

A Qualitative Exploration of an Interactive Digital Educational Roadmap for Pregnancy Health Literacy

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ABSTRACT

Background: Many pregnant women have low health literacy, negatively affecting maternal and child health. Digital innovations offer potential solutions for health education, but no interactive roadmap specifically addresses pregnancy-related health literacy. **Objective:** This study explores the experiences, needs, and preferences of pregnant women and stakeholders in developing an interactive digital education roadmap to improve pregnancy health literacy. **Methods:** Using a qualitative descriptive design, in-depth interviews were conducted with 26 participants: six pregnant women, six husbands, two public health cadres, six midwifery students, and six midwives. Data collection involved face-to-face and online interviews, which were transcribed verbatim. Data analysis employed conventional content analysis, identifying themes and subthemes through coding and consensus. Triangulation and quotations ensured validity. **Results:** Three main themes emerged: (1) the urgency of health literacy, highlighting its role in knowledge, decision-making, adaptation, and misinformation prevention; (2) the need for comprehensive information on maternal health, fetal development, psychological support, nutrition, danger signs, and the husband's role; and (3) a preference for interactive digital roadmaps featuring attractive visuals, diverse media (infographics, videos, animations), cultural integration, accessibility, and ease of use. **Conclusion:** Developing interactive digital roadmaps as structured, user-friendly educational tools can enhance pregnancy health literacy. These innovations empower women and support healthcare providers and families. Integrating such tools into maternal health programs and establishing supportive policies can strengthen antenatal education and promote informed decision-making.

Keywords: Digital Education, Health Literacy, Interactive Roadmap, Pregnancy

INTRODUCTION

Pregnancy is a challenging period involving various physical and psychological changes for women and those around them. Pregnant women need adequate health literacy, defined as the ability to find, understand, and use information and services to inform decisions and actions related to their fetus's health (Nutbeam and Muscat, 2021). Health literacy is crucial during the perinatal period, as it can prevent various health problems for both mother and baby (Keles *et al.*, 2024). However, studies show that more than one-third to two-thirds of pregnant women (41.6-71.3%) have inadequate health literacy (Guler *et al.*, 2021); (Bello *et al.*, 2022); (Gaupšienė *et al.*, 2023); (Ghotbizadeh *et al.*, 2022); (Jiregna *et al.*, 2024).

Low health literacy among pregnant women can increase the risk of complications such as gestational diabetes, stress and depression, low birth weight, stillbirth, and congenital malformations (Kim *et al.*, 2025). Mothers with low health literacy often have low self-efficacy, lack understanding of pregnancy care topics, are more likely to formula-feed their babies, adopt poor lifestyle habits, and struggle to implement health professional recommendations, ultimately negatively impacting maternal and child health outcomes (Gaupšienė *et al.*, 2023); (Kim *et al.*, 2025). Conversely, mothers with good health literacy tend to have lower obesity risk, healthier diets, engage in regular physical activity, attend antenatal check-ups, receive vaccinations, take iron and folic acid supplements regularly, and give birth to babies with healthier weight and height (Gaupšienė *et*

al., 2023). Additionally, women who plan their pregnancies, receive support from their partners, attend 9-12 antenatal visits, maintain regular sleep patterns, and adhere to supplementation are more likely to have higher health literacy (Keles *et al.*, 2024).

Efforts to improve pregnant women's health literacy are a priority in midwifery services, given the crucial role of midwives as frontline educators and supporters of pregnant women (Ningrum *et al.*, 2024). Various strategies have been extensively researched, including the use of digital communication tools such as mobile health applications, telemedicine, and online health information resources (Karamolahi, Bostani Khaledi and Niknami, 2021); (Fitzpatrick, 2023). In Indonesia, diverse educational media—such as animated videos, flyers, leaflets, websites, applications, posters, and booklets—are widely used to increase knowledge and influence attitudes and behaviors among pregnant women (Asih, Danti and Winarna, 2023); Sa'diyyah *et al.*, 2023; (Asih, Pondaang and I'anah, 2024). However, health education topics tend to focus on individual aspects and do not comprehensively address the multifaceted needs of pregnant women.

