Time-to-recovery After Cesarean Section Delivery Among Women who Gave birth through Cesarean Section at Hawassa University Comprehensive Specialized Hospital, south Ethiopia: A Prospective Cohort Study

Anteneh Fikrie (antenehfikrie3@gmail.com)
Bule Hora University

Rahel Zeleke
Pharma College Hawassa Campus

Henok Bekele
Pharma College Hawassa Campus

Wengelawit Seyoum
Pharma College Hawassa Campus

Dejene Hailu
Hawassa University

Research Article

Keywords: Time to recovery, Survival Status, Predictors, Ethiopia

Posted Date: April 30th, 2021

DOI: https://doi.org/10.21203/rs.3.rs-442628/v1

Abstract

Background: Despite the progressive increment of caesarean section rates worldwide over the last decades; still the trend has not been accompanied by significant maternal or perinatal benefits. Moreover, information on the quality of the service, as measured by timely recovery, is scarce. This study assessed predictors of time-to-recovery after cesarean section delivery among women who gave birth through cesarean section at Hawassa University Comprehensive Specialized Hospital (HU-CSH), southern Ethiopia.

Methods: Institution based prospective cohort study was conducted on 381 randomly selected women who gave birth by cesarean section in HU-CSH during the follow up period. Pre-tested structured questionnaire was used to collect the data. Data were analyzed using Kaplan Meir (KM) curve, Log rank test and Cox-Proportional hazard model. The outputs of the bivariable and multivariable Cox model are presented using Adjusted Hazard Ratio (AHR) with the respective 95% confidence intervals (CIs).

Results: After a maximum of 19 days of stay, 96.2% [95%CI: 94.04-98.4%] of the women were early recovered. The overall median IQR) time of recovery was 2.00 (2, 3) days. The overall incidence density rate (IDR) of recovery in the cohort was 0.34 per Person-days or 2.38 per person-week. On the other hand the overall mean survival time was 3.07(95%CI: 2.75-3.40) days. Women who had ANC follow-up (AHR=1.49, 95%, CI: 1.05-2.10) and discharge from the wound site (AHR=0.13, 95%, CI: 0.03-0.56) were identified as significant positive and negative predictors of time-to- recovery after CS delivery respectively.

Conclusion: This study showed that the rate of early recovery was high and is comparable to the global level figures. However, further improving preoperative maternal status, intraoperative follow up and post-operative care is needed to improve early recovery.

Background

Caesarean section(CS) is the most commonly performed surgical procedures worldwide that effectively prevents maternal and newborn mortality when used for medically indicated reasons [1-3]. However, there is lack of evidence revealing its benefits for women who do not require the procedure [2]. Despite the progressively increased CS rates worldwide over the last decades; still the trend has not been accompanied by significant maternal or perinatal benefits. Conversely, the existing evidence showed that higher rates of CS have been associated with increased maternal and perinatal morbidity [1].

For more than three decades the ideal rate for caesarean sections was estimated to be between 10% and 15% [2]. However, nearly 20% of births were delivered by CS universally of which the vast majority (more than 40%) was observed in Latin America and the Caribbean followed by Oceania and North America with prevalence rate of 35%. In England, 27.8% of all pregnant women undergo CS to deliver their babies [4]. Likewise, in Ethiopia most recently a prevalence rate of 24.7% was reported [5]. Many factors had been implicated for the substantial rise of the CS rates [3] such as increase in the prevalence of obesity, multiple pregnancies, and increase in the proportion of nulliparous women or older women, fear of pain, physician factors, increasing fear of medical litigation, as well as organizational, economic and social factors [1].

An increasing rise in the rate of CS delivery becomes a major public health concern [3, 6]. According to a large study result in low and middle income countries; one-fourth of women were died after giving birth through CS [3]. CS is associated with short-term risks such as; blood transfusion, the risks of anesthesia complications, organ injury, infection and long-term risks that can extend many years beyond the current delivery and affect the health of the woman, the child, future pregnancies [1, 2, 7, 8].

