

# Adverse birth outcome: a comparative analysis between cesarean section and vaginal delivery at Felegehiwot Referral Hospital, Northwest Ethiopia: a retrospective record review

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**Introduction:** Some studies favor elective cesarean delivery, and other surveys benefit vaginal delivery, while others emphasize that the quality of care during labor, birth, and immediate postpartum period plays a great role than the route of delivery. However, little information is locally available regarding the incidences of adverse birth outcome with respect to the route of delivery.

**Methods:** This study was a retrospective analysis of eligible patient records that included 3,003 pregnant women who had undergone either cesarean or vaginal delivery from July 1, 2012, to June 31, 2013. Pretested questionnaire was used to collect the data. The completeness and consistency of the data were checked, cleaned, and double entered to EPI-INFO 3.5.2 and analyzed with SPSS V20. Independent sample *t*-test and chi-square test were conducted to compare the outcome of vaginal delivery and cesarean section (CS) using index variables. Significance was taken at  $P < 0.05$ .

**Results:** Among the enrolled women, 760 mothers had CS delivery and the remaining 2,243 mothers delivered vaginally. Children born through CS (mean = 6.83, standard deviation = 1.31) had a significantly lower first-minute Apgar score than those in the vaginal delivery group (mean = 7.19, standard deviation = 1.18,  $P = 0.001$ ). Similarly, the observed respiratory distress syndrome ( $c^2 = 0.09$ ,  $P = 0.793$ ) and neonatal transfer rate to neonatal intensive care unit ( $c^2 = 0.086$ ,  $P = 0.766$ ) were more in neonates delivered by CS than those in the vaginally delivered group. Besides, the observed neonatal death ( $c^2 = 0.675$ ,  $P = 0.411$ ) and maternal death ( $c^2 = 8.878$ ,  $P = 0.003$ ) were higher among CS deliveries compared with vaginal deliveries.

**Conclusion:** Neonatal and maternal morbidity and mortality appear to be more in CS than in vaginal delivery. Therefore, decision to perform CS should be based on clear, compelling, and well-supported justifications.

**Keywords:** intensive care unit, emergency cesarean delivery, vaginal delivery, adverse birth outcome

## Background

The current maternal mortality ratio in Ethiopia is 426/100,000 live births.<sup>1</sup> Reducing the maternal mortality has arrived at the top of health and development agendas.<sup>2</sup> To achieve the millennium development goal of a 75% reduction in the maternal mortality ratio between 1990 and 2015, countries throughout the world are investing more energy and resources into providing equitable and adequate maternal health services.<sup>3</sup> One of the proposed ways of reducing maternal mortality is improving the availability, accessibility, quality, and use of services for the treatment of complications that arise

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during pregnancy and childbirth.<sup>3,4</sup> The proportion of births by cesarean section (CS) has been chosen as the indicator of provision of lifesaving services for both mothers and newborns.<sup>5</sup>

Studies demonstrated that nonemergency cesarean deliveries are associated with a reduced risk of neonatal complications in cases of breech (buttocks first) presentation when compared with vaginal delivery.<sup>4</sup> However, newborns with a cephalic (head first) presentation if delivered by cesarean are more likely to have complications or to die before hospital discharge, and women delivering by CS are more likely to experience severe complications (including death).<sup>4,6</sup>

Some studies recommend elective cesarean delivery to prevent urinary and fecal incontinence after vaginal delivery and adverse neonatal outcome as a complication of labor.<sup>6-8</sup> Other surveys benefit vaginal delivery because cesarean delivery has a higher risk of maternal death,<sup>9</sup> a longer recovery time and operative complications,<sup>10</sup> a higher risk of unexplained stillbirths in subsequent pregnancies,<sup>6</sup> and respiratory problems of the newborn infant.<sup>11-13</sup>

Others<sup>3,5,12</sup> emphasize that good-quality care during labor, birth, and in the immediate postpartum period than the route of delivery plays a key role to prevent the onset of complications and enable their early detection and prompt management. Interventions around the time of birth have the greatest effect on reducing neonatal mortality, as low coverage and poor quality of health care at that time account for high rates of newborn mortality as well as maternal mortality and intrapartum stillbirths.<sup>7</sup> However, little information is locally available with regard to the difference in the outcomes between vaginal and CS delivery. In this study, we have tried to explore newborn and maternal outcome of births conducted in Felegehiwot Referral Hospital.

