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# Maternal Perspectives on and Preferences for an Enhanced Neonatal Jaundice Education Program: An Evaluation Using the Consolidated Framework for Implementation Research

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**Introduction:** Neonatal mortality is a major contributor to under-five deaths yet the main causes of these deaths are preventable. Postnatal health education programs can improve timely detection and care seeking for newborn morbidities such as neonatal jaundice (NNJ). Being a common occurrence in low-income countries, it is surprising that women do not have sufficient knowledge about NNJ. Although the knowledge can be improved through routine education programs, healthcare providers rarely engage women in evaluating such programs, which limits their uptake and sustainability.

**Methods:** This was a qualitative study evaluating a postnatal neonatal jaundice health education program conducted at Jinja Regional Referral Hospital (JRRH). Narrative data on the structure, design, and delivery of the program was recorded from 12 postnatal women through unstructured interviews. The participants were those who had taken part in an enhanced NNJ education program. Qualitative content analysis, guided by the Consolidated Framework for Implementation Research (CFIR) was performed.

**Results:** Using the CFIR, two themes were identified; the intervention characteristics domain and the individual domains. The constructs under these domains were intervention design quality and packaging, relative advantage, and maternal knowledge needs. The augmented nature of the intervention, sorting individual needs, ability to promote continuity of care, and care-seeking were identified as key facilitators. Lack of group interaction was identified by some women as a possible barrier.

**Conclusion:** Overall, the education program was positively perceived by women and preferred compared to the conventional method of health education. In low-resource settings where maternal health education can contribute to a reduction in newborn mortality, the design, implementation, and evaluation of maternal education programs should be informed by women's preferences. Healthcare providers should utilize multiple sources of information and routinely practice patient-centered evaluation to meet the changing knowledge demands of postnatal women.

**Keywords:** maternal health education, neonatal jaundice, enhanced neonatal jaundice education, postnatal education, maternal knowledge

## Introduction

Global efforts to reduce premature deaths have significantly improved the quality of life and life expectancy.[1] However, it has been estimated that by 2040, neonatal mortality will still be a major contributor to years of life lost (YLL).[1] Currently, low-income countries are facing disproportionate rates of high under-five mortality, and surprisingly, the neonatal period is contributing to nearly one-half of all the deaths before the fifth birthday.[2] The first week of postpartum is the most vulnerable time for newborn babies as most mortalities occur in this period.[3] Although several causes of



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newborn mortality can be prevented[4] through increasing awareness among women regarding newborn illnesses, there has been persistently poor engagement of women in postnatal care and health education programs, especially in Sub-Saharan Africa, where mortality is the highest.[5] To progressively reduce newborn mortality, the decrease in hospital stays post-birth[6] requires that post-natal women have the essential knowledge to identify key indicators of ill health such as neonatal jaundice (NNJ).

Jaundice is a common newborn danger sign[7] developing as early as 24 hours postnatally, with the African region having the highest incidence rate of 667.8 per 10,000 live births.[7] NNJ is majorly self-resolving but in its severe untreated form, prolonged hyperbilirubinemia increases the risk for long-term neurological disability and possible mortality.[8] Given the nature of its course, NNJ is likely to develop or worsen after the infant has been discharged home, and yet postnatal women have been found inadequately informed about the condition, causing delayed detection and initiation of appropriate treatment.[4,9] The knowledge gap regarding NNJ and the associated sequelae can be improved through routine health education tailored to maternal-specific needs and preferences.

Perinatal health education can be provided during prenatal and postnatal health sessions,[10] and it is a vital, effective, and cost-saving approach to improving newborn health, as it prepares women to take full responsibility for their infants' well-being[11] after discharge. It's an avenue for promoting postnatal care attendance thus increasing accessibility to health information and the likelihood of timely identification of ill infants.[12–16] Moreover, it increases knowledge levels regarding newborn and maternal danger signs[17–21] such as NNJ, thus enabling appropriate and timely care-seeking and early detection of severe illness,[22] with a resultant decrease in mortality.[23] Optimal NNJ knowledge in newborn health is not only critical among healthcare providers[24] but also among parents.[25,26] However, for effective adoption of NNJ education messages, women should be integral in designing, implementing, and evaluating such knowledge-enhancing interventions.

In resource-constrained countries where newborn morbidity and mortality are the highest, the implementation of maternal-centered post-natal health education programs can be challenging. For instance, given the high patient load, women can be discharged in less than 24 hours after delivery,[6] which limits the interaction time with healthcare providers. This also hinders the optimal engagement of women in the designing and evaluating of such routine health education programs. A systematic review and meta-synthesis including mostly studies outside Sub-Saharan Africa established that postnatal women want to develop knowledge, competence, and autonomy in managing the new changes.[27] A study elaborating on what women want and how they would like their NNJ knowledge to be improved during postnatal education is a prerequisite for the improvement of newborn health but also provides a basis for progressive evaluation and creating a patient-centered approach in Uganda.

