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Magnitude of Post Caesarean Section Surgical Site Infection and its Associated Factors among Mothers who Underwent Caesarean Section in Mizan Tepi University Teaching Hospital, South West Ethiopia, 2017

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Abstract

Background: Wound infection is a common complication of caesarean section and may lead to maternal sepsis, increased health care costs, prolonged hospital stay and negatively influences the outcome of the patient. Even though the extent of the problem is expected to be high in Ethiopia, it was not studied well.

Objective: To assess the magnitude of post caesarean section surgical site infection and its associated factors among mothers who underwent caesarean section in Mizan Tepi university teaching hospital, south west Ethiopia, 2017.

Methods: Cross-sectional study design was conducted in Mizan Tepi university teaching hospital from March 10-30, 2017. A total of 325 records of mothers were reviewed based on CDC criteria for surgical site infection after selecting the cards by simple random methods. Data were entered in epidata version 3.1and analysed with using frequency, percentage and binary logistic.

Result: Overall post caesarean section surgical site infection rate was 12.9%. Rupture of membrane <24 h (AOR=0.35, 95% CI: 0.129, 0.897), pre-operative hematocrit count of <30% (AOR=2.598, 95% CI: 1.125, 6.003) and post-operative admission for less than 8 days (AOR=0. 109, 95% CI: 0.043, 0.276) were found to be independent predictors of post caesarean section surgical site infection.

Conclusion and recommendation: Post caesarean section surgical site infection was found to be high in Mizan Tepi University teaching hospital. Rupture of membrane <24 h, pre-operative hematocrit count of <30% and post-operative admission for less than 8 days were found to be significant factors for post caesarean section surgical site infection. Effort should be made to prevent prolonged rupture of membrane and accessing and proper counselling on the appropriate utilization of iron folate at antenatal care setting should be stressed.

Keywords: Caesarean section; Post caesarean section surgical site infection; CDC; South west Ethiopia

Background

Caesarean section is an operative technique by which a fetus is delivered through an abdominal and uterine incision [1]. Essential and emergency obstetric care has been prioritized politically in many low- and middle-income countries in order to reduce maternal and child mortality and morbidity [2]. For more than three decades, the international healthcare community has considered the optimal rate for caesarean sections to be between 10% and 15% and caesarean section can effectively prevent maternal and perinatal mortality and morbidity [3].

Surgical site infections are a significant cause of post-surgical morbidity and mortality and can be an indicator of surgical quality as any breach in the integrity of skin and mucous membranes is a risk factor to acquisition of infection by endogenous or exogenous organisms [4].

Though caesarean section has become increasingly a safe and common surgical operation, it is still associated with significant morbidity and mortality and carries five to 20-fold increased risk of infection compared to vaginal delivery [5,6].

The rate of post Caesarean section surgical site infection varied from 5-18% globally [7]. One research report explained, the magnitude of the problem in developing countries was underestimated or even unknown largely for the reason that hospital associated infection diagnosis is complex and surveillance activities to guide interventions require expertise and resources [8]. According to a study conducted in Ethiopia, the incidence of surgical site infection was 51% [9]. Another study revealed surgical site infection rate among obstetric cases was 11.4% [10].

Research reports illustrated that; pregnancy induced hypertension, prolonged labor duration, type of surgery, prolonged operation time, multiple vaginal examinations during labor, chorio-amnionitis, presence of meconium, large intraoperative blood loss and Perioperative blood transfusion, younger age and premature rupture of the membranes were significantly associated with post caesarean section surgical site infection [10-13].

Similar to other low income countries, the extent of the problem expected to be high in Ethiopia [8], but the problem was not studied well in our country. Only one research was done in Jimma university specialized teaching hospital on "surgical site infection rate and risk factors among obstetric cases" and it had a limitation to show the association of obstructed labor, pregnancy induced hypertension, uterine rupture, antepartum haemorrhage, previous caesarean section and mal presentation. So this study is aimed to find out magnitude of post caesarean section surgical site infection and factors associated with it among mothers who underwent caesarean section in Mizan Tepi university teaching hospital, south west Ethiopia, 2017.

Materials and Methods

Study area and design

Institution based cross-sectional quantitative study was conducted in Mizan Tepi university teaching hospital.

Mizan Tepi university teaching hospital is found in southern nations, nationalities and people's regional state particularly in Bench maji zone. It is 561 km away from Addis Ababa, the capital city of Ethiopia, in south west direction. Before of its teaching service provision, it was established in 1971 during the "Derg" regime and has been now serving bench Maji zone, Keffa zone, Sheka zone and partial Gambella regions as referral center. Currently there are 2 general surgeons, 2 gynaecologists, 22 GPs, 103 nurses and 23 midwives in the hospital.

