

Assessment of maternal knowledge on neonatal danger signs in a tertiary level hospital: a cross-sectional study

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ABSTRACT

Introduction: Identification of neonatal danger signs is crucial for providing timely management on neonatal care and reducing neonatal morbidity and mortality.

Objective: To assess mother's knowledge on neonatal danger signs and its contributing factors in a tertiary level hospital.

Methodology: A cross-sectional study was conducted from 9th December 2025 to 8th January 2026 among 385 mothers of neonates aged 0–30 days at Kathmandu Medical College Teaching Hospital, Kathmandu, with ethical approval obtained (Ref: 03122025/07). Data on socio-demographic characteristics, maternal knowledge of WHO-defined neonatal danger signs, and associated factors were collected using a structured questionnaire and analyzed in SPSS version 26 using descriptive statistics and logistic regression.

Results: Overall, 94% of mothers demonstrated good knowledge on neonatal danger signs, with particularly high recognition of respiratory distress, jaundice, persistent vomiting, umbilical infection, and hypothermia. However, notable gaps were evident, with a proportion of mothers reporting “don't know” for signs such as poor feeding, skin/eye infections, fever, and lethargy. Institutional delivery was significantly associated with better maternal knowledge compared to home delivery (aOR = 0.13; 95% CI: 0.02–0.80; p = 0.029).

Conclusion: Maternal knowledge on neonatal danger signs was high overall. However, gaps persisted in recognizing poor feeding, skin/eye infections, and lethargy. Institutional delivery was significantly associated with maternal knowledge, although the small number of home deliveries limits the strength and generalizability of this finding.

Key words: Maternal knowledge; Neonatal danger signs; Tertiary level hospital

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INTRODUCTION

Neonatal mortality remains a major public health challenge with nearly 99% of deaths occurring within one month of life in low and middle income countries (LMICs).¹ Newborns are highly vulnerable to life-threatening conditions such as severe infections, feeding difficulties, hypothermia, convulsions, jaundice and other non-specific symptoms collectively known as neonatal danger signs.² Early recognition of these danger signs largely depend on mothers and is essential for prompt care-seeking and timely intervention to reduce neonatal morbidity and mortality.³

Studies across South Asia including Nepal have shown that many mothers lack adequate knowledge on neonatal danger signs resulting in delay in seeking medical care and increased risk of complications leading to death.^{4,5} Many of these deaths are related to late recognition of danger signs by parents leading to delay in the decision to seek medical care. Since the health-seeking behavior

of mothers for neonatal care depends on the mothers' knowledge about WHO recognized neonatal danger signs, it is essential to investigate their knowledge of these signs.⁶ So, this study aims to assess the maternal knowledge and its associated factors on neonatal danger signs of newborns aged 0-30 days of life.

METHODOLOGY

A cross-sectional study over the period of one month (9th December 2025 -8th January 2026) involved 385 mothers of newborns aged 0–30 days attending the immunization clinic, Paediatrics Outpatient Department (OPD), postnatal ward and Neonatal Intensive Care Unit (NICU) of Kathmandu Medical College Teaching Hospital, Sinamangal, Kathmandu. Mothers were recruited using consecutive sampling until the required sample size was reached and data were collected through face-to-face interviews lasting approximately 10–15 minutes. Maternal knowledge on ten neonatal danger signs were assessed using a structured questionnaire adapted from the WHO (World Health Organization) and incorporated into Integrated Management of Neonatal and Childhood Illness (IMNCI) guidelines. Ten neonatal danger signs according to WHO incorporated by IMNCI are poor feeding/not breastfeeding well, fever (temp $\geq 37.5^{\circ}\text{C}$), hypothermia (temp $\leq 35.5^{\circ}\text{C}$), difficulty in breathing/fast breathing (resp rate $>60/\text{min}$)/chest indrawing, convulsion/ seizure, lethargy/ very sleepy/ not responsive, jaundice, umbilical pus/ umbilical bleeding, persistent vomiting and skin infection/eye infection.⁷ Ethical clearance was obtained from Institutional Review Committee KMCTH (Ref no. 03122025/07) and informed consent, confidentiality, and voluntary participation were ensured for all participants.

