

ORIGINAL ARTICLE

Prevalence of Cesarean Delivery and Associated Factors among Women Attending a Comprehensive Hospital in Central Ethiopia, 2024

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ABSTRACT

Background: A Cesarean delivery is an obstetric surgical procedure used to deliver a live baby by making incisions on the abdominal and uterine walls of a pregnant woman after 28 weeks of gestation. Although it reduces maternal and fetal deaths, it is becoming more common in countries worldwide, including in Ethiopia, where rates have gone above the level recommended by the World Health Organization. There is little research into how common it is in Ethiopia and what factors might be contributing to its use.

Objective: This study aimed to assess the prevalence of cesarean deliveries and associated factors among women attending a comprehensive hospital in central Ethiopia in 2024.

Methods: A hospital-based cross-sectional study design with systematic random sampling was used to enrol 330 women. SPSS statistical package was used to analyse the data. Results were presented using descriptive and inferential statistics. A p-value below 0.05 was considered level of significance.

Results: The prevalence of cesarean delivery in the study hospital was 41.2%. Women with illiteracy (AOR: 0.202; 95% CI: 0.057-0.711), primary school level education (AOR: 0.256; 95% CI: 0.11-0.594), 1 to 4 times antenatal care follow-ups (AOR: 0.298; 95% CI: 0.138-0.646), gestational age of 37-42 weeks (AOR: 0.276; 95% CI: 0.075-0.992) and fetal weight less than 3.99 kilograms (AOR: 0.026; 95% CI: 0.005-0.148), were less likely to undergo cesarean delivery.

Conclusion: The rate of cesarean deliveries in the study hospital was above the World Health Organization's suggested limit. Surprisingly, typical obstetric factors linked to cesarean deliveries did not show a significant statistical association with the procedure, suggesting that non-obstetric reasons might be influencing the decisions to perform cesarean deliveries at the study hospital.

Keywords: Cesarean delivery, prevalence, associated factors, central Ethiopia

INTRODUCTION

A Cesarean delivery (CD) is a major obstetric surgical intervention that can be performed either electively or as an emergency procedure to deliver the baby alive. In Ethiopia, the rate of CD varies between 11% and 49%. After this procedure, several potential complications can arise in the mother and her baby; including, febrile illnesses, surgical site infections, maternal mortality, anemia, postpartum bleeding, and perinatal oxygen deprivation, sepsis of the newborn, newborn death, stillbirth and premature birth [1, 2]. Therefore, it has its own set of risks that can lead to health problems on both the mother and the baby, sometimes resulting in serious illness or even death. On the other hand, CDs do offer some protective benefits for mothers, like a lower likelihood of experiencing issues such as urine or bowel incontinence and pelvic organ prolapse compared to women who have vaginal births [3, 4].

Around the world, the rate of CD has been rising at an alarming pace. In recent years, the global increase in CD has been quite substantial. In sub-Saharan African countries, the rates of CD exceeding 10% have not been linked to lower rates of maternal and newborn deaths [5]. The WHO recommends CD rates in hospitals to be 5% to 15%. However, many countries have CD rates that surge from 6% to 34% [6, 7]. The persistent high rate of CD is influenced by institutional, demographic, and sociocultural factors [8, 9]. Studies have shown that several factors confluence the rates of CD, including a woman's level of education, her past pregnancy and CD history, her attendant physician's recommendation, the type of hospital she attends (public or private), the fetal weight, the family's income, and dwelling places (urban or rural) [10, 11].

On the other hand, the increasing number of CDs is inducing significant effects on healthcare systems and various health issues on both mothers and their babies [12, 13]. There are factors that trigger a woman to have a CD, including longer intervals between pregnancies,

prepregnancy, having a greater income, illiteracy, and living in a rural area [14]. Despite the procedure's significance and potential complications, some nations in Latin America and the Caribbean exhibit the highest rates, varying between 42.8% and 91.2% [15]. It is also a common practice in Ethiopian hospitals.

