

Full Length Research Paper

Magnitude of maternal complications and associated obstetric factors among women who gave birth by cesarean section at Arba-Minich General Hospital, Southern Ethiopia: Retrospective cohort

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Cesarean section is the most common major surgical procedure in obstetrics and gynecology in the world. Though advance in cesarean section technique, it still poses higher maternal morbidity and mortality than vaginal delivery. This study aimed to determine the magnitude of maternal complications (including the presence of one of the intra-operative surgical complication or postoperative maternal complication; postoperative complication-is defined as the existence of one of the following; febrile morbidity, extended antibiotics treatment, extended hospital stay, wound infection (SSI), deep venous thrombosis (DVT), pneumonia, admission to Intensive Care Unit (ICU), drop in hemoglobin/hematocrit (HCT/HGB), blood transfusion, postpartum hemorrhage (PPH) maternal death in the Hospital) and associated obstetric factors among women who delivered by cesarean section at Arba-Minich General Hospital, Southern Ethiopia Hospital based retrospective cohort study was conducted among women who delivered by cesarean section from July 8, 2013 to August 6, 2014 at Arba-Minich General Hospital. Demographic data, obstetric factors and occurrence of intra-operative and postoperative maternal complication during their hospital stay were collected using a pre-tested data collection format. SPSS version 20.0 was used for data analysis. A total of 416 mothers' charts were reviewed. The mean (\pm SD) age of the mothers was 25.72 (\pm 5.175 years). Emergency cesarean delivery accounted for 87% of all cesarean deliveries. Fetal distress, Cephalo Pelvic Disproportion (CPD), and obstructed labor accounted half of the indications for cesarean sections. Overall maternal complication rate was 38.2%. Living in rural setting (AOR, 1.4,95%CI:1.0,2.3), maternal age \geq 30 years, (AOR=2.0,95%CI:1.1,3.8), presence of obstetric complications, (AOR=2.6,95%CI:1.4,4.7), operation done in second stage of labor, (AOR=2.5,95%CI:1.3,4.6), labor \geq 25 h (AOR=1.4,95%CI:1.0,2.4) and general anesthesia (AOR=2.456,95%CI:1.382,4.356) were found to have significant association with maternal complication. Maternal complication was found to be high. Timely management of labor before a woman develops obstetrics complication and use of appropriate anesthesia will reduce the occurrence of complications.

Key words: Maternal complication, cesarean section (C/S), Ethiopia

INTRODUCTION

Pregnancy and parturition are events of considerable importance in the life cycle of women. Pregnant women may deliver their children via normal spontaneous vaginal delivery or through cesarean section. Parturition or giving birth is physiological; however, it poses a significant risk to the life and well-being of both mother and child. Of all deliveries, approximately 10% are considered as high-risk, some of which require cesarean section (Abebe et al., 2016).

Cesarean section (CS) is the most common surgical procedure performed on women worldwide. It could be performed as an elective procedure when there is a predictable risk to the mother or fetus during labor or in the presence of an identifiable indication for the procedure.

The procedure is however undertaken as an emergency when a complication of pregnancy or labor warrants quick intervention to deliver the fetus (Jaiyesimi and Ojo, 2003).

Cesarean section significantly reduces maternal and prenatal mortality (Osonwa et al., 2016). The World Health Organization considers Cesarean section rates of 5 to 15% to be the optimal range for targeted provision of these life-saving interventions to mothers and infants (Luz, 2010); lower rates suggest unmet need, while higher rates suggest improper selection (Betran et al., 2007; Ronsmans et al., 2006).

The majority of cesarean deliveries are performed for condition that might pose a threat to both the mother and the fetus if vaginal delivery occurred (Abdissa et al., 2013). Cesarean deliveries are potentially morbid procedures with overall infectious morbidity rates as high as 25% (Padmaleela et al., 2013).

In addition to the increased risk for infections with cesarean section, women are exposed to complications such as excessive blood loss and damage to pelvic organs (Phillips and Brankman, 1990; Atombosoba et al., 2015).

