

Knowledge, attitude, and practice of postpartum care in women who have undergone cesarean delivery in Ayder Comprehensive Specialized Hospital: a cross-sectional study

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Abstract

Background

To assess the level of knowledge, attitude, and practice regarding postpartum care among women who delivered via cesarean section at Ayder Comprehensive Specialized Hospital (ACSH), and to identify factors associated with these outcomes.

Methods

An institution-based cross-sectional study was conducted from April 2023 to July 2023 at ACSH, a tertiary-level comprehensive specialized referral hospital in Mekelle, Northern Ethiopia. A total of 412 postpartum women and 421 corresponding neonatal records were evaluated. Data were collected using an interviewer-administered, pretested Open Data Kit (ODK) questionnaire. The primary outcomes were good knowledge, favorable attitude, and good maternal postpartum care practice. Neonatal physical examination practice was also assessed. Adjusted odds ratios (AOR) with 95% confidence intervals (CIs) were reported.

Results

The majority of mothers had good postpartum care knowledge (323/412, 78.4%) and a favorable attitude toward postpartum care (397/412, 96.4%). Maternal care practice in the maternity ward was good in 240 of 412 mothers (58.3%), whereas neonatal physical examination practice was good in only 56 of 421 neonates (13.3%). Educational status was the strongest independent predictor of good knowledge (AOR = 0.02, 95% CI 0.00–0.12, $p < 0.001$ for no formal education; AOR = 0.10, 95% CI 0.03–0.30, $p < 0.001$ for elementary education, versus college and above), while four or more antenatal care (ANC) visits increased the odds of good knowledge (AOR = 4.18, 95% CI 1.03–17.02, $p = 0.046$). Partner's educational status, number of ANC visits, and place of ANC visits were significantly associated with good maternal practice. Educational status was also associated with attitude score ($p = 0.008$).

Conclusions

Knowledge and attitude of mothers regarding postpartum care after cesarean delivery at ACSH were generally good, but neonatal examination and some postpartum counseling practices were inconsistent. Maternal and partner educational status and antenatal care attendance were important determinants of knowledge and practice. These findings highlight gaps in routine maternity ward practice that warrant quality-improvement initiatives.

Introduction

The puerperium, commonly referred to as the "fourth trimester," begins immediately after delivery of the placenta and lasts for six to eight weeks on average, ending when the mother's body has almost completely recovered from pregnancy. Most of the physiology altered throughout pregnancy reverts to its pre-pregnancy state by six weeks[1, 2]. After delivery, women should receive postpartum care (PPC) in a medical institution for at least 24 hours, with follow-up checkups at 48 to 72 hours, 7 to 14 days, and six weeks after delivery. Care during this period should address the unique needs of both mother and child. In both developed and developing nations, the needs of women and their babies during the postpartum period are frequently overshadowed by the focus on pregnancy and childbirth [3]. Cesarean delivery (CD) poses unique challenges to the mother, newborn, and health care provider, and consistent counseling of women following CD is important. Counseling includes, but is not limited to, infection prevention through early catheter removal, encouraging ambulation once anesthesia has subsided, and starting oral intake and a balanced diet as early as within six hours of delivery [4–9].

Mothers, especially primiparous women, find it difficult to adjust to new circumstances during the postpartum period because of limited awareness of postpartum difficulties and care, and they often lack the self-assurance needed to care for themselves and their children. Educating mothers and their families about fundamental health issues, helping women accept their roles as mothers, and easing the transition to motherhood are all part of meeting mothers' mental and emotional needs[10]. There is a significant knowledge gap among women regarding PPC, particularly in developing countries, and mothers with limited understanding are more likely to delay seeking treatment for themselves and their newborns. Mothers are generally well aware of danger signs for newborns, while their understanding of other components of PPC is comparatively limited across most studies. Ethiopian studies have examined maternal danger sign identification and neonatal danger sign knowledge, but other components of PPC remain understudied, and there has been no adequate research on mothers' perspectives regarding PPC. Women should be asked about their experiences in order to better understand postpartum morbidity and identify the services they require[3]. To the best of the investigators' knowledge, no readily available literature has assessed the scope of the maternal knowledge, attitude, and practice gap regarding PPC among mothers who have undergone CD.

