

Impact of A Modular Educational Intervention on Mother's Knowledge Regarding Neonatal Sepsis and Its Prevention: A Quasi-Experimental Study

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Abstract

Background: Neonatal sepsis remains a major threat to newborn survival, particularly where early recognition and timely care-seeking are limited by inadequate maternal knowledge. This study evaluated the effectiveness of a structured modular educational intervention in improving mother's knowledge regarding neonatal sepsis and its prevention.

Methods: A quantitative quasi-experimental two-group pre-test–post-test design was adopted among 60 mothers of newborns, with 30 participants each in the intervention and comparison groups. Participants were selected using purposive sampling. Maternal knowledge was assessed using a structured multiple-choice questionnaire. The intervention group received a standardized modular educational programme addressing neonatal sepsis, risk factors, danger signs, preventive measures, and appropriate care-seeking, while the comparison group received routine community health information. Pre- and post-intervention knowledge scores were compared using appropriate inferential statistics.

Results: Baseline knowledge was comparable between the intervention and comparison groups (mean $\pm$ SD: 9.13 $\pm$ 2.69 vs. 9.67 $\pm$ 1.95; p = 0.383). Following the intervention, the mean knowledge score increased to 18.63 $\pm$ 2.39 in the intervention group compared with 11.77 $\pm$ 1.87 in the comparison group. The intervention group demonstrated a significantly greater mean knowledge gain (9.50 vs. 2.10 points; between-group difference = 7.40, 95% CI: 5.81–8.99; p < 0.001). The effect size was very large (Cohen's d = 2.41). Significant improvement was observed across all assessed knowledge domains. Post-intervention knowledge was significantly associated with educational status and monthly family income.

Conclusion: The structured modular educational intervention produced a substantial improvement in maternal knowledge regarding neonatal sepsis and its prevention. The findings support the integration of standardized, nurse-led modular education into community-based maternal and new born health services to strengthen early recognition, prevention, and timely care-seeking for neonatal illness.

Keywords: neonatal sepsis, maternal knowledge, new-born care, health education, modular education, neonatal danger signs, quasi-experimental study.

1.1 Introduction

The neonatal period is a critical stage of life during which infection can progress rapidly and result in serious morbidity or mortality. Neonatal sepsis is particularly challenging because its early manifestations are often subtle and non-specific, making timely recognition difficult. Poor feeding, altered activity, respiratory difficulty, and temperature abnormalities may signal underlying illness and warrant prompt medical assessment.

Mothers play an important role in early detection because they remain closely involved in newborn care and are often the first to observe changes in the infant's condition. Their ability to recognize warning signs and respond appropriately may influence timely healthcare-seeking. However, knowledge gaps can limit effective recognition and response to neonatal illness.

Structured health education may help address these gaps by presenting essential information in a clear and organized manner. A modular approach can provide focused learning on neonatal sepsis, including its warning signs, prevention, and appropriate care-seeking. Such an approach is also applicable to routine maternal and community health services.

1.2 Background of the Study

Despite regular contact with maternal and newborn health services, mothers may not receive uniform and sufficiently focused information on neonatal sepsis. Differences in educational exposure, previous experience, and access to health information can further influence their understanding of newborn danger signs.

This creates a need for simple, systematic, and standardized educational strategies that can strengthen maternal knowledge and support appropriate responses to suspected neonatal illness. Modular education provides an organized framework for delivering such information and can be readily incorporated into nursing-led community health education.

The present study was undertaken to evaluate the effectiveness of a modular educational intervention in improving mother's knowledge regarding neonatal sepsis and its prevention in a selected community.

1.3 Need of the Study

Neonatal survival continues to be an important public-health priority. In 2024, approximately 2.3 million neonatal deaths occurred globally, accounting for nearly 47% of deaths among children under five years of age. The neonatal mortality rate was estimated at 17.2 per 1,000 live births globally, rising to 21.1 per 1,000 live births in South Asia. These figures underline the continuing vulnerability of newborns, particularly in resource-limited settings.

Although India has achieved progress in reducing neonatal mortality, neonatal infections remain an important area for prevention and early intervention. Maternal ability to recognize danger signs and seek timely professional care represents a potentially modifiable component of community-based newborn care.