Women elsewhere have indicated that receiving appropriate and timely information reduces anxiety, promotes self-efficacy, and helps them navigate postnatal newborn challenges.[28] However, it has been found that the majority of women are usually not satisfied with the kind of health education they receive[29] from their care facilities, as it fails to meet their knowledge needs.[30] In some settings, inconsistent and inadequate health information received from care providers has resulted in frustration, stress, and anxiety,[31] thus affecting the women's ability to take care of the newborn baby. In settings like Uganda where accessibility to postnatal services is poor,[32] maternal perspectives on such knowledge-enhancing interventions especially those provided in the immediate postpartum period for neonatal jaundice awareness have not been well explored. This has limited the improvement of such interventions' design and delivery strategies to meet the women's preferences thus affecting the uptake, sustainability, and the overall effectiveness of the interventions in improving newborn outcomes.

Recently, Alinaitwe et al investigated the effectiveness of an enhanced maternal health education session in improving knowledge on neonatal jaundice in Jinja, Eastern Uganda.[26] Although the education program achieved an overall improvement in maternal knowledge of NNJ, some women had a negative change in knowledge levels.[26] To understand the experience, perspectives, and possible reasons for variations in knowledge change among these women, and create a foundation for participatory engagement, we utilized the Consolidated Framework for Implementation Research (CFIR) to explore the women's thoughts on this education program. The CFIR through its five domains (the intervention, inner setting, outer setting, individuals, and process)[33] can be utilized to explore and shed more light on context-specific implementation barriers and facilitators.

In Uganda, there is limited literature on the application of the CFIR to understand maternal perspectives and preferences as drivers and indicators for neonatal health education programs' effectiveness. To the best of our knowledge, this is the first study to utilize the CFIR to understand what women want regarding the design and implementation strategy of a postnatal NNJ maternal health education program. This qualitative exploration was performed as a patient involvement study following the implementation of an enhanced neonatal jaundice education package among postnatal women.

The main purpose of this study therefore was to understand the women's experiences and preferences during the delivery of a neonatal jaundice education program in Jinja, Busoga sub-region Eastern Uganda, highlighting possible barriers and facilitators. The research questions in this study were; what are the key maternal thoughts on the content and mode of delivery of the neonatal jaundice education program? What are the key aspects of the education program that could have influenced the preferences for uptake and utilization of the NNJ information by the postnatal women?

# Materials and Methods

## Study Sample, Setting, and Procedures

The study evaluated a before and after investigation that implemented an enhanced maternal neonatal jaundice education program in the immediate post-delivery period to improve maternal knowledge of neonatal jaundice. The primary study enrolled postnatal women at a tertiary health facility, a regional referral hospital in Eastern Uganda (Jinja Regional Referral Hospital).

The current qualitative exploration presents data from the intervention evaluation. The evaluation was conducted using semi-structured qualitative in-depth interviews, exploring maternal perspectives and preferences regarding the design and the implementation strategy. Participants were the women who had delivered a live baby from Jinja Regional referral hospital, enrolled in the neonatal jaundice education study and received the educational intervention.

The feedback was obtained from 12 women during the post-intervention follow-up (10–14 days post-discharge) through telephone-based individual interviews after discharge from the hospital, away from any distractions. The interviews lasted between 25–40 minutes and were conducted until no more new information was being generated. Saturation was reached after interviewing 12 participants.

Participants' responses to the interview questions were directly written by the researcher (BA). The researcher was the team Lead, had a Bachelor's degree at that time, and was not directly involved in the delivery of the educational intervention to the women therefore, there was no prior relationship and preconceived ideas established between the interviewer and the participants. All the women invited for the interview agreed to participate and there was no dropout before the completion of the interview.

## The Enhanced Neonatal Jaundice Education Intervention

The neonatal jaundice educational intervention as described by Alinaitwe et al[26] was a maternal-tailored information package that provided post-natal health education messages on neonatal jaundice (NNJ), its signs, risk factors, causes, and complications, how to check for NNJ, and general care for infants who develop NNJ. Additionally, general information on other danger signs of a newborn baby was also provided.

During the intervention, all enrolled postnatal women received the information within 72 hours after delivery before the women were discharged home. The intervention was delivered to each participant individually in a private setting through the following steps as described in the main study;[26]

1. After the baseline assessment, the study Midwives gave a general overview of NNJ and other newborn danger signs to every participant.
2. A video presentation narrated in either Lusoga or English was presented to participants which they watched on a 7-inch tablet in the presence of the research Midwife. The Lusoga and English videos were 10 and 5 minutes in length respectively. Upon completion of the video, the women were allowed to ask questions.