Despite raise in rates, cesarean delivery is the single most important factor associated with 5-20 folds increased postpartum infection than vaginal delivery [4, 9, 10]. Likewise, studies conducted in Ethiopia found that 11-15% of women who had given birth through CS developed surgical site infection which later leads to delayed recovery [10, 11]. Moreover, information on the quality of the service, as measured by timely recovery, is scare particularly in the study area. Therefore, this study assessed time-to-recovery after cesarean section delivery and predictors among women who gave birth through cesarean section at Hawassa University Comprehensive Specialized Hospital (HU-CSH), southern Ethiopia.

Methods And Materials

Study design and settings

Institution-based prospective cohort study design was conducted from July to August, 2020 at Hawassaa University Comprehensive Specialized Hospital (HU-CSH), Southern Ethiopia. The hospital is located in Hawassa city, the capital of Sidama regional state. It is one of the teaching and specialized and comprehensive hospital in the Southern part of Ethiopia. It has over 400 beds. The averages monthly CS deliveries are estimated to be 200.There are 72 midwives nurses and 7 senior Gynecologist doctors serving in the hospital.

Study population and sample size

The source population was all women who gave birth through CS in HU-CSH. Sample size was calculated based on double population proportion formula by using Epi info version 7 computer program considering the following assumptions: 95% CI, power 80%, ratio of unexposed to exposed 1:1 and outcome in exposed 24.63% and outcome in unexposed 12.2% [11], with Risk ratio of 2: and 10% non-response rate. Finally the calculated sample became 381. Consecutive sampling was used to enroll mothers who underwent cesarean section delivery at the study hospital till the estimated sample size was attained.

Data collection procedure and data quality control

Three trained midwife nurses from Labor and Obstetrics and Gynecology ward and a Public Health Officer were participated in the data collection and supervision, respectively. Both the data collectors and supervisor were trained for two-days on the procedures of data collection. A pretested structured questionnaire which were adapted by reviewing different peer reviewed articles were used to collect the data [5, 12]. Data like socio-demographic characteristics (age, marital status, residences, BMI, educational

status, religion, family income, number of children's, source of referral), medical and obstetrics characteristics (ANC visits, number of ANC visits, HTN, DM, HIV/AIDs, anemia, blood transfusion, history of abortion and gestational age during CS), Pre, intra and post-operative characteristics (Pervious history of CS, number of CS delivery, Types skin incision, breast feeding, type of anesthesia used, presence of discharge from wound site, mobility after CS delivery), the date of CS procedure done and discharge date were obtained by the face-to-face interview, individual maternal records and referral notes review.

Data processing and analysis

The data were thoroughly cleaned, coded and then entered in to EPINFO version 3.5.3 and exported to the Statistical Package for Social Science (SPSS) version 20 for analysis. Descriptive analysis was run to assess missing values and presence of outliers. The Kolmogrov Smirnov test of normality was used to check the normality of distributions for continuous variables. The dependent variable was time-to-recovery after CS delivery. The recovery time after CS delivery was dichotomized into early recovered or censored. Those who stayed ≤4 days after the CS delivery were taken as early recovered [13]; whereas the others were regarded as censored (late recovered) based on thier length of stay. Length of stay (LOS) is the number of days the women stayed in the hospital from the date CS was done until the womens develop event of interest (early recovery) or censored (late recovery). Length of stay was computed using the difference between the date of discharge and date of CS procedure done.

Multicollinearity test was carried to see the correlation between the independent variables and no multicollinearity between independent variables was witnessed (Variance inflation factor <10). Data were described using frequency distribution and measures of central tendency and dispersion. Kaplan- Maier Curve and Long rank test were used to estimate cumulative survival probability and to compare survival status probablity across different groups. Cox proportional-hazard regression were used to adjust the potential cofounding varables and identify predictors of time-to-recovery. Variables with *p*-value less than 0.25 during bivariate analysis were considered as a candidate for multivariable analysis. The assumption of proportional hazard was graphically evaluated by log-minus-log survival curve. Adjusted hazard ratio (AHR) with 95% confidence interval (CI) were used to present the output of the analysis [14].

