

Magnitude of Immediate Adverse Newborn Outcome Between Cesarean Section Versus Vaginal Delivery and Its Associated Factors at East Gojjam Zone General and Referral Hospitals, Amhara, Ethiopia

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Abstract

Background: During the neonatal period, the most susceptible phase of life is the first 24 hours, in which immediate adverse newborn outcomes occurred. Generally, 50% of the global neonatal mortality and morbidity occurs during the first 24 hours after birth. Even though most of the causes are preventable, one million newborns died or become morbid on their first day.

Methods: Institutional-based comparative cross-sectional study was conducted among 613 participants. A systematic sampling method and census were used to select newborns from vaginally and cesarean section delivered newborns respectively. Pretested structured questionnaire was used to collect the data. The logistic regression model was used using an adjusted odds ratio with 95% CI and P-value <0.05.

Results: Immediate adverse newborn birth outcome appeared more in C/S than in vaginally delivered group. 28.8 % (95% CI; 23.8%, 33.8%) vs 21.8% (95% CI; 17.2%, 26.4%) (C2=3.90, p-value =0.048) respectively. Presence of meconium (AOR=12.57; 95% CI :(7.6-20.81), p-value=0.00*), Women who had no ANC (AOR=3.79; 95% CI :(1.57-9.15), p-value=0.003), Monthly household income <4654 Ethiopia birr (AOR =1.79; 95% CI: (1.05-3.08), p-value=0.033) and Low birth weight (AOR =10.0; 95% CI: (5.58-18.3), p-value=0.000*) were significantly associated with adverse immediate newborn birth outcomes.

Conclusion: Adverse birth outcomes appeared more in C/S than in a comparable group. Presences of meconium, women who had no ANC follow-up, Monthly household income <4654 Ethiopia birr, and low birth weight <2500gm were significantly associated with the adverse immediate newborn birth outcomes.

Key words: benign breast diseases; malignant breast diseases; mastalgia

1.Introduction

Globally, 2.4 million children morbid or die in the first month of life in 2019, with approximately 6,700 neonatal deaths every day; among them, a third of all neonatal deaths occurred within the first day after birth and the neonatal mortality rate decreased by only 37% (from 33 deaths per 1 000 live births to 21 deaths per 1 000 live births) represented 44% of the total child mortality (1).

Newborn adverse outcomes related to the mode of delivery are defined as newborns having at least one parameter among the following; death in the

hospital, birth trauma, absences of primitive reflex, birth asphyxia, or admission to neonatal intensive care unit that causes an impact on newborns, parents, and the countries. In Ethiopia, the immediate newborn adverse birth outcomes in the cesarean section were 22% (2).

Cesarean delivery is a marker of obstetric services, but maternal clinical associated factors and fetal conditions lead to a risk of post-delivery morbidity and mortality (2-4). In Ethiopia, neonatal mortality has contributed significantly to the under-five mortality rate. Even though, discrepancies existed among regions the estimated neonatal deaths per

1000 live births are 20 according to EDHS 2016 (9). The rate of cesarean section in Latin America and the Caribbean shows 29.2%. However, Africa shows the lowest one, which is 3.5%. In developed countries, the proportion of cesarean is 21.1% and in the least developed countries, only 2% of deliveries are performed through C/S. Even though the operational delivery rate increases globally and saves the mother and the newborn, in 2015, WHO stated that "cesarean section rates higher than 10% are not associated with reductions in maternal and newborn morbidity and mortality; which is a strong inverse association between its rate and neonatal morbidity and mortality level (5-7).

Most of the newborns are morbid and died in the first 24 hours and the first week after birth, which accounts for 75% and 50% respectively(8). Hence, among the different neonatal age groups, special attention is needed for those newborns that are less than one week old, particularly at the time of birth and on the first day of life.

In Ethiopia, the estimated neonatal deaths were 20 per 1000 live births. This is similar to the global rate of neonatal deaths according to Ethiopian Demographic Health Survey 2016 reports. Even though several health programs targeted to the optimal reduction of the neonatal adverse birth outcome, neonatal morbidity and mortality were still high (9). The neonatal phase, especially the immediate one, is the most vulnerable time for adverse outcomes. Changes in early neonatal mortality and morbidity were less evident in Ethiopia.

Factors contributing of immediate adverse newborn outcomes are presences of meconium, had no ANC follow-up, Low fetal weight, monthly household income <5200 Ethiopian birr, maternal age ≥ 35 years in cesarean section group but there is no study on vaginally delivered newborn adverse birth outcome associated factors (2).

In Ethiopia according to the study conducted at Harer newborn mortality in C/S was 11.1%, which is high in magnitude. Even though cesarean sections minimize neonatal death, it is still high in newborn adverse birth outcomes, which account for 22%, in cesarean mode and in vaginal delivery mode, the overall adverse birth outcome is unknown (2, 10).