From 11/9/2013-10/9/2016, a total of 1317 caesarean section delivery services were provided in the hospital. From these, 414 caesarean section were done from 11/9/2013 to 10/9/2014, 538 from 11/9/2014 to 11/9/2015 and 365 from 12/9/2015 to 10/9/2016.

Sample size determination and sampling technique

To determine the sample size for the study, the following assumption is considered, prevalence of surgical site infection among obstetric case taken from study done in Jimma university specialized hospital, P=11.4% and this is taken as (p=0.114), margin of error (0.05) and standard normal distribution value for the 95% confidence interval (1.96) are considered. After using of correction formula the final sample size was 325. Based on this a three year patients card review were made after proportional allocation. Simple random sampling technique was used to get calculated sample size.

Data collection procedure

Different data collection tools were used to collect relevant information based on the study objectives. To meet this pre-designed questionnaire which was adapted and modified from different reviewed literature were used and it had 4 parts: Demographic, obstetric, comorbidity and operation factors. The CDC standardized surveillance criteria for defining surgical site infections, was used to detect post caesarean infections. All cards of mothers who underwent caesarean section from 11/9/2013-10/9/2016 and who fulfils the inclusion criteria were reviewed to determine the relevant data. The principal investigators were coordinating the overall activity of the study.

Data were collected, cleared, edited and analysed using frequency, percentage and binary logistic. The result was presented using tables and diagrams as needed.

The qualities of data were ensured through proper training of data collector and close supervision of data collectors. All collected data were checked for completeness, accuracy and consistency by the principal investigators and communicated to the data collectors on the next day.

Ethical consideration

The study was approved by Institutional review board of Jimma University. Permission letter was provided to the administrator of Mizan Tepi university teaching hospital before data collection. Confidentiality and privacy were ensured by avoiding put of any extra maternal information like name on the questionnaire.

Results

Demographic characteristics of participants

A total 325 records of mothers who underwent caesarean section in three years period (11/9/2013-10/9/2016) were reviewed from March 10, 2017 to April 8, 2017.

Majority of the participants, 233 (71.7%) were in age groups of 20-34 years old; while 43 (13.2%) of participants were have age greater than 34 years old (Table 1).

Variable (age)	Frequency	Percent
<20	43	13.2
20-34	233	71.7
>34	49	15.1
Total	325	100

Table 1: Age distribution of mothers included in the study in Mizan Tepi University teaching hospital, south west Ethiopia 2017 (N=325).

Obstetrics Characteristics of Participants

The current study revealed that 209 (64.3%) participants were multi Para. The mean parity of the study sample was 2.07 (± 0.075). About 246 (75.7%) of women had underwent caesarean section in gestational age between 37 and 40 weeks. 289 (88.9%) of mothers had been in labor before the operation. More than half of the mothers (54.8%) had a record of membrane rupture before the operation. In this study 67 (20.6%) of caesarean section were done due while fetal distress contributed for 61 (18.8%) caesarean section (Table 2).

Characteristics	Responses	Frequency	Percent
Parity	Nulipara	49	8
	Primpara	76	23.4
	Multipara	209	64.3
	Grand multipara	14	4.3
	Total	325	100
Gestational age	<37 weeks	66	20.3
	37-42 weeks	246	75.7

	>42 weeks	13	4
	Total	325	100
Mother has been in labor before operation	Yes	289	88.9
	No	36	11.1
	Total	325	100
Duration of labor	<24 h	235	81,3
	>24 h	54	18.7
	Total	289	100
Membrane state	Intact	165	50.8
	Ruptured	160	49.2
	Total	325	100
Duration of membrane rupture	<24 h	119	74.4
	>24 h	41	25.6
	Total	160	100
Color of the liquor	Clear	121	75.5
	Meconium stained	30	18.8
	Blood stained	9	5.6
	Total	160	100
Indication of CS	Obstructed Labor	67	20.6
	Pregnancy induced hypertension	35	10.8
	Uterine rupture	18	5.8
	Antepartum hemorrhage	15	4.6
	Previous CS	58	17.8
	Mal-presentation	44	13.5
	Multiple gestation	19	5.8
	Cord prolapse	12	3.7
	Fetal distress	61	18.8
	Other*	11	3.4
	Total	325	100

*Others: induction/augmentation failure, PROM, malposition, post-dated pregnancy and by request

Table 2: Obstetric characteristic of study participants in in Mizan Tepi University teaching hospital, south west Ethiopia 2017 (N=325).

Chronic illness among participants

Eleven clients (3.4%) had known chronic disease of which diabetic case was common (Table 3).

