



Research Article

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# Kangaroo Mother Care Practice and Associated Factors Among Postnatal Mothers in Tertiary Care Hospitals, of Central Ethiopia Region, Ethiopia, 2023

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## Abstract

**Introduction:** Kangaroo mother care is early, prolonged, and ongoing skin-to-skin contact between the mother and her child while they are both in the hospital and following their discharge. The country-level practice of kangaroo mother care has been low, and few studies have examined the reasons for this poor practice. Therefore, this study aimed to assess kangaroo mother care practice and associated factors among mothers in tertiary care hospitals in the central region of Ethiopia 2023.

**Method:** An institutional-based cross-sectional study was conducted among 132 mothers from May 1 to June 30, 2023. A single population proportion with an adjusted formula was used to calculate the total sample size. A face-to-face interview with a structured questionnaire and an observant checklist for the practice part was used to collect data. Data was collected through the Kobo toolbox, exported into an Excel sheet, and finally exported into SPSS version 25 for statistical analysis. Bivariate and multivariate logistic regressions with proportion values  $<0.25$  and  $<0.05$  were used, respectively.

**Result:** A total of 130 participants were included in the study, with a response rate of 98.48%, of which 68 (52.3%) had good KMC practice. Type of recent birth [AOR: 6.59 (95% CI: 1.46, 29.67)], spontaneous vaginal mode of delivery [AOR: 8.24 (95% CI: 2.12, 32.01)], mothers who got help from other mothers [AOR: 4.16 (95% CI: 1.02, 16.94)], and mothers who had good knowledge [AOR: 6.54 (95% CI: 1.82, 23.42)] were significantly associated factors with good kangaroo mother care practice among mothers with pre-term and low birth weight babies.

**Conclusion:** This study addresses the overall prevalence and associated factors for the practice of KMC, the results were comparable with other evidence conducted in Ethiopia. Mode of pregnancy, getting support from other mothers in the KMC unit, and mothers' knowledge about KMC were identified as significantly associated variables with KMC practice. Knowledge of the mothers about KMC practice is an important point to administer KMC safely and effectively. Even though half of the postnatal mothers in the KMC unit have good KMC practices, in the study area still huge number of neonates dies due to low birth weight and preterm, so the central region of Ethiopia and zonal health bureau should use this evidence to decrease neonatal death.

**Keywords:** Kangaroo Mother Care; Practice; Preterm; Low Birth Weight; Educational Status

**Abbreviations:** KMC: kangaroo mother care; LBW: Low birth weight; SVD: Spontaneous Vaginal Delivery; NEMMCSH: Nigist Ellen Mohammed memorial compressive specialized hospital; WHO: world health Organization; NICU: Neonatal Intensive Care Unit; WCSH: Worabe compressive specialized hospital; WSCSH: Wolita Soddo compressive specialized hospital; WUTSCH: Wolkite University teaching compressive specialized hospital

## Introduction

Kangaroo mother care is early, prolonged and ongoing skin-to-skin contact between the mother (substitute(s)) and her child, along with exclusive breastfeeding while they are both in the hospital and following their discharge [1]. Globally, preterm birth

and low birth weight are estimated to account for around 15 million and 20 million each year, respectively from which one million of them passed away each year [2]. Also in sub-Saharan Africa, the prevalence rate of LBW was 9.76%, and 17.3%, in Ethiopia [3]. In

another way the pooled prevalence of preterm neonatal death in Ethiopia was 12.97% [4] and 27 deaths per 1000 live births in the region [5]. One of the variables that determine newborn mortality among preterm babies is not providing kangaroo mother care [6]. The risk of death, nosocomial infection risk, and hypothermia at discharge or 40-41 weeks post-menstrual age increase by 40%, 65%, and 72%, respectively [7].

According to the present WHO suggestion to start kangaroo mother care only once a baby is stable, it can take 3 to 7 days on average, initiating it right away after birth has the potential to save up to 150,000 additional lives per year. On the other hand, as compared to traditional care, KMC offered to stable newborns in hospitals is linked with a 40% relative reduction in the risk of mortality, a 65% reduction in the risk of nosocomial infections, and a 72% reduction in hypothermia at discharge. Also, Preterm and low-birth-weight newborn care provided by kangaroo mothers was linked to reduced postpartum maternal depression, and stress, decreased maternal blood cortisol levels and anxiety as well as improved mother-infant engagement and bonding [8,9].

