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ORIGINAL RESEARCH

An Analysis of the Rate, Indications, and Associated Maternal Mortality for Cesarean Sections at a Tertiary Care Hospital, First Report from Somalia

Ahmed Issak Hussein[1], Sabri Kurtay[1], Abdikarim Ali Omar[1], Abdisalam Abdullahi Yusuf[2], Rahma Yusuf Haji Mohamud[1]

[1]Obstetrics and Gynecology department, Mogadishu Somalia Turkish Training and Research Hospital, Mogadishu, Somalia; [2]Pediatric Department, Mogadishu Somalia Turkish Training and Research Hospital, Mogadishu, Somalia

Correspondence: Ahmed Issak Hussein, Mogadishu Somalia Turkish Training and Research Hospital, Mogadishu, Somalia, Tel +252615597479, Email daacat100@gmail.com

Background: There has been an increase in worldwide cesarean section rates, although they remain low in most Sub-Saharan African countries, including Somalia. The present is the first hospital-based study that analyzes the rate, indications, and associated maternal mortality of cesarean deliveries reported from Somalia.

Methods: This retrospective study reviewed data of all deliveries from 2015 to 2021 using electronic medical records in the hospital information system. Retrieved data include baseline demographic characteristics, mode of delivery, indications and the type of cesarean section, and the documented maternal mortality during the study period.

Results: During seven years, there were 12,540 total deliveries. Among these, 2703 were cesarean sections giving an overall cesarean section rate of 21.6%. The mean age of the patients was 26.7±7.3 years [14–44 years]. Multiparous mothers constituted 67.7% during the study period. According to cesarean deliveries, nulliparous mothers (55.7%) underwent the maximum number of cesarean sections. Emergency cesarean section was the predominant intervention compared to elective C-sections (59.2% vs 40.8%). Primary CS was the most common predominant, while repeat CS increased timely, 77.7% vs 22.3%, respectively. Overall, previous C-sections and fetal distress were the two most common indications for cesarean delivery (22.3% and 22.1%), respectively. C-sections were predominant in women of younger age, Primiparity, having term deliveries, and did not receive regular antenatal care. The maternal mortality rate was 1.7%, and 61% was due to direct obstetric hemorrhage, including postpartum hemorrhage, Placenta abruption, and uterine rupture.

Conclusion: The study findings showed a slight increase in cesarean delivery rates during the study period. This rate is higher than the 10–15% recommended by the WHO in developing countries. Policies and efforts to decrease unnecessary cesarean sections should be promoted and implemented at each health facility.

Keywords: cesarean delivery, indications, maternal mortality, Sub-Saharan Africa

Introduction

While most pregnancies and births are uneventful, all pregnancies are at risk.[1] Around 15% of all pregnant women will develop a potentially life-threatening complication that calls for skilled care; some will require significant obstetrical intervention to survive.

Cesarean section is a significant obstetric procedure used to save the lives of mothers and their infants from potentially fatal pregnancy and childbirth complications.[2] There has been an increase in worldwide cesarean section rates, although they remain low in most African nations.[3] Despite a global increase in rates, the cesarean delivery rate in Sub-Saharan Africa remains stable at around 3.5%.[4] However, the number of C-sections performed in private hospitals has risen in almost every country compared to public healthcare settings, including sub-Saharan Africa.[3,5]

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Unnecessary Cesarean section may increase maternal, neonatal, and infant morbidity and mortality.[2] Furthermore, this increasing caseation rate is a significant public health problem because it increases the health risks for mothers and babies as well as the costs of health care compared with normal delivery, particularly in low and middle-income countries.[6] Non-medical indications account for one-third of the total 18.5 million C-sections performed annually, contributing significantly to the global excess of C-sections. This very high C-section rate in the world necessitates monitoring all C-section indications in public and private facilities.[2] Compared to women who have a vaginal delivery, the risk of pregnancy-related morbidity and mortality is significantly higher for women who have a Caesarean delivery, according to a report by the American College of Obstetricians and Gynecologists (9.2 deaths per 100,000 live births for vaginal deliveries vs 35.9 deaths per 100,000 live births for cesarean deliveries, respectively).[7] The World Health Organization considers Cesarean section rates of 5–15% the optimal range for targeted provision of this life-saving intervention for mothers and infants.[8]

In resource-limited settings, however, access to safe Cesarean sections is much lower, with estimates ranging from 1–2% in Sub-Saharan African countries.[8] Even though not all caesareans are life-saving, cesarean rates of less than 1% indicate an unmet need for potentially life-saving care.[9]

There have been no studies regarding the rate, indications, and maternal mortality rate for cesarean delivery reported from Somalia. Therefore, this study aimed to analyze the rate, indications and associated maternal mortality rate of cesarean section deliveries over seven years at an only tertiary care hospital in Somalia, which serves a diverse urban and rural population in the country.