Operative characteristics among participants

Majority of the (78.2%) operations were done by gynaecologists. About 192 (59.1%) of operations were performed within 15 min, while 1 (0.3%) within 45-60 min. About one third (33.5%) of participants were given with regional anaesthesia. 131 (96.3%) of participants had received prophylaxis before surgical procedure while 13 (2.7%) of participants didn't. 266 (81.8%) of participants had less than eight days hospital stay, while 59 (18.2) were admitted for more than eight days after surgery (Table 4).

Variable (chronic disease)	Frequency	Percent
Cardiac case	1	9.1
Diabetes	5	45.5
Hypertension	3	27.3
HIV	2	18.2
TOTAL	11	100

Table 3: Diagnosis of chronic disease among mothers underwent caesarean section in Mizan Tepi University Teaching Hospital, south west Ethiopia 2017 (N=325).

Characteristics	Responses	Frequency	Percent
Who performed the operation?	Emergency surgeon	58	17.8
	Resident	13	4
	gynecologist	254	78.2
Type of operation	Emergency	290	89.2
	Elective	35	10.8
Duration of the operation	<15 min	192	59.1
	15-30 min	114	35.1
	30-45 min	18	5.5
	45-60 min	1	0.3
Type of anesthesia	Regional	109	33.5
	General	216	66.5
Had Prophylaxis given?	Yes	313	96.3
	No	12	3.7
Estimated blood loss	<500 ml	158	48.6
	500-1000 ml	145	44.6
	1001-1500 ml	17	5.2
	>1500 ml	5	1.2
Pre-operative hematocrit count	>30%	48	14.8
	<30%	277	85.2
Was client transfused with blood?	Yes	13	4
	No	312	96

Post-operative hospital stay	<8 days	266	81.8
	>8 days	59	18.2
	Total	325	100

Table 4: Operational characteristics of study participants in Mizan Tepi University Teaching Hospital, south west Ethiopia 2017 (N=325).

Surgical site infection among participants

In present study 42 (12.9%) of mothers developed surgical site infection after caesarean section, while 283 (87.1%) didn't (Figure 1).

Factors associated with post caesarean section surgical site infection

The Hosmer and Lemeshow goodness of fit from Binary logistic analysis with P-value of 0.21 indicates all predicting variables are good predictors of surgical site infection among caesarean sectioned mothers. All variables with P value less than 0.25 from bivariate logistic regression analysis were moved to multivariate logistic regression to control confounding variables and to identify independent predictors of post caesarean section surgical site infection (Table 5).

Variables		Surgical site infection		COR (95% CI)	AOR (95% CI)
		Yes (%)	No (%)		
Age	<20	15 (30.6)	34 (69.4)	0.672 (0.239,4.32)	3.447 (0.805, 14.76)
	20-34	19 (7.7)	227 (92.3)	3.462 (0.112,8.33)	1.250 (0.163, 9.568)
	>34	8 (26.7)	22 (73.3)	1	1
Parity	Nulliparous	8 (30.7)	18 (69.3)	1.250 (0.316,4.94)	1.097 (.065, 18.468)
	Primi Para	10 (13.2)	66 (86.8)	3.66 (1.020,13.13)*	3.574 (.213, 9.971)
	Multi Para	19 (9.1)	190 (90.9)	5.556 (1.689,18.27)	3.617 (0.231, 16.629)
	Grand multipara	5 (35.7)	9 (64.3)	1	1
Duration of membrane rupture	<24 h	11 (9.2)	108 (81.8)	3.60 (1.423, 9.110)*	0.35 (0.129, 0.89)**
	>24 h	11 (26.8)	30 (83.2)	1	1
Pregnancy induced hypertension	Yes	10 (28.6)	25 (71.4)	3.225 (1.420,7324)*	0.318 (0.045, 2.232)
	No	32 (11)	258 (89)	1	1
Previous cesarean section	Yes	4 (6.9)	54 (83.1)	0.446 (0.153,1.30)	4.310 (0.375, 9.551)
	No	38 (14.2)	229 (85.8)	1	1
Had Prophylaxis given?	Yes	38 (12.1)	275 (87.9)	3.618 (1.040,12.5)*	0.385 (0.088, 2.688)
	No	4 (33.3)	8 (76.7)	1	1
Estimated blood loss	<500 ml	14 (8.9)	144 (91.1)	1	1
	500-1000 ml	19 (13.1)	126 (86.9)	0.645 (0.311,1.33)	0.686 (0.313, 1.504)
	1001-1500 ml	6 (35.3)	11 (64.7)	0.178 (0.057,0.55*	0.452 (0.127, 1.608)
	>1500 ml	3 (60)	2 (40)	0.065(0.010,0.42)*	0.86 (0.011, 1.686)
Pre-operative hematocrit count	<30%	14 (29.2)	34 (70.8)	3.618(1.75,7.635) *	2.59 (1.12, 6.003)**
	>30%	28 (10.1)	249 (89.9)	1	1
Post-operative hospital stay	<8 days	19 (7.1)	247 (92.9)	6.402(3.22,12.715) *	0.109 (0.04, 0.27)**
	8 days and above	23 (39)	36 (61)	1	1

* Statistically significant at P<0.05 in crude and ** statistically significant at P<0.05 in adjusted logistic regression analysis, respectively

Table 5: Crude and adjusted odds ratio from logistic regression analysis of predictors of surgical site infection among caesarean sectioned mothers at Mizan Tepi University Teaching Hospital, south west Ethiopia, 2017 (N=352).

