

A mixed-method study to assess the effectiveness of assisted virtual care on the satisfaction of mothers regarding newborn care

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Abstract

Virtual newborn care, a mobile phone-based platform, supports mothers in newborn care. These platforms offer comprehensive education on crucial aspects of newborn care, including breastfeeding techniques, recognizing signs of illness, thermal care, and basic hygiene practices. Virtual-assisted newborn care stands as a pivotal tool in empowering mothers with the skills, confidence, and satisfaction needed to nurture their newborns during the critical early stages of life. This mixed-method study aimed to assess the effectiveness of assisted virtual care on the satisfaction of mothers regarding newborn care in a selected hospital in Coimbatore. The conceptual framework of the study was based on Modified Roy's Adaptation theory. The study used a sequential explanatory mixed-method design. The research was conducted in two phases: Phase I involved a quasi-experimental post-test control group design with 60 mothers (30 in the experimental group and 30 in the control group), assessing satisfaction with newborn care using structured interviews, bio-physiological measurements, and a satisfaction rating scale. Phase II used a phenomenological design to gather qualitative data from 12 mothers through in-depth interviews, focusing on their experiences and satisfaction. The intervention consisted of assisted virtual newborn care, where mothers received daily guidance and support via WhatsApp video calls from the 3rd to the 28th day after delivery. Data analysis involved both descriptive and inferential statistics for Phase I and thematic analysis for Phase II. Ethical considerations, including informed consent, confidentiality, and participant comfort, were maintained throughout the study. The result revealed that on the 29th-day post-intervention, significant differences were observed between the experimental and control groups in newborn-related parameters, with higher mean scores for length ($T=2.342$, $P=0.023$) and weight ($T=2.23$, $P=0.030$) in the experimental group. Physiological parameters also improved significantly in the experimental group, including sucking behavior ($\chi^2=18.912$, $P=0.000$), stool passing frequency ($\chi^2=7.801$, $P=0.020$), and shorter crying duration ($\chi^2=16.922$, $P=0.000$). Satisfaction scores were significantly higher in the experimental group overall ($T=16.516$, $P=0.000$) and across six domains of newborn care: thermal care ($T=2.6$, $P=0.011$), breastfeeding support ($T=7.18$, $P=0.000$), nurturing care ($T=5.73$, $P=0.000$), infection prevention ($T=10.88$, $P=0.000$), recognition and response to danger signs ($T=8.13$, $P=0.000$), and general aspects ($T=11.91$, $P=0.000$), highlighting the effectiveness of Assisted Virtual Care. The thematic analysis concluded that mothers in the experimental group who received Assisted Virtual Care (AVC) were more satisfied with the guidance and support provided across all aspects of newborn care compared to the control group. The personalized and comprehensive care delivered by the AVC provider significantly contributed to the mothers' confidence and satisfaction in caring for their newborns, highlighting the effectiveness of assisted virtual care in enhancing newborn care practices. The study underscores that Assisted Virtual Care (AVC) proves to be a highly effective approach in delivering comprehensive support, ensuring cost-efficient care, creating a stress-free environment, and enhancing care outcomes for both mothers and their new-borns.

Keywords: Assisted virtual care, newborn care, postnatal mothers.

Introduction

The arrival of a newborn marks the beginning of a transformative journey for families, filled with joy and challenges. Neonatal care, particularly in the first 28 days of life, is critical for ensuring survival and laying the foundation for lifelong health. During this period, newborns depend highly on caregivers for feeding, warmth, hygiene, and protection, necessitating informed and attentive

caregiving. Despite advances in healthcare, UNICEF has reported neonatal mortality remains a global concern, with 2.3 million newborns dying in the first month of life in 2022, predominantly due to preventable causes like preterm birth, infections, and birth complications.

Virtual newborn care has emerged as an innovative solution to bridge gaps in maternal knowledge and healthcare accessibility. Delivered via mobile platforms, it offers

timely, evidence-based guidance on essential newborn care practices, such as breastfeeding, thermal regulation, hygiene, and early illness detection. This approach empowers mothers with the confidence and skills needed to nurture their babies while addressing disparities in healthcare delivery, particularly in underserved areas. Integrating virtual care into postnatal services supports maternal well-being by reducing anxieties and promoting proactive caregiving. It complements traditional healthcare by offering round-the-clock access to expert advice, fostering stronger maternal-child bonds, and encouraging best practices like exclusive breastfeeding and kangaroo care. The transformative potential of virtual newborn care underscores its relevance in achieving global health goals, including reducing neonatal mortality and improving maternal and child health outcomes. This study seeks to evaluate the effectiveness of assisted virtual care in enhancing maternal satisfaction with newborn care, addressing the observed gaps in maternal knowledge and confidence, and ensuring comprehensive, accessible support for mothers during the critical neonatal period.