Studies show that KMC practice was highly associated with the mother's educational attainment, the place of delivery, being granted a private KMC area in the hospital, and being eligible for family support [10]. As a result of this additional assessment of the factors influencing KMC practice, it is preferable to lower newborn mortality by focusing on them. Even if several plans to expand KMC's presence in healthcare settings were made, there is still a discrepancy between the Ethiopian Federal Ministry of Health and the real KMC coverage. A study indicates the poor performance of KMC services in Ethiopia about 46.4% of the LBW newborns got KMC practice [11].

Despite several plans to expand KMCs in healthcare settings, most hospitals at a national level have no KMC unit and still much uncertainty on postnatal mothers on KMC practice to their newborn infant regarding maternal role, which leads to increased neonatal morbidity and mortality. Therefore, this study is intended to assess the practice and associated factors of KMC among postnatal mothers in tertiary care hospitals in the central region of Ethiopia in 2023 to solve this problem.

## Methods

### Study Area and Period

This study was carried out in the central Ethiopia Region and conducted from May 1<sup>st</sup> to June 30<sup>th</sup>, 2023, at compressive specialized hospitals in the region namely Worebe, Nigist Ellen Mohammed Memorial, and Wolkite Comprehensive Specialized Hospitals. Worebe Comprehensive Specialized Hospital is located in Silte Zone which far 172 km from the capital city of Addis Ababa. The hospital offers a full range of obstetric services, including skilled delivery, and has a high volume of maternity patients and emergency medical, surgical, and other services for about 2 million people [12].

Nigist Ellen Mohammed Memorial Hospital is located in the Hadiya zone and 233 km away from Addis Ababa, which was established in 1984. It provides service for more than 1.5 million catchment populations [13]. Wolkite Comprehensive Specialized Hospital was established in 2018 G.C. and is located 172 km away from the capital city of Addis Ababa. The total service coverage of the hospital is about 4 million people in catchment areas [14,15].

### Study Design

Institution based cross sectional study was conducted.

### Population

**Source Population:** All postnatal mothers having preterm and/or LBW babies during the study period.

**Study Population:** Selected postnatal mothers had pre-term and/or LBW babies at selected tertiary Hospitals at the time of data collection.

### Sample Size Determination

The sample size was calculated using the single population proportion formula considering 54.4% had the good practice of KMC in preterm and low birth weight infants in the Tigray region [16].

Where  $p$  = proportion of low birth weight (LBW) and preterm was 54.4%.

$d$  = is the margin of error tolerated 5%.

$n$  = Minimum sample size for a statistically significant survey.

$z$  = is the significance level (at 5% significance level its value is 1.96).

Substituting the values for each of these variables in the above formula, the sample size was estimated to be 381. Since the total population less than 10,000 we use correction (adjusted) formula.

Where  $N$  = is the two month total number of preterm and low birth weight newborns in selected three hospitals which is 174 (WCSH  $N_1=58$ , NEMMCSH  $N_2=65$ , WCSTH  $N_3=51$ ).

Substituting the values for each of these variables in the above formula, the sample size was 120, after adding 10 %, non-response rate the final total sample size was 132

### Sampling techniques and procedure

Tertiary hospitals were selected purposefully based on advanced service provision, including the Neonatal Intensive Care Unit (NICU) and KMC units. The lottery method was used to select three compressive specialized public hospitals from a total of four comprehensive specialized governmental hospitals (i.e., NEMMCSH, WSCSH, WCSH, and WUTSCH). The total sample  $n_f$  = final sample size of the study).

The total sample size of the study was allocated to each selected hospital based on the flow of postnatal mothers with

preterm and/or LBW babies to each hospital within two months based on information obtained from each selected public hospital. To ensure the representativeness of the sample and its non-probability, a complete enumerative sampling method was used. In cases of multiple births, one baby was selected by the lottery method for the study.

The proportional allocation of sample size was done as follows.

$$In = (n \text{ total})/N_{\text{total}} \times Ni$$

- i.  $In (i = 1-3) = \text{proportionate sample of individual hospital.}$
- ii.  $n \text{ total} = \text{the total sample size.}$
- iii.  $Ni (i = 1-3) = \text{number of postnatal mothers with LBW and/or preterm babies within two months at individual selected public hospitals.}$
- iv.  $N \text{ total} = \text{total postnatal mothers with LBW and/or preterm babies within two months at three selected public hospitals.}$
- v.  $\text{Proportionate sample of WCSH } (n1) = 132/174 \times 58 = 44.$
- vi.  $\text{Proportionate sample of NEMMCTH } (n2) = 132/174 \times 65 = 49.310 \cong 49.$
- vii.  $\text{Proportionate sample of WUTSH } (n3) = 132/174 \times 51 = 38.68965 \cong 39.$

## Eligibility Criteria

**Inclusion Criteria:** Mothers who recently gave birth to LBW and/or preterm infants in the NICU and/or KMC took part in the study.

