BMJ Open

Length of hospital stays after caesarean section delivery and associated factors in Northeast Ethiopia: a cross-sectional study

Segenet Zewdie [1], Bereket Kefale,[2] Melaku Yalew [3], Bezawit Adane [3], Assefa Andargie Kassa [3]

To cite: Zewdie S, Kefale B, Yalew M, *et al*. Length of hospital stays after caesarean section delivery and associated factors in Northeast Ethiopia: a cross-sectional study. *BMJ Open* 2025;**15**:e083357. doi:10.1136/bmjopen-2023-083357

► Prepublication history and additional supplemental material for this paper are available online. To view these files, please visit the journal online (https://doi.org/10.1136/bmjopen-2023-083357).

Received 19 December 2023
Accepted 05 February 2025

[1]Department of Pharmacy, Injibara University, Injibara, Ethiopia
[2]Department of Public Health, Wollo University, Dessie, Ethiopia
[3]Department of Public Health, Injibara University, Injibara, Ethiopia

Correspondence to
Dr Segenet Zewdie;
segenetzewdie@gmail.com

ABSTRACT

Objective This study aimed to assess the length of hospital stay after caesarean delivery and the associated factors from 15 March to 15 May 2021.

Design We conducted an institution-based, cross-sectional study.

Setting The study was conducted at a government hospital in Northeast Ethiopia.

Participants The study was conducted among 405 mothers who delivered by caesarean section. All mothers who delivered by caesarean section at the hospital during the study period and who consented to participate were included in the study.

Primary and secondary outcome The primary outcome of this study was length of hospital stay following caesarean section delivery. The secondary outcomes were factors associated with length of hospital stay.

Results The overall mean length of hospital stay after caesarean delivery was 2.81 (±1.72) days. Gestational age at birth less than 38 weeks (B=0.547), being hypertensive (B=1.235) and having postoperative complications (B=0.909) were significantly associated with length of hospital stay following caesarean delivery at a 0.05 level of significance.

Conclusion In this study, the mean length of hospital stay following caesarean delivery was 2.8 days. Women with hypertension, gestational age at birth less than 38 weeks and postoperative complications have prolonged length of hospital stay. Healthcare professionals should identify those mothers at risk of prolonged length of hospital stay following caesarean delivery and implement preventive strategies to reduce the clinical as well as economic burden posed by prolonged length of hospital stay. Moreover, researchers should conduct further multicentre longitudinal follow-up studies.

STRENGTHS AND LIMITATIONS OF THIS STUDY

⇒ The study used multiple data sources (interviews, chart reviews and follow-up), ensuring a well-rounded and validated data set.
⇒ The study included a relatively adequate sample size for an institution-based study, improving the reliability of the findings.
⇒ The study was conducted at a single government institution and therefore may not be representative and may lack generalisability.
⇒ Some of the data were collected through interviews, potentially affected by recall bias.
⇒ The study includes a limited number of variables, which may increase the risk of confounding.

INTRODUCTION

Maternal mortality reduction has been the primary priority on development and health agendas. Ensuring health and encouraging well-being for all is the focus of the third Sustainable Development Goal (SDG). The first objective under this goal is to bring the global rate of maternal death down to less than 70 per 100 000 live births.[1] Improving the quality, accessibility, availability and utilisation of services for the treatment of issues that emerge during pregnancy and childbirth is one strategy to lower the rate of maternal mortality.[2]

During the postpartum period, the mother is monitored for bleeding, bowel and bladder function and baby care. The mother is also assisted in her recuperation following labour and delivery, which is a demanding and stressful experience that is frequently linked to uncomfortable tests and medical treatments. Additionally, the baby's health is observed.[3 4]

According to *Mosby's Medical Dictionary*, the length of stay (LOS) is the amount of time a patient spends as an inpatient in a hospital or other healthcare facility.[5] Hospital LOS is one of the most significant and straightforward indicators widely used today.[6] It is an important measure of healthcare utilisation and a determinant of hospitalisation costs.[7] This indicator is employed for several purposes, such as hospital planning, quality control, administration of hospital care and appropriate utilisation of hospital services.[6]

