-sectional study was employed from May 1, 2018, to August 30, 2018 among a total of 3360 deliveries within four months. Data were collected using an interviewer-administered questionnaire and chart review checklist from 320 women who delivered at Nigist Eleni Mohammed Memorial Referral Hospital. The data were collected from every four women until the desired sample size was achieved. After checking visually for completeness, the collected data were entered into EpiData version 3.1 and analyzed using SPSS version 20.0. Descriptive statistics such as frequency, mean and standard deviation were used to describe the characteristics of the participants. Bivariate and multivariable logistic regression was applied to identify factors associated with cesarean delivery. Statistical significance was declared at $P < 0.05$. Among a total of 1120 women delivered during the study period, a total of 315 women were involved in this study making a response rate of 98.4%. Of the participants, 24.1% (95%CI: 19.3%, 28.8%) delivered through caesarean section. Age less than twenty-five years (AOR = 0.36, 95% CI = 0.14, 0.91), attend primary education (AOR = 0.33, 95% CI: 0.14, 0.78), secondary education (AOR = 0.36, 95% CI: 0.15, 0.85), gravida to IV (AOR = 3.99, 95% CI: 1.23, 12.98) and labor not attended using partograph (AOR = 4.04 95% CI: 2.08, 7.82) were independently associated with cesarean delivery. In general, one-quarter of women delivered through the cesarean section which is higher than the WHO recommendation. Factors such as high maternal age, not attending formal education, multigravida, and not using partograph to monitor labor were independent factors associated with cesarean delivery. Thus, labor progress must be followed using partograph and all mothers should be encouraged to deliver through the natural route. Furthermore, obstetric care providers need not rush into cesarean section except for minimal episode of fetal or maternal complication and they should adhere to the clinical and WHO guidelines.

Keywords: Caesarean Section, Factors, Delivery, Ethiopia

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1. INTRODUCTION

Cesarean delivery is lifesaving procedure defined as birth of the fetus, placenta, membrane through an incision the abdominal (laparotomy), and a uterine wall (hysterectomy) (CSA, 2014). The first modern cesarean section (C/S) was performed by German gynecologist Ferdinand Adolf Kehrer in 1881 (Becher *et al.,* 2013). Cesarean section is usually performed when a vaginal delivery would put the baby's or mother's life or health at risk. However, nowadays it has been also performed upon maternal request (Cavallaro *et al.,* 2013).

Cesarean section can be performed electively or in emergency conditions. An emergency type is broad and it may be performed within minutes to save the life of the woman and her fetus. Obstetric conditions such as antepartum hemorrhage, obstructed labour, cephalo pelvic disproportion, and eclampsia fetal distress and non-reassurable fetal heart rate can be managed with timely cesarean delivery (Cunningham *et al., 2014;* Gebremedhin, 2014; Guzman *et al.,* 2015). Access and use of C/S in low- income and middle-income countries are not well performed, even when they are indicated (Khan and Zaman, 2010).

Although C/S is important, unnecessary CS causes maternal and perinatal morbidity like postpartum hemorrhage, reduced fertility, and placental complications such as placental previa, vasa previa, and abruption placenta in subsequent pregnancies for mothers and increases the duration of time for the next pregnancy (Becher *et al.,* 2013; Mölgg *et al.,* 2014; O'Neill *et al.,* 2014). Besides, C/S increases the risk of postpartum respiratory morbidity, inflammatory Bowel disease, Type-1 diabetes, and obesity for children, postoperative pain, cost, prolonged hospital stay, neonatal respiratory distress, and delay breastfeeding initiation and substantial economic burden for the country (Ramiro *et al.,* 2014; Shamsa *et al.,* 2013).

Regardless of vaginal birth importance, the rate of cesarean section increases rapidly worldwide since the 1960's (Shi *et al.,* 2016). The world health organization (WHO) suggested that a C/S rate of 10-15% is accepted at the population level for better maternal and fetal outcomes (Swende, 2011).

Access to obstetric surgery in Ethiopia is compromised by the relatively few appropriate facilities being concentrated in urban centers (Vieira *et al.,* 2015). There is a shortage of surgeons and anesthetists, and a largely rural population with limited access to transportation to get access to urban health facilities where the service is provided. According to the EDHS (2014), 2% of births were

delivered by cesarean section. Out of the 11 regions the rate of the caesarian section was below 2% in seven regions. The rate lies in a range of 8-10% in Gambella, Harar, and Dire Dawa. The highest rate was reported in Addis Ababa which was 20% (Vieira *et al.*, 2015).