Results

Socio-demographic characteristics of participants

From a total of 381 randomly selected womens delivered by CS, the data of 369 with response rate of 96.8%. All most all, 365 (98.9%) of women were married. Majority 307 (83.2%) of the women came from urban areas. The mean (± SD) age of the participants was 27(± 3.5) years and the majority (90.2%), were less than the age of thirty years. The majority of women, 127 (34.4%) and 193 (52.3%) have college and above level of education and housewife in thier occupation respectively. Nearly half, 176 (47.7%) of the participants family have monthly income of 63.06-126.13$ range. More than three-fourth, 277(76.2%) of

the women have source of referral and the majority, 205(74%) of them were referred from health center (Table 1)

Table 1
Socio-demographic characteristics of participants delivered at HUCSH, 2020.

Variable		Frequency	Percent (%)
Age in years	≤ 20	22	6
	21–25	99	26.8
	26–30	212	57.5
	≥ 31	36	9.8
Educational level	No formal education	26	7
	Primary education	94	25.5
	Secondary education	122	31.1
	College and above	127	34.4
Religion	Orthodox	110	29.8
	Protestant	186	50.4
	Muslim	73	19.8
Residence	Urban	307	83.2
	Rural	62	16.8
Occupation of mother	House wife	193	52.3
	Private employee	58	15.7
	Governmental employee	79	21.4
	Others[@]	39	10.6
Family monthly income in USD	63.06$	42	11.4
	63.06-126.13$	176	47.7
	126.13-252.27$	125	33.9
	252.27$	26	7
Number of children	< 2	259	70.2
	2–3	80	21.7
	≥ 4	30	8.1
Do you have source of referral	Yes	277	76.2
	No	92	23.8

[@] Merchant, student, unemployed (n = 369)

Variable		Frequency	Percent (%)
The source of referral (n = 277)	Health center	205	74
	Hospital	72	26
BMI (kg/m2)	Normal	264	71.5
	Overweight	105	28.5
@ Merchant, student, unemployed (n = 369)			

Medical and obstetrics characteristics of the women

The vast majority of participants, 328(88.9%) had at least one ANC visits. Accordingly, 31.1% and 57.7% of the women had 1–3 and ≥ Four ANC visits respectively. The mean (± SD) Gestational age (GA) during delivery was 37.9 (± 1.72) weeks and 24.7% had GA of less than 37 weeks. Regarding chronic diseases; about 3.5%, 2.7%, and 1.9% of the women had hypertension, diabettus melites and HIV/AIDs respectively. Likewise, nearly one-in-five, 19.2% of women were diagnosed with anemia and 1.6% of them recieved blood transfussion. (Table 2).

Table 2
Medical and obstetrics characteristics of the women on ppredictors of time-to-recovery from cesarean section delivery among women who gave birth by CS at HUCSH, 2020 (n = 369).

Variable	Category	Frequency	Percent
ANC visit	Yes	328	88.9
	No	41	11.1
Number of visits (n = 328)	No visits	41	11.1
	1–3 times	115	31.2
	≥Four times	213	57.7
Hypertension	Yes	13	
	No	356	
Diabetes mellitus	Yes	10	
	No	359	
HIV/AIDs	Yes	7	
	No	362	
Anemia	Yes	71	19.2
	No	298	80.8
Blood transfusion	Yes	6	1.6
	No	369	98.4
History of abortion	Yes	51	13.8
	No	318	86.2
Number of abortions (n = 51)	One times	45	88.2
	≥ two times	6	11.8
GA at during CS	< 37 weeks	91	24.7
	37–40 weeks	251	68
	> 40 weeks	27	7.3

Pre, intra and post-operative characteristics of the women

One-in-seven, (15.4%) of the women had previous history of CS delivery; whereas he majority (84.4%) of them had one time exposure including the current. The vast majority 94.6% of women has undergone transverse type's skin incision. About 3% of the women experienced discharge from wound site (Table 3).

Table 3
Pre, intra and post-operative characteristics of the women on predictors of time-to-recovery from cesarean section delivery among women who gave birth by CS at HUCSH, 2020 (n = 369).

