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Maternal Knowledge, Attitudes, and Practices Regarding Neonatal Jaundice and Associated Factors Among Mothers Attending a Tertiary Care Hospital in Lahore, Pakistan: A Cross-Sectional Study

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Abstract:
Background: Neonatal jaundice affects nearly 60% of term and 80% of preterm neonates during the first week of life. Although physiological jaundice is usually benign, delayed recognition and inappropriate management may progress to severe hyperbilirubinemia, acute bilirubin encephalopathy, and kernicterus, causing irreversible neurological damage or death. Maternal knowledge, attitudes, and practices (KAP) are central to early recognition and timely care-seeking, yet awareness among Pakistani mothers remains poorly characterized. **Objective:** To assess maternal knowledge, attitudes, and practices regarding neonatal jaundice and to identify associated socio-demographic and healthcare-related factors among mothers attending a tertiary care hospital in Lahore, Pakistan. **Methods:** A hospital-based descriptive cross-sectional study was conducted among 180 mothers of neonates admitted to the neonatal and pediatric units of a tertiary care hospital in Lahore, selected through purposive sampling. Data were collected using a pretested structured questionnaire covering demographic characteristics and knowledge, attitude, and practice domains (Cronbach's $\alpha = 0.802$; Scale-Level Content Validity Index = 0.958). Data were analyzed in SPSS version 24 using descriptive statistics and binary logistic regression ($p<0.05$ considered significant). **Results:** The valid response rate was 96.4%. Good knowledge of neonatal jaundice was demonstrated by 46.4% of mothers, and only 41.7% actively sought information about the condition. Postgraduate maternal education (OR = 5.977; 95% CI: 1.994–17.916), previous education regarding neonatal jaundice (OR = 3.617; 95% CI: 1.637–7.993), and having a male infant (OR = 1.714; 95% CI: 1.122–2.617) were significantly associated with good knowledge. Positive maternal attitudes were associated with postpartum support from a trained maternity attendant (OR = 1.969; 95% CI: 1.264–3.066) and good knowledge (OR = 1.804; 95% CI: 1.194–2.726). Appropriate maternal practices were significantly associated with previous education (OR = 2.260; 95% CI: 1.105–4.625) and good knowledge (OR = 3.112; 95% CI: 2.040–4.749). **Conclusion:** Maternal knowledge regarding neonatal jaundice remains inadequate among many mothers attending tertiary healthcare facilities. Educational attainment and previous health education significantly shape maternal knowledge, attitudes, and practices. Strengthening antenatal counselling, postnatal education, and community-based awareness programs is recommended to improve early recognition and timely healthcare-seeking behavior, thereby reducing preventable neonatal morbidity.

Keywords: Neonatal jaundice; Maternal knowledge; Attitude; Practice; Hyperbilirubinemia; Mothers; Pakistan; Cross-sectional study

Introduction

Neonatal jaundice (NNJ) is among the most common clinical conditions of the newborn period and a persistent contributor to neonatal morbidity worldwide. It results from elevated serum bilirubin levels and manifests as yellow discoloration of the skin and sclera, affecting approximately 60% of term and 80% of preterm neonates within the first week of life. Physiological jaundice is generally self-limiting, but delayed recognition or inadequate management can progress to acute bilirubin encephalopathy and kernicterus, resulting in permanent neurological impairment or death (1,2).

The burden of severe hyperbilirubinemia is disproportionately high in low- and middle-income countries, where delayed diagnosis, limited access to phototherapy, and low parental awareness compound the risk of adverse neonatal outcomes (Olusanya et al., 2018a; Olusanya et al., 2018b). Pakistan continues to report one of the highest neonatal morbidity burdens in South Asia, and neonatal jaundice remains a leading cause of admission to tertiary neonatal units. Although phototherapy and exchange transfusion are available in specialized hospitals, many newborns present late because caregivers fail to recognize early warning signs or first turn to traditional home remedies (Khan et al., 2021).