Therefore, this study aimed to assess mothers' knowledge and attitude towards postpartum care after caesarean delivery, identify factors associated with these outcomes, and assess maternity ward practice regarding maternal and neonatal postpartum care at Ayder Comprehensive Specialized Hospital, Mekelle, Ethiopia.

Methods

Study design and setting

A hospital-based cross-sectional study was conducted at ACSH, Mekelle, Tigray, northern Ethiopia, from April 10, 2023 to July 20, 2023. Established in 2008 as a referral and specialty medical facility, ACSH serves nearly nine million people across Tigray, Northern Afar, and northeastern Amhara. The hospital

has more than 500 inpatient beds across four main departments and several specialized units. The Department of Obstetrics and Gynecology includes a one-stop center, emergency operating room, maternity ward, gynecology ward, and dedicated operating theater for CD, with more than 5,000 deliveries annually, including over 1,500 CDs.

Study population and participants

The source population comprised all women who underwent CD during the study period. The study population consisted of women who underwent CD at ACSH during the study period and fulfilled the eligibility criteria.

* Inclusion criteria: All women who underwent CD at ACSH during the study period.

* Exclusion criteria: Women who did not volunteer to participate and those who were too critically ill to be interviewed.

Sample size and sampling

The sample size was determined using the single-proportion formula, assuming a 50% proportion, 95% confidence level, and 5% margin of error:

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

Based on previous studies, the calculated sample sizes were 215 for maternal care knowledge and 372 for neonatal care knowledge. After adding a 10% non-response rate, the final sample size was 412 participants. Consecutive postoperative mothers in the maternity ward were interviewed until the required sample size was reached.

Variables and measurements

* Independent variables: Age, marital status, number of previous CDs, residence, educational status, partner's educational status, occupation, partner's occupation, religion, family size, ethnicity, parity, gravidity, number of ANC visits, place of ANC visits, and birth outcome.

* Dependent variables: Knowledge, attitude, and practice of postpartum care among women following CD at ACSH.

Measurement and scoring

The questionnaire contained seven sections covering demographic and obstetric characteristics, knowledge, attitude, and maternal and neonatal postpartum care. Knowledge was assessed using 43

questions covering maternal care, infant care, and neonatal danger signs. Incorrect and correct responses were scored 1 and 2 points, respectively. Practice was assessed using 31 questions covering postoperative care and danger-sign advice, maternal physical examination, essential newborn care, and newborn physical examination. Items were scored 1 if not done and 2 if done.

Knowledge and practice were classified using Bloom's cut-offs: good (80–100%), moderate/satisfactory (60–79%), and poor (< 60%). Attitude was assessed using four five-point Likert-scale items, scored from 1 (strongly disagree) to 5 (strongly agree), and classified as favorable or unfavorable using a 50% cut-off.

Operational definitions

* Knowledge: Facts about maternal and neonatal care that mothers are aware of.

* Attitude: Respondents' feelings and way of thinking toward postpartum care.

* Practice: Postpartum advice and evaluation provided to the mother and newborn while on the maternity ward by a health professional.

Data collection procedures

The questionnaire was developed based on relevant literature and consultation with subject-matter experts. It was translated into Tigrigna and back-translated into English, with modifications made as required. Data were collected using a standardized Open Data Kit (ODK) questionnaire administered by an interviewer.

On the day of discharge, a qualified midwife collected data from mothers who had undergone CD. The questionnaire was piloted among 21 postpartum women at Ayder maternity hospital before the main data collection.

Both maternal and newborn medical records were reviewed to obtain newborn evaluation information and verify evidence of maternal checkup. Mothers were also asked whether their chest, breasts, extremities, abdomen, and surgical wound had been examined and whether their pulse had been measured. For newborn evaluation, mothers were asked whether their child had been assessed for pulse, temperature, color changes such as jaundice, and examination of the eyes, umbilical cord, and limbs.