The magnitude of newborn immediate adverse outcomes like; low birth weight, prematurity, congenital anomalies, and others are well researched in different parts of Ethiopia. However, the magnitude of adverse immediate newborn outcomes related to the modes of delivery with their associated factors not addressed. Cesarean section rate without improving newborn outcomes will increase the delivery services resources which the country would be unable to handle(11). Therefore, this study will fill this gap by assessing the magnitude of the immediate adverse newborn outcome and its associated factors.

2. Material and Methods

2.1. Study area and Period

The study conducted in East Gojjam zone Comprehensive specialized and General Hospital from April 1/2021 to April 30/2021. There is one Comprehensive Specialized Hospital and one General Hospital in the study zone. Debre markos Comprehensive Specialized Hospital and Motta General Hospital are the two hospitals in the study zone, which provide comprehensive obstetric care including NICU services.

Debre Markos Comprehensive Specialized Hospital is found in East Gojjam zonal administrative city, which is 304.4 km far from Addis Ababa (the capital city of Ethiopia) and 254.2 km from Bahairdar (Administrative town of Amhara region), which is the only Specialized Hospital in East Gojjam Zone, serves the East Gojjam population and nearby Zone which is West Gojjam. Motta General Hospital found in the East Gojjam zone, located in Motta Wereda, which is 83 km far from Debre Markos and 119.3 km from Bahairdar (12, 13).

In the two East Gojjam Hospitals, on average around 5,011 (836 per months) mothers delivered vaginally, which includes spontaneous and instrumental assisted delivery, and 1849(308 per months) by cesarean section based on the six- months service delivery report in each hospital.

2.2. Study Design: - The institutional-based Comparative cross-sectional study design conducted

Source and Study Population. The source population of this study was all singleton newborns delivered through vaginal and cesarean section at $\geq 28^{\text{th}}$ weeks of Gestational age with in East Gojjam zone Referral and General Hospitals and the Study Population was The singleton newborn delivered through vaginal and cesarean section at $\geq 28^{\text{th}}$ weeks of Gestational age with in Debre markos Compressive Specialized and Motta General Hospital, from 1/04/2021 to 30/04/2021.

2.3. Sample size determination

Stata SE (64-bit) version 14 and Epi Info used to calculate the number of study participants included in the study. A study conducted at Felege Hiwot Referral Hospital, which was related to my study, used to determine the sample size for the first objective based on the first minutes Apgar score that is the only significant value shows a significant difference in the two modes of delivery.

For association factors, use the study conducted at Harer on the Magnitude and Determinants of Immediate Adverse Newborn Outcome among newborns delivered by Cesarean Section in Public Hospitals. Because Debre Markos Comprehensive Specialized and Motta General Hospitals are the same extent in emergency and newborn care with other Referral and General Hospitals. The following assumptions used to calculate sample sizes for the first objective, two-sample means test of the first minutes Apgar score with their standard deviation (SD).

Power = 0.8000,

Mean1 for cesarean section = 6.83,

SD for cesarean section = 1.31

Mean 2 for vaginal delivery = 7.19,

SD for vaginal delivery =1.18 and

Mean differences = 0.36

The sample size calculation formula of Stata version 14 by using the mean of the two population, which is power two means, diff (d) SD(value) power (0.8) then enter (2, 14).The larger sample size calculated with 10% none response rate was 613 (307 for vaginally delivered group and 306 for C/S group) (Table 1).

Variables	The sample size for objective 1 (C/S)			The sample size for objective 1 (V/D)		
	Mean	Mean diff	Sd	Mean	Mean diff	Sd
Apgar score in the first minutes in each mode of delivery	6.83	0.36	1.31	7.19	0.36	1.18
Sample size using 80% power, 10% NRR* 95% confidences intervals	460			374		

*NRR- Non-Response Rate SD --- Standard Deviation

Table 1: Sample size determination to compare immediate newborn outcome between a cesarean section versus vaginal delivery and its associated factors based on the first minute Apgar score of the newborns in each modes of delivery

Variables	The Proportion among exposed (%)	The Proportion among unexposed (%)	Ratio exposed to unexposed	Sample size using (95%CI and 80% power), using 10% NRR*
Presence of meconium	57 (34.55%)	100 (18.18%)	1:1	275
Body mass index (BMI)	90 (27.52%)	67 (17.27%)	1:1	613
ANC	69 (43.00%)	88 (16.00%)	1:1	112
Monthly household income	120 (34.29%)	37 (10.14%)	1:1	119
History of Obs/med ill	69 (43.00%)	88 (16.00%)	1:1	112