There is an increased risk of uterine rupture, placenta accreta, and placenta previa associated with a previous cesarean section (Starr, 2003). Post-operative complications include endomyometritis, wound infection, fascial dehiscence, urinary tract infections, bowel dysfunction, thromboembolic complications, and pelvic thrombophlebitis (Maimoona et al., 2014).

Now a day's caesarean section is safer than it has never been. But, in Africa it is still performed in harmful conditions for saving the mother and fetus (Abubakar et al., 2015, Fesseha et al., 2011).

Although the magnitude of maternal complication following C/S in Ethiopia is high, there are no baseline

information regarding maternal complication and associated factors in the study area. Therefore, this study will help in filling the gap of information on magnitude of maternal complication of cesarean delivery and associated obstetric factors contributing to poor maternal outcomes. It can also be used as baseline information for future research.

METHODOLOGY

Study setting

The study was conducted in Arba-Minch General Hospital. The average number of deliveries conducted in this hospital is estimated to be 1800 to 2000 women per year and the average number of cesarean deliveries is estimated to be 450 to 550 women per year

Study design and period

Hospital register based retrospective cohort study design was used. Document of mothers who underwent cesarean section from July 8, 2013 to August 6, 2014 in Arba-Minch General hospital were reviewed. It is a general cohort.

In which all women who underwent cesarean deliveries during the study period have had multiple exposure in the study setting during the study period were considered as exposure variables where as developing maternal complication as outcome variables.

In this the study alternate hypothesis may be stated as multiple factors will have relation with maternal complication for those women who underwent casern section where as the null hypothesis states that there is no any relation of the multiple factors for women underwent casern section so as to develop maternal complication.

Population

Women who delivered by cesarean section in Arba-Minch General Hospital from July 8, 2013 to August 6, 2014 were study population. Records of women with ectopic pregnancy (abdominal pregnancy), whose cesarean section was done in other hospital and referred to Arba-Minch General Hospital due to complications and those with incomplete chart records were excluded.

Variables

1. Outcome variable: Maternal complication.
2. Independent variables (multiple exposures) such as socio demographic factors (age, residence), obstetric factors (parity, gestational age, number of pregnancy, previous CS, indication of CS, status of the labor and membrane), obstetric complication (Pre-eclmpsia/eclampsia APH PROM/chorioamnionitis malpresentations OL suspected ux rupture), operation related factors (type c/s, anesthesia, surgeon, type of incision, duration of operation, facility factors (referral status, ANC follow up).

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Sampling procedure

All records of caesarean deliveries done at Arba-Minch General Hospital during the study period were traced using delivery room, operation room and postnatal ward log books. The list of all women who gave birth by caesarean section was prepared and selected based on inclusion criteria.

Data collection, processing and analysis

Checklist adopted from emergency cesarean delivery outcome tracing tools and from WHO research format tool which uses proxy events (antibiotics treatment, prolonged hospital stay, prolonged catheterization) in order to identify maternal complication and associated obstetric factors was used for data collection.

Study participants were identified from delivery and postnatal log books. Using a checklist, socio-demographic data, obstetric profiles which are associated with maternal complication and indicators of intra-operative and post-operative maternal complications were retrieved from patient record and operation log book.

Data were coded, entered, cleaned and analyzed using SPSS version 20.0. Descriptive analysis was carried out to explore the socio-demographic characteristics and magnitude of maternal complication following cesarean section. Bivariate and multivariate logistic regression analysis was carried out to examine the relationship between the outcome variable and the selected obstetric factors. Factors for which there was association in the bivariate analysis at $P < 0.25$ were selected for subsequent multivariate analysis using multiple logistic regression.

Quality control measures

To insure quality of data pre-test was done on 10% of the study population and necessary adjustment was incorporated to the questionnaire. In addition, the collected data were checked for completeness, accuracy, and consistency by the supervisor before accepting from the data collectors.