In Ethiopia, unnecessary C/S is performed in urban settings. In Addis Ababa C/S rate was 20.6% in public and 41.75% in private health institutions. Similarly, in Harar urban public and private health facilities were 26.6% and 58.7% respectively and the overall rate was 34.3% which exceeds the WHO recommendation (WHO, 2010; Fikirte *et al.*, 2016). Previous literature revealed that both medical and non-medical factors such as age, income, parity, educational status, previous C/S, induction of labour and clinical indications are associated with the rising rate of C/S (Betran *et al.*, 2016). Although the status of C/S is investigated well in the context of developed countries, there is still insufficient evidence in low-and-middle-income countries including Ethiopia; particularly, the factors were not well investigated. Hence, the aim of this study was to determine the magnitude of cesarean delivery and associated factors at Nigist Eleni Mohammed Memorial Referral Hospital, Hossana Town, Southern Ethiopia.

2. METHODS AND MATERIALS

2.1. Study Area, Period and Study Design

An institution-based cross-sectional study was conducted from May 1 to August 30, 2018, at Nigist Eleni Mohammed Memorial Referral Hospital (NEMMRH), Hadiya zone, Hossana, Southern Ethiopia. The Hospital is located approximately 232 km to the Southwest of Addis Ababa and 194 km from Hawassa capital of the region. The Hospital was established in 1990 and it is the only Referral Hospital in Hadiya Zone that served for an estimated population of 1,506,733**.** The hospital also serves as a teaching Hospital for medicine, health officer, midwifery, and nursing students. The hospital is well equipped with medical equipment and staff. There were three gynecologists, one general emergency Obstetrician, 15 General Practitioner, and 25 midwives. There are 36 beds in obstetrics and gynecology departments. A total of 3360 deliveries were performed in the previous year in the Hospital. The modes of deliveries were spontaneous vaginal delivery, C/S and instrument assisted delivery.

2.2. Study Population

All women who came to Nigist Eleni Mohammed Memorial Referral Hospital (NEMMRH) for delivery service during the data collection period were the study population. Those women who had a mental health problem, severely ill, unable to communicate, and referred from other institutions after delivery were excluded from the study.

2.3. Sample Determination and Sampling Technique

The sample size was calculated using single population proportion formula with the following assumptions: proportion of cesarean section 25.4% (19), 95% level of confidence, 5% margin of error, and 10% non-response rate. Then, the final calculated sample size was 320.

There was a total of 3360 deliveries in the previous year; to get the average monthly delivery. This figure was divided by twelve and it results in 280 and multiplied by four to get the estimated number of deliveries for four months which is 1120. The interval (K-value) was determined by dividing 1120 by the sample size. Lastly, the data were collected with an interval of four until the desired sample size was achieved. This means each fourth women arriving for delivery service were included in the study.

2.4. Data Collection Tools and Data Collection Procedure

Interviewer administered questioner and medical record extraction checklists were developed in English by reviewing different literature and translated to Amharic by a language expert. The tool included: socio-demographic and economic status and obstetrics characteristics mainly the indication and type of C/S were included. Two trained diplomas and one BSC midwifery professionals were recruited as data collectors and supervisor, respectively. Data were collected from postnatal mothers within 6-72 hours after delivery.

2.5. Study variables

The dependent variable was the magnitude of caesarian section and the independent variables were socio-demographic characteristics, economic status, obstetrics characteristics and indication and type of C/S.

2.6. Data Quality Assurance

Both theoretical and practical training for 2-days was given for the data collecting team. The data collection tool was pre-tested at NEMMRH one month before the actual data collection to increase clarity and understandability. On-site supervision was carried out daily during the whole period of data collection by the supervisors and investigators.