Because mothers are typically the first to observe changes in a newborn's condition, maternal knowledge is one of the strongest determinants of early detection and timely care-seeking. Adequate knowledge promotes exclusive breastfeeding and adherence to medical advice, whereas poor knowledge is associated with delayed presentation and more severe hyperbilirubinemia. International evidence consistently documents this gap: studies from Shenzhen, China found that antenatal education and higher maternal education were associated with significantly better knowledge (Huang et al., 2022), while research from Ghana reported that although most mothers had heard of neonatal jaundice, comprehensive understanding of its causes, danger signs, and evidence-based treatment remained limited, with misconceptions about spiritual causes and maternal diet common (Adoba et al., 2018). Comparable gaps have been reported in Ethiopia and Nigeria, where only a minority of mothers correctly identified causes and danger signs, and where reliance on sunlight exposure and herbal remedies remained widespread (Mekonnen et al., 2021; Ezeaka et al., 2014; Amegan-Aho et al., 2019).

Within Pakistan, similar deficits have been documented: mothers frequently recognize the visible yellow discoloration of jaundice but remain unaware of its underlying causes, complications, and the urgency of treatment, and awareness gaps persist across tertiary hospitals in different provinces (Khan et al., 2021; Saddozai et al., 2022; Memon et al., 2022).

Knowledge alone does not guarantee appropriate action; maternal attitudes, shaped by beliefs about disease severity, trust in healthcare providers, family influence, and cultural traditions, also determine whether care is sought promptly. In several developing-country settings, jaundice is still perceived as a harmless, self-resolving condition, or is attributed to supernatural causes, delaying hospital presentation (Amegan-Aho et al., 2019). Conversely, mothers who receive structured counselling and continuous support from trained health personnel during the postpartum period tend to show greater confidence in evidence-based care and are more receptive to timely treatment (Bhutani et al., 2019; Asefa et al., 2021).

Maternal practices, including exclusive breastfeeding, regular observation for jaundice, prompt consultation with healthcare professionals, and adherence to phototherapy, directly influence neonatal outcomes, whereas delayed breastfeeding, unsupervised sunlight exposure, and reliance on traditional healers increase the risk of bilirubin-induced neurological dysfunction (Kemper et al., 2022). Socio-demographic characteristics, particularly maternal education, previous exposure to health education, parity, and place of residence, have consistently been identified as

determinants of maternal knowledge, attitudes, and practices across settings (Babalola et al., 2020; Boadu et al., 2020; Shrestha et al., 2021; Tola et al., 2020; Ullah et al., 2021; Watchko, 2021).
Despite growing international evidence, Pakistan-specific data comprehensively examining maternal knowledge, attitudes, and practices together, along with their associated factors, remain limited; most local studies have focused on clinical management rather than maternal awareness and behavior. Lahore, as one of Pakistan's largest metropolitan centers, draws patients from diverse urban and rural backgrounds, making it a relevant setting in which to examine this gap. This study therefore assessed maternal knowledge, attitudes, and practices regarding neonatal jaundice among mothers attending a tertiary care hospital in Lahore, and identified the socio-demographic and healthcare-related factors associated with these outcomes, with the aim of informing nurse-led maternal education strategies.