As evidenced by the WHO, caesarean sections save the lives of mothers and their babies, but only when they are required for clearly defined medical conditions. Higher than 10% caesarean section rates are not linked to lower rates of maternal and neonatal death at the population level. Caesarean sections can result in serious, even irreversible problems, disability or even death, especially in low-income settings where adequate resources for safe, effective surgery and management of postoperative complications are not available. Rather than aim for a particular rate, every attempt should be made to provide women in need with caesarean procedures.[8]

The typical duration of stay differs between nations, medical facilities and state of health. Pregnant women who give birth vaginally should stay in the hospital for 1 or 2 days, while those who give birth by caesarean section should stay for 3 or 4 days, according to the recommendations of the Royal College of Obstetricians and Gynaecologists.[9] Some previous studies employed the median LOS as a parameter instead of the average, because mean LOS can be distorted by a few study participants with excessively prolonged hospital stays.[10]

Prolonged length of stay (PLOS) has been identified as a risk factor for mortality.[11] Research conducted in Mexico revealed that in-hospital crude mortality in patients with PLOS nearly tripled compared with patients with normal LOS.[12] Evidence indicated that PLOS results in less patient satisfaction compared with those who have shorter LOS.[13] It also has a strong correlation with higher healthcare costs.[14]

According to WHO estimates of unit cost for patient services, a patient admitted to a tertiary care hospital in Mozambique will spend $15.46 per bed day. Similarly, it costs $9.85 per bed day in Ethiopia.[15] PLOS is associated with both younger and older maternal age,[16 17] primiparity,[16] illiteracy, low socioeconomic status and rural residency.[18 19] Preterm labour, numerous pregnancies, caesarean delivery (CD) history, pre-eclampsia, low birth weight and other obstetric problems have been linked to longer LOS.[19] Postoperative complications are also associated with LOS. Patients who experienced endometritis, ileus, wound complications and postoperative infections faced the highest risk of prolonged postpartum period and extended total LOS.[20 21] On the contrary, shorter LOS increases the risk of morbidity and mortality because it gives healthcare professionals less time to identify, diagnose or treat delivery-related problems.[22] Limited published data are available on LOS[18 19 23–25] in CD, and there is only one study conducted in sub-Saharan Africa.[25] Furthermore, the majority of previous research used self-reported secondary data extracted from a national health survey, which has the risk of recall and social desirability bias. Ethiopia is experiencing an alarming rise in the number of CD, with a prevalence of 29.55% (49.33% in 2019); however, the LOS following CD has not been given emphasis. To the best of the researchers' knowledge, no research has been done on the extent of and the contributing factors to the length of hospital stay following CD. Identifying factors affecting the length of hospital stay following CD is crucial to achieve SDG Target 3.1 and promote maternal health outcomes, as adequate postnatal care is determined by length of hospitalisation.[26 27] In addition, the study can inform targeted interventions that can promote adequate length of hospital stay of mothers following CD. Lastly, the findings of this study can be used as additional evidence for researchers who need to conduct further investigations. Therefore, the study aimed to assess the length of hospital stay and the associated factors after CD at Dessie Comprehensive Specialized Hospital.

METHODS

Study design

An institution-based, cross-sectional study was conducted from 15 March to 15 May 2021.

Study setting

The study was conducted at Dessie Comprehensive Specialized Hospital, which is located in Dessie Town, from 15 March to 15 May 2021. On average, more than 200 mothers deliver by caesarean section monthly in this hospital. Dessie is the centre of South Wollo Zone, located 401 km away from Addis Ababa, the capital city of Ethiopia, and 480 km away from Bahir Dar, the administrative centre of Amhara Region.

Data collection procedures and quality control

Data were collected using pretested, structured Amharic version questionnaire adapted from previous studies[18 28] through interviews, chart reviews and follow-up. Four data collectors collected the data, under the supervision of a designated supervisor. The data collectors and the supervisor were midwives. A qualified translator was also recruited. The questionnaire was developed in English, then translated to Amharic language and again translated back to English to ensure consistency. Data collectors and the supervisor were trained for 2 days on the objective of the study, the content of the questionnaire and the data collection procedure. Data were pretested on 5% of the total sample size at Boru Meda Hospital. Based on the feedback obtained from the pretest, necessary modifications were performed. During the study period, the collected data were checked continuously on a daily basis for completeness.