2.7. Data Processing and Analysis

Data was checked visually by the investigators, entered using EpiData version 3.1, and analyzed using SPSS version 20.0. Descriptive statistics, frequencies, and summary statistics (mean, standard division and percentage) were used to describe the characteristics of study participants. Bivariable logistic regression analysis was used to determine the association between each independent variable and the outcome variable. All variables with p-value ≤ 0.25, significant association in previous studies, and biological plausibility were taken into the multivariable logistic regression model to control possible confounders. Multicollinearity was checked using the variance inflation factor Hosmer-Lemeshow's test and Omnibus tests were used to check model fitness. Adjusted OR with 95% CI were estimated to identify the factors associated C/S. The level of significance was declared at *P*-value < 0.05.

2.8. Ethical Considerations

The study protocol obtained ethical clearance from Arba Minch University, College of Medicine and Health Sciences, institutional ethical review board (IRB). An official support letter was obtained from Arba Minch University to NEMMRH. Besides, participants were informed about the purpose of the study, their rights, and the minimal risk associated with participating in this study. Also, before the commencement of data collection, verbal informed consent was obtained from each participant. Code numbers were used throughout the study to maintain the confidentiality of information.

3. RESULTS

3.1. Socio-Demographic Characteristics

A total of 315 women were involved in this study making a response rate of 98.4%. The mean age of participants was 25.93 (±5.2) years. Two-thirds (67.6%) of respondents were protestant, 301 (95.6%) were married, 169 (53.7%) were living in the urban area. The median monthly incomes of the

participants were 940 Ethiopian birr. Among the respondents 85 (27%) had no formal education. Majority of the respondents were housewife 243 (77.1%) **(Table 1).**

Table 1. Socio-demographic characteristics of women who gave birth in Nigist Eleni Mohammed Memorial Referral Hospital, Southern Ethiopia, 2018 (N =315)

Variables	Categories	Frequency(N=315)	Percentage (%)
Age	<25	129	40.9
	25-34	154	48.9
	>34	32	10.2
Religion	Protestant	213	67.6
	Orthodox	52	16.5
	Muslim	48	15.2
	Adventist	2	0.6
Marital status	Married	301	95.6
	Other*	14	4.5
Level of educational	Not formal education	85	27
	Primary (1-8)	87	27.6
	Secondary (9-12)	90	28.6
	Collage and above	53	16.8
Occupational status	House wife	243	77.1
	Governmental employed	40	12.7
	Self-employed	21	6.7
	Student	11	3.5
Residence	Rural	146	46.3
	Urban	169	53.7
Average monthly Income (ETB)	≤940	158	50.2
	>940	157	49.8

Other: single, divorced, and separated*

3.2 Obstetric Characteristics

More than half (51.7%) of the respondents were multigravida. The majority 291 (92.4%) of respondents had ANC follow-up for the current pregnancy; among them, 61.9% had for and above visits. The majority (83.5%) of respondents deliver at term (37-42 weeks). Labor was followed using partograph for 73.0% of women. Regarding fetal weight, majority 257 (81.6%) of respondents' babies were between 2500 gm to 4000 gm (**Table 2**).

Table 2: Obstetric characteristics of women who gave birth in Nigist Eleni Mohammed Memorial Referral Hospital, southern Ethiopia, 2018 (N = 315).

Variables		Frequency	Percentage (%)
Gravidity	One	112	35.6
	Two-four	163	51.7
	Five and above	40	12.7
Parity	One	121	38.4
	Two-four	157	49.8
	Five and above	37	11.7
Do you have ANC follow-up	Yes	291	92.4
	No	24	7.6
Number of ANC follow up (n=291)	1-3	96	30.5
	≥4	195	61.9
Gestational age at delivery in weeks	37-42	263	83.5
	<37	29	9.2
	>42	23	7.3
Duration of labor	≤12	155	49.2
	>12	160	50.8
Labor induction	Yes	68	21.6
	No	247	78.4
Labor attended by partograph	Yes	230	73.0
	No	85	27.0
Rapture of membrane	Spontaneous	224	71.1
	ARM*	91	28.9
Mode of delivery	SVD*	224	71.1
	C/S	76	24.1
	Instrument assisted	15	4.8
Vaginal birth after C/S (VBAC)	Yes	8	2.5
	No	307	97.5
Birth weight in gram	< 2500	43	13.7
	2500-3999	257	81.6
	≥4000	15	4.8