3. The women were finally provided with informational leaflets containing the same information as that in the video watched. The leaflets were printed in color to provide clear pictures of a jaundiced baby and were also available in both Lusoga and English. Participants were allowed to take these leaflets to their homes to always read and familiarize themselves with neonatal jaundice.[26]

## Data Collection Tool

The study interviews were conducted using an unstructured interview guide (Supplementary Material). The key areas of the guide were informed by the structure and mode of delivery of the neonatal jaundice education intervention to include aspects of maternal preferences regarding the intervention design, intervention packages, and the design of the intervention delivery strategy, linking the intervention and infant care with more prompts from the researcher. The questions were also compared to the CFIR domains and constructs to explore the dimensions of implementation research. The developed tool was reviewed by maternal health and qualitative research experts and was later pre-tested on four non-study postnatal women.

## Rigor and Trustworthiness

Researcher triangulation was utilized in analyzing the data with researcher agreement on the codes generated and final themes for confirmability. For the dependability of the findings, text quotations for participant responses have been included. To ensure the transferability of study findings, the Consolidated Framework for Implementation Research was used to guide the analysis of the data obtained.

## Data Analysis

Feedback notes were transferred into a Word document and organized as per participant in sequences. Data were analyzed initially inductively through the content analysis approach and then deductively by mapping the identified codes and themes to the Consolidated Framework for Implementation Research (CFIR). The initial step involved reviewing the feedback notes by two independent authors. The authors performed the analysis following iterative stages including familiarization with the feedback reports through continuous text reading and establishing initial codes and themes. This was then followed by mapping the codes with the respective CFIR domains and constructs. The researchers then met to discuss the codes and themes as identified within the CFIR. Any discrepancies were discussed and where consensus failed a third author was involved to break the tie. Constructs that fed directly into the current study as described by Damschroder and Lowery[34] were considered and were then tabulated. As described by Braun and Clerk,[35] the analysis process involved coding, finding patterns and themes, interpreting and comparing the emerging themes to the CFIR domains and constructs, and reporting them as long as they captured the subject matter within CFIR domains.

## Ethics Approval and Consent to Participate

The implementation of the study was guided by the fundamental ethical principles and complies with the Declaration of Helsinki. Ethics approval was obtained from the Makerere University School of Health Sciences Research and Ethics Committee (reference number MUSSS-2020-10) and the University of Minnesota Institutional Review Board and Research and Ethics Committee (number STUDY00011629). Further approval was obtained from the Uganda National Council of Science and Technology (UNCST) (HS1479ES). Before the delivery of the educational intervention, participants were informed about the intervention, the follow-up quantitative and qualitative interviews. They were informed that this would be captured through a telephone interview and that they retained the right to decline participation or withdraw from the study. All participants who agreed to take part in the pre-intervention survey, intervention, and post-intervention follow-up interviews provided written informed consent. Participants' informed consent included the publication of anonymized responses/direct quotes.

# Results

## Sample Characteristics

Twelve (12) participants were involved in this qualitative study. The mean age was 25.08 years with a minimum of 16 years and a maximum of 30 years. All participants were married, about one-third (66.7%) attained ≥ secondary level of education, and one-half 6(50%) were primiparous (Table 1). After the use of the CFIR in data coding, two domains were obtained; intervention characteristics domain and individual characteristics domain (Table 2).

**Table 1** Categorization of Study Participants by Individual Socio-Demographic and Obstetric Characteristics

| Characteristics | Frequency | Percentage (%) |
|---|---|---|
| **Age in years** | | |
| <18 | 01 | 8.3 |
| 18–24 | 04 | 33.3 |
| 25–30 | 07 | 58.4 |
| **Residence** | | |
| Jinja District | 05 | 41.7 |
| Elsewhere | 07 | 58.7 |
| **Education level** | | |
| No education | 01 | 8.3 |
| Completed Primary | 01 | 8.3 |
| Completed Secondary | 08 | 66.7 |
| Completed Tertiary | 02 | 16.7 |
| **Marital status** | | |
| Single | 00 | 0.0 |
| Married | 12 | 100.0 |
| **Occupation** | | |
| Housewife | 06 | 50.0 |
| Self-employed | 02 | 16.7 |
| Employed | 04 | 33.3 |
| **Parity** | | |
| Primiparous | 06 | 50.0 |
| Multiparous | 06 | 50.0 |
| **Antenatal care (ANC) attendance** | | |
| Yes | 12 | 100.0 |
| No | 00 | 0.0 |
| **No. of ANC attendance** | | |
| < 4 times | 02 | 16.7 |
| ≥ 4 times | 10 | 83.3 |
| **Gestation age at delivery** | | |
| ≤36 weeks | 00 | 0.0 |
| ≥37 weeks | 12 | 100.0 |
| **Mode of delivery** | | |
| Vaginal birth | 08 | 66.7 |
| Cesarean section | 04 | 33.3 |