Operational definition

1. Maternal complication: Includes the presence of one of the intra-operative surgical complication or postoperative maternal complication.
2. Postoperative complication-is defined as the existence of one of the following febrile morbidity, extended antibiotics treatment, extended hospital stay, wound infection (SSI), DVT, pneumonia, admission to ICU, drop in HCT/HGB, blood transfusion, PPH maternal death in the Hospital.
3. Severe maternal complication includes one of the following hemorrhage, blood transfusion, hysterectomy, thromboembolism, and intensive care unit admission, postpartum lengths of stay, postpartum antibiotics treatment, adjacent internal organ injury, prolonged catheterization, febrile maternal morbidity and death in hospital.
4. Obstetric complications: Presence of one of the following Antepartum hemorrhage (APH), PROM/chorioamnionitis, preeclampsia or eclampsia, obstructed labor, malpresentation, suspected uterine rupture, previous cesarean delivery or gynecology operations.
5. Postpartum hemorrhage: Is defined as estimated blood loss of ≥ 1000 ml, fall in Hct $> 10\%$, post-operative Hct $< 25\%$.

Ethical considerations

The study protocol was approved and ethically cleared by the

Institutional Review Board of the college of medicine and health science of Hawassa University. Official letter of co-operation was written by school of medicine to the Arba-Minch General Hospital. Information on the studies was given to the hospital officials and team leaders of the respective department about the purposes and procedures. In order to protect the confidentiality of the information, name or ID was not included in written questionnaires.

RESULTS

During the study period from July 8, 2013 to August 6, 2014 a total of 1980 deliveries were attended in Arba-Minch general Hospital, out of which 488 women delivered by cesarean section. The Hospital cesarean section rate was 24.65%. Seventy two patients were excluded from the study because their medical records were either unavailable or incomplete.

Socio-demographic characteristics of the mothers

A total of 416 questionnaires were used for analysis after questionnaires were checked for completeness. Two hundred fifty (66.1%) of the mothers were rural dwellers and 166 (39.9%) of them were urban dwellers.

The mean age of the mother's was 25.72 years with standard deviation of ± 5.175 years. Most of the mothers (51.4%) were in the age group of 25 to 34 years (Table 1).

Maternal obstetric data and medical illness

Written referral papers were used to refer 211(50.7%) of the mothers from other health institutes. Three hundred and thirteen (75.2%) had one or more ANC follow up in the same or other health institution. Majority of the women were nulliparous which accounted for 189(45.4%) followed by 92(22.1%) para-II mothers and the least were 28(6.7%) para-IV and 63(15.1%) grandmultipara women. Operation at gestational age of 37 to 42 weeks or at term were done for 369 (88.9%) of the women. Only 8.7 and 2.6% of mothers were operated at gestational age of < 37 weeks and > 42 weeks respectively. Of the total mothers who delivered by cesarean section 49 (11.8%) have at least one medical illness during their pregnancy. The leading medical disease were HIV/AIDS among 11(22.44%), diabetes mellitus among 10(20.4%), malaria and Acute Febrile illness (AFI) among 25(51.04%) and tuberculosis among 3(6.1%) of the mothers (Table 2). Regarding obstetric complication, 312 (75%) of the mother had one or more obstetric complications during their pregnancy period and 104 (25%) had no obstetric complication (Table 3).

Labor status of mothers

Three hundred twenty three (77.6%) of the women were

Table 1. Socio demographic characteristics of the mothers who delivered by cesarean section in Arba-Minch General Hospital, SNNPR Ethiopia, July 8, 2013 to August 6, 2014.

Variable (n=416)	Frequency	Percentage
Age of the mother at the time of cesarean section		
<20	87	20.9
20-24	73	17.5
25-34	214	51.4
35-44	42	10.1
Place of residence of the mother		
Urban	166	39.9
Rural	250	60.1

Table 2. Obstetrics data of the mothers who delivered by cesarean section in Arba-Minch General Hospital, SNNPR Ethiopia, July 8, 2013 to August 6, 2014.