*NRR- Non-Response Rate

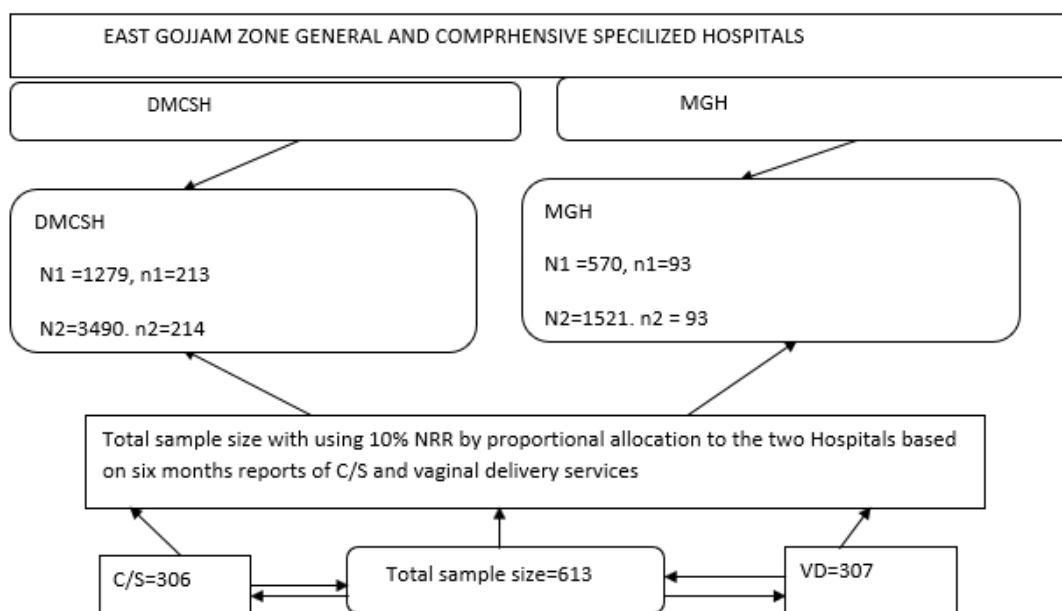
Table 2: Sample size determination of the second objective by using associated factors of adverse newborn birth outcome based on the significant factors

2.4. Sampling techniques

First estimating monthly average number of delivery services in East Gojjam zone General and Referral Hospital for the last six months, then dividing the sample size proportionally based on their monthly services. In Debre Markos Comprehensive Specialized and Motta General Hospital, the six-months services delivery of C/S in average from registered data was 1849, monthly 308 and for vaginal delivery 5,011, monthly 835 the calculated value of k for c/s is one and for vaginal delivery is two, (N/n).

All delivered newborns through C/S included in the study unit based on the inclusion criteria and for vaginally delivered newborns, a systematic sampling technique used every kth value.

The first study unit for vaginally delivered newborn was selected from the last delivered mother’s newborn on the starting day of data collection, and then every second newborn included in the study unit. Fulfilling the inclusion criteria used to select the study unit from all vaginally and cesarean section delivered newborns (figure 1).



Key: -

MGH	Motta General Hospital
DMCSH	Debre Markos Comprehensive Specialized Hospital
N1	6 months C/S delivery services
n 1	Sample taken from C/S delivery group
N2	6 months' vaginal delivery services,
n2	Sample taken from vaginal delivery group
C/S	Cesarean Section
VD	Vaginal Delivery

Figure 1: - Flow chart that shows sampling technique in East Gojjam zone Referral and General Hospitals, allocation proportionally at DMCSH and Motta General Hospital in 2021.

2.5. Study variables

2.5.1. **DEPENDENT VARIABLE:** Immediate Newborn adverse birth Outcome (Yes or No)

2.5.2 **INDEPENDENT VARIABLES**

Maternal socio-demographic and economic characteristics: - Age, Residences, Educational status, marital status, Occupation, Body mass index (BMI) and Monthly average household income.

Obstetric related factors: - Premature rupture of membrane, Cord accident, Hypertensive diseases (pre-eclampsia eclampsia), Preterm labour, Ante partum hemorrhage

Antenatal care, Iron folate supplementation, fetal factors (birth weight, GA), Parity and Gravidity.

Maternal medical-related factors: - Renal disease, Cardiac disease, Anemia, Diabetes and Hypertension.

2.6. Operational definitions

Immediate adverse newborn birth outcome: when at least one of the neonatal parameter occurs: neonatal death from the hospital before NICU admission, birth trauma, primitive reflexes absent, birth asphyxia or admission to the intensive care unit after the procedure(2, 15, 16).

Favorable immediate newborn birth outcome: outcome of a newborn has no adverse birth outcome parameters in the time of delivery or delivery procedure(2).

Absent Primitive Neonatal reflex: After delivery when three or more neonatal primitive reflexes are absent among; Sucking, Babinski, Moro, and Grasp reflexes (2, 15, 16).