(*Continued*)

**Table 1** (Continued).

| Characteristics | Frequency | Percentage (%) |
|---|---|---|
| **HIV status** | | |
| Positive | 00 | 0.0 |
| Negative | 12 | 100.0 |

**Table 2** Emerging CFIR Domains and Constructs, Study Categories and Codes Identified After Data Coding

| Domains/ Themes | Constructs/ Subthemes | Categories | Codes |
|---|---|---|---|
| **Intervention characteristics domain** | Design quality and packaging | An augmented intervention | Multiple sources, enhanced comprehension, clarity, audio-visual, enhanced colors, pictures, vouchers, audio-videos, information leaflets, visual aids, pictorial learning, detailed video |
| | Relative advantage | Promoting maternal engagement in infant care | Vital information, future reference, newborn check-up, continuous monitoring, increased attention, care seeking, appropriate action |
| | | Promoting continuity of care | Continued check-ups, postnatal advice, relief of fears, calling is caring, communicating complications, settling inquiries, |
| | | Perceived benefits of one-on-one health education | Privacy, infection control, ample time, learning differences, attention, mother-midwife interaction |
| | | Perceived benefits of group health education | Reminders, compliments, shared learning, |
| | | Limitations in group health education | Diversion, time-consuming, noise, group phobia, inhibition, fear of embarrassment |
| **Individual domain** | Maternal knowledge needs construct | Individual-specific learning needs | Individualized, bedside learning, alone, learning differences, knowledge deficit, feeding options, newborn illnesses, future knowledge gaps |

## Theme 1: Intervention Characteristics Domain

The intervention encompasses the new product or approach being implemented and, in our study, this was the enhanced neonatal jaundice education. Women's perceptions of the features of the intervention can determine whether they will prefer the new approach or the old method of maternal health education. The postnatal women had an experience of the enhanced education intervention and their perceptions fell into two CFIR constructs, including intervention design quality and packaging as well as relative advantage.

## Subtheme 1: Intervention Design Quality and Packaging Construct

The content of the intervention and the sequencing of the different packages can influence an individual's understanding and preference for the intervention. A combination of different parts of the intervention contributed to successful improvement in knowledge levels. Overall, the participants highlighted that the mode of delivery and execution were unique and novel. The use of several approaches including verbal messages as well as visual and audio enhancements made the sessions unique and attracted their attention, making them eager to learn about neonatal jaundice (NNJ). In this construct (subtheme), we illustrate how the different parts of the intervention package were perceived as facilitators for the enhanced acquisition of NNJ knowledge by post-natal women.

## Category 1. An Augmented Intervention

Participants understood the nature of the intervention and were able to describe it as one that utilizes more than one approach to deliver NNJ health messages. They indicated that the intervention had multiple components including videos, pictures, and NNJ vouchers, all of which were supplementary to each other and made understanding of the information easy.

A woman narrates;

> According to me, the midwife explained what neonatal jaundice is, showed me the video with pictures and illustrations of a jaundiced baby, and then gave me a piece of paper with similar information. This kind of health education combines several approaches and it is fine because you can see what the midwife is talking about. For instance, they tell you when the baby has jaundice, they have certain characteristics which you also see in the video and the bright photos in the leaflets RP.11

Another woman stated that;

> The Midwife first asked me what I know regarding neonatal jaundice, and then went ahead to teach me about it all. She used papers with words and pictures, then a video with pictures on a phone -RP.5.

Another mother narrates;

> After watching the video, she explained to me everything about jaundice. She then gave me a paper that I put with the rest of my things and carried it home -RP.7.

Because multiple components were used to deliver the same message, the women identified the educational information delivered to them as being augmented. The visual and audio enhancements increased the understanding of the information being communicated and were complementary to each other, making everything simplified. Additionally, the women highlighted that being able to carry a simplified information brochure made remembering the teaching points easy. The leaflets were useful in the home, especially in refreshing their memory regarding what the Midwife had taught them, which made them contented with their involvement in newborn care.

A woman was quoted saying;

> I like the fact that combining more than one approach was used to improve my learning. I might not have understood the topic well but following the combination of keywords from the midwife, messages on the phone, and the leaflets made it easy for me to follow the message closely. Given that I was able to take the information back home, I was able to use it to teach other people who were helping me with the baby -RP.12.

> Another woman stated; When I read through the information sheet and look at my baby and doesn't have any yellowing, I feel contented' -RP.5.