Materials and Methods

This retrospective study reviewed and analyzed data of all deliveries at Mogadishu Somali Turkish Training and Research Hospital, a referral teaching and training hospital in Mogadishu, Somalia, from January 2015 to December 2021, using labor ward records and electronic medical records in the hospital information system (HIS).

The Mogadishu Somalia Turkish Training and Research Hospital Clinical Research Ethics Committee were approved for this study (approval number MSTH/7892). In addition, all study participants and a parent of participants under 18 years of age previously consented to use their medical and surgical data in this study. This study was carried out in accordance with the Helsinki Declaration's contents.

Over seven years, all women who gave birth vaginally or underwent a Cesarean section were included in this study. All Cesarean sections were performed according to established peri-operative protocols. 106 Patients with incomplete data were excluded from the study.

Retrieved data include baseline demographic characteristics such as age, gravity, parity, gestational weeks, mode of delivery, indications for cesarean delivery, the type of cesarean section (Elective or Emergency), and the documented maternal mortality during the study period.

Cesarean section indications were classified as follows: previous cesarean section, fetal distress, prolonged labor, pre-eclampsia, eclampsia, antepartum hemorrhage (placenta Previa or placental abruption), cephalopelvic disproportion, macrosomia, malpresentation (breech, transverse lie, face presentation, arm prolapse), multiple gestations (twins/triplets), cord prolapse, and others. Pregnant mothers with previous uterine surgeries (ie, myomectomy), history of previous traditional cervical cauterizations, those with severe cardiac diseases, fetuses with congenital anomalies such as severe hydrocephaly, and mothers with bad obstetric history are included in other indications.

Obstetric ultrasound and cardiotocography (CTG) machines were used to diagnose maternal and fetal indications such as fetal distress, placenta Previa and abruption, fetal macrosomia, and multiple births. Maternal indications are defined as maternal conditions that could complicate delivery. Fetal distress was defined on cardiotocography (CTG) alone in our setting.

A combination of obstetric ultrasound and vaginal examination by an obstetrician assessing head descent into the pelvic brim before labor was used to diagnose cephalopelvic disproportion.

Statistical analyses were used in the Statistical Package for Social Sciences (SPSS -IBM, Armonk, NY, USA) for Windows, version 26. Data were analyzed using univariate descriptive statistics. The frequencies and percentages, as well as the mean (SD), were presented. Numerical variables were first test for assumption of normality with Shapiro–

Wilk test. Binary logistic regression was applied to assess the association between categorical variables and the Cesarean section.

Results

Description of the Study Population

During a 7-year period, there were 12,540 total deliveries. Among these, 2703 were cesarean sections. The mean age of the patients was 26.7±7.3 years [14–44 years]. Most patients were between 20 and 30 years of age (51.3%), followed by the 31–40 years group, who accounted for 36.5%. According to parity, overall deliveries, multiparous mothers constituted 67.7% during the study period. Regarding gestational weeks, 78.6% of deliveries were term, while 21.4% were preterm deliveries. Regarding antenatal visits (ANC), most patients (n=8665, 69%) were unbooked. Table 1 displays the demographic characteristics of the patients.

The Rate of Cesarean Sections, Including a Time Trend

Out of 12,540 deliveries, 2703 were cesarean sections giving an overall cesarean section rate of 21.6%. According to cesarean deliveries, primiparous mothers (55.7%) underwent the maximum number of cesarean sections. Emergency cesarean section was the predominant intervention compared to elective cesarean sections (59.2% vs 40.8%). According to the mode of cesarean sections, primary CS was the most common predominant, while repeat CS increased timely, 77.7% vs 22.3%, respectively.

There were no significant differences in Cesarean section rates over the years during the study period, with the highest C-section performed in 2018 (23.5%) and the lowest C-section performed in 2016 (16.1%) (Figure 1).

Indications for Cesarean Sections

Our cohort analyzed the documented indications for all cesarean sections. Overall, previous cesarean section and fetal distress were the two most common reasons for cesarean delivery (22.3% and 22.1%), respectively. Other indications are listed in Table 1. The five leading causes of maternal indications include previous cesarean sections (22.3%), severe pre-eclampsia (8.7%), prolonged labor (5.8%), Cephalopelvic disproportion (5.8%), and eclampsia (5.3%).