Respiratory Depression at Birth: at birth fast breathing (> 60 Breaths/Minuit) or low breathing (< 30 Breaths / Minuit in the first minutes of life (2, 15, 16).

Birth asphyxia: based on APGAR: score: 7-10 --- No birth asphyxias, <=6 Birth asphyxias (17).

2.7. Data collection methods and tools

Primary data and record review of the newborns outcomes and factors collected by structured questioner. Newborn delivered by C/S classified as a case and all vaginal deliveries as a comparable group. The case records of the two comparable groups and primary data were used. Pretested structured questionnaire prepared in English language, then translated to Amharic to collect some primary data from the mother and re-translate to English to keep the consistency of the questionnaire by language experts. Six data collectors (both BSc Degree midwives) and

two supervisors (MSc) participated in the data collecting activities. All the data collectors and supervisors can speak and write in Amharic. In addition to this, the data collectors and supervisors are not as a staff in the hospital in which the data were collected.

2.8. Data quality control issues

The quality of the data was assured through 5% of the sample size pretest of the tools was done at Finote Selam General Hospital, proper training of the data collectors and supervisors for a one-day training in each Hospital and proper handling of the data. Moreover, during data collection period, supervisors were checked in the field how the data collectors done their task.

The principal investigator was checking the completeness of the questionnaires, but did not interfere with the data collection process. Besides this, the principal investigator carefully entered and cleaned the data before the commencement of the analysis done.

2.9. Data processing and analysis

Completeness and consistency of the data checked, cleaned by the principal investigator, and entered into Epi Data 3.1 and then exported to SPSS Version 25 for analysis. Descriptive statistics were generated with frequencies and proportions used to summarize categorical data and means were used for continuous variables. The chi-square test was used to compare immediate adverse newborn birth outcome in cesarean section and vaginal delivery mode. Bivariable and multi variable analysis were conducted. A p-value <0.25 at bivariate, consider variables candidate for multivariate logistic regression analysis. Multicollinearity was checked among the independent variables by variance inflation factors, which was (1.04-2.05). The model fitness was checked using Hosmer and Leme show goodness of fit ($P \geq 0.05$) (0.765). Variables with a p-value of <0.05 were used as a cut point for the declaration of significant association.

Ethical consideration

Ethical clearance was obtained from the ethical review committee of Debra Markos university, college of health science. A permission letter granted from Debre Markos specialized Comprehensive Hospital, and Motta General Hospital. Confidentiality related to the information recorded in the datasheet and no need of recording the name or identification medical number of the study unit.

3. Results

3.1. Socio-demographic and economic characteristics for the new born mothers

On average, ~38 women are giving birth daily in the two Hospitals. Among 306 cesarean sections delivered newborns and 307 vaginally, delivered newborns with their mothers were included in the study giving a response rate of 100%. The mean age (\pm SD) of mothers, were 27.28(\pm 5.6) and 26.97(\pm 4.78) years old for vaginally and cesarean section group respectively. In both groups' majorities of the newborn's mother were under the category of primary educational status. The majority of the newborn delivered vaginally were from married mothers it is also the same in the cesarean section group. One hundred eighty-

three (59.6%) of vaginally delivered mothers were multi Para and 174(56.9%) in cesarean section group. The majority of the newborn mothers among the vaginally delivered groups had a monthly average household income <4655 Ethiopian birr which accounts 192(62.5%) it is also the same in C/S which is 218(71.2%). In addition, there was significances difference in immediate adverse birth outcome depending on maternal socio-demographic characteristics except residences and BMI (table 3).

Characteristics		VD (n=307)	C/S (n=306)	Chi square test
		Frequency (%)	Frequency (%)	p-value
Maternal age	<=20	54(17.6)	23(7.5)	0.000*
	21-34	211 (68.7)	249(81.4)	
	\geq 35	42(13.7)	34 (11.1)	
Marital status	Marriage	295(96.1)	278(90.8)	0.002
	Single	4(1.3)	15(4.9)	
	Divorced	8(2.6)	13(4.3)	
Educational status	can't read and write	38(12.4)	52(37.13)	0.005
	No formal education	11(3.3)	10(3.3)	
	1 ^o education	148(48.2)	128(41.8)	
Occupational status	2 ^o and preparatory college	30(9.8)	20(6.5)	0.002
	House wife	80(26.10)	96(31.4)	
	Daily laborer	192(62.5)	159(52)	
	Government employee	12(3.9)	10(3.3)	
	Merchant	66(21.50)	89(29.1)	
	Farmer	21(6.8)	27(8.8)	
	Other	5(1.6)	11(3.6)	
Residence	Urban	11(3.60)	10(3.3)	0.284
	Rural	205 (66.5)	177(57.8)	
Monthly house hold income	<4654Ethiopian birr	102 (33.2)	129(42.2)	0.001
	\geq 4654Ethiopian birr	170(55.4%)	206(67.3%)	
BMI	Normal BMI	137(44.6%)	100(32.7%)	0.307
	Abnormal BMI	235(76.5%)	238(77.8%)	
		72(23.5%)	68(22.2%)	