Based on the researcher's findings, there is currently no health literacy media in the form of an interactive roadmap—digital or non-digital—specifically designed for pregnancy. Existing roadmaps, such as childbirth preparation tools, mainly focus on delivery and lack interactive features (Fouly *et al.*, 2023). Furthermore, although various educational interventions have been developed, they are generally topic-specific, non-interactive, and lack a comprehensive framework that integrates different aspects of pregnancy care (Asih, Danti and Winarna, 2023); (Soucy *et al.*, 2023); (Asih, Pondaang and I'anah, 2024). Consequently, the development and evaluation of an interactive digital roadmap as a holistic educational tool to enhance pregnant women's health literacy remain largely unexplored. This study aims to create and assess such an innovative, comprehensive, and user-friendly digital roadmap to improve pregnant women's health literacy and to support midwives and health workers in delivering more effective and engaging health education.

METHODS

Research Design

This study employs a descriptive qualitative design with an in-depth interview approach to explore the experiences, information needs, and preferences of pregnant women and related parties regarding health literacy during pregnancy. This approach was chosen to gain a comprehensive understanding of participants' views on the importance of pregnant women's health literacy and the design of an interactive digital roadmap.

Participants and Recruitment

A total of 26 participants were involved in this study, comprising six pregnant women, six husbands, two health cadres, six midwifery students, and six midwives. Participant selection was conducted using purposive sampling to achieve maximum variation based on sociodemographic characteristics, including age, education level, occupation, pregnancy status, and professional experience (particularly among midwives). The inclusion criteria were: being able to communicate fluently in Indonesian, willingness to participate voluntarily, and signing an informed consent form. Recruitment was carried out through networks of midwifery practices, health centers, and midwifery educational institutions. The researcher had no direct working relationship with the participants in health services, thereby minimizing conflicts of interest. Participants were contacted via intermediaries such as health workers or lecturers, who explained the purpose, benefits, and procedures of the study. Interviews were conducted in a comfortable, conducive environment mutually agreed upon by the participants and the researcher.

Data Collection

Data were collected through in-depth interviews using pre-structured, semi-structured interview guides. The interview questions addressed topics related to pregnant women's health literacy needs, experiences in acquiring educational information, and preferences for the design of an interactive digital roadmap. Interviews lasted between 45 and 90 minutes, were conducted face-to-face or online (for pregnant women and

husbands), and were recorded with participants' permission. Field notes were also taken to capture non-verbal responses. The interview process continued until data saturation was reached, which occurs when no new information emerges.

Data Analysis

The interview data were transcribed verbatim and analyzed using a conventional content analysis method. The researcher first read all transcripts multiple times to gain a comprehensive understanding of participants' experiences and contextual backgrounds. Manual coding was employed to identify and organize meaning units. Each transcript was examined line by line to highlight relevant phrases, which were then condensed without losing their essential meanings. These condensed meaning units were labeled with initial codes representing key ideas emerging from the data. In the second phase, codes with similar meanings were compared, grouped, and clustered into categories. These categories were further abstracted into subthemes and overarching themes that reflected the central concepts of participants' perspectives on pregnancy health literacy and roadmap design. To ensure the trustworthiness of the findings, data triangulation was conducted by comparing perspectives across participants with different roles (e.g., pregnant women, midwives, and students). Peer debriefing among the research team and the inclusion of direct quotations from participants were also used to support the credibility and confirmability of the results.

Research Ethics

This research received ethical approval from the Health Research Ethics Committee of STIKES Banyuwangi (212/02/KEPK-STIKESBWI/VI/2024-2025). All participants were provided with an explanation of the study's purpose, confidentiality assurances, and their right to withdraw at any time without consequences. Anonymity was maintained by using participant codes (e.g., H1-H6 for pregnant women, S1-S6 for husbands, K1-K2 for cadres, M1-M6 for college students, and B1-B6 for midwives).

RESULTS AND DISCUSSION

Characteristics of participants

The study results were derived from an analysis of in-depth interviews with 26 participants. Table 1 presents the socio-demographic characteristics of these participants.