Variables	Category	Frequency	Percent (%)
Pervious history of CS	Yes	57	15.4
	No	312	84.6
Number of CS done including the current	One time	312	84.4
	Two time	46	12.5
	≥ Three time	11	3
Types skin incision	Transvers	349	94.6
	Vertical	20	5.4
Breast feeding	Yes	352	95.4
	No	17	4.6
Type of anesthesia used	General	23	6.2
	Local	346	93.8
Discharge from wound site	Yes	11	3
	No	358	97
Bad odor discharge	Yes	9	2.4
	No	360	97.8
Mobility after CS	Yes	367	99.5
	No	2	0.5
Indication for CS	Maternal	185	50.1
	Fetal	184	49.9

Time to recovery from Cesarean section delivery

In this study the proportion of timely recovery (within 4 days) is 96.2% [95%CI: 94.04–98.4%]. The overall median (IQR) time-to-recovery was 2.00 (2, 3) days. The overall incidence density rate (IDR) of timely recovery was calculated using person-days of follow up as a denominator for the entire cohort. Thus, 369 study participants were followed for 1,042 person-days of observation. Henceforth, the IDR 0.34 per person-days or 2.38 per person-week. Whereas, the cumulative probability of early recovery at the 1st and 4th day was 0.995 and 0.038 respectively. The overall mean survival time was 3.07(95%CI: 2.75–3.40) days (Table 4).

Table 4
Life table analysis of severely among women who gave birth by CS delivery at HUCSH, 2020

Interval Start Time	Number Entering Interval	Number Withdrawing during Interval	Number Exposed to Risk	Number of Terminal Events	Proportion Terminating	Proportion Surviving	Cumulative Proportion Surviving at End of Interval
0	369	0	369.000	0	.00	1.00	1.00
1	369	0	369.000	2	.01	.99	.99
2	367	0	367.000	214	.58	.42	.41
3	153	0	153.000	116	.76	.24	.10
4	37	0	37.000	23	.62	.38	.04
5	14	1	13.500	0	.00	1.00	.04
6	13	1	12.500	0	.00	1.00	.04
7	12	0	12.000	0	.00	1.00	.04
8	12	1	11.500	0	.00	1.00	.04
9	11	0	11.000	0	.00	1.00	.04
10	11	0	11.000	0	.00	1.00	.04
11	11	2	10.000	0	.00	1.00	.04
12	9	3	7.500	0	.00	1.00	.04
13	6	0	6.000	0	.00	1.00	.04
14	6	2	5.000	0	.00	1.00	.04
15	4	1	3.500	0	.00	1.00	.04
16	3	1	2.500	0	.00	1.00	.04
17	2	1	1.500	0	.00	1.00	.04
18	1	0	1.000	0	.00	1.00	.04
19	1	1	.500	0	.00	1.00	.04

Factors associated with early recovery time of women delivered by CS

Multivariable Cox regression was carried out for variables verified as significant at p = value, < 0.25 during bivariate Cox regression. Accordingly, after adjusting for different variables ANC follow-up and discharge form the wound site were found to be independent predictors of recovery time in women delivered by CS at HU-CSH. Accordingly, women who had ANC follow-up were 1.5 times more likely to recover early as

compared to thier conuter parts (AHR = 1.49, 95%, CI: 1.05–2.10). On the other hand women who had discharge from the wound site had 87% reduced chance of early recovery time than those women who did not have dischagre from the wound site (AHR = 0.13, 95%, CI: 0.03–0.56) **(**Table 5**).**

Table 5
Output of Bivariable and Multivariable Cox regression analyses on factors associated with time-to-recovery after CS delivery among women who gave birth by CS delivery at HUCSH, 2020.

Variables	Outcome		CHR	AHR
	Early recovered N (%)	Censored N (%)	(95 % CI)	(95 % CI)
Age in years				
≤ 30	326(91.8)	7 (50)	1.47 (1.09–2.16)	1.07 (0.72–1.18)
≥ 31	29 (8.2)	7 (50)	1	1
Residence				
Rural	57 (16.1)	5(35.7)	0.97(0.73–1.29)	-
Urban	298(83.9)	9(64.3)	1	-
Occupation				
Employeed	131 (39.9)	6 (42.9)	1	
Unemployeed	224 (63.1)	8(57.1)	1.00(0.80–1.24)	
Source of referral				
No	87 (24.5)	1(7.1)	1.13(0.89–1.44)	1.02(0.79–1.31)
Yes	268 (73.6)	13 (92.9)	1	1
ANC visit				
Yes	317 (89.3)	3 (21.4)	1.78(1.26–2.51)	1.49(1.05–2.10)*
No	38 (10.7)	11(78.6)	1	1
Prolonged labor				
Yes	105 (29.6)	2 (14.3)	1.08(0.86–1.36)	
No	250 (70.4)	12 (85.7)	1	
Abortion				
Yes	49 (13.8)	2 (14.3)	1.03(0.76–1.39)	
No	306 (86.2)	12 (85.7)	1	
Anemia				
Yes	67 (18.9)	4 (28.6)	0.85(0.65–1.11)	0.98(0.74–1.29)
No	288 (81.1)	10 (71.4)	1	1