Table 3: Socio-demographic and Economic characteristics between vaginally vs C/S delivered mother, East Gojjam Referral and General hospitals, Amhara, Ethiopia, 2021 (n=613)

3.2. Medical related factors of immediate newborn adverse birth outcome in the two modes of delivery

Among the study participants of 307 newborns, mother delivered vaginally, around 13(4.2%) of them had a history of previous chronic medical disease. In a cesarean section group, 1.3% and 0.6% of them had previously and newly diagnose medical disease respectively.

Among cesarean section and vaginally delivered mother 4.9% vs 2.9% of them had a positive HIV status respectively (table 4).

Table 4. Show the chronic medical disease factors for adverse birth outcome in the two modes of

Delivery, East Gojjam General and Referral hospitals, Amhara, Ethiopia, 2021.

Characters	VD	C/S	Chi square test
	Frequency (%)	Frequency (%)	p-value
Chronic medical disease	Heart disease	2(0.7)	1(0.3)
	Diabetes mellitus	4(1.3)	2(0.7)
	Hypertension	2(0.7)	0
	Kidney disease	3(1.0)	2(0.7)
	Others	2(0.7)	0
	Total	13(4.2%)	5(1.3%)
HIV status	Positive	15(4.9)	9(2.9)
	Negative	292(95.1)	297(97.1)
	Total	307(100)	306(100%)

Table 5. Immediate newborn birth outcomes between cesarean section vs vaginal delivery groups at East Gojjam zone General and Referral Hospitals, Amhara, Northwest Ethiopia, 2021.

3.3. Magnitude of immediate newborn adverse birth outcome

In this study there were a significant difference in the magnitude of immediate newborn adverse birth outcome between cesarean section vs vaginal delivery group; 28.8 % (95% CI; 23.8%, 33.8%) vs 21.8% (95%

CI; 17.2%, 26.4%) respectively (C²=3.90, p-value =0.048). The overall immediate adverse birth outcome in this study was 25.3 % (95% CI; 21.9%, 28.7%). In addition to that, there were significant differences between C/S vs vaginal delivery group in adverse birth outcome parameters; birth asphyxia 24.8% vs 17.3 % (C²=5.138, p-value =0.023), RDS 17% vs 10.7% (C²=4.881, p-value =0.027), NICU admission 22.5% vs 11.7% (C²=12.460, p-value =0.00*), absent primitive reflex 22.9% vs 12.7% (C²=9.914, p-value =0.002) respectively (table 5).

Variables		V/D Frequency (%)	C/S Frequency (%)	Chi square p-value
Sex of the new born	Female	170(55.4%)	156(51%)	0.506
	Male	137(44.6%)	150(49%)	
Newborn birth weight	<2500gm	38(12.4%)	22(7.2)	0.000*
	2500-3999gm	264(86.0%)	259(84.6)	
	>=4000gm	5(1.6%)	25(8.2)	
Immediate adverse newborn outcome	Yes	67(22.8%)	88(28.8)	0.048
	No	240(77.2%)	218(71.2)	
Absent primitive reflex	Yes	39(12.7%)	70(22.9%)	0.184
	No	268(87.3%)	236(77.1%)	
Birth asphyxia	Ye	53(17.3%)	76(24.8%)	0.023
	No	254(82.7%)	230(75.2%)	
RDS	Yes	33(10.7%)	52(17%)	0.027
	No	274(89.3%)	254(83%)	
NICU Admission	Yes	36(11.7%)	69(22.5%)	0.001
	No	271(88.3%)	237(77.5%)	
Newborn status	Died	10(3.26%)	8(2.6%)	0.637
	Alive	297(96.74%)	298(97.4%)	
Injury	Yes	14(4.6%)		
	No	293(95.4%)		

Table 5: Immediate newborn birth outcomes between cesarean section vs vaginal delivery groups at East Gojjam zone General and Referral Hospitals, Amhara, Northwest Ethiopia, 2021.

3.4. Immediate adverse birth outcome between the two groups

Among vaginally delivered newborn’s mother, the majority of them delivered through SVD, which accounts 77.9%, and 18.9% assisted by Instruments whereas in cesarean section group, 4.2 % of the mother delivered by emergency cesarean section (table 6).