MATERIALS AND METHODS

Design and setting: An institution-based cross-sectional study was employed in Debre Berhan Comprehensive Hospital, in central Ethiopia.

Study population: Women who delivered their babies after 28 weeks of gestation in the study hospital during the study period were included.

Study time and sampling: The study was conducted from October to December 2024. The study participants at the study site were selected by a systematic random sampling technique until the required sample size was obtained. The first client was selected by the Lottery method.

Sample size: The total sample size (N=333) was calculated by using a single population proportion formula by considering the previous prevalence of CD (27%), as reported from a recent study [16] with a 95% confidence level and 5% margin of error, and a nonresponse rate of 10%. The calculated sample sizes for independent factors were smaller.

Study tool and data collection: We collected the data using a structured, translated questionnaire, conversations with clients (after they had given birth), and by reviewing clients' medical records. To ensure the quality of the data, we trained the collectors and supervised the process closely. Before we started collecting data, we tested the questionnaire (the translated Amharic version) for accuracy and reliability with 5% of our sample group at another general hospital in the same region.

Study variables: We measured the outcome of a delivery when it was done via CS. Meanwhile, we looked at several independent factors that could impact this, including the mother's socio-demographic background, details about her

pregnancies, and the specific medical conditions that might lead to a CD.

Statistical analysis: We cleaned and entered the data into EpiData software, then transferred it to SPSS version 26 for further analysis. We used descriptive statistics and presented the results using frequencies and percentages. Then, we ran a bi-variable logistic regression to decipher which factors might be candidates for multivariable logistic regression. To ensure our model was sound, we tested for linearity using a multi-collinearity test with the variance inflation factor (VIF). We also used the Hosmer-Lemeshow goodness-of-fit test to evaluate how well our model was working for compulsory adjustments. In the multivariable logistic regression, a variable with a p-value below 0.05 was taken as statistically significant. We then tested how strong the relationships were using adjusted odds ratios with their 95% confidence levels.

Ethical consideration: We obtained ethical approval from the IRB of Debre Berhan University. We also got approval letters from the health authorities in the North Shoa zone and the study hospital before the data collection. Every participant signed the consent forms after adequate information was provided regarding the purpose of the study. To protect privacy, data collection was handled anonymously, and every woman participated willingly.

RESULTS

Prevalence and types of cesarean delivery: Among the 333 women we initially calculated for our sample, 330 actually participated in the study; with a 99% response rate. Overall, in the setting we studied, the rate of Cesarean deliveries (CD) was 41.2%. Out of those, 95, or 69.8%, were emergency C-sections, and 100, or 73.5%, were primary, conducted for the first time in the mothers' history.

Socio-demographic characteristics: Among the women involved in the study, 28 (8.4%) were under 20 years (teenagers), 258 (78.1%) were

between 20 and 35 years, and 44 (13.3%) were over 35 years of age. Most, 263 (79.6%), were married, 74 (22.4%) had a tertiary level education, 71 (21.5%) had attended secondary school, and 104 (31.5%) had gone to primary school; the remaining 81 (24.5%) could not read or write. About half of the participants, 158 (47.8%), were housewives, 198 (60%) lived in urban areas, and 139 (42.1%) made 5,000 Ethiopian Birr or less each month (Table 1).

Table 1: Socio-demographic characteristics of women who gave birth in a comprehensive hospital in central Ethiopia, 2024 (N=330).