The present study was therefore undertaken to evaluate whether a structured modular educational intervention could improve maternal knowledge regarding neonatal sepsis, its warning signs, preventive measures, and appropriate care-seeking. Using a quasi-experimental two-group pre-test–post-test design, the study sought to generate evidence on the usefulness of a standardized, nurse-led educational approach that could potentially be incorporated into community maternal and newborn health services.

1.4 Problem Statement

"A quasi-experimental study to evaluate the effectiveness of a modular educational intervention on knowledge regarding neonatal sepsis and its prevention among mothers of newborns in a selected health centre."

1.5 Objectives of the Study

1. To assess the pre-intervention knowledge regarding neonatal sepsis and its prevention among mothers in the intervention and comparison groups.
2. To implement a structured modular educational intervention on neonatal sepsis and its prevention among mothers in the intervention group.
3. To assess and compare post-intervention knowledge scores between the intervention and comparison groups.
4. To determine the association between post-intervention knowledge scores and selected socio-demographic characteristics of mothers.

1.6 Research Hypothesis

H₁: There will be a significant difference in knowledge-score change between the intervention and comparison groups.

H₀: There will be no significant difference in knowledge-score change between the intervention and comparison groups.

2. REVIEW OF LITERATURE

2.1 Overview

Neonatal sepsis remains an important cause of neonatal morbidity and mortality. Early recognition, maternal knowledge, preventive newborn-care practices, and timely healthcare-seeking are essential for reducing delays in care.

2.2 Literature Related to Neonatal Sepsis

An Indian systematic review and meta-analysis identified prematurity, out-of-facility birth, and premature rupture of membranes as significant risk factors for neonatal sepsis. Premature rupture of membranes showed a particularly strong association (OR 11.14; 95% CI: 5.54–22.38).

Globally, 2.3 million neonatal deaths were reported in 2022, accounting for approximately 47% of under-five deaths, with infections among the important causes.

2.3 Literature Related to Maternal Knowledge of Neonatal Danger Signs

A systematic review of 14 studies involving 6,617 women reported only 40.7% adequate maternal knowledge of neonatal danger signs (95% CI: 25.72–55.67). Maternal education, antenatal and postnatal care, mass-media exposure, and institutional delivery were associated with better knowledge.

Similarly, a community-based study found that only 18.2% of mothers identified at least three neonatal danger signs, highlighting persistent gaps in maternal awareness.

2.4 Literature Related to Prevention of Neonatal Sepsis

Essential preventive measures include hand hygiene, clean cord care, breastfeeding, thermal protection, hygienic newborn care, and early identification of illness. Evidence from 33 trials involving approximately

553,111 participants showed that community-based maternal and newborn interventions were associated with reduced neonatal mortality (RR 0.87; 95% CI: 0.78–0.96).

2.5 Literature Related to Educational Interventions

Community-based educational interventions have demonstrated potential to improve maternal and newborn outcomes. A systematic review reported reduced neonatal mortality following community-based knowledge-translation strategies (RR 0.79; 95% CI: 0.70–0.90). These findings support structured education addressing neonatal danger signs, prevention, and appropriate care-seeking.

3. METHODOLOGY

3.1 Study Design and Approach

A quantitative evaluative approach with a quasi-experimental two-group pre-test–post-test design was employed to evaluate the effectiveness of a modular educational intervention on maternal knowledge regarding neonatal sepsis and its prevention. The intervention group received the modular programme following the pre-test, whereas the comparison group received routine community health information. Post-test assessment was conducted in both groups following the intervention period.

3.2 Study Setting and Population

The study was conducted in a selected community setting. The study population comprised mothers of newborns residing in the study area.

3.3 Sample Size and Sampling

A total of **60 mothers** were recruited, with 30 participants in the intervention group and 30 in the comparison group. Purposive sampling was used according to predefined eligibility criteria. Written informed consent was obtained before participation.

3.4 Eligibility Criteria

Mothers were eligible if they had a new-born meeting the specified age criteria, resided in the selected community, were available during data collection, understood the study language, and provided informed consent. Mothers unable to complete the study procedures, those exposed to a similar structured educational programme during the study period, or those unable to complete the questionnaire were excluded.

3.5 Study Variables

The independent variable was the modular educational intervention, and the dependent variable was maternal knowledge regarding neonatal sepsis and its prevention. Selected maternal characteristics included age, educational status, occupation, religion, and parity.