Conducted a preliminary evaluation of a telehealth nursing intervention aimed at improving the transition from the neonatal intensive care unit (NICU) to home for infants and their caregivers at a pediatric institution in South Florida. Their study concluded that the nurse-led telehealth intervention is a feasible and highly satisfactory approach to improving NICU patient outcomes and supporting caregivers during the transition from hospital to home. The findings suggest that post-discharge telehealth support provided by nurses enhances caregiver satisfaction and reduces readmissions and emergency care use among NICU patients.

Statement of the problem

A mixed-method study to assess the effectiveness of assisted virtual care on the satisfaction of mothers regarding newborn care in a selected hospital at Coimbatore.

Objectives of the study

Phase 1:

- To assess the level of satisfaction with newborn care among mothers in the experimental and control groups.
- To determine the effectiveness of assisted virtual care on the satisfaction of mothers regarding newborn care.
- To find the association between selected demographic variables and the level of satisfaction among mothers regarding newborn care in the experimental group.
- To find the association between child-related information and the level of satisfaction among mothers regarding newborn care in the experimental group.
- To assess and compare the clinical parameters of newborns in the experimental and control groups after

the intervention.

Phase 2:

- To explore and compare the experiences of mothers regarding their satisfaction with newborn care in the experimental and control groups.

Hypothesis

- **H₁:** There will be a significant difference in the mean satisfaction scores between the experimental and control groups after the intervention.
- **H₂:** There will be a significant association between the level of satisfaction and selected demographic variables in the experimental group after the intervention.
- **H₃:** There will be a significant association between the level of satisfaction and child-related information in the experimental group after the intervention.

Operational Definition

Assisted Virtual Care

Assisted virtual care refers to the care provided to the baby by the mother under the supervision and guidance of an AVC provider through a virtual platform. The AVC provider in this study is the researcher herself.

Satisfaction

In this study, in the quantitative aspect, the satisfaction of mothers with new born care will be measured using a five-point satisfaction rating scale after 28 days of assisted virtual care and for the qualitative aspect, an in-depth interview technique will be used to explore the mothers' satisfaction.

Assumptions

- Multiparous mothers may have higher satisfaction levels than primiparous mothers.
- Education related to newborn care can improve mothers' satisfaction with newborn care.
- Child outcomes will have an impact on maternal satisfaction.
- Mothers' experiences and perceptions of virtual nursing care will influence their satisfaction levels.

Delimitations of the study

This study was delimited to

- Mothers who are admitted to the selected hospital.
- Healthy term newborns.
- The use of a virtual platform for nursing care through WhatsApp video calls only.