Variables (n=416)	Frequency	Percentage
Referral status		
Referred from other health institute	211	50.7
Self-referral	205	49.3
ANC follow up		
Had one or more ANC follow up	313	75.2
No ANC follow up	103	24.8
Parity of the mother		
One	189	45.4
Two	92	22.1
Three	44	10.6
Four	28	6.7
Five and above	63	15.1
Number of gestation		
Single	387	93.0
Twins	29	7.0
Gestational age		
<37	36	8.7
37-42	369	88.7
≥42	11	2.6
Medical illness during pregnancy		
No medical illness	367	88.2
Diabetes mellitus	10	20.4
Tuberculosis	3	6.1
HIV/AIDS	11	22.44
Others (acute febrile illness, malaria)	25	51.02

operated after labor started and 153(46.1) of the women were in labor for >12 h before operation. Membrane was ruptured in 287(69%) of mothers before operation. One hundred and eighty (58.8%) of the women have meconium stained amniotic fluid.

One hundred and thirty nine (39.94%) of the women were operated at second stage of labor after fully dilatation of the cervix. Two hundred and forty two

(58.2%) of the women were operated at high station of the presenting part (Table 4).

Indications for cesarean section and types of cesarean section

The leading indication for cesarean section was fetal

Table 3. Obstetric complications of mothers who delivered by cesarean section at Arba-Minch General Hospital, SNNPR Ethiopia, July 8, 2013 to August 6, 2014.

Variable (n=416)	Frequency	Percentage
Types of obstetric complications		
No complication	104	25.0
APH*	28	6.7
PROM/Chorioamnionitis**	45	10.8
Preeclampsia/ eclampsia	20	4.8
Obstructed labor	55	13.2
Malpresentation	71	17.1
Suspected uterine rupture	5	1.2
Previous cesarean section/gyn operation	54	13.0
Others ***	34	8.2

APH* antpartem hemorrhage; PROM** premature rupture of memberane; Others*** preterm labor, polyhydramniou

Table 4. Labor status of the mothers who delivered by cesarean section in Arba-Minch General Hospital, SNNPR Ethiopia, July 8, 2013 to August 6, 2014.

Variable (n=416)	Frequency	Percentage
Status of membrane		
Ruptured	288	69.0
Not ruptured	128	31.0
Duration of ruptured membrane (h)		
<4	83	28.8
4-12	128	44.4
>12	77	26.8
Status of amniotic fluid N=288		
Clear amniotic fluid	54	18.8
Meconium stained amniotic fluid	234	81.2
Cervical status		
Closed cervix	68	16.3
< 4 cm dilated	46	11.1
4-9 cm dilated	163	39.2
10 cm or fully dilated	139	33.4
Station of the presenting fetal part in relation with maternal pelvis		
High	242	58.2
Zero	54	13.0
Low	120	28.8
Stage of labor (n=384)		
Latent first stage of labor	46	13.2
Active first stage of labor	163	46.9
Second stage of labor	139	39.9

distress 86(20.4%), followed by CPD 67(16.1%), obstructed labor 62(14.9%) and the least was cord prolaps 6(1.4%). Emergency cesarean section was done for most (87%) of the women after labor started or maternal obstetric complications occurred (Table 5).

Intra-operative profile

On-training health officers performed 180 (43.3%) of the cesarean section. Gynecology and obstetrics specialists did 118(28.2%) of cesarean sections and 114(27.4%)

Table 5. Indication and types of cesarean section of the mothers who delivered by cesarean section in Arba-Minch General Hospital, SNNPR Ethiopia, July 8, 2013 to August 6, 2014.

Variable (N=416)	Frequency	Percentage (%)
Indication for cesarean section		
Cephalopelvic disproportion	67	16.1
Twine 1 st non vertex	14	3.4
Previous two or more c/s	10	2.4
Malpresentation	18	4.3
Obstructed labor	62	14.9
Fetal distress	86	20.4
Suspected uterine rupture	12	2.9
Antepartum hemorrhage	32	7.7
Failed induction	16	3.8
Cored prolaps	6	1.4
Failure to progress	35	8.4
Others (preeclampsia,eclampsia)	58	13.9
Types of cesarean section		
Emergency cesarean section	362	87
Elective cesarean section	54	13
Number of cesarean section		
Primary	362	87
One previous cesarean section	44	10.6
Two and above previous cesarean section	10	2.4

were done by general practitioners. Three hundred fifty one (84.4%) of the mothers were operated under spinal anesthesia and 406 (97.6%) were delivered by lower uterine segment incision. Time for accomplishing the operations shows 260 (62.5%) was completed within 30 to 60 min (Table 6).