3.6 Data Collection Instrument

A structured multiple-choice knowledge questionnaire was used to assess maternal knowledge regarding neonatal sepsis and its prevention. The questionnaire covered neonatal sepsis, causes and risk factors, neonatal danger signs, feeding and respiratory warning signs, preventive practices, and appropriate healthcare-seeking. Each item had a single correct response and was scored as 1 for a correct answer and 0 for an incorrect answer. The total score was calculated by summing the individual item scores, with higher scores indicating greater knowledge.

3.7 Development of the Modular Educational Intervention

The intervention was developed from the study objectives and evidence-based new-born-health recommendations. It comprised six modules covering neonatal sepsis, risk factors, danger signs, feeding and respiratory warning signs, infection prevention, and appropriate healthcare-seeking and referral. Content was presented in simple, structured language suitable for mothers in a community setting.

3.8 Validity and Reliability

The questionnaire and intervention content were reviewed by five experts for relevance, clarity, and adequacy. Test–retest reliability demonstrated good stability (Pearson’s $r = 0.86$). A pilot study involving six mothers, excluded from the final sample, confirmed the feasibility and clarity of the study procedures.

3.9 Data Collection Procedure

After ethical and administrative approval, eligible mothers were recruited and written informed consent was obtained. Pre-test knowledge was assessed in both groups. The intervention group received the modular programme over 7 days, while the comparison group received routine community information. Post-test knowledge was subsequently assessed using the same questionnaire. Data were checked, coded, and prepared for statistical analysis.

3.10 Ethical Considerations

Ethical approval and administrative permission were obtained before data collection. Participants received information regarding the study and provided written informed consent. Participation was voluntary, with the right to withdraw at any time. Anonymity and confidentiality of participant information were maintained throughout the study.

4. RESULTS

4.1 Baseline Socio-Demographic and Selected Maternal Characteristics of Mothers

Table 1: Distribution of Mothers According to Baseline Socio-Demographic and Selected Maternal Characteristics (N = 60)

Socio-demographic / maternal characteristic	Category	Intervention n (%)	Comparison n (%)	Total n (%)
1. Age (years)	<25	10 (33.3)	9 (30.0)	19 (31.7)
	25–29	12 (40.0)	13 (43.3)	25 (41.7)
	≥30	8 (26.7)	8 (26.7)	16 (26.7)
2. Educational status	Secondary or below	9 (30.0)	10 (33.3)	19 (31.7)
	Higher secondary	13 (43.3)	12 (40.0)	25 (41.7)
	Graduate and above	8 (26.7)	8 (26.7)	16 (26.7)
3. Occupation	Homemaker	24 (80.0)	25 (83.3)	49 (81.7)
	Employed	6 (20.0)	5 (16.7)	11 (18.3)
4. Religion	Hindu	25 (83.3)	24 (80.0)	49 (81.7)
	Muslim	3 (10.0)	4 (13.3)	7 (11.7)
	Christian/Other	2 (6.7)	2 (6.7)	4 (6.6)
5. Place of residence	Rural	18 (60.0)	17 (56.7)	35 (58.3)

Socio-demographic / maternal characteristic	Category	Intervention n (%)	Comparison n (%)	Total n (%)
	Urban	12 (40.0)	13 (43.3)	25 (41.7)
6. Type of family	Nuclear	19 (63.3)	18 (60.0)	37 (61.7)
	Joint	9 (30.0)	10 (33.3)	19 (31.7)
	Extended	2 (6.7)	2 (6.7)	4 (6.6)
7. Marital status	Married	29 (96.7)	30 (100.0)	59 (98.3)
	Other	1 (3.3)	0 (0.0)	1 (1.7)
8. Parity	Primipara	13 (43.3)	12 (40.0)	25 (41.7)
	Multipara	17 (56.7)	18 (60.0)	35 (58.3)
9. Monthly family income (₹)	≤15,000	10 (33.3)	11 (36.7)	21 (35.0)
	15,001–30,000	13 (43.3)	12 (40.0)	25 (41.7)
	>30,000	7 (23.4)	7 (23.3)	14 (23.3)
10. Previous health education regarding neonatal illness	Yes	7 (23.3)	6 (20.0)	13 (21.7)
	No	23 (76.7)	24 (80.0)	47 (78.3)