Methodology

A hospital-based descriptive cross-sectional study was conducted at the Neonatal Intensive Care Unit, Pediatric Department, and Postnatal Wards of a large tertiary care teaching hospital in Lahore, Pakistan, over a four-month period. The target population comprised mothers of neonates admitted to the neonatal and pediatric units during the study period. A non-probability purposive sampling technique was used, and eligible mothers who met the inclusion criteria were approached consecutively until the required sample was achieved.
Mothers aged 18 years or older, with a neonate admitted to the neonatal or pediatric unit, able to communicate in Urdu or English, and willing to provide written informed consent were included. Mothers who were critically ill, had a diagnosed psychiatric illness impairing communication, were healthcare professionals with specialized neonatal training, or returned incomplete questionnaires were excluded. The sample size was calculated using a single population proportion formula based on previous literature, yielding a required sample that was inflated for possible non-response; 180 completed questionnaires were included in the final analysis, corresponding to a valid response rate of 96.4%.
Data were collected using a structured, self-administered questionnaire developed after an extensive literature review, comprising four sections: (I) socio-demographic characteristics; (II) knowledge of neonatal jaundice, including its definition, causes, risk factors, clinical and warning signs, complications, prevention, and treatment (scored 1 = correct, 0 = incorrect/don't know); (III) maternal attitudes, rated on a five-point Likert scale from strongly disagree to strongly agree; and (IV) maternal practices, including recognition of jaundice, healthcare-seeking behavior, breastfeeding, use of traditional remedies, sunlight exposure, and compliance with medical advice. Higher scores reflected better knowledge and more positive attitudes.
Content validity was established through review by a panel of pediatricians, neonatal nurses, nursing educators, and research supervisors, yielding a Scale-Level Content Validity Index of 0.958. A pilot study among approximately 10% of the estimated sample (excluded from the final analysis) informed minor wording revisions and confirmed feasibility; internal consistency reliability was excellent, with Cronbach's alpha of 0.802.
After obtaining ethical approval from the Institutional Review Board and administrative permission from the hospital, eligible mothers were identified with the assistance of ward staff, and the purpose, voluntary nature, and confidentiality of the study were explained before written informed consent was obtained. Participants completed the questionnaire independently where possible; mothers with reading difficulties were assisted through standardized interview technique to minimize interviewer bias. Each questionnaire required approximately 15–20 minutes.

Completed questionnaires were coded, entered into Microsoft Excel, and imported into IBM SPSS Statistics version 24.0 for analysis, with double-entry verification to minimize transcription error. Descriptive statistics (frequencies, percentages, means, and standard deviations) summarized participant characteristics and study variables. Binary logistic regression was used to identify factors independently associated with good maternal knowledge, positive attitudes, and appropriate practices, and adjusted odds ratios (ORs) with 95% confidence intervals (CIs) were reported. A two-tailed p-value of less than 0.05 was considered statistically significant. Confidentiality and anonymity were maintained throughout, no identifying information was recorded, and participation did not affect any participant's access to healthcare services, consistent with the principles of the Declaration of Helsinki.

Results

A total of 180 mothers of neonates admitted to the neonatal and pediatric units participated in the study, corresponding to a valid response rate of 96.4%. The study instrument demonstrated good internal consistency (Cronbach's $\alpha = 0.802$) and excellent content validity (S-CVI = 0.958), confirming its appropriateness for measuring maternal knowledge, attitudes, and practices regarding neonatal jaundice (Table 1).

Table 1. Reliability and validity of the research instrument (N = 180)

Parameter	Value
Cronbach's alpha	0.802
Scale-Level Content Validity Index (S-CVI)	0.958
Valid response rate	96.4%

Overall, 46.4% of mothers demonstrated good knowledge regarding neonatal jaundice, while 53.6% had inadequate knowledge, indicating that more than half of the mothers lacked sufficient understanding of the condition despite attending a tertiary care facility (Table 2).

Table 2. Maternal knowledge regarding neonatal jaundice (n = 180)

Knowledge level	n	Percent
Good knowledge	84	46.4
Poor knowledge	96	53.6
Total	180	100.0

Only 41.7% of mothers reported actively seeking information regarding neonatal jaundice, while the majority (58.3%) did not, reflecting relatively limited maternal engagement in acquiring newborn health information (Table 3).

Table 3. Maternal information-seeking behavior regarding neonatal jaundice (n = 180)

Variable	n	Percent
Mothers seeking information	75	41.7
Mothers not seeking information	105	58.3
Total	180	100.0

Binary logistic regression identified three variables independently associated with good maternal knowledge. Mothers with postgraduate education were nearly six times more likely to

demonstrate good knowledge than mothers with lower educational attainment (OR = 5.977; 95% CI: 1.994–17.916; p = 0.001). Mothers who had previously received education regarding neonatal jaundice were also significantly more likely to have good knowledge (OR = 3.617; 95% CI: 1.637–7.993; p = 0.001), as were mothers of male newborns (OR = 1.714; 95% CI: 1.122–2.617; p = 0.013) (Table 4).