## Subtheme 2: Relative Advantage Construct

This explores several advantages of the new neonatal jaundice education approach as perceived by the women. Overall, the women consistently identified key features of the intervention that enabled them to engage well in the care of their infants. They indicate that the different aspects of the intervention were perfectly fitting and made it exciting, thus attracting their attention to learn more about neonatal jaundice. Five categories were generated to describe the relative advantage perceived by women.

## Category 1: Promoting Maternal Engagement in Infant Care

Women indicated that the information obtained during the neonatal jaundice education program was important for their understanding of newborn care. The information was useful for appropriate management of the current baby's condition, and since there is a point of reference, the experience could also be useful in handling challenges faced by babies in the future and even for the next pregnancies. It helped them engage proactively in ensuring that the baby was well.

Some noted that after the intervention, their attention to the baby's condition increased. A woman narrates;

Every time I check the eyes, the mouth to see if my baby has developed yellowing" -RP.09.

They applied the knowledge in continuously checking up on their babies to identify danger signs such as yellowing of the baby's skin, poor breastfeeding and other indicators of a sick baby. A participant states;

I have put all my mind and thoughts on the baby, for instance whenever the baby is crying, I always check out on the baby's eyes, and feces and always check on the baby generally' -RP.12.

There was a belief that the message was not only important for the well-being of the current baby but also for babies that will be born in the next pregnancies, given that there was a voucher kept by the mother and could be referenced at any time as stated by a woman;

In the future, the education message will help me in a way that when I give birth to a baby with the same illness, I can easily identify it and consult the health care workers -RP.04

another participant states that;

This information is not for me alone. I will use it to teach my fellow women in my village and those that I will find at the health facility during antenatal about this condition of yellowing -RP.01

The first few days of post-delivery can be so stressful for postnatal women since the newborn baby requires regular attention from the mother. The NNJ education program was in itself considered to be stress relieving, since the women were encouraged to constantly check on their babies, creating a sense of awareness of the baby's wellbeing. A twin mother narrated;

During this period, the information has helped me a lot because when I read through the messages on the leaflets and remember what I was taught, finding that my babies don't have any of those makes me feel contented-RP.05.

Sometimes it becomes quite challenging to identify the baby who is ill and yet timely detection of severe illness by the mother is vital for early care seeking. Women believed that the NNJ education program empowered them to recognize some signs of infant illness, in case their babies were unwell. One mother stated

This has helped me because if my baby is unwell or even when they have yellowing anywhere, I can be able to understand it-RP.04.

The reminders in the message received served as a motivating factor to take the sick child to the hospital for timely initiation of treatment. A woman was quoted saying;

the time I spent on the video, I learnt how to identify jaundice and be able to go to the hospital to seek care. I further learnt about the general care for my baby such as breastfeeding -RP.01

Another mother stated that;

when I see the signs of yellowing, I will be able to take my baby to the hospital and continue to do so even in the future -RP.07

A well-balanced educational package, therefore, makes it possible to create a continuum of newborn care throughout the postpartum period up to the next delivery, as women become more empowered to take action especially when they recognize any unusual signs. However, this can only be achieved if the information is packaged in a way that facilitates its assimilation by postnatal women.

## Category 2: Promoting Continuity of Care

In addition to providing the intervention messages, integral to the study was a post-intervention assessment 10–14 days post-discharge, which was conducted through a telephone call. When asked about the post-discharge follow-up package, all women reported that it was new to them being followed up by telephone calls. They were however positive and

indicated that it is a very good initiative in improving maternal and child care and they were willing to receive post-discharge telephone calls in the future.

Women thought that follow-up by the research team was a vital part of care and it demonstrated a high level of compassion. A mother stated;

> Calling me about my health and the baby's health encouraged me as a mother to know that someone is thinking about me and the baby' -RP.11

The participants acknowledged that following discharge, a lot could happen and that telephone follow-ups present a great opportunity to continuously communicate with professional care providers about challenges, complications, and fears the women were facing after discharge. A participant stated;

> Sometimes you can go through challenges when you don't even have any number of a healthcare worker to call and ask them something, but when they call, it is a very great chance to explain everything to them' -RP.05.

Follow-ups were also identified as a great opportunity to receive postnatal advice from the Midwives and promote continuous learning of infant care as stated by a participant;

> It is a good thing because I get to ask them about anything on the baby when they call -*RP.10.*

The follow-up during the NNJ education program was not only important in improving the baby's well-being but also allowed for the expression of the mother's health concerns. A mother narrates;

> I delivered by cesarean section and after being discharged, I got frightened by the sutures. When the neonatal jaundice teaching midwife called me and I explained to her, she guided me on what to do-R.P.02.