## Methods

### Study setting, design, and population

The study was a comparative retrospective analysis of patient records that included 3,003 pregnant women who had undergone either cesarean or vaginal delivery from July 1, 2012, to June 31, 2013, in Felegehiwot Referral Hospital, Amhara, Ethiopia. The hospital is a tertiary-level hospital where basic and comprehensive emergency obstetric care with full package of obstetric care, including CS and blood transfusion, is being given.

### Data collection and analysis

Women who had CS delivery were classified as cases, and all forms of vaginal delivery were classified as comparable group. The case records of the study and control groups

were analyzed for Apgar score at first and fifth minutes, birth weight, length of gestation, and incidence of maternal and neonatal complications and mortalities. Perinatal outcome of the newborn including incidence of admission to the neonatal intensive care unit (NICU) was also recorded.

A pretested questionnaire was used to collect mothers' information. The completeness and consistency of the data were checked, cleaned, and double entered to EPI-INFO 3.5.2 and analyzed with IBM SPSS Version 20 (IBM Corporation, Armonk, NY, USA). Independent sample *t*-test was used for comparison between mean values, and chi-square test was used for comparison between percentages. Significance was taken at  $P < 0.05$ .

## Ethical consideration

Ethical approval to conduct the study was obtained from Amhara Regional Health Bureau research ethics review committee. Communication with the hospital administration was made through a formal letter obtained from the regional health bureau. The data obtained from the hospital were kept confidential. No patient consent was required as secondary data was used.

## Result

On average, ~30 women are giving birth daily in the hospital. Among the enrolled women, 760 mothers had CS delivery, of whom 70 (9.6%) had elective CS and 690 had emergency CS, and 2,243 mothers delivered vaginally. The minimum age of newborns in this study was 28 weeks, and the maximum age was 45 weeks. Four hundred sixty-seven newborns had a gestational age of <37 weeks (Table 1).

The minimum birth weight recorded was 500 g, while 6,000 g was the maximum birth weight. In this study, 350 (12.8%) newborns had a weight <2,500 g, of which 24 had a birth weight between 1,000 g and 1,500 g and five newborns had a birth weight of <1,000 g, whereas 71 (2.6%) newborns had a birth weight of  $\geq 4,000$  g.

Antenatal care attendance was made by 77.3% of the women, and ~90% of them started antenatal care attendance during the first trimester. The prevalence of HIV among tested 2,786 women was 4.7%, and it has no significant association with fetal or maternal outcome.

## Maternal and neonatal outcome

Three hundred five (10.2%) newborns were stillbirth. One hundred twenty-eight were fresh stillbirth. Thirteen newborns died after delivery due to birth asphyxia. Ten of the 13 neonates who died during the immediate postnatal period were delivered by CS.

**Table 1** Sociodemographic characteristics of study participants, Bahir Dar, 2013

Variables	Route of delivery	
	CS, no (%)	Vaginal, no (%)
Maternal age, years		
15–19	35 (4.6)	170 (7.6)
20–24	207 (27.2)	749 (33.4)
25–29	273 (36.0)	754 (33.6)
30–34	141 (18.6)	331 (14.8)
≥35	104 (13.6)	240 (10.6)
Residence		
Urban	358 (47.1)	1,352 (60.2)
Rural	402 (52.9)	892 (39.8)
Gravida		
Primigravida	335 (44.0)	1,167 (52.0)
2–4	311 (40.9)	839 (37.4)
≥5	114 (15.1)	238 (10.6)
HIV status		
Positive	27 (3.6)	104 (4.6)
Negative	673 (96.4)	1,983 (95.5)
ANC attendance		
Yes	586 (77.1)	1,734 (77.3)
No	174 (22.9)	507 (22.7)
Admission during pregnancy		
Yes	53 (7.0)	71 (3.2)
No	707 (93.0)	2,173 (96.8)
Risk factor diagnosed		
Yes	108 (14.2)	140 (6.2)
No	652 (85.8)	2,104 (93.8)
Labor monitored		
Yes	137 (18.0)	780 (34.8)
No	483 (72.0)	1,167 (65.2)
Gestational age, weeks		
28–33	25 (3.3)	102 (4.5)
34–36	101 (13.3)	239 (10.6)
37–42	494 (65.0)	1,472 (65.6)
>42 weeks	63 (8.3)	131 (5.8)
Birth weight, g (n=2,738)		
<2,500	85 (12.5)	265 (12.9)
2,500–3,999	558 (84.0)	1,758 (85.5)
≥4,000	37 (5.4)	34 (1.6)
Fetal and neonatal outcome		
Alive	664 (87.4)	2,200 (90.8)
Dead	96 (12.6)	222 (9.2)
Maternal outcome		
Alive	747 (98.3)	2,422 (100)
Dead	13 (1.7)	0 (0.0)