ARM: artificial rupture of membrane, SVD*: spontaneous vaginal delivery*

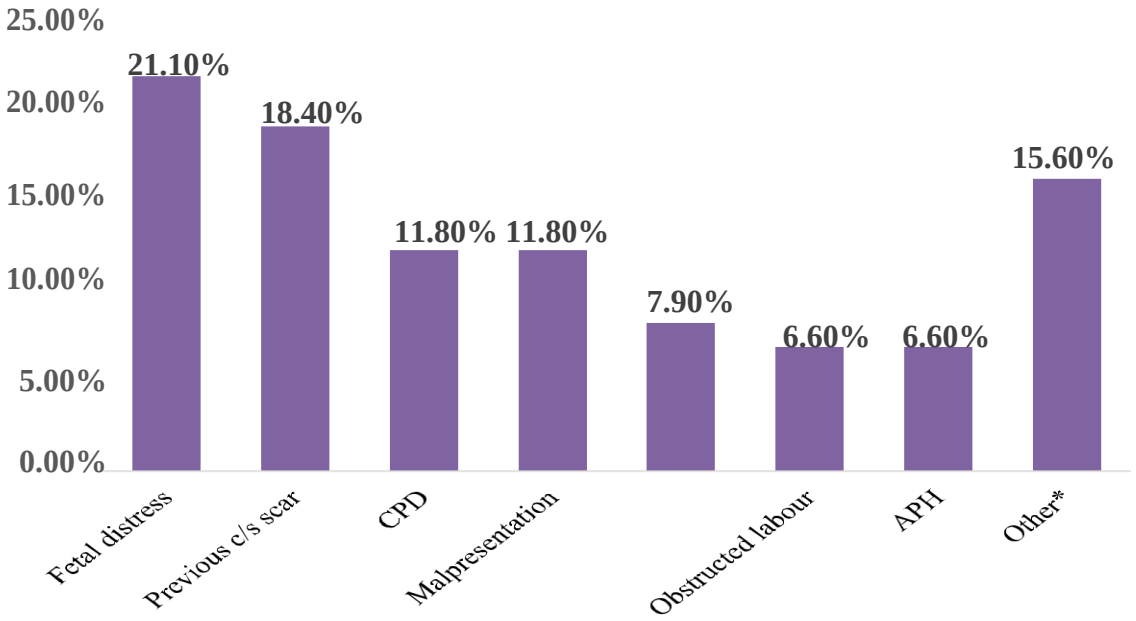
3.3 The magnitude of the Caesarean Section

The magnitude of the cesarean section was 24.1 % (95%, CI: 19.4%, 28.9%), of which 84.2% (95%, CI: 79.6%, 88.8%) was an emergency cesarean section. Fetal distress (21.1%), previous c/s scar

(18.4%), cephalopelvic disproportion (CPD) (11.8%), malpresentation (11.8%) and multiple pregnancy (9.7%) were the major indications for caesarean section (**Figure, 1).**

Factors Associated with Caesarean Section

Those variables with a P-value of ≤ 0.25 in the bivariate analysis were entered in to the multivariable analysis to control for possible confounding factors. Mothers whose age within less than twenty-five years old were 64% (AOR=0.36, 95% CI: 0.14, 0.91) less likely to deliver with C/S as compared to those who were thirty years and above. Similarly, those participants who attended primary and secondary education were 67% (AOR=0.33, 95% CI: 0.14, 0.78) and 64% (AOR=0.36, 95% CI: 0.15, 0.85) less likely to deliver with c/s as compared to those who did not attend formal education.



Others: failed induction, Macrocosmic baby, sever pre-eclampsia, failed instrumentation and cord prolapse*

Figure 1: Indications of caesarean section among women who gave birth by caesarean section in Nigist Eleni Mohammed Memorial Referral Hospital, 2018.

Gravidity was associated with cesarean delivery; those mothers with Gravida II to IV were four times (AOR = 3.99, 95% CI: 1.23, 12.98) more likely to deliver with C/S as compared to those whose Gravida was five and above. Besides, those mothers whose labor not attended using partograph were 4 times more likely (AOR = 4.04 95% CI: 2.08, 7.82) to undertook C/S as compared to those whose labor followed by using partograph (**Table 3**).

Table 3: Bivariate and multivariable logistic regression result for factors associated with cesarean delivery in Nigist Eleni Mohammed Memorial Referral Hospital, Southern Ethiopia, 2018 (n=315).