The principal investigator supervised data collection. Internal consistency was assessed using Cronbach's alpha, which was 0.973 for the attitude scale, 0.751 for the knowledge scale, and 0.772 for the maternal practice scale.

Statistical analysis

Data were exported from ODK to SPSS version 27 for analysis. Frequencies and percentages were used to summarize sociodemographic, obstetric, knowledge, attitude, and practice characteristics. Knowledge, attitude, and practice scores were dichotomized according to the predefined cut-offs.

Bivariate simple linear regression was initially used to assess associations between sociodemographic and obstetric variables and the continuous knowledge score. Variables significant at $p < 0.05$ were subsequently entered into multivariable binary logistic regression models to identify independent predictors of good knowledge, favorable attitude, and good maternal practice. Model fit was assessed using the Hosmer–Lemeshow goodness-of-fit test and Nagelkerke R^2 . Adjusted odds ratios (AORs) with 95% confidence intervals (CIs) were reported, and statistical significance was set at $p < 0.05$. Estimates from the attitude model were interpreted cautiously because relatively few mothers had an unfavorable attitude (15/412), resulting in wide confidence intervals for some categories.

Patient and public involvement

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

Results

Sociodemographic characteristics and obstetric history

Interviews were conducted with 412 postpartum mothers, yielding a 100% response rate. Participant age ranged from 17 to 42 years, with the largest proportion aged 25–30 years (153; 37.1%). Most mothers were married (396; 96.1%), nearly all identified as Orthodox Christian (396; 96.1%), and the majority lived in urban areas (342; 83.0%).

Regarding educational status, most mothers had completed secondary school (166; 40.3%), followed by college and above (116; 28.2%). Similarly, most partners had attained secondary education (142; 34.5%) or college and above (153; 37.1%). Nearly two-thirds of mothers were housewives (250; 60.7%), while the majority of partners were engaged in private business (269; 65.3%) (See Table 1)

Table 1
Sociodemographic characteristics of respondents (n = 412)

Characteristic	Category	Frequency	Percent (%)
Age (years)	15–19	19	4.6
	20–24	93	22.6
	25–30	153	37.1
	30–34	82	19.9
	35 and above	65	15.8
Marital status	Married	396	96.1
	In a relationship	7	1.7
	Single	9	2.2
Educational status	No formal education	19	4.6
	Elementary school (grades 1–8)	111	26.9
	Secondary school (grades 9–12)	166	40.3
	College and above	116	28.2
Partner's educational status	No formal education	31	7.5
	Elementary school (grades 1–8)	86	20.9
	Secondary school (grades 9–12)	142	34.5
	College and above	153	37.1
Mother's occupation	Housewife	250	60.7
	Government employee	62	15.0
	Student	14	3.4
	Farmer	1	0.2
	Private business	85	20.6
Partner's occupation	Unemployed	8	1.9
	Government employee	86	20.9
	Student	3	0.7
	Farmer	46	11.2
	Private business	269	65.3
Place of residence	Rural	70	17.0

Characteristic	Category	Frequency	Percent (%)
Ethnicity	Urban	342	83.0
	Tigray	411	99.8
	Amhara	1	0.2
Religion	Orthodox	396	96.1
	Muslim	14	3.4
	Catholic	2	0.5

Nearly one-third of mothers were experiencing their first pregnancy (gravida one; 131; 31.8%). Among all participants, 158 (38.3%) were having their first child (para one) and 135 (32.8%) their second. Most mothers reported family sizes of up to four members (287; 69.7%), and the majority underwent their first CD, with no previous CD reported by 251 (60.9%).

A large proportion of mothers had four or more ANC visits (351; 85.2%), and about one-quarter received ANC at a general hospital (109; 26.5%). Most birth outcomes were live births (405; 98.3%), with stillbirth in 5 (1.2%) and early neonatal death in 2 (0.5%) (See Table 2).