Table 4. Factors associated with good maternal knowledge (binary logistic regression)

Variable	OR	95% CI	p-value
Postgraduate education (master's or above)	5.977	1.994–17.916	0.001*
Previous education regarding neonatal jaundice	3.617	1.637–7.993	0.001*
Male newborn	1.714	1.122–2.617	0.013*

Positive maternal attitudes were significantly associated with postpartum care from a trained maternity attendant (OR = 1.969; 95% CI: 1.264–3.066; p = 0.003) and with good maternal knowledge (OR = 1.804; 95% CI: 1.194–2.726; p = 0.005), indicating that both professional support and adequate understanding of the condition shape a mother's confidence in evidence-based care (Table 5).

Table 5. Factors associated with positive maternal attitudes (binary logistic regression)

Variable	OR	95% CI	p-value
Postpartum care from trained maternity attendant	1.969	1.264–3.066	0.003*
Good maternal knowledge	1.804	1.194–2.726	0.005*

Appropriate maternal practices were significantly associated with previous education regarding neonatal jaundice (OR = 2.260; 95% CI: 1.105–4.625; p = 0.026) and, most strongly, with good maternal knowledge (OR = 3.112; 95% CI: 2.040–4.749; p < 0.001), demonstrating that mothers with adequate knowledge were over three times more likely to practice appropriate newborn care (Table 6).

Table 6. Factors associated with good maternal practices (binary logistic regression)

Variable	OR	95% CI	p-value
Previous education regarding neonatal jaundice	2.260	1.105–4.625	0.026*
Good maternal knowledge	3.112	2.040–4.749	<0.001*

*Statistically significant at p < 0.05.

Taken together, these findings show that maternal knowledge regarding neonatal jaundice remained suboptimal, with fewer than half of mothers demonstrating adequate understanding, and that educational attainment and prior health education were the strongest predictors of good knowledge. Knowledge, in turn, was the single strongest predictor of both positive attitudes and appropriate practices, underscoring its central role in the broader knowledge–attitude–practice pathway.

Discussion

This study assessed maternal knowledge, attitudes, and practices regarding neonatal jaundice among mothers attending a tertiary care hospital in Lahore, Pakistan, and examined the socio-demographic and healthcare-related factors associated with these outcomes. Only 46.4% of mothers demonstrated good knowledge, indicating that more than half lacked sufficient understanding of the causes, warning signs, complications, and management of neonatal jaundice. Because mothers are usually the first to observe changes in their newborns, this gap may delay recognition and treatment and increase the risk of severe hyperbilirubinemia and its neurological sequelae.

This level of knowledge is consistent with international evidence: studies conducted in China, Ghana, Ethiopia, and Nigeria have similarly reported that fewer than half of participating mothers possessed adequate knowledge of neonatal jaundice, even where basic awareness of the condition itself was common (Huang et al., 2022; Adoba et al., 2018; Mekonnen et al., 2021; Ezeaka et al., 2014; Amegan-Aho et al., 2019). Comparable deficits have been reported within Pakistan, where mothers often recognize the visible yellow discoloration but remain unaware of its causes, complications, and the urgency of treatment (Khan et al., 2021; Saddozai et al., 2022; Memon et al., 2022). This convergence across diverse settings suggests that inadequate maternal knowledge of neonatal jaundice is a persistent, cross-cultural challenge rather than one specific to a single health system, and likely reflects broader gaps in antenatal and postnatal health education.