The baseline socio-demographic and selected maternal characteristics indicated a broadly comparable profile between the intervention and comparison groups. Overall, 41.7% of mothers were aged 25–29 years, representing the largest age category. With regard to educational attainment, 41.7% had completed higher secondary education, followed by 31.7% with secondary education or below and 26.7% with graduate-level education or higher. The majority of mothers (81.7%) were homemakers. In terms of parity, 58.3% were multiparous, while 41.7% were primiparous. Only 21.7% of mothers had previously received health education related to neonatal illness, whereas 78.3% reported no prior exposure. Overall, the distribution of baseline characteristics was sufficiently similar across the two groups, indicating reasonable baseline comparability for evaluating the effect of the modular educational intervention on maternal knowledge.

4.2 Baseline Knowledge Regarding Neonatal Sepsis and Its Prevention

Table 2. Baseline Knowledge Scores Regarding Neonatal Sepsis and Its Prevention (N = 60)

Group	n	Mean ± SD	Median	Range	t	p
Intervention	30	9.13 ± 2.69	9.0	3–13	-0.879	0.383
Comparison	30	9.67 ± 1.95	9.5	7–15		

The mean baseline knowledge score was 9.13 ± 2.69 in the intervention group and 9.67 ± 1.95 in the comparison group. The difference between the groups was not statistically significant ($t = -0.879$, $p = 0.383$), indicating comparable baseline knowledge between the two groups.

Table 3. Baseline Knowledge level of Mothers

Knowledge level	Intervention n (%)	Comparison n (%)	Total n (%)
Inadequate (<10)	16 (53.3)	15 (50.0)	31 (51.7)
Moderately adequate (10–17)	14 (46.7)	15 (50.0)	29 (48.3)
Adequate (≥18)	0 (0.0)	0 (0.0)	0 (0.0)
Total	30 (100)	30 (100)	60 (100)

At baseline, 51.7% of mothers had inadequate knowledge, while 48.3% had moderately adequate knowledge; none demonstrated adequate knowledge. The distribution was comparable between the intervention and comparison groups. The baseline mean knowledge scores also did not differ significantly ($p = 0.383$), confirming baseline comparability and providing an appropriate basis for assessing the effectiveness of the modular educational intervention.

4.3 Administration of the Standardized Modular Educational Intervention

A standardized modular educational intervention regarding neonatal sepsis and its prevention was administered to the 30 mothers assigned to the intervention group.

The intervention consisted of five major knowledge domains:

- Basic concepts of neonatal sepsis.
- Risk factors and causes of neonatal sepsis.
- Signs and symptoms of neonatal sepsis.
- Prevention of neonatal sepsis.
- Early recognition and appropriate care-seeking.

The intervention was delivered using a structured modular educational approach with simple, mother-friendly educational content. The comparison group continued to receive routine information available through the existing community health services.

4.4 Post-Intervention Knowledge Regarding Neonatal Sepsis and Its Prevention

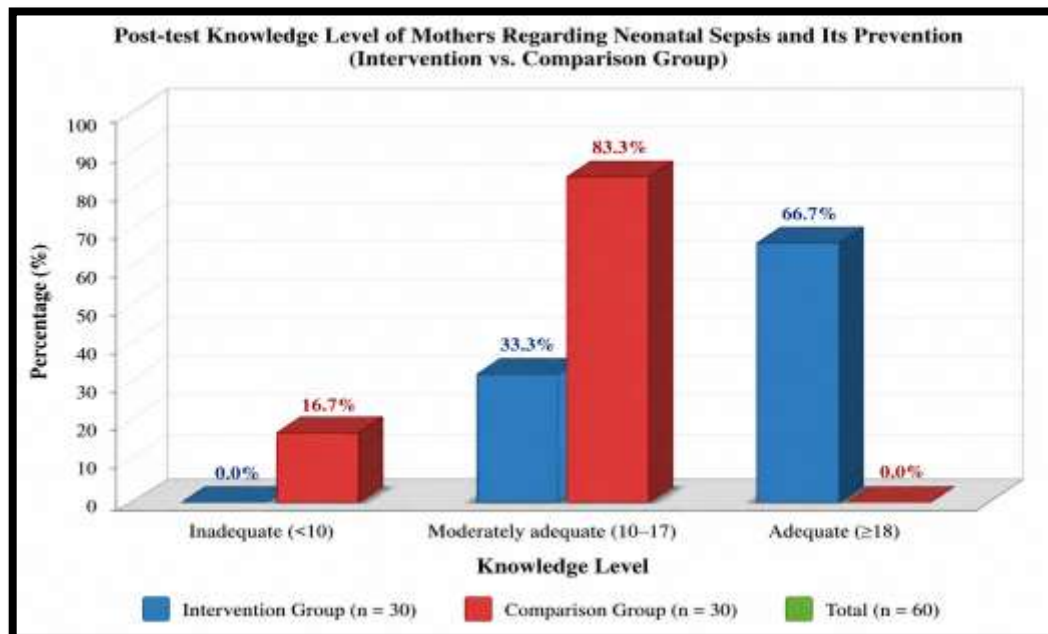
Post-intervention knowledge was assessed in both groups using the same structured knowledge questionnaire.