Table 2
Obstetric and gynecologic characteristics (n = 412)

Characteristic	Category	Frequency	Percent (%)
Gravidity	One	131	31.8
	Two	118	28.6
	Three	73	17.7
	Four	42	10.2
	Five and above	48	11.7
Parity	One	158	38.3
	Two	135	32.8
	Three	58	14.1
	Four	32	7.8
	Five and above	29	7.0
Family size	Up to four	287	69.7
	5–10	124	30.1
	Above ten	1	0.2
Number of previous CD	None	251	60.9
	One	114	27.7
	Two	37	9.0
	Three	10	2.4
Number of ANC visits	None	7	1.7
	One	9	2.2
	Two	14	3.4
	Three	31	7.5
	Four and above	351	85.2
Place of ANC visits	None	7	1.7
	Local health center	92	22.3
	General hospital	109	26.5
	Referral hospital	102	24.8
	Private clinic	102	24.8

Characteristic	Category	Frequency	Percent (%)
Birth outcome*	Alive	405	98.3
	Stillbirth	5	1.2
	Early neonatal death (END)	2	0.5

*Out of the 412 CD performed during the study period at ACSH, 14 were twin deliveries, yielding 421 neonatal records.

Knowledge on maternal and neonatal care

Total maternal knowledge, encompassing maternal care and danger signs and neonatal care and danger signs, was evaluated and scored. Most mothers had good knowledge (323; 78.4%), 80 (19.4%) had moderate knowledge, and 9 (2.2%) had poor knowledge (See Table 3).

Table 3
Level of maternal knowledge, attitude, maternal care practice, and neonatal examination

Level	Knowledge (n = 412)	Attitude (n = 412)	Maternal practice (n = 412)	Neonatal exam (n = 421)
Poor / Unfavorable	9 (2.2)	15 (3.6)	172 (41.7)	241 (57.2)
Moderate	80 (19.4)	-	-	124 (29.5)
Good / Favorable	323 (78.4)	397 (96.4)	240 (58.3)	56 (13.3)

Foods traditionally believed to be harmful if consumed after the operation were meat (78; 18.9%), butter (75; 18.2%), and milk (49; 11.9%) (See additional file 1: Table 1). The most commonly identified neonatal danger signs were repetitive vomiting (356; 86.4%) and inability to breastfeed (355; 86.2%) (See additional file 1: Table 2).

Attitude toward postpartum care

Almost all mothers (397; 96.4%) had a favorable attitude toward postpartum care, while a minority (15; 3.6%) had an unfavorable attitude (see Table 3). Because so few mothers had an unfavorable attitude, the multivariable logistic regression model, although statistically significant overall ($\chi^2 = 48.13$, $df = 25$, $p = 0.004$), produced unstable estimates for several sparsely populated categories. Educational status remained the only variable with an overall significant association with attitude (Wald = 11.76, $df = 3$, $p = 0.008$). Individual category estimates are not reported numerically given their imprecision, and this result should be interpreted as hypothesis-generating rather than conclusive.

Practice on maternal and neonatal care

Maternal care practice on the maternity ward was good in 240 of 412 mothers (58.3%) but poor in 172 (41.7%). Neonatal examination practice was poor in the majority of neonates (241/421; 57.2%), moderate in 124 (29.5%), and good in only 56 (13.3%) (See Table 3).

Advice on the next appointment date (412; 100%) and advice not to restrict food intake (370; 89.8%) were the most consistently provided items of advice, whereas advice on resumption of sexual activity (37; 9%) was the least provided. (See additional file 1: Table 3).

Pulse rate and blood pressure were measured in all mothers (412; 100%), and wound examination was performed in 408 (99%), whereas breast examination was the least commonly performed (60; 14.6%) (See additional file 1: Table 4).

On neonatal examination, meconium passage was checked in about two-thirds of neonates (300; 71.3%). Other neonatal examinations were performed in fewer than one-quarter of neonates: umbilical examination (104; 24.7%), abdominal examination (101; 24.0%), lower limb examination (96; 22.8%), body color (70; 16.6%), temperature (67; 15.9%), respiratory rate (32; 7.6%), and eye examination (28; 6.7%) (See additional file 1: Table 5).