Sample size estimation was done using the following formula

$$n = \frac{Z^2 \times p \times q}{e^2}$$

where,

Z = 1.96 for confidence interval 95%

p = Prevalence of maternal good knowledge on neonatal danger signs = 47%⁸

q = 1-p

e = margin of error = 5%

$$n = \frac{(1.96)^2 \times 0.47 \times (1-0.47)}{(0.05)^2} = \frac{3.84 \times 0.47 \times 0.53}{0.0025} = 385 \text{ mothers were included.}$$

The study included both independent and dependent variables. Independent variables consisted of socio-

demographic and maternal characteristics such as mother's age, residence, educational status, occupation, ethnicity, religion, monthly family income, place of delivery, and receipt of counselling on neonatal danger signs. The dependent variable was maternal knowledge on neonatal danger signs. Knowledge was assessed using ten neonatal danger signs recognized by WHO, incorporated by IMNCI with response options of "Yes," "No" and "Don't know." For descriptive analysis, all response categories were retained, while for further analysis responses were recorded into binary variables (Yes=1, No=0 and Don't know=99). A cumulative knowledge score was computed by summing the ten binary variables, yielding scores that ranged from 0 to 10. Based on this scoring system, mothers identifying correctly more than 50% (≥ 5 out of 10) of neonatal danger signs indicates good knowledge and mothers identifying less than 50% of neonatal danger signs (< 5 out of 10) indicating poor knowledge.⁸ This binary classification served as the dependent variable in logistic regression to identify predictors of sufficient knowledge among mothers regarding neonatal danger signs. The data were entered into Excel sheet and then exported to statistical package for social sciences, IBM SPSS Statistics for Windows version 26 (IBM Corp., Armonk, N.Y., USA) with descriptive statistics (frequencies and percentages) presented in text and tables. Associations between variables were assessed using binary and multivariable logistic regression, reporting crude and adjusted odds ratios with 95% confidence intervals and Chi-square tests.

RESULTS

A total of 385 mothers of neonates aged 0–30 days were included, more than half 206 (53.5%) of them were aged 31–45 years. Most neonates were of within the first 15 days of life 250 (64.9%). The majority of mothers were educated 363 (94.3%), about half were employed 200 (51.9%), and most resided in urban areas (85.7%), with nearly all deliveries occurring in health institutions (98.4%) and 55.6% receiving counselling on neonatal danger signs (Table 1).

Overall, 362 (94%) of mothers demonstrated good knowledge on neonatal danger signs whereas 23(6%) had poor knowledge (Table 2).

Awareness of mothers on individual neonatal danger signs were generally high, particularly for difficulty breathing 364 (94.5%), persistent vomiting 356 (92.5%), jaundice 355 (92.2%) and hypothermia 353 (91.7%). However, response as "don't know" in recognizing poor

feeding 69 (17.9%), skin or eye infections 45 (11.7%), fever 42 (10.9%) and lethargy/very sleepy 39 (10.1%) revealed knowledge gaps among mothers (Table 3).

Place of delivery was significantly associated with knowledge of newborn danger indicators. After

controlling for maternal age and receipt of danger-sign counseling, mother's who had a home delivery had significantly lower odds of understanding newborn danger signs than those who had an institutional delivery (aOR = 0.13, 95% CI: 0.02-0.81, $p = 0.029$, table 4).

Table 1: Socio-demographic characteristics of mothers and newborn

Socio-demographic variables	n (%)
Mother's age (years)	
20-30	179 (46.5)
31-45	206 (53.5)
Neonate's age (days)	
0-15	250 (64.9)
16-30	135 (35.1)
Education	
No education	22 (5.7)
Education	363 (94.3)
Occupation	
Not working	185 (48.1)
Unskilled/semiskilled/professional	200 (51.9)
Residence	
Urban	330 (85.7)
Rural	55 (14.3)
Delivery place	
Home delivery	6 (1.6)
Institution delivery	379 (98.4)
Ethnicity	
Brahmin	150 (38.9)
Chhetri	72 (18.7)
Janajati	106 (27.4)
Dalit	18 (4.7)
Madhesi	23 (6.0)
Muslim	16 (4.2)
Religion	
Hindu	364 (94.5)
Muslim	15 (3.9)
Buddhist	6 (1.6)
counselling on danger signs	
No	171 (44.4)
Yes	214 (55.6)
Estimated monthly family income	
≤ 40000 /-	225 (58.4)
≥ 41000/-	160 (41.6)

Table 2: Maternal knowledge on neonatal danger signs (n= 385)

Variables	n (%)
Good Knowledge (identifying danger signs ≥ 50%)	362 (94.0)
Poor Knowledge (identifying danger signs < 50%)	23 (6.0)

Table 3: Maternal knowledge on various neonatal danger signs (n=358)