Maternal complications

Intra-operative surgical complications

Overall there were 119(28.6%) of mothers with intra-operative surgical complication. The leading intra-operative surgical complications were hemorrhage 45(10.8%), incision extension 35(8.4%), accidental internal organ injury 23(5.5%) and atone 8(1.9%). Procedures done to manage complications were repair, cesarean hysterectomy, uterine artery ligation and B Lynch compression suture for 33(7.9%), 13(3.1%), 12(2.9%) and 9 (2.2%) of women respectively (Table 7).

Post-operative maternal complication

The overall post-operative maternal complication was 98(23.6%) and 318(76.4%) of the mothers had no post-operative complications. Two of the mothers died either during or immediately after the operation. The major post-

operative complications were surgical wound infection among 50 (12%), febrile morbidity among 19(4.6%), PPH among 9(2.2%), DVT among 2(0.5%) and UTI in 1(0.2%) of the mothers.

The average duration of catheterization was 1.75 days and the average duration of therapeutic intravenous antibiotics was 1.89 days. The average duration of hospital stay after the operation was 7.73 days with \pm SD of 2.83 days (Table 8).

Overall maternal complication

One hundred and fifty nine of the mothers had at least one of the intra-operative or post-operative maternal complications. This makes the overall rate of complication among mothers who delivered by Caesarean section in Arba Minch General Hospital 38.2% (Figure 1).

Neonatal outcomes following cesarean section

A total of 402 (90.3%) of neonates were born alive. Only 60 (14.9%) of the neonates had poor first minute APGAR score. For 153 (38.06%) of the neonates resuscitation was done soon after delivery. Seventy six (18.9%) of the neonate were transfer to pediatric unit and of these 15 neonates died after born alive (Table 9).

Table 6. Intra-operative profile of the mothers who delivered by cesarean section in Arba-Minch General Hospital, SNNPR Ethiopia, July 8, 2013 to August 6, 2014.

Variable (n=416)	Frequency	Percentage
Surgeon qualification		
Specialist (gyn and obs)	118	28.2
GP*	114	27.4
HO**	180	43.3
Resident	4	1.0
Type of anesthesia		
Spinal anesthesia	351	84.4
General anesthesia	65	15.6
Type uterine incision		
LUST***	406	97.6
Inverted "T"	4	1
Classic	2	05
"J" shaped	4	1
Operation time (min)		
<30	39	9.4
30-60	260	62.5
60-90	103	24.8
>90	14	3.4

GP*, General practitioners; HO**, health officer; LUST***, lower uterine segment transverse incision.

Table 7. Intra-operative surgical complications of the mothers who delivered by cesarean section in Arba-Minch General Hospital, SNNPR Ethiopia, July 8, 2013 to August 6, 2014.

Variables (n=416)	Frequency	Percentage
Intra-operative surgical complications		
Hemorrhage	45	10.8
Accidental adjacent organ injury	23	5.5
Incision extension	35	8.4
Atony	8	1.9
No complication	305	73.3
Additional procedures to manage complications		
Cesarean hysterectomy	13	3.1
B-Lynch compression suture	9	2.2
Uterine artery ligation	12	2.9
Repair	33	7.9
Blood transfused in the OR during operation		
Yes	22	5.3
No	394	94.7
Composite measure of intra-operative surgical complication		
Yes	119	28.6
No	297	71.4

Factors associated with maternal complications

Based on multivariable logistic regression, living in rural setting (AOR= 1.452,95%CI:1.002,2.301), maternal age \geq 30 years (AOR=2.076,95%CI:1.132,3.8 05) presence of

obstetric complications with (AOR=2.617,95%CI:1.437,4.767), operation done in second stage of labor (AOR=2.511,95%CI:1.361,4.631), prolonged labor \geq 25 h with (AOR=1.442,95%CI:1.041,2.472) operation done under

Table 8. Post-operative maternal complication of the mothers who delivered by cesarean section in Arba-Minch General Hospital, SNNPR, Ethiopia, July 8, 2013 to August 6, 2014.