**Exclusion criteria:** Mothers who were ill and unable to provide KMC

## Study variables

Mothers KMC practice is the outcome variable where, as Socio-demographic and economic characteristics (age, educational level, religion, employment position, marital status & place of residence) Obstetric factor (ANC visit, parity, gravidity, mode of delivery, place of delivery & number of pregnancy) Source of information (Social media, neighbors, health workers, friends & internet) Environmental factors (staff attitude, family support, inter-maternal support) Child's status (Baby weight, gestation age, health condition) and Mothers KMC knowledge were independent factors.

## Operational definitions

**Kangaroo mother care:** early, ongoing, and prolonged skin-to-skin contact; exclusive breastfeeding; early release following hospital-initiated KMC with continuation at home; and enough care and follow-up for mothers at home [17,18].

**Knowledgeable/good knowledge:** Mothers who got above the median score from the knowledge question were considered as knowledgeable [19].

**Good practice:** Participants were deemed to have had good practice if they received a score on the practice questions of greater than or equal to the median [20].

**Poor practice:** Mothers scored less than median of the total score of observational checklist criteria [19].

## Data collection Instrument and procedure

A Kobo toolbox was used to collect the data. An adapted structured questionnaire was uploaded to the tool in both Amharic and English versions. Four BSc nurses for data collection and one BSc neonatal nurse as supervisors were used. Eligible mothers were interviewed for 10 to 15 minutes and observed for the practice of KMC for 20 to 30 minutes at a time.

## Data quality control

Data quality was assured by a pretesting instrument on 5% of the total sample size and Two-day intensive training about tool utilization, ethics, data collection methods, and the study's purpose was given to data collectors and a supervisor. The principal investigator monitored the supervisors' and data collectors' daily tasks and repeated checkups of individual data were done before it was synchronized to the server.

## Statistical analysis

All checked and coded data was exported into an Excel sheet and again exported into SPSS version 25 for further statistical analysis. To identify the candidate variables, CORs and 95% CIs with P-value less than 0.25 were computed in the bivariate logistic regression analysis to include in the multivariate logistic regression model and the odds ratio with a 95% confidence interval and p-value of less than 0.05 was considered as statistically significant. Multicollinearity and goodness of fit tests were done using the Hosmer-Lemeshow model goodness fit test then descriptive statistics were presented using frequency tables, graphs, and charts for all variables.

## Result

### Socio-demographic characteristics of the mothers

A total of 130 participants were involved in this study, with a response rate of 98.48%. The mean age of the mother was 28 years. The overall socio-demographic characteristics of the mothers are described below (Table 1).

### Practice of KMC

The majority of mothers who gave KMC were observed to have dressed their baby with a front-open shirt, cap, socks, and diaper. Over three-fourths (88.5%) of the mothers were observed while they practiced positioning the infant with its head up and between their breasts. Three-fourths, or 75.4%, of the mothers who gave KMC, were observed to have repeatedly handled their babies. The overall prevalence of good practice among mothers who gave KMC in the neonatal care unit (NICU) was 68 (52.3%) with a 95% CI (43.61, 61.01) (Table 2) (Figure 1).