** & * show statistically significant association at P < 0.01 and 0.05 respectively

Variables	Outcome		CHR	AHR
	Early recovered N (%)	Censored N (%)	(95 % CI)	(95 % CI)
Gestational age at CS				
Term	245 (69)	2 (14.3)	1.24(0.99–1.56)	1.13(0.89–1.12)
Pre & post term	110 (31)	12 (85.7)	1	1
Previous CS				
Yes	47(13.2)	10 (71.4)	0.71 (0.52–0.97)	0.87 (0.64–1.20)
No	308 (86.8)	4 (28.6)	1	1
Discharge wound site				
Yes	2 (0.5)	9 (64)	0.09(0.024–0.38)	0.13(0.03–0.56)**
No	353 (99.5)	5 (36)	1	1
Types skin incision				
Transvers	339 (95.5)	10 (71.4)	1.59(0.97–2.59)	1.55(0.58–4.09)
Vertical	16 (4.5)	4 (28.6)	1	1
Type of anesthesia used				
General	15 (4.2)	8 (57.1)	0.49(0.30–0.81)	1.31(0.46–3.71)
Local	340 (95.8)	6 (42.9)	1	1
Chronic disease				
Yes	42 (11.8)	12 (85.7)	0.70 (0.50-0;97)	0.92 (0.66–1.29)
No	313 (88.2)	2 (14.3)	1	1
PROM				
Yes	4 (1.1)	5 (35.7)	0.29(0.11–0.79)	0.65(0.23–1.83)
No	351 (98.9)	9(64.3)	1	1
** & * show statistically significant association at P < 0.01 and 0.05 respectively				

On the other hand, time-to-recovery patterns of the women delivered by CS across selected variables were compared using Log-rank test. Hence, there were significantly different recovery rates among women with and without PROM. The mean recovery time with the presence and absence of PROM in women was 7.66 and 2.86 days respectively and their difference was statistically significant (Log-rank test = 18.659, $P < 0.001$). Similarly, women who received general and spinal anesthesia (Log rank test = 25.663, $P < 0.001$) and

women who had and had not discharge from the wound site (Log-rank test = 48.623, $P < 0.001$) had statistically significant difference in the recovery times (Table 6).

Table 6
Log rank (Mantel-Cox) test for association of explanatory variables with time-to-recovery after CS delivery among women who gave birth by CS delivery at HUCSH, 2020.

Variables	Mean recovery time(95% CI)	Over all comparison Log Rank	
		X^2	P-value
PROM	7.66 (4.49–10.83)	18.659	< 0.001
Yes	2.86 (2.59–3.14)		
No			
Age	2.75 (2.52–2.98)	11.357	0.001
≤ 30	5.69 (3.55–7.83)		
≥ 31			
Discharge from wound site	15.90 (12.03–19.78)	48.623	< 0.001
Yes	2.62 (2.46–2.79)		
No			
Previous CS	4.98 (3.53–6.42)	12.767	< 0.001
Yes	2.67 (2.44–2.88)		
No			
Gestational age at CS	2.55 (2.38–2.72)	10.15	0.001
Term	4.09 (3.21–4.97)		
Pre & post-term			
Chronic disease	5.98 (4.12–7.84)	12.445	< 0.001
Yes	2.56 (2.42–2.71)		
No			
Type of skin incision	2.94 (2.61–3.21)	11.120	0.001
Transverse	5.55 (3.01–8.06)		
Vertical			
Type of anesthesia	8.26 (5.05–11.47)	25.663	< 0.001
General	2.66 (2.48–2.84)		
Local			