Variable (n=416)	Frequency	Percentage
Status of women after operation		
Alive	414	99.52
Dead	2	0.48
Post-operative maternal complication		
wound infection	50	12
DVT*	2	0.5
UTI**	1	0.2
Febrile morbidity	19	4.6
PPH***	9	2.2
Post-operative blood transfused		
Yes	32	7.7
No	384	92.3
Blood transfused		
No blood transfusion	384	92.3
One unit	14	3.4
Two units	16	3.8
Three and above	2	0.5
Length of hospital stay after operation (days)		
<5	31	7.5
5-7	219	52.6
>7	166	39.9
Composite measure of Post-operative maternal complication		
Yes	98	23.6
No	318	76.4

DVT*, deep venous thrombosis; UTI**, urinary tract infection; PPH***, postpartum hemorrhage.

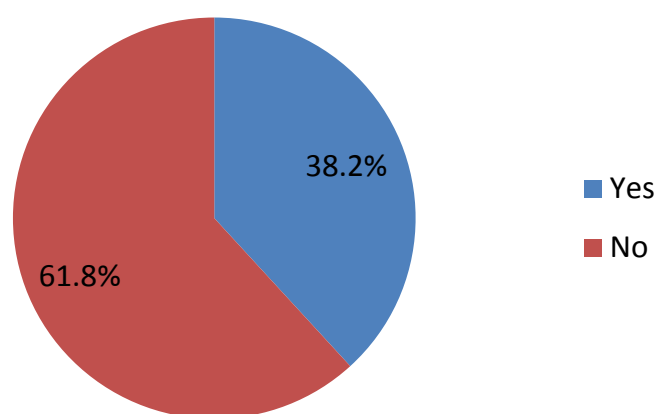


Figure 1. Intra-operative or post-operative maternal complications of women who delivered by cesarean section at Arba-Minch General Hospital, SNNPR, Ethiopia, July 8, 2013 to August 6, 2014.

general anesthesia (AOR=2.456,95%CI:1.382,4.356) were found to be significantly association with maternal complications (Table 10).

Based on multivariate logistic regression, cesarean section done for an indication of mal presentation have high maternal complication than other indication with

Table 9. Neonatal outcomes of mothers' who delivered by cesarean section in Arba-Minch General Hospital, SNNPR, Ethiopia, July 8, 2013 to August 6, 2014.

Variable	Frequency	Percentage
Neonatal outcomes at time of delivery (n=445)		
Alive	402	90.3
Dead	43	9.7
First minute APGAR score (n= 402)		
<4	60	14.9
4-6	153	38.1
≥7	189	47
Five minutes APGAR score (n= 402)		
<4	12	3
4-6	73	18.2
≥7	317	78.8
Neonate resuscitated (n= 402)		
Yes	153	38.06
No	249	61.94
Neonate transferred to neonatology/ pedi units (n=402)		
Yes	76	18.9
No	286	71.1
Died after born alive	15	10
Weight of the neonate (g)		
1500-2499	52	11.7
2500-3999	328	73.7
≥4000	65	14.6

(AOR=14.426, 95%CI: 3.210, 64.842), obstructed labor with (AOR=3.279, 95%CI: 1.787, 6.017) and suspected ruptured uterus (AOR=9.016, 95%CI: 1.914, 42.484) were found to have significant association with maternal complication (Table 11).

DISCUSSION

In this study, 316 (75%) of the mother had at least one obstetric complications during pregnancy or intra-partum. The leading obstetric complications were malpresentation (17.1%), obstructed labor (13.2%), previous cesarean section or gynecology operation (13%), PROM or chorioamnionitis (10.8%), APH (6.7%), preeclampsia and eclampsia (4.8%). In this study, the prevalence of APH and eclampsia/ preeclampsia were found to be less than the Tikur Anbessa hospital study which accounts 11 and 10% respectively (Hussen et al., 2014).