Participants

All mothers who delivered at Dessie Comprehensive Specialized Hospital by caesarean section were the source population, and mothers who delivered by caesarean section during the study period (from 15 March 2021 to 15 May 2021) were the study population. The study participants were prospectively followed from delivery until discharge.

All mothers who delivered at Dessie Comprehensive Specialized Hospital by caesarean section during the

Table 1 Sociodemographic characteristics of the mothers who delivered by caesarean section at Dessie Comprehensive Specialized Hospital in 2021

Variables	Category	Frequency	%
Age	20–24	94	23.2
	25–29	183	45.2
	30–34	87	21.5
	35–39	41	10.1
Residence	Urban	312	77.0
	Rural	93	23.0
Occupation	Housewife	236	58.3
	Employee	169	41.7
Educational level	No formal education	49	12.1
	Primary education	76	18.8
	Secondary education	113	27.9
	College and above	167	41.2

study period and who consented to participate were included in the study.

Sample size determination and sampling procedure

The sample size was determined using the single population proportion formula:

$$n = \frac{(Z_{\alpha/2})^2 \times P(1-P)}{d^2}$$

Where n is the required sample size; *Zα/2* is the standard normal distribution score at the (100-α)% confidence level (1.96 for a 95% confidence level), *P* reprents the population proportion (assumed to be 50% due to the absence of prior studies), and *d* denotes the margin of error for the population proportion, set at 0.05.

$$\frac{(1.96)^2 \times 0.5(1-0.5)}{0.0025} = 384$$

Adding a 10% non-response rate, the total sample size becomes 422.

All eligible mothers with CD at the hospital during the study period were taken consecutively.

Variables

The dependent variable was length of hospital stays in days. LOS is the number of days spent in the hospital ward following CD. It is measured as the difference between the date of discharge and the date of CD. Independent variables included sociodemographic background such as women's age, residence, educational level and occupation.

Obstetric history included parity, previous caesarean section, previous stillbirths, previous preterm births, previous abortions and previous neonatal deaths. Maternal health and healthcare factors included hypertensive disorders, fetal presentation, number of antenatal care (ANC) visits, postoperative complications and type of caesarean section. Newborn factors included gestational

Table 2 Maternal health and healthcare characteristics of the mothers who delivered by caesarean section at Dessie Comprehensive Specialized Hospital in 2021

Variables	Category	Frequency	%
Hypertensive	Yes	61	15.1
	No	344	84.9
Number of ANC visits	≤2	81	20.0
	≥3	324	80.0
Postoperative complications	Yes	20	4.9
	No	385	95.1
Type of caesarean section	Elective	135	33.3
	Emergency	270	66.7
Who performs caesarean section	Gynaecologist	20	4.9
	Resident gynaecologist	385	95.1

ANC, antenatal care.

Table 3 Characteristics of the newborns at Dessie Comprehensive Specialized Hospital delivered by caesarean section in 2021

Variables	Category	Frequency	%
Fetal presentation	Vertex	359	88.6
	Other*	46	11.4
Tone of pregnancy	Singleton	385	95.1
	Twin	20	4.9
Newborn live status	Yes	384	94.8
	No	21	5.2
Asphyxia	Yes	45	11.1
	No	360	88.9
ICU admission	Yes	52	12.8
	No	353	87.2
Gestational age	38	86	21.2
	≥38	319	78.8
Birth weight (g)	<2500	39	9.6
	2500–4000	335	82.7
	>4000	31	7.7
APGAR score	<7	27	6.7
	7–10	378	93.3

*Other: shoulder, breach or leg.
APGAR, appearance, pulse, grimace, activity, respiration; ICU, intensive care unit.

age, birth weight, sex of the child, parity, APGAR (appearance, pulse, grimace, activity, respiration) score at 5 min, asphyxia, intensive care unit (ICU) admission and tone of pregnancy.

Data processing and analysis

After checking the completeness of the questionnaires, data entry and analysis were performed using SPSS V.26.