Variable	Frequency	Percent
Age (years)		
<20	28	8.4
20-35	258	78.1
>35	44	13.3
Marital status		
Married	263	79.6
Single	39	11.7
Separated	12	3.6
Divorced	7	2.6
Widowed	10	3.0
Education		
Illiterate	81	24.5
Grades 1-8	104	31.5
Grades 9-12	71	21.5
Tertiary level	74	22.4
Occupation		
Housewife	158	47.8
Government	81	24.5
Non-governmental	9	2.7
Merchant	37	11
Daily laborer	28	8.4
Others	17	5.1
Residence		
Urban	197	59.7
Rural	133	40.3
Monthly income (Birr)		
<= 5000	139	42.1
5001-10000	129	39.1
>10000	62	18.7

Obstetric characteristics: Among the women participated in the study, 172 (52.1%) were pregnant for their second to fourth time, while 155 (46.9%) were expecting their first pregnancy in their life time. Regarding their current pregnancy, 277 (83.9%) of the participants received prenatal care; 196 (59.3%) attended four or more prenatal check-ups. In terms of gestational period, 280 (84.8%) had a pregnancy that went to full term (37-42 weeks), 27 (8.1%) went past the due date (>42 weeks), and 23 (6.9%) delivered prematurely (before 37th completed week). Regarding their past pregnancy experiences, 87 (26.3%) had stillbirth, 58 (17.5%) had miscarriage, and 23 (6.9%) had infertility. As for the birth weight of their babies, 244 (73.9%) had infants weighing between 2500 and 3999 grams (Table 2).

Indications of cesarean delivery: Among the total 136 Cesarean deliveries performed with different indications during the study period, 40 (29.4%) were done due to fetal distress, followed by previous CD scar 29 (21.3%), obstructed labor 13 (9.5%), and failed inductions 10 (7.3%) (Figure 1).

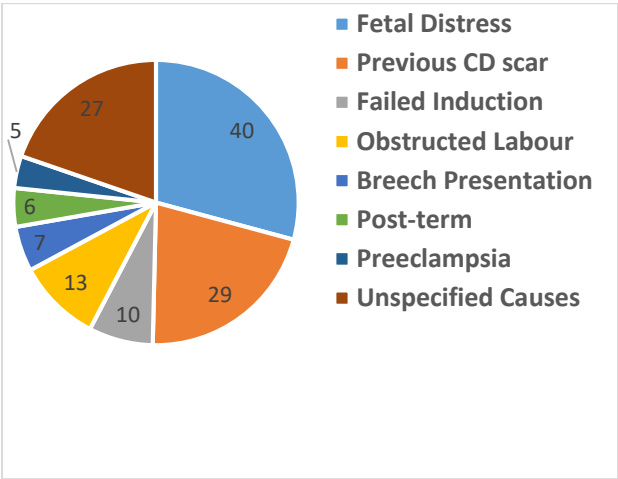


Figure 1: Major indications of CD among women who gave birth in a comprehensive hospital in central Ethiopia, 2024.

Table 2: Obstetric parameters of women who gave birth in the study hospital of central Ethiopia, 2024 (N=330).

Variable	Frequency	Percent
Gravidity		
1	127	38.4
2-4	172	52.1
>=5	31	9.3
Parity		
1	155	46.9
2	116	35.1
3	42	12.7
>/=4	17	5.1
Previous still birth		
Yes	87	26.4
No	243	73.6
Miscarriage		
Yes	58	17.5
No	272	82.5
Previous infertility		
Yes	23	6.9
No	307	93.1
ANC follow-ups		
Yes	277	83.9
No	53	16.1
ANC follow-ups		
0	53	16.0
1-4	81	24.5
>/=4	196	59.3
Gestational age		
<37	23	6.9
37-42	280	84.8
>42	27	8.1
Mode of delivery		
Vaginal	194	58.8
CD	136	41.2
Birth weight		
<2.5 Kgs	46	13.9
2.5-3.999 Kgs	244	73.9
>/=4 Kgs	40	12.1

Associated factors of cesarean delivery: Educational status, place of residence, average monthly income, gravidity, gestational age, number of antenatal care follow-ups, fetal weight, and previous history of infertility were

significantly associated with CD in the bi-variable analysis, with a p-value of less than 0.02. However, the multivariable analysis confirmed that illiteracy (AOR; 0.202; 95% CI: 0.057-0.711), primary school education level (AOR; 0.256; 95% CI: 0.11-0.594), few number of ANC follow-ups (< 4 visits) (AOR; 0.298; 95% CI:

0.138-0.646), gestational age between 37 and 42 weeks (AOR; 0.276; (95% CI: 0.075-0.992), fetal weights less than 2500 grams (AOR; 0.018; 95% CI: 0.003-0.111), fetal weights 2500-3999 grams (AOR; 0.026; 95% CI: 0.005-0.148) were significantly associated factors with CD (Table 4).