Conceptual Framework

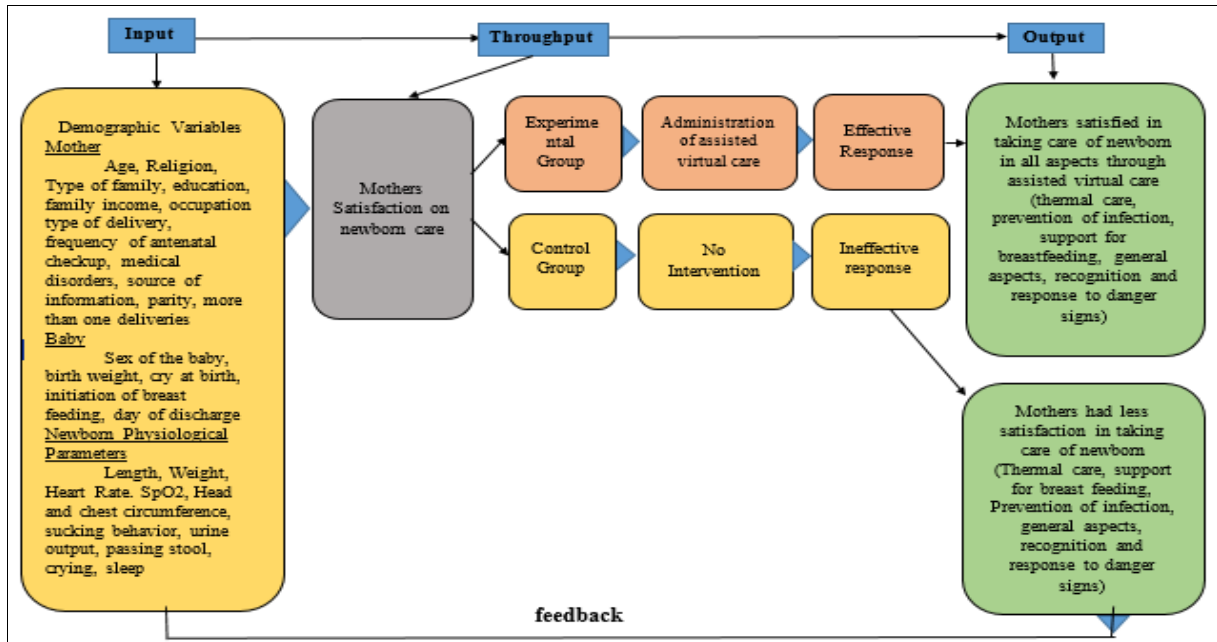
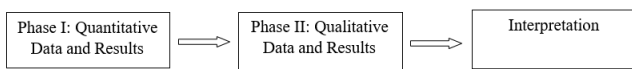


Fig 1: Conceptual framework based on modified Roy's adaptation model (1996)

Research Methodology

Research Approach and Design: The research approach used was a mixed-method approach and the research design selected was a sequential explanatory mixed-method design. This approach consists of two phases such as Phase I involves the collection and analysis of quantitative data, while Phase II focuses on qualitative data and findings. The results from both phases are then integrated to provide a comprehensive interpretation of the data.



In Phase I, the research design was a quasi-experimental post-test control group design for the quantitative method, while in Phase II, a phenomenological research design was used for the qualitative method.

Variables in the study

Dependent variables: Satisfaction regarding newborn care.

Independent variables: Assisted virtual newborn care.

Population: All mothers who delivered a normal newborn baby.

Sample Size

60 mothers who delivered normal newborn babies. In Phase I, the sample was divided equally, with 30 mothers assigned to the experimental group and 30 mothers to the control group. In Phase II, a total of 12 mothers were selected from these 60 participants, with 6 mothers from the experimental group and 6 mothers from the control group.

Sampling Technique

In Phase I, a non-probability convenience sampling technique was used for the quantitative method, and in Phase II a purposive sampling technique was used for the qualitative method.

Sampling Criteria

Phase I

- Mothers who delivered a healthy newborn.
- Mothers who delivered at term (> 37 weeks gestation).
- Mothers willing to participate in the study.
- Mothers who own an Android mobile device with a data plan.
- Mothers who were primiparous and multiparous.
- Mothers who were residing around 10 km from the hospital.
- Mothers who can read, understand, and speak English or Tamil Phase II
- Mothers willing to participate in Phase II.
- Mothers who were willing to share their experience in detail about newborn care in Phase II

Tool and Technique

The data were gathered by using multiple techniques and tools. In Phase I, observation, bio-physiological parameters, and interview techniques were used with a structured interview schedule, a newborn observation chart, and a satisfaction rating scale to gather quantitative data. In Phase II, in-depth interviews were conducted with open-ended questions to collect qualitative data, allowing for a deeper understanding of mothers' satisfaction with newborn care. Additional tools such as audio recording and field notes were used in Phase II to capture detailed responses during interviews, ensuring a comprehensive analysis of the mother's experiences and satisfaction.

Validity and Reliability

The content validity of the tool was ensured through evaluation by 5 experts from pediatrics departments, who provided feedback for refinement.

The reliability of the tool was assessed using Cronbach's alpha with the value of 0.928, which demonstrates internal consistency, confirming the tool's suitability for measuring satisfaction.

Ethical Consideration

Ethical clearance was obtained from the Institutional Ethical Committee, and formal permission was secured from the hospital and institution head. The study’s purpose was explained to participants, and verbal consent was obtained, ensuring voluntary participation. Privacy, confidentiality, and participant comfort were maintained throughout, with all questions addressed transparently. Post-data collection, the control group also received education on newborn care.