Table 1 Demographic Characteristics and C-Section Indications of the Study Population

Variables		Frequency	Percent
Age Group	<20 years	1225	9.8
	20–30	6441	51.3
	31–40	4576	36.5
	>40	298	2.4
Parity	Primapara	4051	32.3
	Multipara	8489	67.7
Gestational weeks	Preterm	2687	21.4
	Term	9853	78.6
Antenatal visits	Booked	3875	30.9
	Un booked	8665	69.1
Mode of delivery	Normal delivery	9837	78.4
	C-section	2703	21.6

(*Continued*)

Table 1 (Continued).

Variables		Frequency	Percent
Type of C-section	Elective	1104	40.8
	Emergency	1599	59.2
C-section indications	Previous C-section	604	22.3
	Fetal distress	598	22.1
	Preeclampsia	235	8.70
	Malpresentation	185	6.84
	CPD	157	5.81
	Prolonged labor	156	5.77
	Eclampsia	144	5.33
	Macrosomia	119	4.40
	Multiple gestation	114	4.22
	Placenta abruption	106	3.92
	Uterine rupture	104	3.85
	Placenta previa	88	3.26
	Cord prolapse	11	0.41
	Others*	82	3.03

Notes: *Others, Pregnant mothers with previous uterine surgeries (ie, myomectomy), mothers with severe traditional cervical cauterization, those with severe cardiac diseases, fetuses with congenital anomalies such as severe hydrocephaly, and mothers with bad obstetric history are included in other indications.

Major fetal indications include fetal distress (22.1%), Malpresentation (6.8%), Macrosomia (4.4%), and Multiple gestations (4.2%).

A significant proportion of cesarean sections was performed due to hypertensive diseases of pregnancy, especially severe Preeclampsia and Eclampsia (n=235, 8.7%, n=144, 5.3%), respectively. 314 (83%) of these cases were young Primigravida mothers under 30 years old.

Determinants of Cesarean Sections

Maternal age, parity, gestational weeks, and antenatal visits were significantly associated with the mode of delivery (Normal delivery vs C-sections). The majority of women who gave birth via cesarean section were under 30 years old, primiparous, had term births, and did not receive regular antenatal care. In binary logistic regression analysis, women with maternal age of less than 30 were four and a half times more likely to deliver by cesarean section compared to women over 30 years of age (OR, 4.31; 95% Cl, 3.74–4.98). Similarly, primiparous mothers were three and a half times more likely to deliver by cesarean section compared to multiparous women (OR, 3.59; 95% Cl, 3.29–3.93). According to gestational age, Women with preterm fetuses (<37 weeks) were 90% less likely to undergo C-section (OR, 0.24; 95% Cl, 0.20–0.28) than women with term fetuses. In addition, regarding the antenatal visit, unbooked women were two times more likely to deliver by Cesarean section compared to booked mothers (OR, 2.15; 95% Cl, 1.94–2.39) (Table 2).