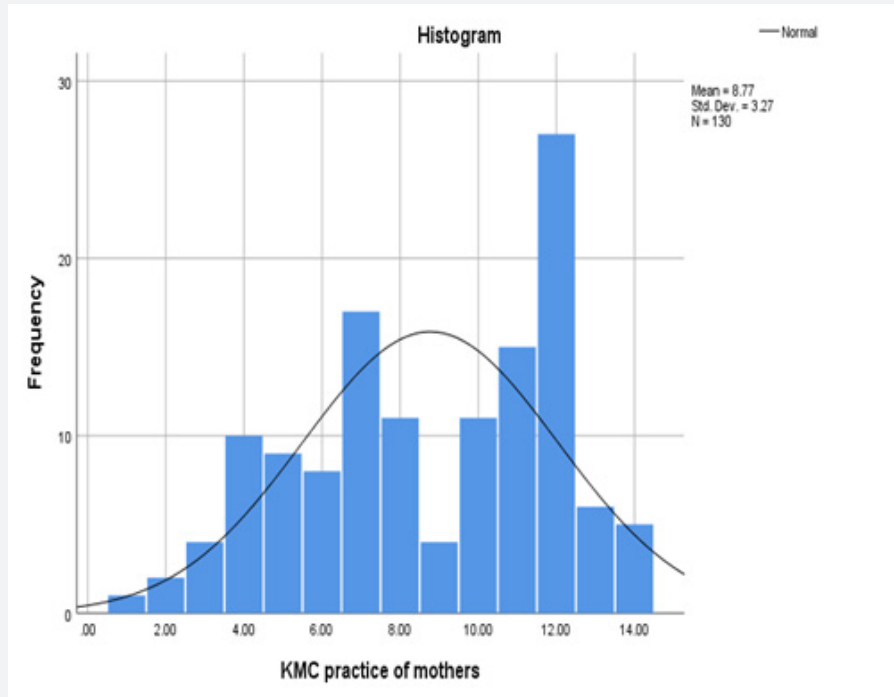


Figure 1: KMC practice among mothers who give KMC in tertiary care hospitals Central region of Ethiopia, 2023.

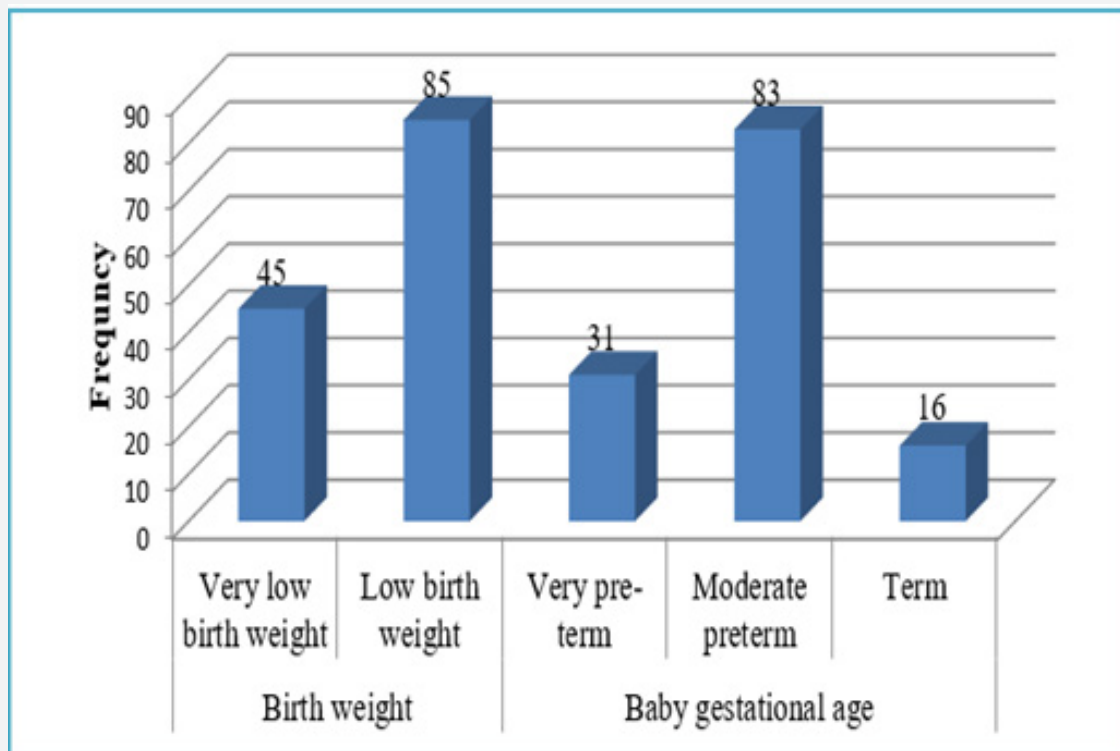
Table 1: Socio-demographic characteristics of mothers who gave KMC in tertiary care hospitals Central region of Ethiopia, 2023 (N = 130).