Data Analysis Procedure

The study employed both quantitative and qualitative methods for data analysis in two phases. In Phase I, descriptive and inferential statistics, were used to summarize demographic variables, physiological parameters and satisfaction levels. Statistical analysis was performed using SPSS software. In Phase II, qualitative data were analyzed using thematic analysis to identify recurring themes related to mother's experiences with newborn care.

Result

Phase 1: Findings revealed that nearly half of the mothers in the experimental (50%) and control groups (46.7%) were aged 26–30 years and belonged to joint families (56.7% and 46.7%, respectively). The majority were Hindus (80% in the experimental group, 90% in the control group) and had collegiate education (66.7% and 56.7%). A monthly family income above ₹15,000 was reported by 70% in the experimental group and 66.7% in the control group. More mothers in the experimental group were housewives (53.3%) compared to the control group (36.7%). Regular antenatal check-ups were common (93.3% experimental, 100% control), with most attending government hospitals (83.3% and 76.7%). The majority were primiparous (83.3%

and 90%) and had female babies (63.3% and 56.7%), with birth weights of 2500-3000 grams (46.7% and 53.3%). Breastfeeding initiation within two hours was noted in 63.3% of the experimental group and 56.7% of the control group. Over half of the mothers were discharged on the third day (56.7% and 60%), and family elders were the primary source of newborn care information (50% and 63.3%).

The findings from the comparison of newborn-related parameters before and after Intervention revealed that on the 3rd day, no significant differences were observed between the experimental and control groups in bio-physiological and clinical parameters, including length, weight, heart rate, SpO₂, head circumference, and chest circumference. Mean length was 48.33 cm (SD=2.12) in the experimental group and 48.50 cm (SD=2.08) in the control group (T=0.307, P=0.760), while mean weight was 2.893 kg (SD=0.31) and 2.853 kg (SD=0.37), respectively (T=0.448, P=0.656). Sucking behavior, urine output, stool passing, crying duration, and sleep duration also showed no significant differences between groups. However, on the 29th day, significant improvements were observed in the experimental group. The mean length increased to 51.87 cm (SD=2.30) compared to 50.47 cm (SD=2.33) in the control group (T=2.342, P=0.023), and the mean weight was 3.212 kg (SD=0.341) versus 3.01 kg (SD=0.37) (T=2.23, P=0.030). Good sucking behavior was seen in 90% of newborns in the experimental group versus 36.7% in the control group ($\chi^2=18.912$, P=0.000), stool passing 3–5 times a day in 73.3% versus 50% ($\chi^2=7.801$, P=0.020), and crying duration under 2 minutes in 73.3% versus 23.3% ($\chi^2=16.922$, P=0.000). These results demonstrate the effectiveness of assisted virtual newborn care in enhancing key parameters, including length, weight, sucking behavior, stool passing frequency, and crying duration.

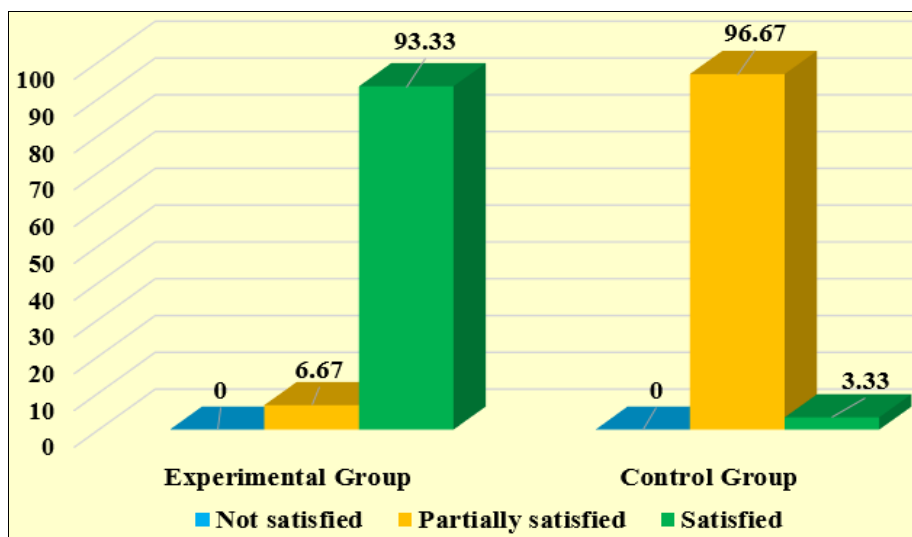


Fig 2: presents overall satisfaction regarding newborn care in Experimental and Control groups