Table 4: Factors associated with cesarean delivery in bi-variable and multivariable logistic regression analyses among women who gave birth in a comprehensive hospital in central Ethiopia, 2024

Variables	Cesarean delivery		COR (95% CI)	p-value	AOR (95% CI)	P-value
	Yes (%)	No (%)				
Educational status						
Illiterate	15 (4.5)	66 (20)	0.123 (0.052-0.292)	0.000	0.202 (0.057-0.711)	0.021*
Primary school	24 (7.2)	80 (24.2)	0.167 (0.87-0.321)	0.000	0.256 (0.110-0.594)	0.030*
Secondary & tertiary	97 (29.3)	48 (14.5)	0.781 (0.291-1.088)	0.008	1.05 (0.502-1.485)	0.353
Monthly income						
<=5000	45 (13.6)	94 (28.4)	0.281 (0.151-0.524)	0.000	0.737 (0.317-1.714)	0.562
5001-10000	51 (15.4)	78 (23.6)	0.371 (0.199-0.691)	0.002	0.470 (0.212-1.041)	0.531
>10000	40 (12.1)	22 (6.6)	1		1	
Residence						
Urban	97 (29.3)	100 (30.3)	2.235 (1.447-3.550)	0.001	0.586 (0.276-1.243)	0.716
Rural	39 (11.8)	94 (28.4)	1		1	
Gravidity						
1	48 (14.5)	79 (23.9)	5.907 (1.706-20.458)	0.005	3.091 (0.658-14.513)	0.661
2-4	82 (24.8)	90 (27.2)	8.809 (2.581-30.060)	0.001	4.853 (0.980-21.438)	0.091
>=5	6 (1.8)	25 (7.5)	1		1	
Previous Infertility						
Yes	17 (5.1)	6 (1.8)	4.486 (1.721-11.697)	0.002	2.040 (0.606-6.866)	0.853
No	119 (36)	188 (57)	1		1	
ANC follow-ups						
0	6 (1.8)	47 (14.2)	1		1	
1-4	17 (5.1)	64 (19.3)	0.202 (0.110-0.369)	0.000	0.298 (0.138-0.646)	0.030*
>=4	113 (34.2)	83 (25.1)	1		1	
Gestational age						
<37 weeks	7 (2.1)	16 (4.8)	0.019 (0.002-0.170)	0.000	0.407 (0.008-1.370)	0.072
37-42 weeks	109 (33)	171 (51.8)	0.199 (0.083-0.479)	0.000	0.276 (0.075-0.992)	0.011*
>42 weeks	20 (6.1)	7 (2.1)	1		1	
Birth weight						
<2500 gram	7 (2.1)	39 (11.8)	0.010 (0.002-0.049)	0.000	0.018 (0.003-0.111)	0.020*
2500-3999 gram	95 (28.7)	149 (45.1)	0.022 (0.004-0.090)	0.000	0.026 (0.005-0.148)	0.021*
>=4000 gram	34 (10.3)	6 (1.8)	1		1	

Note: *=p-value<0.05, COR-crude odds ratio, AOR- adjusted odds ratio, CI-confidence interval