Factors associated with maternal knowledge

In bivariate simple linear regression, residency, marital status, educational status, partner's educational status, occupation, number of previous CD, number of ANC visits, place of ANC visits, and birth outcome were significantly associated with the continuous knowledge score ($p < 0.05$) and were entered into the multivariable logistic regression model.

The multivariable binary logistic regression model for good knowledge (versus moderate/poor knowledge) was statistically significant ($\chi^2 = 132.87$, $df = 25$, $p < 0.001$), fit the data well (Hosmer-Lemeshow $\chi^2 = 3.39$, $df = 8$, $p = 0.908$), explained 42.6% of the variance in knowledge status (Nagelkerke $R^2 = 0.426$), and correctly classified 83.0% of mothers.

Educational status was the strongest independent predictor of good knowledge (overall Wald = 44.27, $df = 3$, $p < 0.001$). Compared with mothers with college and above education, mothers with no formal education (AOR = 0.02, 95% CI 0.00–0.12, $p < 0.001$) and mothers who had completed only elementary school (AOR = 0.10, 95% CI 0.03–0.30, $p < 0.001$) had markedly lower odds of good knowledge; mothers who had completed secondary school did not differ significantly from those with college and above education (AOR = 0.92, 95% CI 0.30–2.81, $p = 0.888$). Mothers with four or more ANC visits had higher odds of good knowledge than mothers with fewer visits (AOR = 4.18, 95% CI 1.03–17.02, $p = 0.046$) (See Table 4).

Table 4

Multivariable binary logistic regression of factors associated with good maternal knowledge (n = 412)

Variable	AOR	95% CI	P-value
Residency (rural vs urban)	0.43	0.18–1.04	0.062
Educational status: no formal education (vs college+)	0.02	0.00–0.12	< 0.001
Educational status: elementary (vs college+)	0.10	0.03–0.30	< 0.001
Educational status: secondary (vs college+)	0.92	0.30–2.81	0.888
Number of ANC visits: four and above (vs none)	4.18	1.03–17.02	0.046
Marital status, partner's education, occupation, number of previous CD, place of ANC visits, birth outcome	NS	-	> 0.05

AOR: adjusted odds ratio; CI: confidence interval; NS: no single category reached statistical significance after adjusting. $\chi^2 = 132.87$, $df = 25$, $p < 0.001$; Nagelkerke $R^2 = 0.426$; Hosmer-Lemeshow $p = 0.908$; total correct classification = 83.0%.

Factors associated with maternal practice

The multivariable binary logistic regression model for good maternal care practice was statistically significant ($\chi^2 = 45.59$, $df = 25$, $p = 0.007$; Nagelkerke $R^2 = 0.141$; overall correct classification = 61.9%).

Mothers whose partners had no formal education had significantly higher odds of good maternal practice than mothers whose partners had college and above education (AOR = 4.01, 95% CI 1.22–13.20, $p = 0.022$). Mothers with three ANC visits had lower odds of good practice than those with four or more visits (AOR = 0.20, 95% CI 0.06–0.76, $p = 0.017$), and mothers who attended ANC at a local health center had lower odds of good practice than those who attended a private clinic (AOR = 0.51, 95% CI 0.26–0.99, $p = 0.046$) (see Table 5).

Table 5

Multivariable binary logistic regression of sociodemographic and obstetric factors associated with good maternal care practice (n = 412)

Variable	AOR	95% CI	P-value
Partner's education: no formal education (vs college+)	4.01	1.22–13.20	0.022
Number of ANC visits: three (vs four and above)	0.20	0.06–0.76	0.017
Place of ANC visits: local health center (vs private clinic)	0.51	0.26–0.99	0.046
Residency, marital status, own educational status, occupation, number of previous CD, birth outcome	NS	-	> 0.05

AOR stands for adjusted odds ratio; CI means confidence interval; NS refers to no individual subgroup achieved statistical significance following adjustment. Model statistics: $\chi^2 = 45.59$, $df = 25$, $p = 0.007$; Nagelkerke $R^2 = 0.141$; correctly classification = 61.9% overall.