Regarding indications for c/s in this study, fetal distress (20.4%), CPD (16.1%) and obstructed labor (14.9%) account for half of cesarean sections. These findings are consistent with the national c/s review (Fesseha et al., 2011).

Prophylactic antibiotics were given for 93.3% of the mother before operation. This result is consistent with a 94% result from Ethiopian national c/s review (Fesseha et

al., 2011). Nevertheless, 50(12.0%) of women developed post-operative wound infection. The rate of wound infection reported in Jimma Hospital was 27.1% of all post-operative maternal complication (Nebreed et al., 2011) which is higher than our findings. The reason could be the difference in sterility technique and choice of prophylaxis antibiotics among the hospitals.

The main intra-operative surgical complications were hemorrhage 45(10.8%), accidental internal organ injury 23(5.5%), incision extension 35(8.4%), and atone 8(1.9%). To manage complication cesarean hysterectomy 13(3.1%), B-Lynch compression suture 9(2.2%), uterine artery ligation 12(2.9%), repair 33(7.9%) were done. In this study, the rate of cesarean hysterectomy is higher than the Tikur Anbessa Hospital 6(2.5%) (London, 2008).

Blood was transfused for 22(5.3%) of women in the operation table. This result is less than the Tikur anbessa hospital study which is 19% (London, 2008). Overall intra-operative surgical complications were 28.6%. This is higher than a 12 and 11.6% results in other studies (Pallasmaa et al., 2008, Ayano et al., 2015).

Among 416 cesarean delivery reviewed, two mothers were died immediately after the operation. This finding is better than the national study finding of 2 deaths out of 267 cesarean deliveries (Fesseha et al., 2011) and 5 deaths out of 318 cesarean deliveries in Tikur Anbessa

Table 10. Bivariate and multivariable analysis for independent variables with maternal complication of women who delivered by cesarean section at Arba-Minch General Hospital, SNNPR, Ethiopia, July 8, 2013 to August 6, 2014.

Variable	Maternal complication		COR 95% CI	AOR 95% CI
	No	Yes		
Residence				
Urban	117	49	1	1
Rural	140	110	1.878(1.237,2.846)	1.452(1.002,2.301)*
Age				
<30 years	234	124	1	1
≥30 years	23	35	2.872(1.625,5.075)	2.076(1.132,3.805)*
Antenatal care				
Yes	205	108	1	1
No	52	51	0.537(0.342,0.843)	1.244(0.734,2.109)
Pregnancy obstetric complication				
Yes	172	140	3.641(2.111,6.281)	2.617(1.437,4.767)*
No	85	19	1	1
Stage of labor				
No labor	41	24	1	1
Latent first stage of labor	32	14	0.486(0.269,0.877)	0.730(0.325,1.643)
Active first stage of labor	125	38	0.323(0.158,0.658)	1.239(0.371,1.357)
Second stage of labor	59	80	0.224(0.137,0.368)	2.511(1.361,4.631)*
Types of anesthesia				
Spinal anesthesia	231	120	1	1
General anesthesia	26	39	2.887(1.678,4.970)	2.456(1.382,4.356)*
Duration of labor (h)				
<24	154	83	1	1
≥25	62	50	0.526(0.327,0.844)	1.442(1.041,2.472)*

* P-value < 0.05.

Hospital (Hussen et al., 2014).

Among 98(23.6%) of post-operative maternal complications, the leading were wound infection (12%), febrile morbidity (4.6%) and PPH (2.2%). Study done in Bamako Mali reported an overall post-operative maternal infection among cesarean delivery was 20.1% which is less than our finding (Teguete et al., 2012).

Overall maternal complications of cesarean delivery were found to be 159(38.2%). This finding is higher than the results from the national review (Eyowas et al., 2016). One study done in Jimma Hospital reported an overall cesarean section maternal morbidity of 20%, but they were not included accidental internal organ injury and blood transfusion (Woubishet et al., 2016).

Socio demographic and obstetrics risk factors for maternal complication were found to be living in rural setting, maternal age ≥ 30 years, presence of one or more obstetric complications, operation done in second stage of labor, duration of labor ≥25 h and use of general anesthesia.