Table 1: presents the mean overall satisfaction regarding newborn care in Experimental and Control groups

Group	Mean	Standard Deviation	Unpaired T-Value	DF	Significant Value
Experimental Group	92.63	3.59	16.516 *	58	0.000
Control Group	75.03	4.60			

NS: Not significant at $p < 0.05$, * significant at $p < 0.05$, DF-Degrees of Freedom

The hypothesis, H₁: There was a significant difference in the mean satisfaction scores between the experimental and control groups after the intervention, was accepted. Also, the findings indicate no significant association between mothers' satisfaction levels regarding newborn care

and various demographic variables, including age, type of family, educational status, family income per month, occupation, sex of the baby, birth weight, and day of discharge. The hypothesis H₂ and H₃ were rejected.

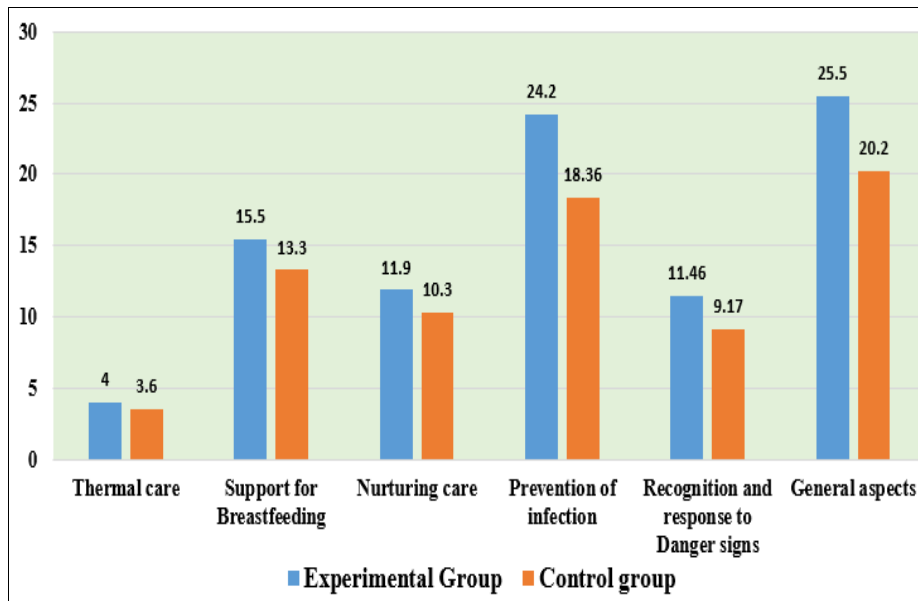


Fig 3: Presents the comparison of the mean satisfaction score in various domains of newborn care between the experimental group and control group

Phase II

Satisfaction of participants with newborn care

The mothers in the experimental group expressed high levels of satisfaction with assisted virtual newborn care. They appreciated the personalized guidance, regular follow-up, comprehensive information provided by the AVC provider, and real-time guidance in the decision-making when needed help regarding newborn health issues. The mothers felt supported and confident in their ability to care for their newborn's, which significantly contributed to their overall satisfaction. Whereas, mothers in the control group, who did not receive AVC, reported mixed levels of satisfaction. Participants were with the traditional care and advice received from family members, others felt that they lacked the detailed, expert guidance and support in certain areas of newborn care. Overall, their satisfaction levels were lower compared to the experimental group.

Problems faced in newborn care

The experimental group mothers did not report significant problems with the AVC provider and they found virtual care accessible and helpful. A few participants mentioned minor issues, such as the need for more detailed information or challenges with communication at times, but these were not seen as major obstacles to receiving care. While in the control group, the mothers faced challenges in newborn care when they had doubts about minor health issues in newborns. They also faced difficulty in decision making due to contradictory opinion from partner and family members in taking care of newborn. The lack of professional guidance and support, was limitation in addressing their questions and concerns.