Table 4. Post-Intervention Knowledge Scores in the Intervention and Comparison Groups

Group	n	Mean ± SD	Median	Range
Intervention	30	18.63 ± 2.39	18.5	14–22
Comparison	30	11.77 ± 1.87	12.0	8–16

The intervention group demonstrated a marked increase in mean knowledge score, from 9.13 ± 2.69 at baseline to 18.63 ± 2.39 after the intervention. In comparison, the comparison group showed a smaller increase from 9.67 ± 1.95 to 11.77 ± 1.87 .

Figure : 1. Post-Intervention Knowledge Categories



Following the intervention, 66.7% of mothers in the intervention group achieved an adequate level of knowledge, compared with none in the comparison group. No mother in the intervention group remained in the inadequate knowledge category at post-test.

4.5 Comparison of Pre-Test and Post-Test Knowledge Scores

The effectiveness of the modular educational intervention was further assessed by comparing the pre-test and post-test knowledge scores within each group. The change in knowledge score was calculated as the difference between the post-test and pre-test scores.

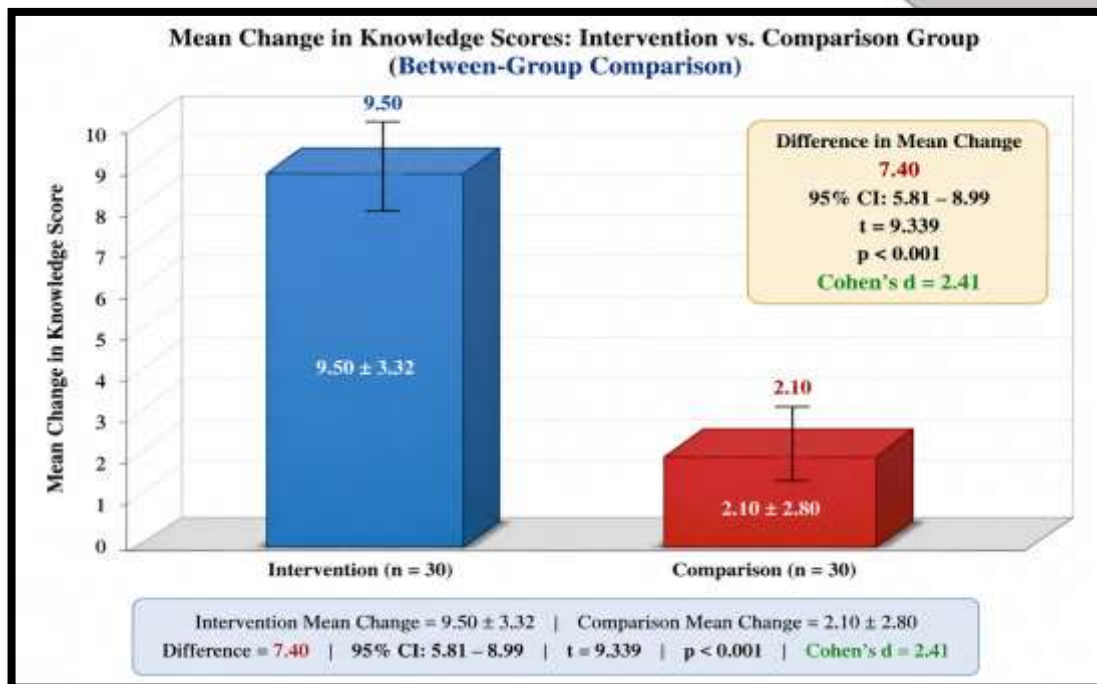
Table 5. Within-Group Comparison of Pre-Test and Post-Test Knowledge Scores