Variables With Category		Frequency (N=130)	Percent
Age of the mother	15-25	47	35.40%
	26-35	69	53.80%
	>=36	14	10.80%
Educational status	Unable to read and write	14	10.80%
	Attend Primary (1-8)	49	37.70%
	Attend secondary (9-12)	35	26.90%
	College and above	32	24.60%
Marital status	Single	5	3.80%
	Married	121	93.10%
	Widowed	2	1.50%
	Separated	2	1.50%
Occupation of the mother	Housewife	66	50.80%
	Merchant	16	12.30%
	Government employee	20	15.40%
	Private employee	16	12.30%
	Daily laborer	8	6.20%
	Others	4	3.10%
Residence of the respondent	Urban	67	51.50%
	Rural	63	48.50%
Average family monthly income	<=1650	19	14.60%
	1651 to 5250	70	53.80%
	5251 to 7800	24	18.50%
	>7800	17	13.10%

Family size	<=2	25	19.20%
	3 to 6	95	73.10%
	>=7	10	7.70%

**Table 2:** KMC practice observational checklist for mothers who gave KMC in tertiary care hospitals Central region of Ethiopia, 2023 (N = 130).

Serial no	KMC Practice Items	No (N/%)	Yes (N/%)
1	Baby is clothed with a front-open shirt, cap, socks, and diaper.	48(36.9)	82(63.1)
2	The infant is positioned with its head up and between the mother’s breasts.	15(11.5)	115(88.5)
3	According to local customs, kangaroo mother care has been provided wearing any front-open, light dress.	53(40.8)	77(59.2)
4	To maintain an unobstructed airway, the baby’s head should be tilted to one side and held slightly raised	27(20.8)	103(79.2)
5	Inspect the baby’s neck to make sure it is not too extended or flexed.	31(23.8)	99(76.2)
6	Mother and child are in direct eye contact while receiving care from a kangaroo mother	29(22.3)	101(77.7)
7	In a “frog” posture, the baby’s hips are flexed, abducted, and the arms are likewise flexed.	27(20.8)	103(79.2)
8	A sling or binder is used to support the baby’s lower body	69(53.1)	61(46.9)
9	The baby is covered with a blanket. At the parent’s desire, screens may be utilized to give privacy.	37(28.5)	93(71.5)
10	Depending on the infant’s health, the mother may express milk while holding the baby close to her chest, feed the baby using a spoon or tube, or hold the baby close to her chest to encourage milk production.	17(13.1)	113(86.9)
11	The baby is handled repeatedly.	32(24.6)	98(75.4)
12	The mother gradually sits down on a chair with the baby still in skin-to-skin contact.	52(40.0)	78(60.0)
13	With only diaper changes as an interruption, skin-to-skin contact will eventually increase to 24 hours per day	87(66.9)	43(33.1)
14	The mother can carry KMC while sleeping and relaxing?	66(50.8)	64(49.2)



**Figure 2:** Newborn baby birth weight and gestational age frequency distribution found in KMC units in tertiary care hospitals in Central region of Ethiopia Ethiopia, 2023 (N = 130).



**Obstetric related factors**

**Table 3:** Obstetric-related factors of mothers who gave KMC in tertiary care hospitals, Central region of Ethiopia, 2023 (N = 130).

Variables With Category		Frequency (N=130)	Percent (%)
Sex of the newborn baby	Male	63	48.50%
	Female	67	51.50%
Health status of the newborn baby	Healthy	105	80.80%
	Sick	25	19.20%
Type of current Birth	Single	105	80.80%
	Twin	25	19.20%
Number of Birth	Prim-Para	42	32.30%
	Multipara	88	67.70%
ANC follow up during pregnancy	Yes	127	97.70%
	No	3	2.30%
Place of delivery of newborn baby	Government hospital	88	67.70%
	Health center	34	26.20%
	Home	8	6.20%

The overall description of obstetrics factors is given in (Table 3) (Figure 2).

**Environmental factors**

Above three-fourths; 113 (86.9%) of the mothers thought that

KMC was important for their baby, and nearly two-thirds of the participants reported that KMC was culturally acceptable in their community (Table 4).

**Table 4:** Environmental and social support factors in KMC unit among who gave KMC in tertiary care hospitals Central region of Ethiopia, 2023 (N = 130).

Questions	No (N/%)	Yes (N/%)
Does your family think that KMC is important for the baby?	17(13.1)	113(86.9)
Is KMC culturally acceptable in your community?	45(34.6)	85(65.4)
Is your home environment conducive for KMC?	54(41.5)	76(58.5)
Did you get help from other family members during KMC procedure?	54(41.5)	76(58.5)
Do hospital staffs facilitate you to perform KMC in the hospital?	6(4.6)	124(95.4)
Did you get help from other mothers in hospital?	57(43.8)	73(56.2)

**Knowledge of mothers about KMC**

Nearly all 125 (96.2%) mothers knew that KMC is holding small babies' skin-to-skin with a career to keep them warm and 124 (95.4%) said that pre-term babies required KMC More than half of 75(58%) of the participant had good knowledge about KMC (Table 5) (Figure 3).