Variables	Mean recovery time(95% CI)	Over all comparison Log Rank	
		X^2	P-value
ANC Visit	2.56 (2.39–2.73)	32.139	< 0.001
Yes	6.30 (4.38–8.22)		
No			

Discussion

The finding of this study revealed that the overall proportion of timely recovery (within 4 days) after a maximum of 19 days is 96.2% [95%CI: 94.04–98.4%]. The median (IQR) time of recovery was 2.00 (2, 3) days. The overall incidence density rate (IDR) of recovery in the cohort was 0.34 per Person-days or 2.38 per person-week. On the other hand the overall mean survival time was 3.07(95%CI: 2.75–3.40) days. Women who had ANC follow-up and discharge from the wound site were identified as significant positive and negative predictors of time-to- recovery after CS delivery respectively.

The finding of this study revealed that early recovery rate of 96.2%, which is similar to WHO recommended average stay 3–4 days in hospital after a CS delivery [13]. The result of this study is in line with other similar study conducted in Ethiopia: Butajira and Attat hospitals [12]. However, the result is lower than a large population based study conducted in the North-Eastern Italy, where the recovery-time was 4.7 days [15] and in India, the recovery-time was 8.6 days [16]. The most likely reason for the similarity of the recovery rate might be due to the participants socio-demographic chracteristics, and the health care providers who performed the CS. Moreover, the hospitals are serving as a teaching institutions and lower rates of most comorbid conditions. Four years back a study conducted at the same hospital found that amongst the total mothers underwent CS, 65(11.0%) developed surgical site infection [1]. However, in our study, only 11 (3%) of women were developed surgical site infection. This shows the progress of quality service delivery of the hospital.

On the other hand, our study found that the median (IQR) time of recovery-time was 2.00 (2,3) days. This is corroborated by studies conducted outside Ethiopia, where the avarage of the women were discharged within 2 days [13, 17]. However, the finding of this study was inconsistent with other study conducted in Ethiopia: Butajira and Attat hospitals where the mean recovery time was 3.27 [12] and a study conducted in 30 low and mid-income countries showed that the mean (± SD) hospitalization after cesarean section was 5.9 (± 3.4) days in the studied localities [18]. This implies that, the study hospital has an improved and quality of pre, intra and post-operative services which help the women to recover early. Moreover, all the women underwent CS at the study hospital were discharged alive; this indicates that the quality of the procedure was at optimal level.

In this study we used Log-rank test to see the patterns of time-to-recovery after CS for selected variables. We found that the mean time-to-recovery among women whose age were ≤ 30 and ≥ 31 years was 2.75 and 5.69 days respectively (Log rank test = 11.357,P = 0.001). The same finding was reported by different

studies where younger women were discharged earlier [3, 11, 17, 18]. This might be due to the fact that, an increased age has been associated with different comorbidities which affects the length of stay at hospital. Similarly women who had had and had not had chronic disease had statistically significant difference in the recovery times (Log-rank test = 12.445, $P < 0.001$). This result is supported by different studies; the hospital stay of women with complications and comorbidities was longer [1, 15, 17, 18]. This is due to the reason that women with complications and/or with co-morbities needs additional service for the mnagement. So, this might prolongs her length of stay at hospital. Moreover, the study hospital is serving as referral for the surrounding and adjacent woredas and zones of Oromia region and Gedio Zones catchment populations. This could over estimated the number of complicated mothers.

Our study revelaed that the women who have discharge from the wound site had 87% reduced recovery time than those women who did not have dischagre from the wound site (AHR = 0.13, 95%, CI: 0.03–0.56). This finding is supported by studies conducted in Ethiopia [1, 11]. Another study conducted in England found that women undergoing CS are at higher risk of developing postnatal infection and this makes the recovery time longer [4]. Evidence suggested that the occurrence of surgical site infection is expected to increase as the incidence of CS increases [9]. The magnitude of wound infection (2.9%) found in this study hospital is comparable to the global guidelines for prevention of surgical infection (2.9%) following cesarean section delivery [6]. This implies improvements in hygiene conditions, antibiotic prophylaxis, sterile procedures, and other practices in our study hospital. However, still women undergoing a CS had better to be equipped with pertinent information on how to keep the surgical site clean, post-operative recovery and infection prevention advices.