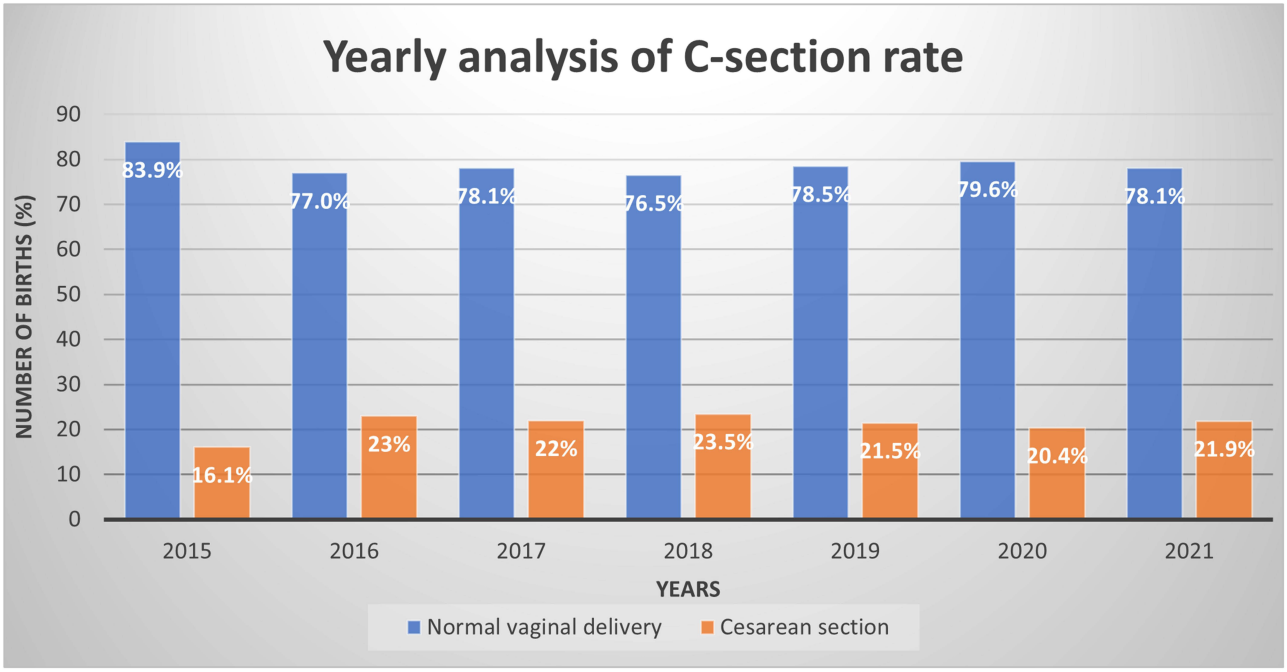

Figure 1 Yearly analysis of cesarean section trend.

Maternal Mortality

Our cohort revealed a significantly higher maternal mortality rate of about 1.7% (n=216) during the study period. Of 216 maternal deaths, 132 (61%) were due to direct obstetric hemorrhage, including postpartum hemorrhage (n=83, 38.4%), Placenta abruption (n=24, 11.1%), and uterine rupture (n=18, 8.3%). Detailed underlying causes of maternal mortality are shown in (Table 3).

Discussion

Cesarean section can significantly reduce maternal and perinatal mortality in appropriate circumstances and should be universally accessible.[23] Despite the significant increase in the CS rate worldwide, inadequate access to CS is still a major issue in most Sub-Saharan African countries, including Somalia.[10–12] The present is the first hospital-based study

Table 2 Determinants of Cesarean Section

Variables	Cesarean Delivery % n=2703	Odd Ratio	95% CI
Maternal age (in years)			
≤30	77.6%	4.31	3.74–4.98
>30	22.4%		
Parity			
Primapara	55.7%	3.59	3.34–3.93
Multipara	44.3%		
Gestational weeks			
Preterm (<37)	7.4%	0.24	0.20–0.28
Term(≥37 weeks)	92.6%		

(*Continued*)

Table 2 (Continued).

Variables	Cesarean Delivery % n=2703	Odd Ratio	95% CI
Antenatal visits			
Booked	39.6%	2.15	1.94–2.39
Unbooked	60.4%		
Type of Cesarean section			
Elective	40.8%	1.76	1.73–1.78
Emergency	59.2%		

Abbreviation: CI, Confidence interval.

Table 3 Maternal Mortality Rate

Underlying Causes of Maternal Mortality	Total n= 216	Percentage%
Direct:		
Hemorrhage		
• PPH	83	(38.4%)
• Placenta abruption	24	(11.1%)
• Uterine rupture	18	(8.3%)
• Placenta Previa	7	(3.2)
Hypertension in pregnancy		
• Eclampsia	28	(13%)
• Hellp syndrome	17	(7.9%)
Maternal sepsis	19	(8.8%)
Indirect:		
• Anemia	9	(4.2%)
• Postpartum Cardiomyopathy	11	(5.1%)
Total	**216**	**100%**

that examines the rate, indications, and associated maternal mortality of cesarean deliveries over seven years reported from Somalia. The cesarean section rate of 21.6% observed in the present study is higher than the rate of 10–15% recommended by the WHO in developing countries.[13] According to the 2020 Somalia Demographic and Health Survey, the percentage of women who delivered babies by cesarean sections was 2% in a population-based study.[4,9] The higher CS rate reported in the present study shows that our hospital is the only referral serving a diverse urban and rural population that usually receives complicated cases, although most births occur at home. Therefore, a much higher incidence of emergency cesarean section is observed compared to elective cesarean section.