**Factors Associated with KMC practices**

In bivariate logistic regression analysis educational status, Residence of the respondent, the health status of the newborn baby, type of recent birth, mode of delivery, thinking of family about important KMC for the baby, home safety for KMC, from family members, Hospital staffs facilitate KMC to do, Age of the mother, birth weight of the newborn, average family monthly

income and number of birth were associated with KMC practice.

After controlling the confounding variables through a multivariate logistic with a P-value <.05 were considered as significant associated factors. Hence, the type of recent birth [AOR: 6.59 (95% CI: 1.46, 29.67)], SVD mode of delivery [AOR: 8.24 (95% CI: 2.12, 32.01)], getting support from other mothers in the KMC unit [AOR: 4.16 (95% CI: 1.02, 16.94)] and knowledge about KMC [AOR: 6.54(95% CI: 1.82, 23.42)] were significantly associated with KMC practice (Table 6).

AOR, adjusted odds ratio; CI, confidence interval; COR, crude odds ratio; 1, reference group, KMC kangaroo mother care, \*p value <0.05 were significantly associated variables with adjusted odd ratio.

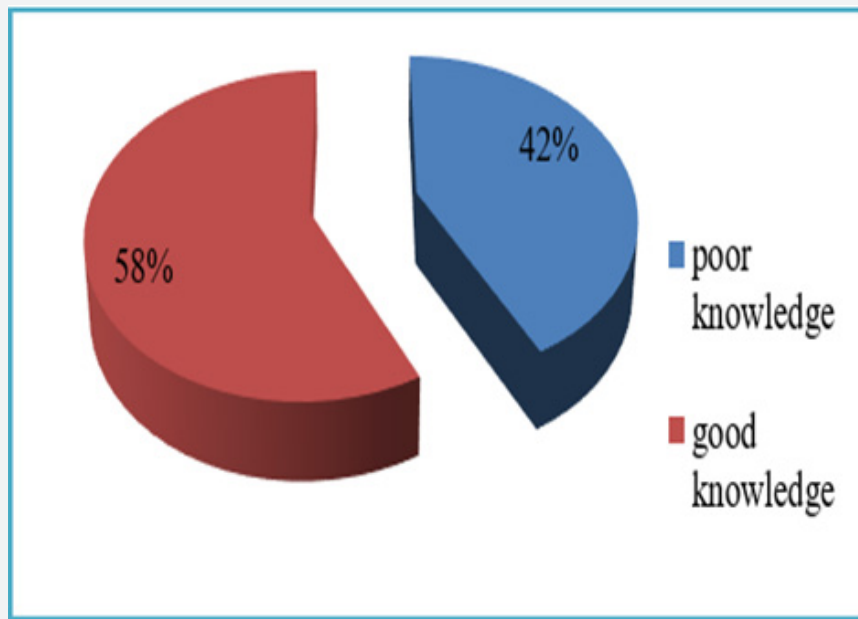


Figure 3: Knowledge of the mother about KMC who gave KMC in tertiary care hospitals, Central Region of Ethiopia 2023 (N=130).

Table 5: Knowledge question for mothers who gave KMC in tertiary care hospitals Central Region of Ethiopia 2023 (N=130).

Variables With Category		Frequency (N=130)	Percent (%)
KMC is a way of carrying baby in front of Mother only	Yes	80	61.50%
	No	50	38.50%
KMC is holding small babies skin-to-skin with caregiver to keep baby warm	No	5	3.80%
	Yes	125	96.20%
KMC is putting hot water bottle in the cot to warm babies	Yes	29	22.30%
	No	101	77.70%
KMC is keeping babies beside fire to warm them	Yes	66	50.80%
	No	64	49.20%
Which newborn requires kangaroo mother care	Other than pre-term	6	4.60%
	Pre-term baby	124	95.40%
Baby can breastfeed during KMC	No	41	31.50%
	Yes	89	68.50%
Benefits of kangaroo mother care	Stimulate mother bonding only	17	13.10%
	Makes baby warm and grow faster	113	86.90%

Table 6: Bivariate and multivariate logistics regression analysis output among mothers who gave KMC in tertiary care hospitals, Central Region of Ethiopia, 2023 (n=130).