Table 4 Obstetric history of the mothers who delivered by caesarean section at Dessie Comprehensive Specialized Hospital in 2021

Variables	Category	Frequency	%
Parity	1	154	38.0
	2	159	39.3
	3	56	13.8
	≥4	36	8.9
Previous caesarean section	No	172	42.5
	Yes	233	57.5
Previous stillbirth	No	375	92.6
	Yes	30	7.4
Previous neonatal deaths	No	379	93.6
	Yes	26	6.4
History of abortion	No	332	82.0
	Yes	73	18.0

Exploratory analysis was performed to check for missing values, outliers and inconsistencies. Descriptive analysis was performed and presented in texts and tables. Linear regression was used to measure the association between independent variables and the length of hospital stay after delivery by caesarean section. First, simple linear regression was performed to identify candidate variables, and finally those variables with a p value below 0.2 were fitted to multiple linear regressions. Model fitness was tested using analysis of variance and R^2 statistics. Variables with a p value below 0.05 were considered statistically significant factors. The regression coefficient (B) with its 95% CI was reported as a measure of effect size.

Patient and public involvement

None.

Consent to participate

After explaining the purpose of the study, informed written consents were obtained using preprepared information and consent form from all participants before the data collection. This consent process used plain language and involved information about the purpose of the study; the procedures to be followed; confidentiality issues; anticipated benefits and harms/discomforts that participation in the study entails, including possible publication of anonymous responses; and the voluntary nature of participation, with the full right to refuse and withdraw participation at any time.

RESULTS

Sociodemographic characteristics of the mothers

A total of 405 mothers participated in the study, resulting in a response rate of 95.8%. The age of the respondents ranged from 20 to 38, with a mean age of 27.59±4.25. Of the total participants, 312 (77%) were from urban areas and 236 (58.3%) were housewives. A total of 183 (45.2%) mothers were in the 25–29 years age group. Regarding education, 167 (41%) study participants have been educated in college and above (table 1).

Maternal health and healthcare characteristics

Of the participants, 61 (15%) were hypertensive and 324 (80%) underwent ANC three or more times during their pregnancy. About 20 (5%) participants have a postoperative complication and one-third (135, 33.3%) had an elective type of CD (table 2).

Newborn characteristics

The majority of participants, 385 (95.1%), had a singleton pregnancy, and 359 (88.6%) of the newborns had a vertex presentation. Among the newborns, 52 (12.8%) were admitted to the ICU and 39 (9.6%) were underweight (table 3).

Obstetric history

About 159 (39.3%) mothers were of parity two and 233 (57.5%) had a history of caesarean section. Majority of

Table 5 Factors associated with length of hospital stay of the mothers following caesarean delivery at Dessie Comprehensive Specialized Hospital in 2021