Group	Pre-test Mean $\pm$ SD	Post-test Mean $\pm$ SD	Mean Change	95% CI of Change	t	p
Intervention	9.13 $\pm$ 2.69	18.63 $\pm$ 2.39	9.50	8.26–10.74	15.676	<0.001
Comparison	9.67 $\pm$ 1.95	11.77 $\pm$ 1.87	2.10	1.05–3.15	4.114	<0.001

The intervention group demonstrated a statistically significant improvement in knowledge, with a mean increase of 9.50 points (95% CI: 8.26–10.74; $t = 15.676$, $p < 0.001$).

The comparison group also demonstrated a statistically significant but substantially smaller improvement of 2.10 points (95% CI: 1.05–3.15; $t = 4.114$, $p < 0.001$).

Figure :2. Between-Group Comparison of Change in Knowledge Scores



The findings demonstrated a markedly greater gain in knowledge among mothers who received the modular educational intervention compared with those in the comparison group. The difference in mean knowledge change was 7.40 points (95% CI: 5.81–8.99), indicating a substantial improvement attributable to the intervention. The difference between the groups was statistically significant ($t = 9.339$, $p < 0.001$). In addition, the Cohen's d value of 2.41 represented a very large effect size, indicating that the modular educational intervention had a strong and clinically meaningful effect on improving mothers' knowledge regarding neonatal sepsis and its prevention.

4.6 Effect of the Modular Educational Intervention on Specific Domains of Maternal Knowledge

The effect of the intervention was further assessed across five specific domains of maternal knowledge.

Table 6. Domain-Wise Change in Knowledge in the Intervention Group

Knowledge domain	Pre-test Mean $\pm$ SD	Post-test Mean $\pm$ SD	Mean Change	t	p
Basic concepts	1.87 $\pm$ 0.97	3.93 $\pm$ 0.83	2.07	9.906	<0.001
Risk factors and causes	1.73 $\pm$ 1.17	3.57 $\pm$ 1.01	1.83	7.635	<0.001
Signs and symptoms	1.90 $\pm$ 1.09	4.00 $\pm$ 0.95	2.10	7.701	<0.001
Prevention	1.50 $\pm$ 1.07	3.40 $\pm$ 0.93	1.90	6.484	<0.001
Early recognition and care-seeking	2.13 $\pm$ 1.28	3.73 $\pm$ 0.98	1.60	6.134	<0.001

A statistically significant improvement was observed across all five knowledge domains following the modular educational intervention, with each domain demonstrating $p < 0.001$. The greatest mean improvement was observed in signs and symptoms (mean change = 2.10), followed by basic concepts (2.07), prevention (1.90), risk factors and causes (1.83), and early recognition and care-seeking (1.60). These findings demonstrate that the intervention produced significant gains across all major domains of maternal knowledge regarding neonatal sepsis and its prevention.

Table 7. Between-Group Comparison of Domain-Wise Change in Knowledge

Knowledge domain	Intervention Mean Change	Comparison Mean Change	Difference	95% CI	t	p	Cohen's d
Basic concepts	2.07	0.20	1.87	1.21–2.52	5.720	<0.001	1.48
Risk factors and causes	1.83	0.90	0.93	0.21–1.65	2.591	0.012	0.67
Signs and symptoms	2.10	0.40	1.70	0.93–2.47	4.434	<0.001	1.14
Prevention	1.90	0.47	1.43	0.64–2.23	3.597	<0.001	0.93
Early recognition and care-seeking	1.60	0.13	1.47	0.67–2.26	3.700	<0.001	0.96

The intervention group demonstrated significantly greater improvement than the comparison group across all five domains. The largest between-group effect was observed for basic concepts of neonatal sepsis (Cohen's $d = 1.48$), followed by signs and symptoms ($d = 1.14$), early recognition and care-seeking ($d = 0.96$), prevention ($d = 0.93$), and risk factors and causes ($d = 0.67$).