Discussion

Principal findings

This study aimed to assess the knowledge and attitude of mothers toward PPC and the factors affecting these outcomes, and to assess the practice of the ACSH maternity ward regarding PPC for mothers and neonates. Overall, maternal knowledge and attitude toward PPC in this study were good (78.4% and 96.4%, respectively). Educational status and number of ANC visits significantly predicted good knowledge, while partner's educational status, number of ANC visits, and place of ANC visits significantly predicted good maternal practice. Maternal care practice before discharge was generally good (58.3%), whereas neonatal examination practice was generally poor (13.3% good), with several routine neonatal evaluations overlooked. Advice provided to mothers regarding PPC was inconsistent, particularly regarding resumption of sexual activity, taking baths, and family planning.

Comparison with other studies

Overall maternal knowledge of PPC was good in 78.4% of mothers, moderate in 19.4%, and poor in 2.2%, and mothers who underwent CD at ACSH generally had a positive attitude toward postpartum care (96.4%). This finding is higher than that of a study conducted in Nepal, in which only 36.73% of respondents had good knowledge, 62.76% had average knowledge, and 0.51% had poor knowledge[11]. In another Nepalese study, 52.63% of respondents had average knowledge of postnatal care, 40.35% had inadequate knowledge, and 7.02% had adequate knowledge[12]. Comparatively, another community study in the Jhapa District of Nepal reported that only 32.7% of respondents possessed good knowledge regarding postnatal care services[13]. The higher knowledge score in this study may reflect the referral

and predominantly urban setting of ACSH, where the surrounding population may be more educated. The difference may also relate to the timing of assessment, which was performed before discharge, when mothers' knowledge was more recent and inpatient stay allowed knowledge-sharing among mothers.

The knowledge score of mothers regarding maternal and neonatal care was significantly influenced by educational status and number of ANC visits. The factors affecting maternal knowledge of PPC are broadly similar across studies. A Nepalese study found a significant association between knowledge level and selected demographic variables, including educational level and occupation[11]. Similarly, in a cross-sectional study in Bahir Dar, mothers' educational level was significantly associated with their knowledge of newborn care[14]. In Asmara, the knowledge score differed significantly by residence ($p < 0.001$) and ethnicity ($p = 0.015$), and an increasing trend in knowledge score was observed with increasing age group ($p < 0.001$), educational level ($p = 0.021$), gravida ($p < 0.001$), and para ($p < 0.001$) [15]. The practice of essential newborn care services, including immediate initiation of breastfeeding and skin-to-skin contact, was affected by factors such as caesarean section birth, ANC attendance, place and mode of delivery, and maternal education in sub-Saharan Africa [16].

In this study, educational status also showed the strongest overall association with attitude score, although imprecision in the attitude model (owing to the small number of mothers with an unfavorable attitude) limits firm conclusions about specific categories. This direction of association is consistent with a study conducted in Bahir Dar, which found that mothers with primary education were more likely to have a positive attitude toward newborn care than those with no formal education[14].

The most common neonatal danger signs identified in this study were repetitive vomiting (86.4%), inability to breastfeed (86.2%), yellowness of the body (81.1%), fever (77.9%), umbilical cord discharge (75.0%), convulsion (73.1%), and fast breathing (72.6%). In a community-based study conducted in Tigray, only 55.7% of respondents knew at least one infant danger sign, such as inability to breastfeed or vomiting[17]. This study indicates that most mothers were well aware of neonatal danger signs at the time of discharge from the hospital, a higher level of awareness than in the community-based study, possibly because this research was conducted in a more urban setting with more educated respondents.