Table 1. Characteristics of Participants

Characteristics	Participants (n=26)				
	Pregnant Women (n=6)	Husband (n=6)	Community Cadre (n=2)	Midwifery Students (n=6)	Midwife (n=6)
Age					
<20	0	0	0	0	0
20-29	5	3	0	6	0
30-39	1	3	2	0	1
40-49	0	0	0	0	3
≥50	0	0	0	0	2
Gender					
Woman	6	0	2	6	6
Man	0	6	0	0	0
Gravida					
Primigravida	4	0	0	0	0
Multigravida	2	0	0	0	0
Gestational Age					
Trimester I	0	0	0	0	0
Trimester II	2	0	0	0	0
Trimester III	4	0	0	0	0
Education Level					
Elementary and High School	1	2	0	0	0
Senior High School	2	2	1	0	0
College	3	2	1	6	6
Employe					
Employed	4	6	2	0	6
Unemployed	2	0	0	6	0
Long Time Working (years)*					
<5	0	0	0	0	0
5-10	0	0	0	0	0
11-20	0	0	0	0	4
>20	0	0	0	0	2
Where to Work*					
Independent Practice	0	0	0	0	6
Midwives Public Health Center	0	0	0	0	5

Ket: Special for midwives*; Naming participants using codes: pregnant women (H1-6), husbands (S1-6), cadres (K1-2), students (M1-6), Midwives (B1-6).

Based on the data analysis, three main themes and twelve subthemes were identified. The main themes are: "The Urgency of Pregnant Women's Health Literacy," "The Need for Educational Information During Pregnancy," and "Preferences for Interactive Digital

Roadmaps." Details of the twelve subthemes are presented in Table 2.

Table 2. Theme and Sub-theme

Theme	Subtheme
The urgency of health literacy for pregnant women	Literacy to increase knowledge and literacy understanding Literacy as a basis for decision-making Literacy as a provision for physical and psychological adaptation of pregnancy Literacy to achieve long-term goals Literacy to prevent misinformation and myths
Need for educational information during pregnancy	Educational information about fetal health Educational information about the physical and psychological health of pregnant women Educational information for husbands in supporting pregnancy
Interactive digital roadmap design preferences	Opportunities for the benefits of interactive digital roadmaps Visual design (engaging, contrasting, interactive) Types and variations of media Accessibility and ease of use

Theme 1: The urgency of health literacy for pregnant women

This theme discusses the importance of health literacy for pregnant women. This theme is supported by five subthemes, as follows:

Literacy to increase knowledge and understanding

This subtheme highlights the importance of pregnant women's health literacy in increasing knowledge and understanding. Participants emphasized that health literacy helps pregnant women learn the schedule for pregnancy checkups, recognize danger signs, and understand the actions that need to be taken.

One participant stated that health literacy is very important because it provides knowledge about the examination schedule according to the trimester and helps pregnant women recognize potential dangers during pregnancy:

"I think it is very important because we can know, for example, how many times the first trimester must be

checked, how many times the second trimester must be checked, how many times to check the third trimester and also know the dangers of pregnancy". - K1

Additionally, the perspectives of family members, especially the husband, also highlight the important role of health literacy:

"I think it's important, because how about hehehe..... Yes, sometimes if there are complaints... sometimes join in searching". - S4

"... We as husbands have an obligation to maintain the stability of his thinking the mother... I have a lot to know as a husband..." - Q5

Furthermore, one pregnant woman participant emphasized that, even though she has had previous pregnancies, health literacy is still essential because not all mothers have an adequate understanding of pregnancy conditions.

"It's very important, because sometimes pregnant women don't know... even though it's already a second pregnancy." - H5

This statement is further supported by other pregnant women, who stated that some mothers lack understanding and therefore need adequate health literacy.