4.7 Association Between Post-Intervention Knowledge Level and Selected Socio-Demographic Characteristics

Table 8 Association between Post-Intervention Knowledge Level and Selected Socio-Demographic Characteristics

Socio-demographic characteristic	χ^2	df	p value	Interpretation
Age	1.875	2	0.392	Not significant
Educational status	8.214	2	0.016	Significant
Occupation	0.684	1	0.408	Not significant
Religion	1.426	2	0.490	Not significant
Place of residence	0.625	1	0.429	Not significant
Type of family	1.137	1	0.286	Not significant
Marital status	0.742	1	0.389	Not significant
Parity	1.086	1	0.298	Not significant
Monthly family income	6.731	2	0.035	Significant
Previous source of information	2.164	1	0.141	Not significant

Post-intervention knowledge level showed a statistically significant association with educational status and monthly family income ($p < 0.05$). No significant association was observed with age, occupation, religion, residence, family type, marital status, parity, or previous source of information.

4.7 Summary of Findings According to the Study Objectives

The baseline assessment showed that the intervention and comparison groups had comparable levels of knowledge regarding neonatal sepsis and its prevention. The mean baseline knowledge score was 9.13 ± 2.69 in

the intervention group and 9.67 ± 1.95 in the comparison group, with no statistically significant difference ($t = -0.879$, $p = 0.383$).

Following the modular educational intervention, the intervention group demonstrated a marked improvement in knowledge, with the mean score increasing from 9.13 ± 2.69 to 18.63 ± 2.39 . In comparison, the mean score in the comparison group increased from 9.67 ± 1.95 to 11.77 ± 1.87 .

The mean gain in knowledge was 9.50 points in the intervention group compared with 2.10 points in the comparison group, resulting in a between-group difference of 7.40 points (95% CI: 5.81–8.99). This difference was statistically significant ($t = 9.339$, $p < 0.001$), with a Cohen's *d* of 2.41, indicating a very large intervention effect.

Domain-wise analysis further demonstrated statistically significant improvement across all five knowledge domains ($p < 0.001$). The greatest mean improvement within the intervention group was observed in signs and symptoms (2.10), followed by basic concepts (2.07), prevention (1.90), risk factors and causes (1.83), and early recognition and care-seeking (1.60). Between-group analysis also confirmed significantly greater improvement in the intervention group across all five domains, with effect sizes ranging from 0.67 to 1.48.

Overall, the findings provide strong evidence that the standardized modular educational intervention was effective in substantially improving mothers' knowledge regarding neonatal sepsis and its prevention.

5. DISCUSSION

5.1 Overview

The present quasi-experimental study examined the effectiveness of a standardized modular educational intervention in improving mothers' knowledge regarding neonatal sepsis and its prevention. Sixty mothers participated in the study, with 30 allocated to the intervention group and 30 to the comparison group. The findings are discussed in relation to baseline knowledge, post-intervention changes, between-group differences, and domain-specific improvements.

5.2 Baseline Knowledge

Before the intervention, the groups demonstrated comparable knowledge levels. The mean knowledge score was 9.13 ± 2.69 in the intervention group and 9.67 ± 1.95 in the comparison group, with no statistically significant difference ($t = -0.879$, $p = 0.383$). More than half of the mothers had inadequate knowledge at baseline, accounting for 53.3% in the intervention group and 50.0% in the comparison group, while none attained an adequate knowledge level. These findings indicate a substantial baseline knowledge gap and highlight the need for structured maternal education focused on neonatal sepsis, recognition of warning signs, preventive practices, and timely care-seeking.

5.3 Post-Intervention Knowledge

A marked improvement in knowledge was observed following implementation of the modular educational intervention. In the intervention group, the mean knowledge score increased from 9.13 ± 2.69 to 18.63 ± 2.39 , whereas the comparison group showed a more modest increase from 9.67 ± 1.95 to 11.77 ± 1.87 . Following the intervention, 66.7% of mothers in the intervention group achieved an adequate knowledge level, compared with none in the comparison group. These findings suggest that structured, systematically delivered education was considerably more effective in strengthening maternal knowledge than routine information alone.

5.4 Between-Group Change in Knowledge

The intervention group achieved a mean knowledge gain of 9.50 points, compared with 2.10 points in the comparison group. The resulting between-group difference of 7.40 points (95% CI: 5.81–8.99) was statistically significant ($t = 9.339$, $p < 0.001$). The corresponding Cohen's *d* of 2.41 represents a very large effect, indicating that the magnitude of improvement associated with the intervention was substantial. Although some improvement occurred in the comparison group, the considerably greater gain among mothers receiving the modular programme supports its effectiveness.