**Abbreviations:** CS, cesarean section; ANC, antenatal care.

Thirteen mothers died during labor, delivery, and immediate postnatal period in the hospital. They died as a result of complications related to CS delivery. While four deaths were due to respiratory failure following general anesthesia, six were due to hemorrhage secondary to uterine rupture, two were due to sepsis, and one was due to disseminated intravascular coagulation.

**Table 2** Comparison of maternal intrapartum and postpartum complications, FHRH, Amhara, Ethiopia, 2013

Complications	Route of delivery		Total
	Vaginal delivery	CS delivery	
Hemorrhage	35	20	55
First degree perineal tear	74	–	74
Second degree tear	66	–	66
Episiotomy	291	–	291
Sepsis	8	8	16
Wound infection	–	23	23
Preeclampsia/eclampsia	17	14	31
Adherent placenta	4	–	4
Blood transfusion	3	24	27
Fistula	2	–	2
Maternal death	0	13	13
Total	500	89	589

**Abbreviations:** FHRH, Felegehiwot Referral Hospital; CS, cesarean section.

Five hundred eighty-nine mothers had intrapartum or postpartum complications, and the commonest of them was perineal lacerations (64.7%; Table 2).

## Comparison between emergency CS and vaginal delivery

Comparative analysis was conducted using Apgar score, respiratory distress, fetal outcome, maternal outcome, and NICU admission rate as a major comparison factor between CS and vaginal delivery. Statistically significant Apgar score difference was noted at first minute between elective CS and vaginal delivery.

Similarly, there was a difference in mean score noted at first minute of both groups, and the results were statistically significant according to the result of independent sample *t*-test. Children born through the CS (mean =6.83, standard deviation =1.31) had a significantly lower Apgar score than those in the vaginal delivery group (mean =7.19, standard deviation =1.18). There was also an observed mean score difference between the two groups at the fifth minute; however, the results were not statistically significant ( $P=0.055$ ; Table 3).

The observed respiratory distress syndrome was more in neonates who were delivered by CS than that in the vaginally delivered group. However, the results were not statistically significant ( $\chi^2=0.09$ ,  $P=0.793$ ; Table 4).

Similarly, among the 243 newborns who had complications at birth, 72 were transferred to NICU and the remaining cases were managed at delivery rooms, among which 13 of them have died due to resuscitation failure. Among newborns that were transferred to NICU for further management, 22 (31.0%) newborns were delivered by CS. The observed neonatal transfer rate was more in neonates who were

**Table 3** Result of independent sample t-test of Apgar score differences between the two groups, FHRH, Amhara, Ethiopia, 2013

Apgar at First and Fifth minute	Mode of delivery	Mean	SD	P-value
Apgar score at first minute	Vaginal	7.19	1.18	0.001
	CS	6.83	1.31	
Apgar score at fifth minute	Vaginal	8.49	1.23	0.055
	CS	8.32	1.34	

**Abbreviations:** FHRH, Felegehiwot Referral Hospital; SD, standard deviation; CS, cesarean section.

**Table 4** Result of respiratory distress syndrome differences between the two groups, FHRH, Amhara, Ethiopia, 2013

Mode of delivery	Respiratory distress syndrome		Total	P-value
	Respiratory distress			
	Yes	No		
Vaginal	40 (16.9%)	197 (83.1%)	237	0.793
CS	17 (18.1%)	77 (81.9%)	94	
Total	57	274	331	

**Abbreviations:** FHRH, Felegehiwot Referral Hospital; CS, cesarean section.

**Table 5** Result of admission to NICU difference between the two groups, FHRH, Amhara, Ethiopia, 2013

Mode of delivery	Transfer to NICU		Total	P-value
	Transferred to NICU			
	Yes	No		
Vaginal	50 (29.1%)	122 (70.9%)	172	0.766
CS	22 (31.0%)	49 (69.0%)	71	
Total	72	171	243	

**Abbreviations:** NICU, neonatal intensive care unit; FHRH, Felegehiwot Referral Hospital; CS, cesarean section.

delivered by elective CS than that in the vaginally delivered group ( $c^2=0.086$ ,  $P=0.766$ ; Table 5). Similarly, regarding fetal outcomes, 83 (10.9%) of the total fetal deaths occurred among mothers with CS delivery compared to vaginally delivered ( $c^2=0.675$ ,  $P=0.411$ ).