## Category 3: Perceived Benefits of One-on-One Health Education

During the NNJ educational intervention, every woman received the education information individually. There were mixed reactions regarding whether the women preferred being health-educated alone or in groups. Some women preferred both methods and regarded each approach as having advantages and limitations and would therefore be complementary to each other. However, others preferred either of the methods for specific individual reasons. How the women perceive the advantages related to the NNJ education program could have greatly influenced the adoption of the information messages delivered during the intervention.

Women who preferred being health-educated alone believed that it was a basis for optimal understanding of the NNJ messages. One important thought was that the women got sufficient time to interact with the midwife which guaranteed adequate attention to their individual needs. A woman narrates;

> The Midwife comes close to you and you have an interaction with them and they are able to answer you very well without any interruptions-*RP12.*

It was noted that there are differences in the ability and speed to learn new information among people and the kind of individualized approach used in the NNJ education program allowed women to learn at their own pace. A participant was quoted saying;

> I remember you taught us separately and I think this is the way to go because each person understands differently -*RP.02*

*O*ther participants highlight that because of maximum attention with no disruptions, being educated alone increases the chance of remembering the message being taught;

> Teaching one mother at a time is helpful because I don't think I can forget what I have been taught' -*RP01.*

## Category 4: Perceived Limitations in Group Health Education

When compared with the conventional routine group health education, some women preferred one-on-one health education. Although groups can serve as a source of extra motivation to inexperienced mothers, participants identified some factors that could potentially inhibit learning and comprehension when health education is provided in groups, compared to individualized health education.

The most common challenge identified was disruption. In a large group, there could be crowding with a lot of noise. Every individual has their point of view and thoughts which could result in uncontrolled conversations. If it is one midwife educating a bigger group of women, there could be a loss of control and thus the message could only benefit a few. A mother narrates;

> When in a group, many people speak randomly, and yet the midwife is also talking about important information -RP07

More so, the midwife does not give individualized attention since s/he has several people to attend to, and when information is repeated, there is a waste of time

> In a group, people are making noise, every person is saying a different thing -RP04.

Some participants highlighted that many people can cause anxiety and fear which might even deter someone from asking questions. A mother states;

> Sometimes you might be shy and when you have something to say or even ask a question, you can fear because of a big crowd -RP03

The fear was related to being embarrassed by fellow patients as indicated by one of the participants;

> In a group, you fear to ask questions thinking my fellow women will laugh at me -RP06.

When there is congestion as seen in groups, there is a tendency to lose focus on the area of interest thus affecting understanding of what is being elaborated;

> In groups you might think ahhh!.what does it help me and you end up not giving it time -*RP09*

Given that the study was conducted at a time when Corona Virus Disease (COVID-19) was rampant, congestion in groups was also identified as a risk for the increased spread of infectious diseases. A woman states;

> You can decide to teach us in a group and someone comes with COVID and infects all of us -RP.02.

## Category 5: Perceived Benefits in Group Health Education

Some women identified key barriers to acquiring knowledge when the individualized approach was used in the delivery of our intervention. Preferences were linked to the key benefits that come along with interacting with other women and majorly stemmed from the saying "no one knows it all". Having different women means that there are different experiences that everyone can learn from unlike when every person is alone. They acknowledge that when you are in a group, several ideas come from different people which supplement the knowledge obtained. A woman states;

> There are some things you may not be thinking about but when in a group, another person asks and you learn from them -RP.05

When it comes to recalling previously learned information, group members can serve as reminders as highlighted by one of the participants;

> In group learning, you might forget something and other mothers remind you what has been taught -RP01

It is worth noting that experience can play a lot in group-based maternal learning. Young and inexperienced women can learn a lot when they interact with women who have previously given birth. However, extra care needs to be taken to ensure that the new mothers' needs to learn are not suppressed by other people's perceptions and experiences.

## Theme 2: The Individual Domain

In the individual domain of the CFIR, the individual characteristics sub-domain forms the second theme in this study. The construct that was found to be relevant in this sub-domain was the individual maternal needs. Every woman has deficiencies that can be handled by health education, or characteristics that could hinder their ability to acquire more knowledge.

## Category 1: Individual-Specific Learning Needs

Participants noted that the intervention was quite different from the general education always received. It allowed each of them to interact with the midwife individually and every participant was provided with the intervention at their convenience. Although there were efforts to ensure that every woman is treated uniquely, the intervention only captured issues around neonatal jaundice and other newborn danger signs. Other aspects of newborn and maternal care were not part of the general intervention and therefore women identified their different expectations as a gap not addressed by the current intervention.