DISCUSSION

Based on this study, the prevalence of CD in the study area was 41.1%. This figure exceeds the upper boundary of the critical limit fixed by the WHO for any nation. Similarly, a previous research carried out in Addis Ababa (Central Ethiopia) indicated the CD prevalence rate ranged between 38.3% and 57.8% [17]. Our findings also align with those reported from different regions of Ethiopia, such as 41.8% in Bahir Dar (Northwest Ethiopia) [18], 47.6% in Dessie (Northeast Ethiopia) [19], 13.2% in Tigray (Northern Ethiopia) [20], and 21% in Butajira (Southern Ethiopia) [21]. However, our result is lower compared to the data from five countries: the Dominican Republic (58.1%), Brazil (55.7%), Cyprus (55.3%), Egypt (51.8%), and Turkey (50.8%), where Cesarean deliveries are more common than vaginal births [22]. On the other hand, our data show a higher rate than what has been reported in other sub-Saharan African nations, including Burkina Faso (3%), Ghana (15.6%), and Congo (2.3%) [23]. The discrepancy might be due to differences in clinical practices among health workers and variation in sociocultural practices of the women.

This research showed that 30% of the mothers involved in the study had their first baby by CD which is similar to the 29.69% found in a study done in Debre Tabor (North west Ethiopia) [24]. Having a first CD significantly determine how the subsequent births go. Therefore, surgeons and women should think carefully about deciding on the mode of delivery of the first baby, as it could lead to negative consequences in later pregnancies. Frequently, health workers might choose to do a CD because they feel it is safer or offers immediate benefits, and they save time. This makes it difficult to reduce the number of CDs being performed.

The study also found that women with less education (either illiterate or primary school) were less likely to have a CD compared to women who had secondary school or college

levels education. This matches up with another study conducted in Addis Ababa hospitals, which reported that mothers with college degrees or higher were 3 to 4 times more likely to have a CD than mothers who could not read or write [25]. The reason might be women who have had more education might see CD as a way to avoid more pain, make more convenient, and feel safer compared to vaginal deliveries. A study conducted in northern Tanzania revealed that one in four deliveries was a CD that happened after labor induction, and that was especially evident in cities [26]. The main reason for conducting the CD in that study was that the baby showed signs of distress. The research also identified that factors like birth weight and first pregnancy were linked to higher CD rates, which matches what other studies have reported before [27]. Our results are also quite similar to a study that was conducted in the Democratic Republic of Congo [28].

One fascinating thing we found in the study was that having a baby weighing over 4000 grams did not seem to be a significant factor in to undergo CD. This suggests that, health workers in the study hospital might have been using non-obstetric indications to perform CDs. The study also disclosed that mothers with less than four antenatal follow-up visits were less likely to have a CD than women who had more than four antenatal visits. This result aligns with the findings of a study conducted at Gondar University Hospital, North West Ethiopia, which reported that women who attended four antenatal visits were 4.49 times more likely to undergo a CD than mothers who had only one visit [29].

Mothers who were pregnant up to term (37 to 42 weeks) were less likely to have a CD than those who were post-term (more than 42 weeks). This aligns with a study in Addis Ababa, which found that mothers who were term pregnant were 26.5% less likely to have a CD compared to post term ones. The reason might be that post-term pregnancies are more likely to have less amniotic

fluid, leading to fears and elective plans for a CD [30].

Limitations of the study: The study did not include the opinions and practices of service providers about CD. Referral cases might overestimate the prevalence of the CD.

CONCLUSIONS

From the results, we inferred that the overall rate of CD at the comprehensive hospital in central Ethiopia was 41.1%. This figure exceeds the 15% threshold suggested by the WHO for developing nations. CD rates exceeding 15% are not linked to a decrease in maternal or neonatal mortalities. Moreover, classic obstetric factors associated with CD, such as post-term pregnancy, did not show a significant statistical association with CD suggesting non-obstetric factors might be contributing to the elevated CD rates. Therefore, to lower the high rate of CD, each case needs to be assessed carefully to check if a vaginal birth is possible. It would be beneficial to implement educational programs, such as short term trainings, seminars, or workshops, for healthcare providers (surgeons) to remind them adhere to the CD guidelines set by the WHO and the Association of Gynecologists.

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