Variables with category Poor practice (N/%)		Mothers, KMC practice		COR(95%CI)	(AOR(95%CI)	p-value
		Good practice (N/%)				
Educational status	Unable to read and write	11(78.6)	3(21.4)	.09(.02, .41)	1.46(.09,21.74)	0.781
	Attend Primary (1-8)	26(53.1)	23(46.9)	.29(.11, .78)	.68(.09, 5.08)	0.713
	Attend secondary (9-12)	17(48.6)	18(51.4)	.35(.12, .99)	.19(.02, 1.34)	0.097
	College and above	8(25.0)	24(75.0)	1	1	

Residence of the Respondent	Urban	23(34.3)	44(65.7)	3.10(1.51,6.36)	4.31(.72,25.77)	0.109
	Rural	39(61.9)	24(38.1)	1	1	
Health status of, the, new-born baby	Healthy	46(43.8)	59(56.2)	2.28(.92, 5.62)	.61(.13, 2.86)	0.538
	Sick	16(64.0)	9(36.0)	1	1	
Type of recent birth	Single	43(41.0)	62(59.0)	4.5(1.68,12.37)	6.59(1.46, 29.67)	0.014
	Twin	19(76.0)	6(24.0)	1	1	
Mode of delivery	SVD	23(33.8)	45(66.2)	3.11(1.41,6.83)	8.24(2.12,32.01)	0.002
	Instrumental delivery	12(66.7)	6(33.3)	.79(.25, 2.51)	.33(.05, 2.09)	0.241
	Cesarean section	27(61.4)	17(38.6)	1	1	
Does your family think that KMC is important for the baby?	No	14(82.4)	3(17.6)	.15(.04, .58)	.20(.02, 1.64)	0.137
	Yes	48(42.5)	65(57.5)	1	1	
Home safe for KMC	No	36(66.7)	18(33.3)	.26(.12, .54)	.39(.11, 1.41)	0.152
	Yes	26(34.2)	50(65.8)	1	1	
Did you get help from family members	No	37(68.5)	17(31.5)	.22(.11, .47)	.43(.10, 1.77)	0.246
	Yes	25(32.9)	51(67.1)	1	1	
Hospital staffs facilitate KMC to do	No	5(83.3)	1(16.7)	.17(.01, 1.49)	.19(.005, 7.07)	0.373
	Yes	57(46.0)	67(54.0)	1	1	
Did you get help from other mothers in hospital?	No	36(63.2)	21(36.8)	1	1	
	Yes	26(35.6)	47(64.4)	3.09(1.51,6.37)	4.16(1.02,16.94)	0.046
Knowledge of the mother	Poor knowledge	38(69.1)	17(30.9)	1	1	
	Good knowledge	24(32.0)	51(68.0)	4.7(2.24,10.05)	6.54(1.82,23.42)	0.004
Age of the mother	15-25	20(43.5)	26(56.5)	3.25(.88,11.89)	1.47(.31, 6.84)	0.623
	26-35	32(45.7)	38(54.3)	2.96(.84,10.37)	.14(.01, 1.40)	0.096
	>=36	10(71.4)	4(28.6)	1	1	
Birth weight of the newborn baby	Very low birth weight	18(40.0)	27(60.0)	1.61(.77, 3.34)	1.38(.39, 4.87)	0.608
	Low birth weight	44(51.8)	41(48.2)	1	1	
Average family monthly income	<=1650	15(78.9)	4(21.1)	.14(.03, .64)	1.30(.05,30.22)	0.868
	1651 to 5250	33(47.1)	37(52.9)	.61(.20, 1.83)	4.15(.44,38.89)	0.213
	5251 to 7800	8(33.3)	16(66.7)	1.09(.29, 4.03)	7.65(.63,92.30)	0.109
	>7800	6(35.3)	11(64.7)	1	1	
Number of Birth	Prim-para	16(38.1)	26(61.9)	1.78(.84, 3.76)	.96(.21, 4.37)	0.961
	Multipara	46(52.3)	42(47.7)	1	1	

## Discussion

The finding from this study reveals that the prevalence of good practice in KMC was 52.3% with (95% CI (43.61, 61.01) which is quite higher than the study conducted in Saudi Arabia, Nigeria, North Ethiopia, and Amhara Region respectively [10,17,21,22]. The possible explanation for this variation could be the duration of the study period, the difference in source of information, and the variation of socio-demographic characteristics, specifically the educational background of the participants. Nonetheless, the finding is lower than a study done in Sri-Lanka Sri Lanka, Nepal, and Uganda respectively [23-25]. This discrepancy may occur due to sample size differences and socio-economic variation between

the study area and other countries, better developed countries have better infrastructure, better accessibility of health facilities, and good health care service with necessary information about KMC. Also, this finding is comparable to a study conducted in Tigray and Dire-dew [20,26] this may be near-similar socio-demographic characteristics.