Women believed that the perinatal period creates a long-term learning opportunity because there are plenty of knowledge gaps that will always need filling. Expectations and needs for future learning span the care continuum and are highly varied from person to person and continuous follow-ups offer an opportunity for a detailed review of such needs. The maternal information needs are to a larger extent dependent on past experiences as someone will always be inquisitive about a problem that they have faced or witnessed and therefore need to know more about how to handle such a situation; a woman indicated "my baby"*s stomach has been disturbing, so I would like to know when the baby is still young and the tummy becomes swollen, what should I do?' -RP.03.*

Another participant narrates;

> I would like to know more about the cord (care) because this baby's cord has disturbed me, now there is a small whitish growth that came up after the cord fell off' -RP09.

Given that first-time mothers (primiparous) have not had any previous newborn care experiences, they have a lot to learn but their needs may be neglected. They might be clueless about their learning expectations and there is a belief that they need to first encounter some challenges and then determine their information needs. A primiparous woman narrated;

> Most of the time, for us first mothers, we don't know a lot. In the beginning, everything is always new. It is after something happens first and then we get to be more inquisitive about it. For instance, right now I can ask why is my child over crying, why is the skin having rashes?… and so forth, because I have seen these things on my child' -RP05.

However, this should be a critical point of consideration as the women believe that for the first pregnancy, Midwives are vital in determining health education needs based on their expertise, but input from the mother should be highly encouraged. A mother states;

> Since this is my first baby, I think it would be you to initiate for me what I need to know and then it would be easier for me in the future when I get my second baby -RP07.

Careful consideration needs to be taken through thorough individualized evaluation for especially first-time mothers such that their needs are not neglected. For instance, a mother states;

> I would like to learn about very many things but since this is the beginning, I don't know much. but I think there is a lot for me to learn…like what are the signs of a sick baby? Or how can you keep the baby well?' -RP10.

# Discussion

Perinatal health education is an important and integral component of maternal and child health as it provides a platform for informing women on the best practices for self and child care.[23,36,37] Health education delivered postnatally has been shown to improve maternal confidence in infant care,[38] increase awareness of newborn signs of illness,[17] and increase utilization of postnatal care services.[39] However, to achieve intended implementation outcomes, women should be

integral in designing, implementing, and evaluating such educational programs. In this current study, we conducted qualitative research as a participant involvement approach in the evaluation of a neonatal jaundice education program implemented in the first 72 hours post-delivery[26] in Eastern Uganda.

In our study, women demonstrated a great admiration for the design and packaging of the NNJ educational intervention. The program was admired because it integrated different components such as verbal messages, videos, and written information to promote the maternal learning process. Additionally, women perceived the intervention as a motivator for their active participation in infant care, identifying danger signs, and seeking appropriate care. As demonstrated by Izudi et al, adequate knowledge is key in identifying newborn danger signs and preventing infant complications through increased use of postnatal care services.[40] Similar to our setting, the provision of take-home messages such as information brochures was found to be desired by women in Ghana[41] and the use of videos and information documents in combination has been practiced by others.[42] Intervention augmentation is therefore critical as it promotes better acquisition of knowledge and enhancement of memory to guide healthcare decision-making[43,44] and promotes healthcare-seeking with an overall likelihood of reducing maternal and infant complications.[42,45]

The NNJ educational intervention involved teaching every participant alone. In promoting a patient-centered approach to care, a one-on-one patient-midwife interaction can be vital to improving maternal awareness of infant health challenges. Having ample quality time with the midwife was identified as an important factor in information exchange as it allows for adequate interaction and fosters the sharing of private information. Similar to our finding, Shorey et al, found that when the patient interacts freely with the midwife, there is a high level of belief that the information is reliable which promotes appropriate decision-making.[43] Our findings underscore the importance of utilizing a patient-centered approach in maternal health education.

However, individualized maternal health education strategies may be challenging in strained healthcare systems due to limited human resources.[11] In the current study, the preference for learning in groups was expressed by some participants, and the desire stems majorly from the need for a diverse view regarding NNJ care information. There was a belief that when in groups, ideas and questions from different people help in reminding other women what they could have forgotten. In the perinatal period, women have different experiences, and grouping them might help inexperienced mothers learn from experienced ones. Elsewhere, it has been demonstrated that women who received group learning education got satisfactorily sufficient information regarding different topics.[46] The ability to form social interactions, receive support and motivation from other patients, as well as engage in group discussions are important aspects of group-based health education programs.[47] More so, the approach has been found favorable for midwives working in the sub-Saharan context, with the potential to promote job satisfaction and reduce stress.[48]

Depending on their parity, women may have different needs for newborn care knowledge needs. This might affect their level of concentration on the chosen topic. For instance, our study indicates that first-time mothers need to be carefully guided through several challenges especially those that they have never experienced. Cardoso et al also found that first-time mothers are at a high vulnerability to having low knowledge and being misinformed in various aspects of newborn care[49] due to limited previous exposures. This was similarly demonstrated in a qualitative study by McLeish et al and was seen as a source of confusion, mental strain, and low self-esteem among mothers.[50] The Midwife needs to perform a thorough situation assessment to ensure that while delivering health education messages, the needs of vulnerable women are carefully addressed. First-time women can therefore benefit from both an individualized approach to health education where their needs are closely established and resolved but also group health sessions where they get to learn from experienced mothers.