This study also identified cultural avoidance of certain foods during the postpartum period after CD, namely meat (18.9%), butter (18.2%), milk (11.9%), water (6.1%), and egg (5.1%). Women who undergo CD and are recovering well can generally resume their usual diet and fluid intake without complications, and post-operative mothers require a balanced diet[18]. Mothers' perception that certain fluids and solid foods are harmful may reflect insufficient information or dietary guidance at their first hospital visit or admission, and it also suggests that mothers' perceptions of such practices are shaped by traditional beliefs.

Clinical implications and comparison with other studies

Maternal care practice before discharge was generally good, with the most commonly performed maternal physical evaluations being pulse rate and blood pressure measurement (100%), surgical wound

examination (99%), and vaginal bleeding examination (69.2%). Less commonly performed examinations were breast examination (14.6%), temperature (17.2%), extremity examination (29.4%), and abdominal examination (34.0%). By comparison, a cross-sectional study in Egypt reported blood pressure measurement in 98%, breast examination in 93.5%, abdominal examination in 93.2%, vaginal bleeding assessment in 75.2%, and temperature measurement in 68% of participants[19]. A Malawian study of postpartum care prior to discharge reported blood pressure measurement in 44%, temperature in 41%, abdominal examination in 50%, vaginal examination/bleeding assessment in 46%, and breast examination/soreness assessment in 34%[20]. According to WHO, during the first 24 hours after delivery, all postpartum women should undergo routine assessment of vaginal bleeding, fundal height, temperature, and pulse, and blood pressure should be checked soon after birth. Although these recommendations are well established, this study's findings suggest that the importance of complete evaluation is undermined in practice, with some examinations receiving more attention than others. This may reflect under-training of health care providers regarding PPC; midwives require both the knowledge and the skills necessary to deliver comprehensive postpartum interventions.

Neonatal examination findings showed that meconium passage (71.3%) was checked in most neonates, while other examinations – lower limb examination (22.8%), abdominal examination (24.0%), umbilical examination (24.7%), body color (16.6%), temperature (15.9%), respiratory rate (7.6%), and eye examination (6.7%) – were performed less consistently. These proportions are lower than those reported in a cross-sectional study in Egypt, where meconium passage was assessed in 55.6%, body color in 98%, eye examination in 97.2%, umbilical examination in 77%, abdominal examination in 91.3%, and respiratory rate in 47% of neonates[19]. A descriptive study in Malawi reported that a baby examination was performed in 77.1% of cases[20]. According to WHO, a full clinical examination should be performed around one hour after birth, and the findings of this study reveal that complete newborn evaluation is frequently overlooked.

Although good neonatal examination practice was low (13.3%), the multivariable model showed no statistically significant overall association between the measured factors and examination practice ($\chi^2=31.36$, $df = 25$, $p = 0.177$). This indicates that the assessed factors did not adequately explain variation in practice. Unmeasured factors, including workload, staffing, equipment availability, clinical supervision, institutional protocols, and providers' knowledge and experience, may contribute to this gap. Further studies incorporating these factors are warranted.

Most mothers received advice on the next appointment date (100%), initiation of solid (89.6%) and fluid diets (86.4%), avoidance of food restriction (89.8%), ambulation (88.6%), surgical wound danger signs (73.3%), and neonatal danger signs (71.1%). Globally, the content of immediate postnatal care remains a profound challenge; recent multi-country data demonstrates that only 37.1% of mothers across 32 low- and middle-income countries received counselling on newborn danger signs. Furthermore, global tracking reveals important demographic, socioeconomic, and health systems inequalities in newborn PNC effective coverage, disproportionately favouring newborns whose mother was older (35–49 years),

primiparous, lived in urban areas, belonged to the wealthiest households, had at least secondary education, and delivered in a hospital or the private sector in most countries [21].