Variables	Category	Simple β (95% CI)	Multiple β (95% CI)	P value	Mean LOS (95% CI)
Age	20–24 (ref)				2.64 (2.46, 2.82)
	25–29	0.354 (–0.075, 0.782)	0.361 (–0.055, 0.776)	0.089	2.99 (2.68, 3.31)
	30–34	0.063 (–0.439, 0.565)	0.190 (–0.292, 0.672)	0.439	2.70 (2.34, 3.06)
	35–39	–0.004 (–0.636, 0.628)	0.236 (–0.370, 0.842)	0.444	2.63 (2.43, 2.84)
Educational level	Illiterate (ref)				2.71 (2.45, 2.98)
	Primary education	0.407 (–0.212, 1.027)	0.293 (–0.289, 0.876)	0.322	2.74 (2.53, 2.95)
	Secondary education	0.140 (–0.439, 0.719)	–0.084 (–0.628, 0.460)	0.761	2.99 (2.54, 3.44)
	College and above	0.202 (–0.348, 0.752)	0.056 (–0.457, 0.569)	0.830	2.75 (2.51, 3.00)
ANC visits	≤2 (ref)				3.17 (2.59, 3.75)
	≥3	0.452 (0.034, 0.870)	0.177 (–0.256, 0.610)	0.422	2.72 (2.57, 2.87)
Gestational age in weeks	<38	1.015 (0.616, 1.414)	0.547 (0.089, 1.005)	0.019*	3.61 (2.91, 4.31)
	≥38 (ref)				2.60 (2.50, 2.69)
Hypertensive	No (ref)				2.58 (2.48, 2.67)
	Yes	1.535 (1.089, 1.980)	1.235 (0.761, 1.709)	0.000*	4.11 (3.18, 5.05)
Postoperative complication	No (ref)				2.76 (2.62, 2.90)
	Yes	1.040 (0.271, 1.810)	0.909 (0.176, 1.641)	0.015*	3.80 (1.61, 5.99)
History of CS	No (ref)				2.63 (2.48, 2.78)
	Yes	–0.313 (–0.652, 0.025)	–0.277 (–0.620, 0.065)	0.112	2.94 (2.67, 3.21)
Newborn survived	Yes (ref)				2.75 (2.57, 2.92)
	No	1.254 (0.506, 2.002)	0.844 (–0.616, 2.305)	0.256	4.00 (3.52, 4.48)
APGAR score	<7 (ref)				3.74 (3.28, 4.20)
	7–10	–0.996 (–1.663, –0.329)	–0.163 (–1.467, 1.142)	0.807	2.74 (2.57, 2.92)
Birth weight (kg)		–0.433 (–0.729, –0.138)	0.003 (–0.320, 0.326)	0.986	

*Significant at p≤0.05.
ANC, antenatal care; APGAR, appearance, pulse, grimace, activity, respiration; CS, caesarean section; LOS, length of stay; ref, reference category.

the study participants (375, 92.6%) had no history of stillbirth, and 379 (93.6%) had no history of neonatal death (table 4).

Length of hospital stay

The mean length of hospital stay of the mothers after CD was 2.8 days. More than half of the study participants (215, 53.1%) were discharged from the hospital within 48 hours after delivery.

Factors associated with length of hospital stay

In the simple linear regression, age, educational level, hypertension, gestational age, APGAR score, postoperative complications, birth weight, number of ANC check-up, newborn survival status and previous caesarean section were significantly associated with length of hospital stay after CD at a p value of less than 0.2. In the multiple linear regression, being hypertensive (B=1.235, p<0.000), having postoperative complications (B=0.909, p<0.015) and gestational age at birth <38 weeks (B=0.547, p<0.019) were positive predictors of length of hospital stay after CD. Length of hospital stay after CD for participants who were hypertensive increased by 1.235 days when compared with their counterparts (B=1.235; 95% CI 0.761, 1.709). In addition, the length of hospital stay after CD of mothers with postoperative complications increased by 0.909 days when compared with mothers without postoperative complications (B=0.909; 95% CI 0.176, 1.641). Similarly, compared with their counterparts, mothers whose gestational age was less than 38 weeks had longer hospital stays following CD by 0.547 days (B=0.547; 95% CI 0.089, 1.005) (table 5).

DISCUSSION

This study aimed at assessing the length of hospital stay and the associated factors among mothers with CD. The findings of this study revealed a mean length of hospital stay of 2.8 days, which is shorter than the international threshold recommended for caesarean section (4 days). This result was in line with a study from California (2.7 days)[29] and Sudan (2.7 days).[25] Furthermore, the study showed that more than half of the mothers (215, 53.1%) were discharged from the hospital within 48 hours following delivery, which is similar to a study conducted

in India.[18] However, the mean length of hospital stay of the mothers in the current study was longer than those of a previous study done in Ethiopia (1.8 days).[30] A possible explanation for this discrepancy may be that the previous study included both vaginal and caesarean deliveries, with only 9% having undergone a caesarean section. According to previous research, CDs are correlated with prolonged hospital stays.[23 30] Furthermore, the previous study was carried out with a large sample size and used self-reported secondary data extracted from a nationally representative survey; the participants' responses could be affected by social desirability and recall bias.