Mode of delivery	of	Frequency (%)	Immediate adverse birth outcome		Chi square test p-value	
			Yes	No		
vaginal delivery	SVD	236(77.9)	67(22%)	240(78%)	0.048	
	Assisted breach	10(3.3%)				
	Instrumental delivery	Forceps	32(10.4%)			
		Vacuum	26(8.5%)			
	Total	307(100%)				
C/S delivery	Emergency	293(95.8%)	88(28.8%)	218(71.2%)		
	Elective	13(4.2%)				
	Total	306(100%)				

Table 6: Result of immediate adverse birth outcome between the two groups, East Gojjam Referral ad general hospitals, Amhara, Ethiopia, 2021.

3.5. Obstetric related factors of immediate newborn adverse birth outcome in the two modes of delivery

Antenatal care at least one visit was 89.3% and 91.8%, respectively (See table 7).

The birth weight recorded in the vaginal delivered newborn was raging through 1100 - 4,000 gm and in C/S groups, 1400 – 4600 gm. Majority of newborns had a weight between 2500-3999 gm which in both groups.

Characteristics		VD	C/S	Chi square test
		Frequency (%)	Frequency (%)	p-value
Gravidity	Primi gravid	117(38.1%)	128(41.8)	0.008
	2-4	154(50.2)	152(49.7)	
	>=5	33(10.7)	26(8.5)	
	Total	307(100)	306(100%)	
Parity	Para one	122(39.7)	130(42.5)	0.001
	2-4	154(50.2)	155(50.7)	
	>=5	31(10.1)	21(6.9)	
	Total	307(100)	306(100%)	
parity category	Primi Para	124(40.4)	132(43.1)	0.004
	Multi Para	183(59.6)	174(56.9)	
ANC follow-up	Yes	274(89.3)	291(91.8)	0.000*
	No	33(10.7)	25(8.2)	
	Total	307(100)	306(100%)	
previous obstetric problem	Yes	48(44.0)	85(27.8)	0.817
	No	135(15.6)	90(29.4)	
	Total	183(59.6)	175(54.2%)	
current obstetric problem	Yes	76(24.8)	89(29.1)	0.005
	No	231(75.2)	217(70.9)	
	Total	307(100)	306(100%)	
Is LNM known	Yes	243 (79.2)	258 (84.3)	0.939
	No	64 (20.8)	48 (15.7)	
	Total	307(100)	306(100%)	
Iron folate supplementations intake	Yes	254(82.7)	259(84.6)	0.001
	No	53(17.3)	47(15.4)	
	Total	307(100)	306(100)	
for how money months iron taken	<3months	165(53.7)	187(61.1)	0.004
	For 3 months	89(29.0)	72(23.5)	
	Total	254(82.7)	259(84.6)	
hemoglobin	<11	6(1.95)	20(5.6)	0.013
	>=11	301(98.05)	286(94.4)	
	Total	307(100)	306(100)	
Gestational age	<37weeks	107(34.9)	68(22.2)	0.125
	>=37weeks	200(65.1)	238(77.8)	

Table 1: Obstetric related factors of newborn adverse birth outcome in the two modes of delivery, East Gojjam Referral and General hospitals, Amhara, Ethiopia, 2021.

3.6. Associated factors for immediate newborn adverse birth outcome

The table below shows; bivariable and multi variable analyses were factors associated with immediate adverse newborn outcome. Marital status, Occupation, Educational status, ANC, Parity, Current Obs history, Iron folate, Maternal age, MHI, Hgb at admission, newborn weight, Meconium, Newborn gestational age was candidate for multi variable analyses by using p-value <0.25. However, in the multivariable analysis, presences of meconium had no ANC follow-up, monthly household income less than 4654 Ethiopian birr and newborn weight <2500 gm were remaining in the model. The odds of immediate newborn adverse birth

outcome, who had meconium in delivery process were 13 times greater compared to their counterpart (AOR=12.57; 95% CI: (7.599, 20.806), p=0.000*). The odds of immediate newborn adverse outcome 3.8 times greater among those newborn who delivered from mother had no ANC follow-up (AOR = 3.79; 95% CI: (1.572, 9.151), p=0.003). The odds of immediate newborn adverse birth outcome newborns delivered from mother’s who had monthly household income <4654 Ethiopia birr were 1.8 times greater than that of the counter (AOR = 1.79; 95% CI: (1.047, 3.075), p=0.033). Newborns weight <2500 gm were 10 times grater to develop adverse immediate birth outcome than normal weighted newborn (AOR = 10.103; 95% CI: (5.578, 18.299), p=0.000*) (Table 8).