The findings of this study demonstrate the role of multisectoral engagement in the designing of maternal NNJ health education programs. Whereas the healthcare providers may have the knowledge and skills to educate the women, they need enough resources to design a well-fitting program for maternal education. More so, women need to be at the center guiding the healthcare providers on the best approaches to implement and evaluate education programs. Our study therefore asserts that the healthcare system needs to support both the care providers and the postnatal women in creating feasible and acceptable knowledge-enriching approaches.

During the design of newborn health maternal education programs, an integrated process could be more beneficial than the use of a single-method approach. In settings like Uganda where postnatal care service utilization is suboptimal,[51]

the use of effective designs could help in improving postnatal care attendances and newborn survival. Maternal and child health experts should therefore consider the provision of newborn-related information beyond the hospital setting such as through information vouchers and telephone follow-ups. The healthcare providers should not assume that one size fits all. They should design a maternal education strategy based on women's preferences. Women should be routinely engaged in providing feedback regarding the design and implementation process to ensure that such health education sessions are tailored to their needs. Additionally, understanding the context in which to implement the intervention is very important. The care provider should therefore perform a detailed individualized needs assessment to identify vulnerable groups and any possible hindrances to maternal behavior change before implementing health education sessions, as information needs have been shown to easily change from one situation and patient to the other.[52,53]

Our study provides important insights for continuous evaluation and improvement of postnatal health education on NNJ care, and it is without limitations. It should be noted that this study was specific for a neonatal jaundice education intervention and the outcome may not apply to interventions addressing other newborn conditions. However, the use of the CFIR in our study allows for the transferability of some concepts to other contexts. Another limitation is that we did not explore how healthcare system and social factors could influence women's preferences and perceptions. Future studies should be conducted on interventions targeting several other danger signs of newborn babies and ensure the integration of the healthcare system's role in influencing individual participant's perceptions. Additionally, in this study, we used convenience sampling which could have resulted in investigator-induced selection bias, and inclusion of a population with unbalanced background characteristics. To minimize this error, the qualitative interviewer did not have prior interactions with the participants, ensuring that there were no preconceived bias about the women. The sample size could have been potentially inadequate but the researchers utilized the technique of data saturation. Interviews on the subject matter continued until there was no more new information obtained from the study participants, thus ensuring that the data obtained was representative of the targeted population.

## Conclusions

Our study shows that women can play a vital role in evaluating a maternal newborn health education intervention and provide critical feedback to best fit their preferences. It can be observed that overall, the intervention and the approach used in the delivery of the enhanced neonatal jaundice education package were positively perceived by women, which partly explains the overall success of the intervention in improving maternal knowledge of NNJ. The intervention and implementation strategy have clear advantages as identified by women and the health education approach could be adopted by all healthcare facilities offering postnatal care to enhance the effective transfer of newborn health information to women. The study highlights the need for designing an approach with multiple sources of information, the integration of a patient-centered approach to health education, and the role of considering individual knowledge needs while implementing an educational program. These are key in promoting both effectiveness and ensuring that the intervention will be sustainably adopted by the women. Healthcare providers should therefore consider routine evaluation of health education strategies to meet the regularly changing maternal needs and the design of the interventions should be guided by an evidence base, with women being part and partial of the decision-making process. Policymakers should integrate the generated evidence in the design of maternal health education policies and frameworks while allocating enough resources towards promoting the adoption and sustainability of inclusive maternal health education programs. It is however worth re-iterating that the results are not fully representative of all factors that could influence the maternal understanding, adoption, and sustainability of health education interventions. Other limitations as discussed above could interfere with the effective implementation of education programs and should be put into consideration by all stakeholders in maternal health education.

## Abbreviations

NNJ, Neonatal Jaundice; CFIR, Consolidated Framework for Implementation Research; JRRH, Jinja Regional Referral Hospital; YLL, Years of Life Lost.

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## Author Contributions

All authors made a significant contribution to the work reported, whether that is in the conception, study design, execution, acquisition of data, analysis, and interpretation, or in all these areas; took part in drafting, revising, or critically reviewing the article; gave final approval of the version to be published; have agreed on the journal to which the article has been submitted; and agree to be accountable for all aspects of the work.

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## Disclosure

The authors declare that they have no competing interests.

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