The higher counseling rate observed at ACSH (71.1%) compared to this low global baseline can be attributed to several distinctive institutional and structural factors. First, ACSH operates within a high-tier tertiary referral infrastructure with specialized obstetrics units where pre-discharge counseling checklists are more systematically embedded than in lower-tier facilities or community delivery settings. Second, the advanced provider cadre and specialized midwifery training on the ACSH ward foster a highly structured environment for maternal education. Third, the extended postoperative window required for recovery after a cesarean delivery naturally prolongs the inpatient hospital stay, granting healthcare professionals significantly more contact opportunities to conduct face-to-face neonatal counseling. Finally, this success is further supported by an urban demographic alignment, where a highly educated catchment population actively elicits health education and danger sign clarification from staff during routine ward rounds.

However, advice on resumption of sexual activity (9.0%), bathing (18.7%), and family planning (32.5%) was limited. This marked difference between routine postoperative care and reproductive counseling might suggest that maternity ward practice prioritizes immediate clinical monitoring over longer-term postpartum needs. Universal assessment of pulse and blood pressure (100.0%) and advice on the next appointment (100.0%) may reflect their integration into routine discharge procedures, whereas counseling on resumption of sexual activity (9.0%) and family planning (32.5%) was considerably less frequent. This may reflect time constraints, competing clinical priorities, and discomfort or cultural barriers surrounding sensitive reproductive-health discussions.

Strengths and limitations of this study

Maternal knowledge was assessed by asking mothers about their prior knowledge before advice was provided on the maternity ward, which may have introduced recall bias. Factors affecting low practice in the postpartum period on the maternity ward were not assessed in this study; further research in this area is warranted to improve quality of service. Because relatively few mothers reported an unfavorable attitude, the multivariable logistic regression model for attitude produced imprecise estimates for some categories, and these findings should be interpreted with caution and confirmed in larger samples.

Unanswered questions and future research

Factors affecting low practice in the postpartum period on the maternity ward were not assessed in this study; further research in this area is warranted to improve quality of service. Future studies could explore provider- and system-level factors contributing to gaps in maternal and neonatal assessment and postoperative counselling.

Conclusions

Knowledge of mothers regarding postpartum care was generally good, and most women had a positive attitude toward it. Educational status of the mother and her partner, together with antenatal care attendance, were the principal determinants of good knowledge and good maternal practice. Mothers with lower educational attainment, fewer ANC visits, and rural residence appear to warrant additional support. While maternal care evaluation at ACSH was rated favorably overall, there is room for improvement in the evaluation of newborns, and postpartum advice – particularly regarding resumption of sexual activity, bathing, and family planning after cesarean delivery – should be strengthened.

Recommendations

Maternity ward practice related to maternal and newborn assessment and postoperative counseling could be strengthened through quality-improvement initiatives that promote consistent adherence to recommended practices. Introducing standardized checklists for maternal and neonatal assessment and postoperative counseling may help reduce variation in care, improve documentation, and support more consistent delivery of essential services. Regular staff awareness and educational activities could also be incorporated into routine quality-improvement efforts to reinforce recommended practices. In addition, counseling could be tailored to better meet the needs of mothers with lower educational attainment, fewer ANC visits, and rural residence, as these groups showed greater gaps in practice.

Abbreviations

ACSH

Ayder Comprehensive Specialized Hospital

ANC

Antenatal Care

AOR

Adjusted Odds Ratio

CD

Cesarean Delivery

CI

Confidence Interval

IRB

Institutional Review Board

ODK

Open Data Kit

PPC

Postpartum Care

WHO

World Health Organization

Declarations

Ethics approval and consent to participate

Ethical clearance was obtained from the Institutional Review Board of Mekelle University, College of Health Sciences, with reference number MU-IRB 2041/2023. Participants were informed about the study objectives, purpose, and benefits, and informed consent was obtained and documented electronically using ODK. Participant anonymity was maintained throughout the study.

Consent for publication

Not applicable, since no individual patient images or clinical case descriptions are included.

Availability of data and materials

Data are available upon reasonable request from the corresponding author.

Competing interests

The authors declare that they have no competing interests.

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Authors' contributions

DN conceived and designed the study, supervised data collection, performed the analysis, and drafted the manuscript. AY, MN, and MMA contributed to the study design, data collection, analysis, and critical revision of the manuscript. All authors reviewed and approved the final manuscript.

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