However, compared with studies done in India,[18] Australia,[19] Italy,[31] USA[20] and Germany,[16] where the mean length of hospital stay following CD was 8.6, 6.2, 4.7, 4.0 and 3.9 days, respectively, the mean length of hospital stay of the mothers in the current study was shorter. This discrepancy could be explained by variations in the healthcare systems, socioeconomic status of the countries, the sample size and the type of data used. Studies from India, Australia and Italy were conducted among a large sample size and using secondary data. In addition, the current investigation was carried out at a government hospital, which has been linked to a short LOS in previous research.[18 32] Furthermore, according to a previous study conducted in 30 low-income and middle-income countries, the average LOS after CD in health facilities varied from 2.5 to 9.3 days.[23]

According to the current study, hypertension, postoperative complications and gestational age at birth of less than 38 weeks were positive predictors of length of hospital stay following CD.

The current findings revealed that having hypertension was positively correlated with length of hospital stay following CD. The length of hospital stay after CD for a woman with hypertension was 1.235 days longer than their counterparts, which is in line with research from Italy,[28] Brazil[17] and Sudan.[25] The possible justification for this association is that maybe mothers with pre-eclampsia or other hypertensive disorders require prolonged hospitalisation for monitoring of blood pressure, treatment completion and promotion of health of both the woman and the newborn.[33] Even though pregnancy-related hypertension is not fully preventable, clinicians should identify those at high risk and give low-dose aspirin.[34]

Furthermore, the length of hospital stay following CD of mothers whose gestational age was less than 38 weeks increased by 0.547 days when compared with their counterparts. This finding was supported by the results of studies conducted in Italy[28] and Ethiopia.[30] The significant correlation seen between the length of hospital stay and gestational age at birth less than 38 weeks could potentially be attributed to the fact that preterm neonates are at increased risk of developing complications, requiring additional monitoring within the hospital.[35] Therefore, clinicians should identify mothers who are at risk of preterm delivery and treat them with progesterone or other preventive mechanisms.[36]

Similarly, the length of hospital stay after CD was 0.909 days longer for mothers with postoperative complications than for mothers without such complications. This finding was consistent with a study in India[18] and Sudan.[25] The positive association between the length of hospital stay following CD and postoperative complications could be attributed to the necessity for further monitoring and treatment, such as antibiotics and fluid resuscitation, for mothers experiencing complications. Therefore, in order to improve maternal and child health outcomes and lessen the burden associated with an extended hospital stay, healthcare professionals should prevent postoperative complications among mothers who deliver babies by caesarean section using adequate prophylactic medications, such as broad-spectrum antibiotics.[37 38]

Despite its strengths, this study has limitations. The current study was conducted at a single government institution which may limit the generalizability of the results. Moreover, we have included a limited number of variables, and some of the data were collected through an interview, which is potentially affected by recall bias.

This paper analyses a rarely discussed indicator, that is, LOS, in a health facility following CD. In this study, the mean length of hospital stay after CD was 2.8 days, and more than half of the mothers were discharged from the hospital within 48 hours. Women with hypertension, gestational age at birth less than 38 weeks and postoperative complications have prolonged length of hospital stay following CD. The Ministry of Health of Ethiopia in collaboration with other governmental and non-governmental organisations should give priority to the length of hospital stay following CD and aim to keep women in the facility for an adequate amount of time to improve maternal and child health outcomes. In addition, healthcare professionals should adhere to the recommended discharge time. Healthcare professionals should identify mothers at high risk of prolonged length of hospital stay following CD and improve maternal and child health outcomes. Moreover, researchers should conduct further multicentre longitudinal follow-up studies.

Acknowledgements The authors would like to acknowledge Wollo University for providing an office and free internet service. They also would like to extend their gratitude to the administrator of Dessie Comprehensive Specialized Hospital, the data collectors and the study participants for their due cooperation and involvement.

Contributors SZ and BK conceptualised the research design, formulated the research questions, took full responsibility for the work and wrote the proposal. AAK, BK and BA contributed to refining the research objectives and conceptualisation of the study, conducted statistical analyses and interpreted the results. SZ, AAK and MY assisted in refining the methodological approach and methodological decisions, led the data collection efforts and organised and managed the data sets. SZ, MY and BA conducted the statistical analyses and interpreted the results. SZ and AAK drafted the manuscript. BA, MY and BK revised and edited the manuscript. All the authors read and approved the final manuscript. SZ acts as the guarantor.