S.N.	Knowledge on Neonatal danger signs	Category		
		Yes n (%)	No n (%)	Don't know n (%)
1.	Poor feeding / not breastfeeding well	304 (79.0)	12 (3.1)	69 (17.9)
2.	Fever	326 (84.7)	17 (4.4)	42 (10.9)
3.	Hypothermia	353 (91.7)	9 (2.3)	23 (6.0)
4.	Difficulty breathing/fast breathing /chest indrawing	364 (94.5)	10 (2.6)	11 (2.9)
5.	Convulsions/seizure	333 (86.5)	23 (6.0)	29 (7.5)
6.	Lethargy/very sleepy/not responsive	316 (82.1)	30 (7.8)	39 (10.1)
7.	Jaundice	355 (92.2)	15 (3.9)	15 (3.9)
8.	Umbilical pus/bleeding	353 (91.7)	18 (4.7)	14 (3.6)
9.	Persistent vomiting	356 (92.5)	12 (3.1)	17 (4.4)
10.	Skin/eye infection	323 (83.9)	17 (4.4)	45 (11.7)

Table 4: Association between sociodemographic variables and maternal knowledge on neonatal danger signs

Variables	n (%)	p-value	cOR (95% CI)	p-value	aOR (95%CI)
Counselling on danger signs					
No	171 (44.4)	0.10	2.03 (0.85-4.81)	0.20	1.78 (0.73-4.34)
Ref 1					
Yes	214 (55.6)				
Place of delivery					
Home	6 (1.6)	0.17	0.11 (0.20-0.67)	0.029	0.13 (0.02-0.80)
Ref 1					
Institution	379 (98.4)				
Maternal age					
		0.05	1.10 (0.99-1.21)	0.12	1.08 (0.98-1.19)

DISCUSSION

The present study demonstrates that a substantial majority of mothers possessed adequate knowledge of neonatal danger signs, with 94% classified as having good knowledge. This finding is higher than other studies from LMICs where maternal knowledge remains suboptimal.^{4,5} The relatively high level of awareness observed among mothers in this study could be due to the predominantly urban (85.7%), educated (94.5%) population and the high rate of institutional deliveries (98.4%). Similar other studies done by Ekwochi U et al⁹ and Nigatu SG et al¹⁰ have also shown maternal education and access to health services had significant impact on maternal awareness for identifying neonatal danger signs and care-seeking behavior for neonatal illnesses.

Despite of overall high level of maternal knowledge, important gaps were identified in recognizing specific danger signs, particularly poor feeding and lethargy. Similar findings have been reported in

study done by Sandberg J et al where less obvious or less emphasized symptoms were frequently under-recognized by caregivers.⁴ Poor recognition of feeding difficulties is especially concerning, as it is often an early manifestation of neonatal sepsis and other life-threatening conditions.⁴ This emphasizes poor caregiver recognition of early danger signs like feeding difficulty leading to delayed care in babies.¹¹ This highlights the need for targeted and practical counselling strategies that place greater emphasis on recognizing subtle but critical neonatal danger signs identification.

The study further demonstrated that institutional delivery was the only significant predictor of maternal knowledge after adjustment (p value=0.029). Mothers who delivered in health facilities were more likely to have better knowledge on identifying neonatal danger signs, which is consistent with the evidence that interaction with skilled health personnel enhances maternal awareness through counselling and education.¹² Although counselling showed a positive association with

knowledge, it was not statistically significant, suggesting possible gaps in the quality, consistency, or retention of counselling messages. This highlights the importance of strengthening counselling approaches, ensuring standardized messaging, and reinforcing key danger signs during antenatal and postnatal care visits.

Maternal age was not significantly associated with knowledge after adjustment, indicating that knowledge may be more strongly influenced by healthcare exposure and educational status rather than age alone. This finding is consistent with the study by Yitayew YA et al which also reported inconsistent associations between maternal age and maternal knowledge on neonatal danger signs.¹³

This study is conducted in only one tertiary hospital, so findings cannot be generalized. The study is limited by the use of self-reported data, which may be subject to recall and social desirability bias. The cross-sectional design further restricts the ability to establish causal relationships between variables. Bottom of Form

CONCLUSION

Overall, the findings suggest that while general awareness of neonatal danger signs is high among mothers, targeted interventions are still required to address specific knowledge gaps. Strengthening facility-based education, improving counselling quality, and promoting repeated health messaging through community and primary healthcare platforms may enhance early recognition and timely care-seeking, ultimately contributing to reduced neonatal morbidity and mortality.

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