A systematic review across 34 SSA countries by Yaya S and associates reported a high prevalence of Caesarean sections in private hospitals compared to public healthcare facilities, with an overall C-section rate of 7.9% in public hospitals and 12.3% in private hospitals, with the highest rate seen in Rwanda about 64.2%.[15] Another systematic review and meta-analysis from Ethiopia included 23 cross-sectional studies of 36,705 patients conducted by Gedefaw et al reported an overall pooled Caesarean section rate of 29.55%, which is higher than the rate reported in our study.[7]

Previous CS is a significant indication of CS worldwide.[13] In our study, previous Caesarean section and fetal distress were the two main indications for Caesarean deliveries. These findings are supported by a study by Penn Z, exploring that 30% of C-sections in developed countries were for repeat Caesarean sections.[16] Another study in Bangladesh reported that 35% of Caesarean sections were repeated C-sections in governmental hospitals.[17] Another review study by Mahadik K found that previous cesarean delivery contributes to rising rates as per evidence from the literature review in

the last five years.[18] Between 2012 and 2016, the proportion of live births to women with a previous CS increased from 10% to 18% in China, and Brazil reached 27% in 2015. The WHO multi-country studies found a significant proportion of women with a history of CS. Previous CS significantly influences increased CS use, highlighting socioeconomic and other inequalities.[5] The American College of Obstetricians and Gynecologists have pointed out that a previous Caesarean section should not be an indication in the absence of any obstetric emergencies.[2] In Somalia, most women with prior Caesarean section try normal vaginal delivery at home or at centers for birth attendants in the hands of untrained midwives, which significantly increases the risk of complications, including uterine rupture, and accompanied catastrophes treated with repeat surgery. However, adopting the policy of trial vaginal delivery after a previous cesarean is essential to reduce high CS rates.

Fetal distress was identified as the second leading cause of Caesarean section in this study. This result aligns with the previously reported studies.[19–21] This might be due to the availability, reliance, and use of electronic fetal monitoring, a well-equipped neonatal intensive care unit, increased misoprostol tab (Cytotec) for labor induction, and meconium-stained liquor. To avoid performing too many cesarean sections for fetal distress, excellent care, clinical expertise, and knowledge should be used but not delay intervention for a truly compromised fetus.

Due to decades of civil war in Somalia, many health indicators are abysmal.[22] According to the Maternal Mortality Estimation Inter-agency Group for Somalia, the MMR in Somalia has reduced from 732 in 2015 to 692 in 2020. Even though this is a reduction, it remains high compared to rates in neighboring countries, such as Kenya (362 per 100,000), Ethiopia (412 per 100,000), and Uganda (336 per 100,000).[14] In our study, Two-thirds of MMR were due to direct obstetric hemorrhage, including postpartum hemorrhage, Placenta abruption, and uterine rupture. Trial of labor after previous uterine scar at home, late arrival, and delay of intervention caused by waiting family decisions contributed the most to uterine rupture cases.[26,27]

Severe Preeclampsia and eclampsia were associated with high maternal morbidity and mortality in our study. A recent study by Omar et al[28] revealed that Preeclampsia -eclampsia was the most common cause of postpartum acute kidney injury in Somalia. This might be due to a lack of antenatal care, harmful socio-cultural beliefs, and late referrals.[24,25] Therefore, health education, antenatal care, early diagnosis, and prompt referrals need to be improved in Somalia.

This study has certain limitations, including its hospital-based study, and the results may not be generalizable for the whole of Somalia. In addition, the study did not provide data regarding perinatal outcomes. Besides the limitations, the present is the first study that analyses the rate, indications, and associated maternal mortality of cesarean deliveries reported from Somalia.

Conclusion

The study findings showed a slight increase in cesarean delivery rates during the study period. This rate is higher than the 10–15% recommended by the WHO in developing countries. Repeat C-sections and fetal distress were the two most common indications of C-sections in our settings; therefore, reduction of primary C-sections should be given priority, and effective clinical interventions for reducing the primary C-section rate and its associated complications are essential. The data presented in this study can increase the awareness of the maternal care concern among the public and policy-makers, leading to a broad basis of support for the necessary steps to improve reproductive health in Somalia.

Abbreviations

ANC, Antenatal care. CS, Cesarean section; CTG, Cardiotocography; MMR, Maternal Mortality Rate; PPH, Postpartum Hemorrhage; SSA, Sub-Saharan Africa; WHO, World Health Organization.

Data Sharing Statement

Data included in the manuscript.

Institutional Review Board Statement

The Mogadishu Somalia Turkish Training and Research Hospital Clinical Research Ethics Committee were approved for this study (approval number MSTH/7892). All methods were performed in accordance with the relevant guidelines and regulations.

Informed Consent Statement

All study participants and a parent of participants under 18 years of age previously consented to use their medical and surgical data in this study.

Author Contributions

All authors made a significant contribution to the work reported, whether that is in the conception, study design, execution, acquisition of data, analysis and interpretation, or in all these areas; took part in drafting, revising or critically reviewing the article; gave final approval of the version to be published; have agreed on the journal to which the article has been submitted; and agree to be accountable for all aspects of the work.

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Disclosure

The authors report no conflicts of interest in this work.

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