Use of ANC designed to guide and support women on the mode of birth after a primary caesarean delivery have been found to be advantageous [19]. Accordingly, our study found that, women who had ANC follow-up were 1.5 times more likely to recover early as compared to thier counter parts (AHR = 1.49, 95%, CI: 1.05–2.10). This result is by supported another study that reported, ANC and correctly indicated CS can positively impact on health outcomes of the mother [20].

The possible reason might be due to the that fact that during ANC follow-up women's with a previous caesarean birth, chronic diseases and women with pregnancy related complications could be identified and decision for mode of birth could be agreed upon by the woman preference.

This study has added weight to the existing literature by quantifying the time-to-recovery following cesarean section delivery; as a result it could be used as an input for policymakers and health program developers on maternal health services. Nevertheless, the findings from this study would be difficult to infer to the wider population, because the study was hospital, HUCSH is tertiary type of hospital which is serving as a teaching institution for different disciplines including specialties. So this might positively affect the quality of the services given to the mothers unlike that of the general and primary hospitals where scare obstetrics and gynecologist found. Moreover, the sample were relatively small, some of the variable, such as qualification of person performed the CS, type of health facility where the CS performed as we have included the referral cases were not assessed.

Conclusions

The rate of early recovery and the median (IQR) time of recovery obtained by this study are comparable to the global level figures. The overall incidence density rate (IDR) of recovery in the cohort was 0.34 per Person-days or 2.38 per person-week. Women who had ANC follow-up and discharge from the wound site were identified as a positive and negative predictors of time-to- recovery after CS delivery respectively. The HUCSH Obestetrics and gynecology department should stress on women undergone CS want more information on what constitutes a ‘normal’ post-operative recovery and keeps the cleanness of the surgical site to prevent the incidence of postsurgical site infection which is the major predictor for time-to-recovery after CS delivery. The STROBE guideline was used to ensure the reporting of this cross-sectional study

Abbreviations

ACOG: American College of Obstetrician and Gynecologists

AHR: Adjusted Hazard Ratio

BMI: Body Mass Index

CDs: Cesarean Delivery

CI: Confidence Intervals

CHR Crude Hazard Ratio

CS: Cesarean Section

HIV Human Immune Deficiency Virus

HUCSH: Hawassa University Comprehensive Specialized Hospital

IQR Inter Quartile Range

PROM: Pre-mature Rapture of Membrane

SPSS: Statistical Package for Social Science

SSI: Surgical Site Infection

WHO: World Health Organization

Declarations

Ethics approval and consent to participate

Ethical approval was obtained from the Institutional Review Board of Pharma College, School of graduate studies department of Public Health. Additional official letter of corroborate was also obtained from HUCSH Chief executive Office. All the participants were approached immediate to delivery by the data collectors and invited to participate in the study voluntarily and took informed verbal consent from each mother before data collection. The ethical review committee had approved our verbal consent procedure. No human participants under the age of 18 years were included in this study as a result no informed consent were obtained from a parent and/or legal guardian. Moreover, information regarding any specific personal identifiers like name of the participants was not collected and also confidentiality of any personal information were also maintained. All methods were performed in accordance with the relevant ethical guidelines and regulations.

Consent for publication

“Not applicable”

Availability of data and materials

Data essential for the conclusion are included in this manuscript. Additional data can be obtained from the corresponding author on a reasonable request.

Competing interests

"The authors declare that they have no competing interests"

Funding

Pharma College has funded the research. The funding institution had no part in study design, information gathering, and analysis, judgment to publish, or development of the manuscript.

Authors' contributions

AF RZ DH conceptualized the paper, conducted the data collection process, and analyzed the data. AF wrote the draft of the manuscript. AF RZ, HB, WS DH, revised and edited the manuscript draft. All authors read and approved the final manuscript.

Acknowledgements

We would like to acknowledge Hawassa University Comprehensive Specialized Hospital for permitting us to undertake this study. We are also grateful for Pharma College Hawassa Campus for the financial

support of the study. Our thanks also go to our study participants, data collectors, supervisors and those who were actively participated in our study.