Variables	Adverse birth outcome		Odds Ratio (95% CI)	Adjusted Odds Ratio(95% CI)	p-value
	Yes	No			

Marital status	Single	11	8	4.374(1.725-11.099)	1.246(0.261-5.952)	0.782
	Divorced	7	14	1.591(0.629-4.022)	1.927(0.434-8.559)	0.388
	Married(ref)	137	436			
Occupation	Farmer	5	9	2.45(.765-7.863)	0.465(0.083-2.624)	0.386
	Merchant	15	33	2.006(0.965-4.169)	0.988(0.378-2.579)	0.980
	Housewife	93	268	1.532(0.960-2.443)	0.828(0.434-1.582)	0.564
	Daily laborer	9	11	3.61(1.374-9.515)	1.704(0.407-7.143)	0.466
	Other	5	8	2.759(0.845-9.048)	3.671(0.795-16.951)	0.096
	Government employee(ref)	29	128			
Educational status	can't read and write	20	72	1.25(0.668-2.338)	0.443(0.082-2.379)	0.342
	No formal education	7	11	2.864(1.03-7.958)	0.862(0.13-5.71)	0.878
	1 ^o education	84	193	1.959(1.235-3.105)	0.636(0.14-2.887)	0.558
	2 ^o and preparatory	13	37	1.58(0.755-3.31)	0.604(0.114-3.200)	0.553
	Collage(ref)	32	144			
ANC	No	28	14	6.922(3.538-13.541)	3.793(1.572-9.151)	0.003
	Yes(ref)	128	443			
Parity	Multi	76	281	0.595(0.413-0.858)	0.914(0.517-1.618)	0.759
	Primi(ref)	80	176			
Current Obs hx	Yes	54	111	0.606(0.409-0.898)	1.221(0.724-2.061)	0.454
	No(ref)	102	346			
Iron folate	No	37	57	2.182(1.375-3.462)	0.967(0.462-2.027)	0.93
	Yes(ref)	119	400			
Maternal age	<=20 years	36	41	2.932(1.783-4.822)	1.901(0.983-3.711)	0.056
	21-34 years(ref)	106	354			
	>=35	14	62	0.754(0.406-1.401)	0.627(0.293-1.346)	0.231
MHI	<4654Ebirr	123	244	3.254(2.125-4.982)	1.794(1.047-3.075)	0.033
	>=4654Ebirr(ref)	33	213			
Hgb at admission	<11gm/dl	12	14	2.637(1.192-5.833)	2.009(0.698-5.788)	0.196
	>=11gm/dl(ref)	144	443			
Newborn weight	<2500	62	36	7.770(4.850-12.446)	10.103(5.578-18.299)	0.000*
	2500-3999(ref)	88	397	1.128(0.448-2.841)	0.705(0.218-2.282)	0.560
	>=4000	6	24			
Meconium	Yes	102	67	10.995(7.228-16.72)	12.574(7.599-20.806)	0.000*
	No(ref)	54	390			
Newborn gestational age	Preterm	52	123	1.346(0.909-1.991)	1.021(0.566-1.842)	0.945
	Term(ref)	104	334			
Modes of delivery	Vaginal delivery(ref)	67	240			
	Cesarean section	88	218	1.446(1.002-2.087)	1.021(0.566-1.842)	0.942

Table 8: Associated factors for immediate newborn adverse birth outcome, East Gojjam Referral and General hospitals, Amhara, Ethiopia, 2021.

3.7. Comparison between cesarean section versus vaginal delivered immediate newborn adverse birth outcome

Compare the immediate adverse birth outcome between the two modes of delivery were conducted using a chi-square test. In addition; birth asphyxia, NICU admission, newborn reflex problem, RDS, Birth trauma and newborn death are major comparison outcome parameters between C/S and vaginally delivered newborns. The observed adverse birth outcome was more in C/S than in comparable groups 28.8% vs 22.8% ($\chi^2=3.900$, $P=0.048$).

There were significant differences in mean score at the first minute. Newborn delivered through C/S (mean =6.21, standard deviation =1.986) 95% CI (5.988-6.433), in the vaginal delivery group (mean =6.54, standard deviation =1.792, 95% CI (6.34-6.74), $p=0.030$). In addition, there was an observed mean score difference between the two groups at the fifth minute for C/S (mean 7.44, standard deviation =2.093), in the vaginal group (mean 7.87, standard deviation = 2.022) the results were statistically significant ($P=0.01$).

RDS were more in neonates delivered through the rout of C/S than that in comparable group ($\chi^2=4.079$, $P=0.043$). Similarly, among 152 newborns that had an adverse birth outcome at birth, 17.3% were NICU

transferred. Among newborns transferred to the NICU for further management C/S delivered accounts 65.1%, which, had significantly associated ($\chi^2=12.460$, $p=0.01$). Birth asphyxia also more in cesarean section 76 Vs 53 ($\chi^2=5.138$, $p=0.023$). Regarding to birth trauma the only protective mode of delivery was a cesarean section.