Funding The authors have not declared a specific grant for this research from any funding agency in the public, commercial or not-for-profit sectors.

Competing interests None declared.

Patient and public involvement Patients and/or the public were not involved in the design, or conduct, or reporting, or dissemination plans of this research.

Patient consent for publication Not required.

Ethics approval This study involves human participants and was approved by the Ethical Review Committee of the College of Medicine and Health Sciences, Wollo University, Dessie, Ethiopia (ethical approval number CMHS 783/13/13) on 30 February 2013 Ethiopian calendar or 9 March 2021 Gregorian calendar, which was followed by permission from the administrator of the study hospital prior to data collection. The study was conducted in accordance with the Declaration of Helsinki. Participants gave informed consent to participate in the study before taking part.

Provenance and peer review Not commissioned; externally peer reviewed.

Data availability statement All data relevant to the study are included in the article or uploaded as supplementary information.

ORCID iDs
Segenet Zewdie http://orcid.org/0000-0003-2764-7819
Melaku Yalew http://orcid.org/0000-0002-7314-2523
Bezawit Adane http://orcid.org/0000-0002-0440-8826
Assefa Andargie Kassa http://orcid.org/0000-0002-8409-7545

REFERENCES

1 World Health Organization. Towards a global action plan for healthy lives and well-being for all: Uniting to accelerate progress towards the health-related SDGs. 2018.
2 World Health Organization. Monitoring emergency obstetric care: a handbook. 2009.
3 Villar J, Valladares E, Wojdyla D, *et al*. Caesarean delivery rates and pregnancy outcomes: the 2005 WHO global survey on maternal and perinatal health in Latin America. *Lancet* 2006;367:1819–29.
4 Braveman P, Egerter S, Pearl M, *et al*. Early Discharge of Newborns and Mothers: A Critical Review of the Literature. *Pediatrics* 1995;96:716–26.
5 Myers T. Mosby's medical dictionary. 2009.
6 Khosravizadeh O, Vatankhah S, Bastani P, *et al*. Factors affecting length of stay in teaching hospitals of a middle-income country. *Electron Physician* 2016;8:3042–7.
7 Freitas A, Silva-Costa T, Lopes F, *et al*. Factors influencing hospital high length of stay outliers. *BMC Health Serv Res* 2012;12:1–10.
8 WHO. WHO statement on caesarean section rates. World Health Organization; 2015.
9 NICE. Nifhace. Caesarean section clinical guide line. 2011.
10 Association AHC. Length of stay calculation. 2014.
11 Rosman M, Rachminov O, Segal O, *et al*. Prolonged patients' In-Hospital Waiting Period after discharge eligibility is associated with increased risk of infection, morbidity and mortality: a retrospective cohort analysis. *BMC Health Serv Res* 2015;15:246.
12 Marfil-Garza BA, Belaunzarán-Zamudio PF, Gulias-Herrero A, *et al*. Risk factors associated with prolonged hospital length-of-stay: 18-year retrospective study of hospitalizations in a tertiary healthcare center in Mexico. *PLoS ONE* 2018;13:e0207203.
13 Tokunaga J, Imanaka Y. Influence of length of stay on patient satisfaction with hospital care in Japan. *Int J Qual Health Care* 2002;14:493–502.
14 Philbin EF, Mccullough PA, Dec GW, *et al*. Length of stay and procedure utilization are the major determinants of hospital charges for heart failure. *Clin Cardiol* 2001;24:56–62.
15 WHO. Choosing interventions that are cost effective (WHO-choice); estimates of unit costs for patient services for Ethiopia.
16 Schaal NK, Hepp P, Heil M, *et al*. Perioperative anxiety and length of hospital stay after caesarean section – A cohort study. *Eur J Obstet Gynecol Reprod Biol* 2020;248:252–6.