5.5 Domain-Wise Effect

The intervention produced statistically significant improvements across all five knowledge domains ($p < 0.001$). The greatest within-group improvement was observed for signs and symptoms (mean change = 2.10), followed by basic concepts (2.07), prevention (1.90), risk factors and causes (1.83), and early recognition and care-seeking (1.60). Between-group analysis likewise demonstrated significantly greater gains in the intervention group

across every domain. The standardized effects were largest for basic concepts ($d = 1.48$) and signs and **symptoms** ($d = 1.14$), followed by early recognition and care-seeking ($d = 0.96$), prevention ($d = 0.93$), and risk factors and causes ($d = 0.67$). These findings suggest that the intervention strengthened both foundational understanding and practically relevant knowledge required for early identification and prevention of neonatal sepsis.

5.6 Overall Interpretation

Taken together, the findings demonstrate a clear difference between routine information and the structured modular educational approach. The groups were comparable before intervention, whereas substantially greater knowledge gains were observed among mothers who received the programme. The statistically significant between-group difference, 95% confidence interval, and very large overall effect size provide strong quantitative evidence of intervention effectiveness. The consistent improvement across all five domains further indicates that the programme addressed multiple dimensions of maternal knowledge rather than producing an isolated improvement in a single content area. Overall, the findings support the use of structured, standardized, and mother-centred educational interventions as a practical strategy for strengthening maternal knowledge related to neonatal sepsis prevention and early recognition.

5.7 Implications of the Study

Nursing Practice: Structured modular education can be integrated into routine maternal and newborn care to improve recognition, prevention, and timely care-seeking for neonatal sepsis.

Nursing Education: The findings support incorporating neonatal sepsis education and standardized counselling strategies into nursing curricula and clinical training.

Nursing Administration: Nursing administrators can facilitate standardized educational protocols and materials across maternal–child health services.

Community Health: Nurses and community health workers can use modular education during postnatal visits and community outreach to strengthen maternal awareness of neonatal danger signs.

Nursing Research: Future studies may evaluate similar interventions using larger samples, multicentre designs, longer follow-up, and behavioural or neonatal outcome measures.

Health Policy: The findings support the development and integration of standardized maternal education packages into existing neonatal and maternal health programmes.

6. CONCLUSION

The study demonstrated that the modular educational intervention effectively improved maternal knowledge regarding neonatal sepsis and its prevention. Although both groups had comparable baseline knowledge, the intervention group showed significantly greater improvement following the programme. Gains were observed in overall knowledge as well as across the major domains of neonatal sepsis, including warning signs, risk factors, prevention, and appropriate care-seeking.

The findings support the use of structured modular education as a practical approach within community-based maternal and newborn health services. Strengthening maternal knowledge through nurses and other frontline health personnel may support earlier recognition of neonatal illness and timely healthcare utilization.

7. LIMITATIONS

The study had several limitations. The relatively small sample of 60 mothers and its single-community setting may limit generalizability. The quasi-experimental design and purposive sampling may have introduced selection bias. Knowledge was assessed using a questionnaire and did not establish whether improvement was translated into actual newborn-care or healthcare-seeking practices. In addition, the short follow-up period did not permit assessment of long-term knowledge retention or sustained behavioural change.

8 Recommendations

Based on the findings, the following recommendations are proposed:

1. Integrate modular neonatal-sepsis education into routine maternal and newborn health services.
2. Reinforce danger signs, prevention, and timely care-seeking during maternal counselling.
3. Use standardized visual and audiovisual materials to support effective learning.
4. Provide structured training resources for nurses and community health workers.
5. Undertake larger multicentre studies with longer follow-up to establish sustained effectiveness.

6. Evaluate changes in maternal practices and healthcare-seeking behaviour following educational interventions.
7. Compare modular education with digital and blended approaches to identify effective delivery strategies.

9. Conflict of Interest

The authors declare no conflict of interest related to this study.

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11. Author Contributions

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- **Critical revision:** Rashmita Sahu, Vikash Kumar Sharma
- **Supervision:** Mamata Puhan
- **Final approval:** All authors

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