The above table showed that duration of membrane rupture, pre-operative hematocrit count and length of post-operative hospital stay were independent predictors of surgical site infection among caesarean sectioned mothers.

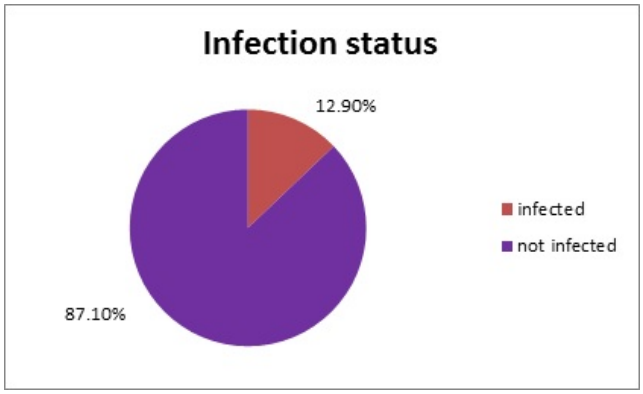

Figure 1: Status of infection among participants in Mizan Tepi university teaching hospital, south west Ethiopia 2017 (N=325).

Women with rupture of membrane less than 24 h had 64% times lower odds of developing post caesarean section wound infection than mothers whose membrane ruptured for more than 24 h, AOR=0.35 CI (0.129, 0.89).

Women with pre-operative hematocrit count less than 30% were 2.6 times more likely to develop post caesarean -section surgical site infection than those mothers with hematocrit count more than 30%, AOR=2.59 CI (1.12, 6.003).

The likely hood of post caesarean surgical site infection in mothers admitted for less than eight days was 89.1% times lower than mothers admitted for more than 8 days post operatively, AOR=0.109 CI (0.04, 0.27).

Discussion

The overall prevalence of surgical site infection among caesarean sectioned mother was 12.9%. This finding is relatively high compared to other prior study findings in the country. In Jimma proportion was 11.4% [10].

This finding was much higher than reports from India, where the prevalence was 4.1% [14], Nepal 5.87% [15] and Brazil 1.4% [16].This variations could be explained by the presence of high standard of hygiene practice and presence of surveillance and infection control mechanisms in developed countries.

In present study mothers who had a history of membrane rupture <24 h were 64.1% times less likely to develop post caesarean section surgical site infection than those mothers whose membrane ruptured for >24 h. This is in the fact; that when the lengths of duration of membrane rupture increases the chance of bacterial multiplication and ascending infections increases. This is also evidenced by a research done in Nnamdi Azikiwe University Teaching Hospital of Nigeria [17].

In current study the likelihood of surgical site infection among caesarean sectioned mothers with pre-operative hematocrit <30% was 2.6 times higher than mothers with pre-operative hematocrit >30%. This is true that anemia can causes impaired oxygen transportation to the uterus and causes delay in wound healing. Moreover; lack of oxygen causes tissue deaths, dysfunction of oxidative activities in the tissues and this creates conducive environment for wound infection. This finding was in line with report from Vijaya et al. [18].

In this study the likelihood of surgical site infection among mothers with post-operative admission less than 8 days were 89.1% times less risk to develop surgical site infection than that of post-operative admission greater than 8 days. This may explain the fact that, patients admitted for long duration are risk for nosocomial infection. Length of post-operative hospital admission was not significantly associated with other study [19].

Conclusion

Post caesarean section surgical site infection was found to be high in Mizan Tepi University teaching hospital. Duration of membrane rupture, hematocrit count and post-operative admission length were independent predictors of post caesarean section surgical site infection.

Recommendations

Based on the findings the following recommendations were drawn.

Hospital staffs should apply standard infection prevention techniques and excellent surgical techniques to reduce surgical site infections harbored by prolonged admission.

Effort should be made to prevent prolonged rupture of membrane by awareness creation and by accessing maternal waiting rooms at suitable environments for mothers and for easy referral.

Accessing and proper counselling on the purpose and appropriate utilization of iron folate at antenatal care setting should be stressed.

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