Variables	Caesarean Delivery		COR (95% CI)	AOR (95% CI)
	Yes (N, %)	No (N, %)		
Age in complete years				
<25	23 (17.8)	106 (82.2)	0.46 (0.24, 0.90)	0.36 (0.14, 0.91) *
25-34	30 (26.3)	84 (73.7)	0.76 (0.40, 1.45)	0.48 (0.20, 1.13)
≥ 34	23 (31.9)	49 (68.1)	1	1
Educational status				
No formal education	29 (34.1)	56 (65.9)	1	1
Primary education	15 (17.2)	72 (82.8))	0.40 (0.20, 0.82)	0.33 (0.14, 0.78) *
Secondary education	15 (16.7)	75 (83.3)	0.39 (0.19, 0.79)	0.36 (0.15, 0.85) *
College and above	17 (32.1)	36 (67.9)	0.92 (0.44, 1.89)	0.56 (0.22, 1.41)
Gravidity				
one	20 (17.9)	92 (82.1)	1.03(0.40, 2.65)	2.87 (0.73, 11.37)
Two to four	49 (30.1)	114 (69.9)	2.03 (0.84, 4.89)	3.99 (1.23, 12.98) *
Five and above	7 (17.5)	33 (82.5)	1	1
Gestational age				
<37	10 (34.5)	19 (65.5)	1	1
37-41^{+6} days	56 (21.6)	203 (78.4)	0.90 (0.30, 2.67)	0.85 (0.19, 3.72)
≥ 42	10 (37.0)	17 (63.0)	0.47 (0.20, 1.08)	0.36 (0.13, 1.00)
Duration of labour (in hour)				
≤ 18	54 (22.4)	187 (77.6)	1	1
>18	22 (29.7)	52 (70.3)	1.47 (0.82, 2.63)	1.44 (0.68, 3.04)
Presence of medical conditions				
Yes	9 (36.0)	16 (64.0)	1.87 (0.79, 4.43)	1.28 (0.42, 3.93)
No	67 (24.1)	223 (76.9)	1	1
Labor monitored using partograph				
Yes	41 (17.8)	189 (82.2)	1	1
No	35 (41.2)	50 (58.8)	3.23 (1.87, 5.58)	4.04 (2.08, 7.82) *
Frequency of ANC follow-up (n=291)				
1-3	19 (19.8)	77(80.2)	1	1
≥ 4	51 (26.2)	144 (73.8)	1.44 (0.79, 2.60	1.79 (0.89, 3.65)
Fetal weight in gram				
< 2000	7 (28.0)	18 (72.0)	0.65 (0.20, 2.16)	0.53 (0.10, 2.96)
2500-3900	60 (22.6)	206 (77.4)	0.49 (0.20,1.16)	0.72 (0.24,2.11)
≥ 4000	9 (37.5)	15 (62.5)	1	1

** Statistically significant at P<0.05*

4. DISCUSSION

This study noted that one-fourth of women delivered through cesarean section. Maternal age, educational status, gravida and partograph were associated with cesarean delivery 24.1% (95%, CI: 19.4%, 28.9%). This finding is supported by studies conducted in Pakistan (21.4%) Ndola Central Hospital, Zambia (20.7%), Felegehiwot Referral Hospital, Ethiopia (25.4%), Hiwot Fana specialized university Hospital, Ethiopia (25.1%) and Mizan Aman General Hospital, Southwest Ethiopia (21.1%) (Fantu, 2016; Hafeez *et at.,* 2014; Nkhata *et at.,* 2016; Yohannes, 2016; Gutema and Shimye, 2014). This showed the cesarean delivery rate increased throughout the world despite the WHO recommendation (<15%). However, this finding is higher than the studies conducted in Addis Ababa (19.2%), St. Joseph Medical Hospital, Tanzania, and southeast Nigeria (7.2%) (Cavallaro *et al.*, 2013; Bayou *et al.*, 2016; Gunn *et al.,* 2017). This finding is also contrary to the previous study conducted in Ethiopia 29.55% (95% CI: 25.46–33.65) (Getnet *et al.*, 2020). This may be because systematic review revealed pooled prevalence and could also be due to the current study setting that was limited to zonal town as compared to systematic review study scope. Similarly, this finding is lower than the pocket studies conducted in China 46% and USA (34%) (Hafeez *et at.,* 2014). This may be probably due to study period deference's, maternal preference, clinical guideline difference, the difference in hospital protocols, health care professionals' level of experience and skill, the standard of the hospital, and sample size deference.

