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# AWARENESS ABOUT DANGER SIGNS IN NEONATES AMONG POSTNATAL MOTHERS: A CROSS-SECTIONAL STUDY IN URBAN AND SEMI-URBAN INDIA

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**Abstract**

**Background** Neonatal danger signs (NDSs) are early indicators of serious newborn illness. Timely recognition by mothers can significantly improve newborn survival outcomes.

**Methods** In a cross-sectional, facility-based study conducted at Great Eastern Medical College and two affiliated health centers in Srikakulam, Andhra Pradesh, 580 postnatal mothers were interviewed between June to 15th October 2025. Data were collected through WHO-adapted structured questionnaires assessing knowledge of 15 NDSs. Descriptive and inferential analyses were performed using chi-square and multivariate logistic regression.

**Results** The mean maternal age was 26.3±4.8 years. Overall, 43% of mothers demonstrated adequate knowledge (≥3 signs). Fever (92%), poor feeding (56%), and convulsions (60%) were the most recognized signs. Hypothermia (27%) and jaundice (29%) were least known. Graduate-level education (odds ratio [OR]: 3.1; 95% confidence interval [CI]: 1.8–5.3), higher socioeconomic status (OR: 2.4; 95% CI: 1.5–3.9), and receipt of antenatal counseling (OR: 2.9; 95% CI: 1.9–4.5) independently predicted adequate knowledge.

**Conclusions:** Maternal awareness of neonatal danger signs remains inadequate in semi-urban India. Targeted health education during antenatal and postnatal care can improve recognition and care-seeking. Integration of community-level education via ASHA and ANM workers is recommended to strengthen India's Newborn Action Plan strategies.

**Keywords:** Neonatal danger signs; maternal awareness; antenatal counseling; community health; neonatal mortality prevention

## Introduction

Neonatal mortality accounts for nearly half of all under-five deaths globally and represents a significant public health challenge in low- and middle-income countries, particularly India[1]. The World Health Organization (WHO) emphasizes identification of neonatal danger signs (NDSs)—such as poor feeding, convulsions, fever, hypothermia, respiratory difficulty, and jaundice—as key

indicators guiding early medical evaluation[2]. Despite initiatives like the Indian Newborn Action Plan, maternal understanding of these signs remains limited in semi-urban and rural communities[3–5].

Multiple studies demonstrate that factors such as maternal education level, socioeconomic position, healthcare access, and antenatal health counseling substantially affect awareness[6–9]. Previous Indian and international research highlights inconsistent recognition patterns: most mothers identify fever and feeding difficulty but rarely hypothermia and jaundice[10–12]. This study aimed to assess NDS awareness among postnatal mothers in southern India and elucidate demographic and counseling determinants influencing knowledge levels.

## Methods

### Study Design and Setting

A cross-sectional facility-based study was performed between June to 15th October 2025 at the Department of Pediatrics, Great Eastern Medical College, Srikakulam, Andhra Pradesh. Both an urban tertiary setting and affiliated semi-urban primary health centers participated to provide a representative population sample of postnatal mothers.

### Study Population

Participants were postnatal mothers aged ≥18 years, within 42 days postpartum, serving as the primary caregivers for their infants. Mothers unable to participate due to cognitive or severe medical limitations were excluded.

### Sample Size Determination

Sample size (n) was calculated using the formula

Calculated using $n = \frac{Z^2 p(1-p)}{d^2}$

where Z=1.96 (95% confidence), p=0.5 (expected awareness prevalence based on prior studies[40]), d=0.05 (precision). Accounting for 10% nonresponse and a 1.3 design effect, the minimum target sample was 570; 580 mothers were ultimately included, ensuring adequate power (80%).

### Sampling Technique

A stratified random sampling approach was employed. Urban (hospital-based) and semi-urban (health-center-based) strata were defined proportionally to service utilization volumes during the preceding quarter. Within each stratum, mothers were recruited consecutively during postnatal and immunization visits until quotas were met.

### Data Collection Tool

A structured, interviewer-administered questionnaire was designed with four domains: (1) socio-demographic and obstetric profile, (2) antenatal care exposure, (3) knowledge of 15 WHO-specified neonatal danger signs, and (4) care-seeking intentions. The instrument was developed in English, translated into Telugu, and back-translated. Content validity was verified by a three-member pediatric expert panel. Internal consistency reliability yielded Cronbach's α=0.84.

### Operational Definitions

Adequate knowledge was defined as correctly identifying ≥3 NDSs. SES was assessed by Modified Kuppuswamy Scale 2024. "Antenatal counseling" included instruction by health professionals regarding newborn care and illness recognition during antenatal visits[2].