References

1. WHO recommendations non-clinical interventions to reduce unnecessary caesarean sections. 2018, World Health Organization
2. WHO Statement on Caesarean Section Rates. 2015, World Health Organization Avenue Appia 20, CH-1211 Geneva 27, Switzerland.
3. Deaths from caesarean sections 100 times higher in developing countries: global study Outcomes for women " far worse " than expected. 2019 [cited 2021 March 20]; Available from: https://www.who.int/reproductivehealth/death-from-caesarean-sections/en/.
4. Weckesser, A., et al., Women's perspectives on caesarean section recovery, infection and the PREPS trial: a qualitative pilot study. BMC Pregnancy and Childbirth, 2019. **19**(245).
5. Halil, H.M., et al., Predictors of Cesarean Section among Women Delivered at Durame General Hospital, Southern Ethiopia. Journal of Women's Health Care, 2020. **9**(482).
6. Global guidelines for the prevention of surgical site infection, second edition. 2018, World Health Organization Geneva.
7. Patel, S., et al., Obstetric and perinatal outcome in previous one cesarean section. Int J Reprod Contracept Obstet Gynecol. www.ijrcog.org, 2016. **5**(9): p. 3141-3146.
8. Begum, T., et al., Indications and determinants of caesarean section delivery: Evidence from a population- based study in Matlab, Bangladesh. PLoS ONE 2017. **12**(11).
9. Zuarez-Easton, S., et al., Postcesarean wound infection: prevalence, impact, prevention, and management challenges. International Journal of Women's Health, 2017. **9**: p. 81-88.
10. Wodajo, S., M. Belayneh, and S. Gebremedhin, Magnitude and Factors Associated With Post-Cesarean Surgical Site Infection at Hawassa University Teaching and Referral Hospital, Southern Ethiopia: A Cross-sectional Study. Ethiopian Journal of Health Sciences May 2017. **27**(3).
11. Lijaemiro, H., S.B. Lemlem, and J.T. Deressa, Incidence of Surgical Site Infection and Factors Associated among Cesarean Deliveries in Selected Government Hospitals in Addis Ababa, Ethiopia, 2019. Hindawi Obstetrics and Gynecology International, 2020.
12. Lamada, K.L., et al. Time to recovery after cesarean section delivery and its predictors in Butajira and Attat hospitals, south Ethiopia: a prospective cohort study in Impacts of Climate Change on Public Health: Ethiopia's Challenge in the 21st Century. 2019. Adama: Ethiopian Public Health Association (EPHA).
13. Jerome J. Federspiel, unitha C. Suresh, and L.M. Szymanski, Hospitalization Duration Following Uncomplicated Cesarean Delivery: Predictors, Facility Variation, and Outcomes. AJP Rep. , Apr, 2020 **10**(2).
14. Fikrie, A., Alemayehu A, and Gebremedhin S., Treatment outcomes and factors affecting time-to-recovery from severe acute malnutrition in 6–59 months old children admitted to a stabilization center

in Southern Ethiopia: A retrospective cohort study. Italian Journal of Pediatrics, 2019. **45**(46): p. 2-9.

15. Cegolon, L., et al., Length of stay following cesarean sections: A population based study in the Friuli Venezia Giulia region (North-Eastern Italy), 2005-2015. PLoS ONE, 2019. **14**(2).
16. Kumar, P. and P. Dhillon, Length of stay after childbirth in India: a comparative study of public and private health institutions. BMC Pregnancy and Childbirth, 2020. **20**(181).
17. Pereiral, S.L., et al., Factors associated with the length of hospital stay of women undergoing cesarean section. Rev Saude Publica, 2019. **53**(65).
18. Campbell, O.M.R., et al., Length of Stay After Childbirth in 92 Countries and Associated Factors in 30 Low- and Middle-Income Countries: Compilation of Reported Data and a Cross-sectional Analysis from Nationally Representative Surveys. PLoS Med 2015. **13**(3).
19. Gupta, J., G. Smith, and M.R. Chodankar, Birth After Previous Caesarean Birth. Green-top Guideline No. 45. October 2015, Royal College of Obstetricians and Gynaecologists. p. 31.
20. Barros, A.J., et al., Antenatal care and caesarean sections: trends and inequalities in four population-based birth cohorts in Pelotas, Brazil, 1982–2015. International Journal of Epidemiology, 2019. **48**(1).