This study distinguished that those mothers whose ages less than 25 years were 64% less likely to undergo C/S as compared to those who were thirty-four years and above. This is similar to the studies conducted in Addis Ababa (Gutema and Shimye, 2014; Bayou *et al.,* 2016). This might be due to as age increase the possibility of pregnancy-related complications also increased. Also, as the number of pregnancies increase the contractility of the uterus is deteriorated and unable to achieve adequate contraction at the second stage of labor.

This study revealed mothers who attend primary and secondary education were 67% and 64% less likely to deliver with the cesarean section as compared to those who did not attend formal education. This finding is contrary to the previous studies conducted in Ethiopia (Bayou *et al.,* 2016; Kahsay *et al.,* 2015). This may due to despite some mothers prefer to deliver in C/S due to the fear of labor pain as the women educational status increase and those who received adequate information about benefits

and complications of cesarean delivery choose cesarean section as a mode of delivery. Also, most of the women who did not attend formal education are from the rural community who reaches to the hospitals after developing a complication that needs advanced surgical interventions deliveries.

This study showed that mothers with Gravida II to IV were four times more likely to go through C/S as compare with gravida five and above mothers. This finding is in line with the previous study in Cameron as gravida of the mother increase, the risk of C/S also increased (Tebeu *et al.,* 2011). This may probably due to the fact that women who suffered a lot from the previous labor pain may prefer to deliver through C/S. Now a day's middle-aged women prefer cesarean section without any medical indication just to avoid suffering from labor pain. Moreover, those who are grand multipara women are strongly warned during the ANC follow-up and they come early before encountering complications.

Thoughtful labor monitoring using partograph has a significant effect to reduce the rate of cesarean section. Those mothers whose labor did not attend by using partograph were four-fold more likely to deliver with the cesarean section as compared to those whose labor was followed using partograph. This is in line with the studies conducted in Hiwot Fana Hospital and Adigrat Hospital, Ethiopia (Yohannes, 2016; Kahsay *et al.,* 2015). This may be due to as the labor is monitored using partograph the fetal condition, labor progress, and the maternal condition is recorded that used as a clue to take early measure before the mother and the fetus develops any kind of complication. Furthermore, effective utilization of partograph is also used to prevent the implementation of unnecessary induction and/or augmentation and vaginal operative deliveries which leads to significant morbidity in the postpartum period.

In this study gestational age was significantly associated with cesarean section. This is consistent with a study done in Addis Ababa both private and public Hospitals (Fantu *et al.,* 2016). Mothers whose gestational age greater than 42 weeks were three times more likely to undergo cesarean section as compared to those who gestational age is between 37 to 42weeks. This might be due to initiating induction of labour in a woman with post-term pregnancy is likely to fail. Likewise, an elective cesarean section may be decided clinically because post maturity is a known risk factor for perinatal mortality.

Generally, the study assessed the magnitude of cesarean delivery and identified its associated factors. However, the study has a limitation of generalizability to all other health facilities because the data collection was restricted to one hospital.

5. CONCLUSIONS

In general, one-quarter of the women delivered through C/S which is higher than the WHO recommendation. Factors such as advanced maternal age, not attending formal education, multigravida, and not using partograph to monitor labor were independent factors associated with cesarean delivery. Thus, all laboring mothers should be followed with partograph to reduce unnecessary cesarean section. Obstetric care providers need to encourage mothers to have a routine early first and third-trimester ultrasound evaluation for gestational age and fetal weight determination during ANC follow up. Time must be given for conservative management of fetal distress and other complications instead of rushing to operation theatre with a single episode of fetal heart rate abnormality. In addition, care should be taken to use the clinical standards and protocols to conduct the cesarean section. Trail of vaginal delivery after cesarean section should be encouraged in appropriate cases. Furthermore, C/S rate should be maintained within the optimum range by introducing clinical audits of labor management in the health facility. Therefore, based on the study findings, the authors recommend a particular emphasis to follow the WHO recommendations and guidelines. Further study is needed on service providers' attitude and their influence on the rising cesarean section rate.

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