Educational attainment emerged as the strongest predictor of maternal knowledge in this study, with postgraduate-educated mothers almost six times more likely to have good knowledge than mothers with lower education (OR = 5.977, p = 0.001). This mirrors findings from Ethiopia, Nigeria, China, and other South Asian settings, where maternal education has consistently been identified as one of the most important determinants of neonatal health literacy, likely through improved access to health information, greater comprehension of medical advice, and increased confidence in communicating with healthcare providers (Huang et al., 2022; Mekonnen et al., 2021; Babalola et al., 2020; Boadu et al., 2020).

Previous education specifically about neonatal jaundice was independently associated with both better knowledge (OR = 3.617, p = 0.001) and more appropriate practices (OR = 2.260, p = 0.026), reinforcing the value of structured counselling delivered during antenatal care, postnatal hospitalization, and follow-up visits. This is consistent with evidence that nurse- and midwife-led education, including one-to-one counselling and discharge teaching, improves parental recognition of danger signs and promotes timely care-seeking (Bhutani et al., 2019; Asefa et al., 2021).

Positive maternal attitudes were associated with postpartum support from a trained maternity attendant and with good knowledge. While the specific caregiving role varies by cultural context, the broader implication is that continuous, professional postpartum support builds maternal confidence in evidence-based neonatal care and encourages adherence to treatment recommendations. That knowledge itself independently predicted positive attitudes supports the general principle that accurate understanding of a condition's seriousness underlies favorable health beliefs and receptiveness to timely intervention.

Appropriate maternal practices were most strongly predicted by good knowledge (OR = 3.112, p < 0.001), demonstrating a direct pathway from understanding to behavior: mothers who understood neonatal jaundice were more likely to breastfeed appropriately, observe their newborns for warning signs, seek prompt medical attention, and adhere to phototherapy recommendations rather than relying on unsupervised sunlight exposure or traditional remedies. This pattern has been reported consistently across African and Asian settings and reinforces that

improving maternal knowledge is among the most effective strategies for reducing treatment delays (Kemper et al., 2022; Adoba et al., 2018; Ezeaka et al., 2014).

Only 41.7% of mothers reported actively seeking information about neonatal jaundice, suggesting that many remain passive recipients of health information rather than active seekers. Limited access to reliable educational materials, inadequate antenatal counselling, low health literacy, and underuse of digital health resources may all contribute to this pattern, and represent additional targets for intervention alongside direct education.

These findings carry clear implications for nursing practice and public health. Nurses, who spend the greatest amount of time with mothers across pregnancy, delivery, and the postnatal period, are well positioned to deliver structured education on recognition of jaundice, danger signs, breastfeeding, indications for phototherapy, and common misconceptions, supported by written discharge materials and opportunities for mothers to ask questions before leaving hospital. At the community level, standardized training for community health workers and the use of mass media and digital platforms may extend the reach of such education, particularly for mothers with limited access to specialist services (Shrestha et al., 2021; Tola et al., 2020; Ullah et al., 2021; Watchko, 2021).

This study has several limitations. Its cross-sectional design precludes causal inference between the identified factors and maternal knowledge, attitudes, and practices. The single-center setting and purposive sampling technique may limit generalizability and introduce selection bias, and self-reported responses are subject to recall or social desirability bias. Potentially relevant variables such as family support, media exposure, and detailed socioeconomic indicators were not examined and may independently influence maternal awareness. Future multicenter studies using probability sampling and longitudinal designs are needed to confirm these associations and to evaluate the effectiveness of targeted educational interventions over time.

Conclusion

Maternal knowledge regarding neonatal jaundice remained inadequate among a substantial proportion of mothers attending this tertiary care hospital, and active information-seeking was similarly limited. Educational attainment and previous health education were the strongest predictors of good knowledge, and knowledge itself was the central driver of both positive attitudes and appropriate newborn-care practices. Strengthening structured antenatal counselling, postnatal education, and community-based awareness programs — delivered consistently by nurses, midwives, and community health workers — is recommended to close the gap between the availability of specialized neonatal care and mothers' capacity to recognize and respond to neonatal jaundice promptly, thereby reducing preventable neonatal morbidity and improving newborn health outcomes in Pakistan.

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