## Discussion

A healthy start is central to the human life course, with birth holding the highest risk of death, disability, and loss of development potential, leading to major societal effects.<sup>2</sup>

Ethiopia has shown a significant stride in reducing maternal and child death recently. However, the pattern of neonatal deaths remains a lingering public health challenge in the country, where 37 newborns are dying annually per every 1,000 live births.<sup>14</sup>

Although we are in the era of achieving millennium development goals, there was a significant number of perinatal and maternal mortalities in this study. Among stillbirths, 42%

were freshly dead, which can be considered as a signal that the quality of care being provided during labor and delivery in the reference hospital was at stake. Large proportion of these perinatal deaths would have been prevented by providing skilled and high-quality labor and delivery care.

Although advocacy and community mobilization is being done to improve utilization of skilled delivery care (from its current rate of 15%),<sup>1</sup> it is really unacceptable to have such a high number of institutional newborn and maternal mortalities. In this study, among the total 305 still births, 128 (42%) fetuses died after admission to the reference hospital. All of them reportedly died due to respiratory distress, where timely decision could have saved their lives. The hospital is a tertiary-level hospital where the number of skilled providers assigned was considered adequate.

Poor quality of obstetric care might account for high rates of newborn mortality as well as maternal mortality and intrapartum stillbirths. A number of studies have revealed the effectiveness of the quality of delivery care on the reduction of maternal and newborn mortality.<sup>3,5,8</sup> The quality of care is the extent to which actual care is in conformity with present criteria for good care.<sup>12</sup>

Skilled management of labor using a partograph is a key to the appropriate prevention and treatment of prolonged labor and its complications.<sup>15</sup> However, only one-third of the women in labor were monitored by partograph during labor. The higher (90.8%) number of stillbirths was born from mothers whose labor was not monitored.

It has long been well documented in several studies<sup>4-7,11,13</sup> that CS delivery is more associated with increased fetal complications including reduced Apgar score, respiratory distress syndrome, and neonatal transfer rate. Consistent with other studies,<sup>10</sup> the risk of birth asphyxia among babies born by CS was higher than those delivered vaginally. The mean Apgar score in the first minute was reduced among the CS group compared to the vaginal delivery group. This observation may be due to the nature of CS done for emergency situation. However, consistent with other studies,<sup>16</sup> there was no difference in Apgar score between the two groups in the fifth minute.

In agreement with other studies,<sup>17-19</sup> neonatal transfer rate to NICU was also associated with CS delivery. As most decisions are usually made after trial of vaginal delivery, fetal distress may occur giving rise to increased risk of persistent postpartum respiratory difficulty among children born through CS. This is also probably because of the effect of anesthetic drugs used during surgery.<sup>20</sup>

The number of newborns died after delivery due to birth asphyxia was also high. It is really striking that the majority

are born through CS. It may suggest that late decision was made to do the CS or the immediate neonatal care given was inadequate to resuscitate them or to transfer to NICU timely. However, the result was not statistically significant.

In this study, many mothers had complications related to CS delivery. Majority of the complications including maternal deaths would have been prevented if timely identification was made and appropriate treatment was given.

## Limitations and strengths of the study

We used a large sample size, which is the strength of the study. However, studies based on secondary data suffer from incompleteness and unreliable information. Use of primary data from the clients would have helped exploring other factors. Therefore, the use of this information for comparison and decision making should consider the inherent limitation of the study.

## Conclusion

Neonatal and maternal morbidity and mortality appear to be more in CS than in vaginal delivery. CS delivery does not confer safety of perinatal and maternal outcomes, and this might be attributed to the poor quality of obstetric care in the reference hospital.

## Recommendation

Ensuring quality of care should be the utmost priority. Quality can tremendously reduce institutional maternal and newborn mortality in the region. Decision to perform CS should be based on clear, compelling, and well-supported justifications.

## Acknowledgments

The authors extend their appreciations to Amhara Regional Health Bureau and Felegehiwot Referral Hospital. Authors gratefully thank data collectors who actively participated in this research work.

## Author contributions

All authors contributed toward data analysis, drafting and critically revising the paper and agree to be accountable for all aspects of the work.

## Disclosure

The authors report no conflicts of interest in this work.

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