4. Discussion

A healthy life start is central to the human life course, with birth holding the highest risk of death, disability, and leading to major effects (1). In Ethiopia, neonatal mortality and morbidity has contributed significantly to the under-five mortality and morbidity. Estimated neonatal deaths are 20 per 1000 live births. It shows a 62.9% reduction in 2016 Ethiopian Demographic Health Survey. Health programs targeted to the optimal reduction of neonatal mortality and morbidity rates and improving newborns health quality. Providing integrated maternal, newborn, health and clean and safe delivery services in health facilities prevents most of the new born immediate adverse birth outcome (9).

This institutional-based comparative cross-sectional study conducted at East Gojjam Comprehensive Specialized and General Hospital, tried to assess the magnitude of immediate newborn adverse birth outcome in

the two modes of delivery and its associated factors. In this study, the magnitude of immediate newborn adverse birth outcome for newborn delivered through C/S vs vaginal were 28.8 % (95% CI; 23.8%, 33.8%) vs 21.8% (95% CI; 17.2%, 26.4%) respectively. The overall immediate adverse birth outcomes in this study were 25.3 % (95% CI; 21.9%, 28.7%). The overall immediate adverse birth outcomes in this study higher than the study conducted in harer (2, 14). The possible explanation for this might be due to the study design effects, sample size deference, in this study included vaginally delivered newborns immediate adverse birth outcome and most of the study units taken from comprehensive specialized hospital.

The magnitude of immediate adverse birth outcome showed statistically significant differences between cesarean section and vaginally delivered newborns. The observed mean score difference between the two groups at first and fifth minute is less in cesarean section group. The mean Apgar score at first minute lower than the study conducted at Bahairdar Felege Hiwot referral hospital retrospective comparative cross-sectional study (14). This may be due to the sources of data through observational and record review in this study may be the reason for the differences than that of record review only.

The observed Respiratory Distress Syndrome, Birth asphyxia, low Apgar score and newborns transfer rate were more in newborns delivered by C/S than vaginally in agreement with several studies (7, 14, 18-23). This is due to most decisions usually made after trial of vaginal delivery, fetal distress may occur giving rise to increased risk of persistent postpartum respiratory difficulty among newborns delivered through cesarean section.

Regarding to birth trauma the only protective mode of delivery in this study was cesarean section. Consistent to the study conducted in harer and Bahairdar (2, 14). This is the nature of cesarean section mode of delivery.

The presence of meconium was significantly associated with the immediate adverse newborn outcome. With meconium, thirteen times more likely to develop immediate newborn adverse birth outcome than clear amniotic fluid. These results consistent with the study conducted in harer and Jimma (2, 24). This could be related to the fact that meconium is an indicator of fetal Hypoxia, placental insufficiency, predisposes the fetus to aspiration and persistence breathing problem in the immediate neonatal period (2, 16).

Newborns whose mother who had no ANC follow-up four times more likely to develop immediate adverse birth outcome than who had ANC services. consistent with the study conducted in harer (2, 8). This similarity is due to ANC services is the same protocol for all Ethiopian health institution and improve newborn outcomes. This study showed that newborn delivered from women whose estimated household income less than 4654 Ethiopian birr were two times more likely to develop immediate adverse birth outcome than those had higher incomes. These results consistent with the study conducted in harer (2). This may be a higher restrain on financial freedom in the household that would hinder health priorities to pregnant women. This may include expenditure for nutrition and difficulty accessing health care in emergencies (25, 26). Thus, the expectation is that low income women are more prone to have delays in seeking care (8).

Low birth weight was ten times more likely to develop immediate adverse birth outcome than newborns in normal birth weight. Many preterm newborns in this study sample had low birth weight and respiratory depression as well. The finding also agrees with other studies that found prematurity was significantly associated with an increased risk of NICU admission and neonatal mortality (2, 14, 27, 28).

Strength and Limitations of the study

This study tried to incorporate the magnitude of adverse birth outcomes among caesarian delivery versus vaginal delivery. The study does not show temporal relationship or causality between immediate newborn adverse birth outcome and significant factors; gestational age by ultrasound scanning at near term and fundal height measurement prone to measurement error and BMI does not show the nutritional status during pregnancy.

Conclusion

Newborn Adverse birth outcome significantly appeared more in C/S than in vaginal delivery group. Cesarean section delivery does not confirm the safety of newborn outcomes unless appropriately applied. Had no ANC follow-up, birth weight <2500gm, presences of meconium and monthly household income less than 4654 Ethiopian birr were significantly associated with immediate adverse birth outcome

Recommendation

For health workers: - Educate the mother about the advantage of ANC follow up in order to minimize adverse birth outcome and low birth weight.

Decision to perform C/S should have been based on clear, well-supported justifications and timely perform as indicated.

Give an attention during the labour process when there was meconium to minimize newborn adverse birth outcome.

For Researchers: - Further follow-up study needed to address newborn outcomes after NICU admission in both modes of delivery.

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