Those mothers who came from rural setting have 1.452 times more odds of maternal complication than urban dwellers. This could be mothers who came from rural

setting or outside Arba-Minch town after prolonged labor and complicated labor.

Mothers who have obstetrics complication during pregnancy or intrapartum have 2.671 times more odds of maternal complication than those mothers without obstetrics complications. Second stage of labor has 2.511 times more odds of maternal complication than operation without labor. Duration of labor ≥25 h have 1.442 times more odds of maternal complication than duration of labor less than 24 h. Operations done under general anesthesia have 2.456 times more odds of maternal complication than operation done under spinal anesthesia. These factors indicate majority of the cesarean section done after the labor is advanced and complicated. Different study in our country and in other African countries indicates complicated labor and use of general anesthesia increase the risk of accidental internal organs injury and hemorrhage due to atony (Pallasmaa et al., 2008; Ayano et al., 2015, Teguete et al., 2012, Woubishet et al., 2016).

Other risk factors that have association with maternal complications were indications for cesarean sections.

Cesarean section done for an indication of

Table 11. Bivariate and multivariable analysis for indications of cesarean section with maternal complication of mothers who delivered by cesarean section at Arba-Minch General Hospital SNNPR, Ethiopia, July 8, 2013 to August 6, 2014.

Variable	Maternal complication		COR(95% CI)	AOR(95% CI)
	No	Yes		
Fetal distress				
Yes	70	19	3.346(1.864,6.006)	0.412(0.220,0.771)
No	187	143	1	1
Suspected ruptured uterus				
Yes	2	10	8.537(1.850,39.580)	9.016(1.914,42.484)*
No	255	149	1	1
Obstructed labor				
Yes	22	40	3.591(2.041-6.318)	3.279(1.787,6.017)*
No	235	119	1	1
Malpresentation				
Yes	2	16	14.266(3.224,62.930)	14.426(3.21,64.842)*
No	255	143	1	1
Cephalopelvic disproportion				
Yes	51	16	2.213(1.213,4.035)	0.566(0.297,1.076)
No	206	143	1	1

malpresentation have high maternal complication than other indications with (AOR=14.4, 95%CI: 3.2, 64.8) obstructed labor with (AOR=3.2, 95%CI: 1.7, 6.0), suspected ruptured uterus (AOR=9.016, 95%CI: 1.914, 42.484). These indications make operation difficult in fetal extraction, risk of incision extension and hemorrhage are high. Study done in Jimma obstructed labor is associated with high maternal complications (Woubishet et al., 2016).

The average duration of hospital stay after operation was 7.25 days with \pm SD 2.865 this finding is higher than the national review of cesarean section in Ethiopia (Hussen. et al., 2014.). Prolonged maternal Hospital stay indicates, there are high maternal complications in Arba-Minch General Hospital.

Generally the magnitude of maternal complications following cesarean section of Arba-Minch General Hospital is high. Factors that have association with high maternal complications were living in rural setting, age of the mothers greater or equal to 30 years, presence of obstetrics complications, operations done in second stage of labor and prolonged labor greater or equal to 25 hours and use of general anesthesia. Indications for cesarean section like obstructed labor, suspected uterine rupture and mal-presentation were other factors that have association with high maternal complications. High obstetric complications and associated factors like obstructed labor, suspected uterine rupture, prolonged and second stage of labor shows laboring mothers were not managed appropriately. Thus, health professionals who are doing cesarean section on second stage of labor, prolonged labor and operation under general anaesthesia should anticipate intra-operative surgical

complications and should be prepare to manage complications like, blood preparation.

Strengths and limitations

This study addresses both the intra-operative and post-operative maternal complication. But, maternal complication related factors like body mass index, estimated blood loss, pre-operative and post-operative hematocrit or hemoglobin were not found in the medical records. If they were included in this study, they may affect the outcome. In addition the study could not compare maternal complication of high risk cesarean delivery with low risk cesarean delivery so that, it needs further study.

CONFLICTS OF INTERESTS

The authors have not declared any conflict of interests.

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