This study identifies four major independent variables that continue to be significantly associated with KMC practice, including the type of recent birth, mode of delivery, getting support from other mothers in the KMC unit, and knowledge about KMC. The present study indicates the type of recent birth plays a significant role in KMC practice. The odds of KMC practice increased about



6 times more compared to mothers who had a single baby than twins. Unfortunately, most studies identify the effect of gravidity and parity on KMC practice, [27,28], but this study tried to show how recent births that is single or twin births have an impact on mothers who practice KMC, so mothers who had single baby more practice KMC than those who had twin. The possible reason for this could be maternal comfort to position and the ability to give adequate care will be denied while the babies are two or more at a time.

The odds of KMC practice increase by 8 times more comparing mothers who gave birth through SVD than those who gave birth through CS and instrumental delivery, this finding is supported by a study conducted in Yergalem and Tigray hospitals respectively [17,29]. The similarity of the study may be due to maternal health problems, those mothers with CS and instrumental delivery may not practice KMC effectively due to fear of wounds as well as the postoperative pain that restricts the overall activity of the mothers. On the other hand, the association between mode of delivery and KMC practice was not found in another study [30,31].

According to this study, social support was significantly associated with KMC practice. Those mothers who got help from other mothers in the KMC unit are four times more likely to practice KMC as compared to their counterparts. This finding is incongruous with those of studies done in the Amhara and Tigray regions [17,10]. Since the KMC unit is restricted to other family members mothers in the unit need the support of others to practice KMC, also mothers who had prior exposure in the KMC unit have more experience than the newcomer mothers that increase, inter-mother relationships and support, on the other hand, encourage them to share their experience of KMC practice and culture.

This study found that the knowledge (awareness) of the mothers about KMC was statistically significant with KMC practice. Mothers who had good knowledge were 6.5 times more likely to perform KMC as compared to those who had poor knowledge about KMC. This finding is in agreement with studies conducted in Nigeria, Nepal, Malawi, South Africa, Tigray region, and Amhara region [10,17,22,23,32,33]. About half of the postnatal mothers in the KMC unit have good KMC practices that are due to good knowledge about KMC, this study also indicates that 97% of the mothers had ANC follow-up during pregnancy and had got health education from health professionals during ANC follow-up that helped the mothers to have good awareness about KMC. Knowledge of the mother on practicing KMC for unstable neonates is a very important point, studies show that poor knowledge of the mother is one of the biggest obstacles to KMC practice, so mothers need to know how to practice KMC safely and effectively.

### Limitation

Even though the study was conducted in tertiary care hospitals of the region and used multiple tools to generate pertinent data limitations were found like the study used a non-probability

sampling technique which affects the generalizability of the findings. Due to different reasons, this study uses a smaller sample size that may reduce the precision of the study.

### Conclusion

This study addresses the overall prevalence and associated factors for the practice of KMC, the results were comparable with other evidence conducted in Ethiopia. Mode of pregnancy, getting support from other mothers in the KMC unit, and mothers' knowledge about KMC were identified as significantly associated variables with KMC practice. Knowledge of the mothers about KMC practice is an important point to administer KMC safely and effectively. Even though half of the postnatal mothers in the KMC unit have good KMC practices, in the study area still huge numbers of neonates die due to low birth weight and preterm, so the central region of Ethiopia and zonal health bureau should use this evidence to decrease neonatal death. Lastly, we recommend tertiary hospitals should focus on strict follow-up on the progress of labor for those mothers with known pre-term and low birth weights to reduce neonatal mortality.

### Authors' contributions

All authors collaboratively made substantial contributions to conception and design, acquisition of data, or analysis and interpretation of data; took part in drafting the article or revising it critically for important intellectual content; gave final approval of the version to be published; and agree to be accountable for all aspects of the work.

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### Ethical Clearance

Ethical clearance for the commencement of the study was obtained from Institutional Review Board of Hawassa University with reference number (Ref: No. IRB/314/15). Permission was also sought and obtained from respective health facilities. Data was kept anonymous by keeping the identity of the neonate's or mother's credentials hidden before, during, and after the study.

### Informed consent

Written informed consent was obtained from each volunteer participant who has no personal identification. Coding was used to eliminate name and other personal identification to ensure privacy and confidentiality

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Availability of data

All data generated or analyzed during this study are available on secure and reasonable request.

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