17 Pereira SL, Silva TPR da, Moreira AD, *et al*. Factors associated with the length of hospital stay of women undergoing cesarean section. *Rev Saude Publica* 2019;53:65.
18 Kumar P, Dhillon P. Length of stay after childbirth in India: a comparative study of public and private health institutions. *BMC Pregnancy Childbirth* 2020;20:181.
19 Mamun AA, Callaway LK, O'Callaghan MJ, *et al*. Associations of maternal pre-pregnancy obesity and excess pregnancy weight gains with adverse pregnancy outcomes and length of hospital stay. *BMC Pregnancy Childbirth* 2011;11:1–9.
20 Blumenfeld YJ, El-Sayed YY, Lyell DJ, *et al*. Risk Factors for Prolonged Postpartum Length of Stay Following Cesarean Delivery. *Am J Perinatol* 2015;32:825–32.
21 Van Otterloo L, Connelly C, Gould J, *et al*. Mothers at Risk: Factors Affecting Maternal Postpartum Length of Stay. *J Perinat Neonatal Nurs* 2018;32:303–14.
22 Plough AC, Galvin G, Li Z, *et al*. Relationship Between Labor and Delivery Unit Management Practices and Maternal Outcomes. *Obstetrics & Gynecology* 2017;130:358–65.
23 Campbell OMR, Cegolon L, Macleod D, *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* 2016;13:e1001972.
24 Federspiel JJ, Suresh SC, Darwin KC, *et al*. Hospitalization Duration Following Uncomplicated Cesarean Delivery: Predictors, Facility Variation, and Outcomes. *AJP Rep* 2020;10:e187–97.
25 Hassan B, Mandar O, Alhabardi N, *et al*. Length of Hospital Stay After Cesarean Delivery and Its Determinants Among Women in Eastern Sudan. *Int J Womens Health* 2022;14:731–8.
26 Guterres A. The sustainable development goals report 2020. United Nations Publication Issued by the Department of Economic and Social Affairs; 2020.1–64.
27 Stuebe AM, Tucker C, Bryant K, *et al*. Hypertensive Disorders of Pregnancy among Mothers of Medically Fragile Infants [38R]. *Obstetrics & Gynecology* 2018;131:204S–205S.
28 Cegolon L, Mastrangelo G, Maso G, *et al*. Determinants of length of stay after cesarean sections in the Friuli Venezia Giulia Region (North-Eastern Italy), 2005-2015. *Sci Rep* 2020;10:19238.
29 Leung KM, Elashoff RM, Rees KS, *et al*. Hospital- and patient-related characteristics determining maternity length of stay: a hierarchical linear model approach. *Am J Public Health* 1998;88:377–81.
30 Biru YB, Lemelem GA, Solomon N. Length of stay in health facilities after childbirth and associated maternal and neonatal factors in Ethiopia: a cross-sectional study from a national survey. *BMJ Open* 2021;11:e055327.
31 Cegolon L, Mastrangelo G, Campbell OM, *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:e0210753.
32 I. Tsiga-Ahmed F, I. Jalo R, M. Ibrahim U, *et al*. Length-of-stay after a health facility birth and associated factors: analysis of data from three Sub-Saharan African countries. *Gmj* 2020;56:100–9.
33 Kitil GW, Birgoda GT, Walle AD, *et al*. Length of stay and determinants of early discharge and extended stay after cesarean delivery in a resource-limited setting: southern Ethiopia, 2023. *Front Glob Womens Health* 2024;5:1346720.
34 Leavitt K, Običan S, Yankowitz J. Treatment and Prevention of Hypertensive Disorders During Pregnancy. *Clin Perinatol* 2019;46:173–85.
35 Robert M, Ward JCB. Neonatal complications following preterm birth. *International Journal of Obstetrics and Gynaecology* 2003;110:9.
36 Koullali B, Oudijk MA, Nijman TAJ, *et al*. Risk assessment and management to prevent preterm birth. *Semin Fetal Neonatal Med* 2016;21:80–8.
37 Childs C, Sandy-Hodgetts K, Broad C, *et al*. Risk, Prevention and Management of Complications After Vaginal and Caesarean Section Birth. *J Wound Care* 2020;29:S1–48.
38 Pierson RC, Scott NP, Briscoe KE, *et al*. A review of post-caesarean infectious morbidity: how to prevent and treat. *J Obstet Gynaecol* 2018;38:591–7.