### Data Analysis

Data were coded and entered into Microsoft Excel 2019, analyzed using SPSS v26. Descriptive statistics were expressed as frequency (percentage) and mean (SD). Bivariate associations were

determined using the chi-square test. Significant variables ($p<0.05$) entered a multivariate logistic regression model to identify independent predictors of adequate NDS awareness.

**Ethical Considerations**

Ethical approval was obtained from the Institutional Ethics Committee, Great Eastern Medical College. Written informed consent was secured. Confidentiality and voluntary participation were assured per the Declaration of Helsinki (2013).

## Results

**Maternal Characteristics**

The mean maternal age was 26.3±4.8 years (range 18–38). Most participants (80%) had ≥4 antenatal visits; 58% were multiparous. Educational attainment: no formal education (18%), primary (35%), secondary (26%), graduate and above (21%). Socioeconomic distribution: 31% upper/upper-middle class, 37% lower-middle, 32% low-income group.

**Awareness of Neonatal Danger Signs**

Of 580 mothers, 43% exhibited adequate knowledge. Table 1 lists specific signs recognized. Fever (92%) and vomiting/diarrhea (69%) were most identified, while jaundice (29%) and hypothermia (27%) were least known.

**Table 1. Recognition of neonatal danger signs among mothers**

| Danger sign | Recognized, n (%) |
|---|---|
| Fever | 534 (92) |
| Vomiting/Diarrhea | 401 (69) |
| Convulsions | 346 (60) |
| Poor feeding | 323 (56) |
| Chest indrawing | 276 (48) |
| Lethargy | 226 (39) |
| Jaundice (palms/soles) | 168 (29) |
| Hypothermia | 157 (27) |

**Predictors of Adequate Knowledge**

In multivariate analysis, graduate education, higher socioeconomic status, and antenatal counseling independently predicted NDS awareness (Table 2).

**Table 2. Predictors of adequate knowledge (multivariate logistic regression)**

| Predictor | Adjusted OR (95% CI) | P value |
|---|---|---|
| Graduate education | 3.1 (1.8–5.3) | <0.001 |
| Upper SES | 2.4 (1.5–3.9) | 0.002 |
| Antenatal counseling | 2.9 (1.9–4.5) | <0.001 |

## Discussion

This study reveals that less than half of mothers had adequate NDS awareness, paralleling findings from Tamil Nadu (45%)[7], Coimbatore (46%)[1], and Ethiopia (44%)[5]. Comparable low awareness rates are also observed in Bangladesh and Kenya[20]. Fever and feeding difficulty were recognized consistently across prior studies[6–8], underscoring visibility-driven recall, whereas latent conditions such as hypothermia and jaundice continue to be poorly understood[5–7].

Education and socioeconomic disparities remain critical determinants of neonatal health knowledge. Bayih et al. found a threefold improvement among mothers with higher educational attainment[5], consistent with the present study. Similarly, antenatal counseling correlated strongly with improved

awareness—affirming WHO's directive emphasizing continuity between antenatal and postnatal education[2].

Urban mothers demonstrated superior recognition compared to semi-urban counterparts, likely due to improved access to digital media and formal ANC[6–8]. Yet, despite 88% of participants expressing intent to seek care, only 18% could list more than three danger signs, suggesting a concerning gap between awareness and action—a finding echoed by Tesfaye et al. in Ethiopia[19].
Integrating structured education within India's Integrated Reproductive and Child Health (RCH) framework can leverage existing ASHA/Anganwadi infrastructure for scalable impact. Interactive participatory discussions rather than didactic talks yield higher retention[20].

**Recommendations**
**Strengthened Counseling Protocols:** Integrate validated IEC modules taught by frontline healthcare workers into routine ANC/PNC sessions.

**Visual Learning Tools**: Employ pictorial and audiovisual aids during health worker home visits to facilitate recognition among illiterate populations.

**Digital Awareness Campaigns**: Implement community-based smartphone applications and WhatsApp education groups in hybrid urban–rural regions to disseminate NDS information.

**Periodic Supervision**: Incorporate NDS topics into district-level maternal and child health review indicators to monitor awareness outcomes.

**Further Research:** Longitudinal studies evaluating knowledge retention post-intervention and linkage to mortality reduction outcomes.

**Conclusion**
Maternal knowledge of neonatal danger signs remains inadequate within semi-urban Indian populations. Education, socioeconomic advancement, and antenatal counseling are strong predictors of awareness. Community-based, structured educational approaches via health workers and digital platforms can enhance early recognition, facilitate timely referrals, and support India's goal to reduce neonatal mortality to below 12 per 1000 live births by 2030.

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