Support family members in receiving information regarding newborn care through the virtual platform

Mothers in the experimental group reported strong support from their family members in utilizing the virtual platform for newborn care. Family members were often involved in the care process, and they appreciated the detailed information and instructions provided by the AVC provider. This collective involvement boosted the confidence of the mothers and ensured better care for the newborns. The thematic analyses highlights that mothers in the experimental group who received Assisted Virtual Care (AVC) were notably more satisfied with their newborn care compared to the control group. The AVC group valued the personalized guidance, regular follow-ups, and comprehensive information provided by the AVC provider, which significantly boosted their confidence and satisfaction. While in the control group, relying on traditional care and family advice, expressed mixed satisfaction and struggled with the lack of detailed, expert support. Issues reported by the control group included difficulty in decision-making and handling minor health concerns due to inconsistent advice. Family support for the AVC was strong, further enhancing the care quality. Overall, AVC demonstrated a positive impact on maternal satisfaction and newborn care practices.

Discussion

The findings align with a study by Danielle Altares Sarik *et al.* (2022), which evaluated a telehealth nursing intervention for transitioning NICU infants to home in South Florida. Among 378 enrolled infants, 74.6% received follow-up

services, with 100% of caregivers expressing satisfaction, confirming the feasibility and high satisfaction of nurse-led telehealth interventions. Additionally, a scoping review by Cindy (Zhirui) emphasized the benefits of virtual care in extending healthcare delivery through advanced technology, facilitating remote interactions. Both studies underscore the positive perceptions of virtual care by patients and providers, particularly in terms of satisfaction and effectiveness.

Conclusion

The findings of the study concluded that assisted virtual care (AVC) significantly enhanced both newborn-related outcomes and maternal satisfaction regarding newborn care. By the 29th day, newborns in the experimental group showed notable improvements in length, weight, sucking behavior, stool frequency, and crying duration compared to the control group. Mothers who received AVC reported higher overall satisfaction and satisfaction in all domains of newborn care, including thermal care, breastfeeding support, nurturing care, infection prevention, and recognition of danger signs. The mothers who received AVC benefited from personalized guidance and regular follow-ups, which fostered greater confidence and improved care practices. Conversely, the control group, relying on traditional care and family advice, experienced lower satisfaction and faced challenges with decision-making and minor health issues. These findings from qualitative and quantitative reports underscore the effectiveness of assisted virtual care (AVC) in providing comprehensive support, cost-effective care, a stress-free care environment, and improving care outcomes for both mothers and their newborns.

Limitation

- The sample size was small, limiting the generalizability of the results.
- The samples were selected using a non-probability convenience sampling technique.
- The study was conducted in a specific healthcare setting, which may not reflect the diversity of practices.
- There were limited qualitative studies for the review of the literature.
- In the qualitative analysis, the sample size for in-depth interviews was small, limiting the depth of understanding and the generalizability of the qualitative findings.
- Satisfaction with self-reported data has been influenced by individual biases, impacting the accuracy of the results.
- Participants' previous experiences with newborns have influenced the study outcomes.

Implication

The study highlights the potential of Assisted Virtual Care (AVC) in nursing practice, education, administration, and research. In practice, nurses can adopt AVC to support postnatal mothers, enhance communication, and improve care quality. Nursing education should integrate AVC into curricula and provide in-service training to equip future nurses with technological skills. Administrators are encouraged to organize continuing education programs, workshops, and seminars to raise awareness and promote

the use of AVC. In research, nurses should apply evidence-based findings to practice, disseminate results through publications and conferences, and foster innovation to improve outcomes for postnatal mothers and newborns.

Recommendation

- Replicate the study with a larger sample size to generalize the findings.
- Conduct a study to assess the effectiveness of assisted virtual newborn care on satisfaction among mother of low-birth-weight babies.
- Conduct a study to explore the impact of assisted virtual newborn care on newborn health outcome
- Conduct a comparative study to evaluate the effectiveness of assisted virtual new born care on maternal satisfaction between mothers with normal deliveries verses caesarean section deliveries.
- Conduct a comparative study to assess the effectiveness of assisted virtual newborn care on the maternal satisfaction in nuclear versus joint families.
- Conduct a qualitative study to explore the support of family members on assisted virtual newborn care.

Conflict of interest

The study was conducted independently, and there were no external influences or biases that could have affected the research process and outcomes.

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