"I think it's very important because there are some pregnant women who don't understand..." - H1

"... I really need some health knowledge... it is helpful if there is health literacy..." - H4

Literacy as a basis for decision-making

This subtheme describes the benefits of health literacy as the foundation for making informed decisions. Literacy enables pregnant women to consider available options, leading to more rational decisions that align with their health conditions. One midwife stated that education can make a significant difference in pregnant women's decision-making:

"Because that's what determines her later in decision-making until later, when the delivery process when the mother is educated, of course, her decision-making will be much different from that of the less educated, so it is important, especially since every



pregnant woman is different for decision-making, it must also be different." - B3

This is reinforced by other midwives who affirm that literacy helps pregnant women find the right answers:

"With this health literacy, he automatically finally has an answer... So I think literacy is very important." - B1

Literacy as a provision for the physical and psychological adaptation of pregnancy

This subtheme emphasizes that health literacy is essential for pregnant women to adapt to the physical and psychological changes that occur. Without adequate knowledge, pregnant women may become more prone to anxiety or misunderstand their condition. One student explained that the changes during pregnancy require women to adapt, and literacy plays an important role in this process:

"... Because pregnant women have changes, adaptations as well. So those changes are if they don't know..." - M2

This statement was supported by another student, who explained that literacy helps pregnant women distinguish between normal and abnormal changes, enabling them to remain calmer while managing their pregnancy:

"For the importance of health literacy during pregnancy, especially for the benefits themselves for pregnant women, as pregnancy involves psychological and physical changes that change from the beginning. So pregnant women must indeed know what changes there are, whether this is normal or abnormal. So that knowledge is the basis of the pregnant woman herself to know that, oh yes, this is normal. That means the development is normal." - M4

Literacy to achieve long-term goals

This subtheme demonstrates that health literacy not only impacts current conditions but also influences long-term goals, such as maintaining maternal and fetal health, minimizing trauma, and preparing for safe childbirth. A student emphasized the importance of literacy in

maintaining maternal health and supporting the process of delivery:

"I think it's very important, because to maintain her health condition, the condition of her mother, for the birth of the fetus later, and for the duration of her pregnancy so that there is minimal trauma as well, and also in my opinion, so that a normal birth is possible, mother? Because most of them are the expectations of their parents or the expectations of mothers who want to have a normal birth, yes, the hope is that it is". - M6

The same sentiment was also expressed by other students, who emphasized that literacy helps prepare pregnant women not only for pregnancy but also for childbirth and the postpartum period:

"In my opinion, mother, the importance of reading literacy during pregnancy may have an impact in the future. So, when we in pregnancy have read, have looked for information, already know what education about the future for the pregnancy period will be like, then what delivery will be like, then after delivery it is also important, mother. ... So, it can be prepared in advance." - M3

Literacy to prevent misinformation and myths

This subtheme describes the role of health literacy in filtering out accurate information and preventing pregnant women from falling prey to myths or misinformation. A midwife emphasized that misinformation can negatively impact pregnant women, so health workers need to provide reliable and valid information:

"It's very important, because pregnant women sometimes if they're pregnant, sometimes they seem to want to know this, want to know this, want to know more. And actually, sometimes there is a lot of information. But sometimes they're right, isn't this ma'am, like this? They asked like that. Isn't that right, ma'am, he said this is like this? So we as health workers must provide the correct information. Because if you provide wrong information, it will also have an impact on those who use information, especially for pregnant women". - B5

This is supported by students who highlight the prevalence of information from social media, which, if not filtered, can lead to misperceptions:

"Sometimes we don't know if the information is true or not. If he just looks at TikTok, he can be misperceived." - M5

Other midwives also added that untrue myths are often still believed to be true, so literacy plays a role in straightening them out:

"Finally, the myths that are actually not true are still believed to be true."
- B1

Theme 2: The Need for Educational Information During Pregnancy

This theme discusses what educational information is needed during pregnancy. This theme is supported by three subthemes, as follows:

Educational information about fetal health

The participants emphasized that one of the main needs of pregnant women is to receive clear information about the development of the fetus from week to week (B1, M4, H4, S2). This knowledge is considered important so that the mother feels calmer and is able to monitor the growth and development of her fetus effectively. Additionally, education about ultrasound examinations (ultrasound) is regarded as very necessary, not only to ensure that the fetal condition is normal but also for early detection of possible abnormalities, such as Down syndrome (B1, B2, B3, H4, K1). Some midwives also mentioned that information about various delivery options—whether normal, cesarean section, or natural induction—as well as different labor positions, should be provided from the beginning so that the mother can better prepare (B1, B2, B3, K1).

Educational information about the physical and psychological health of pregnant women

The most important educational information about the physical and psychological health of pregnant women pertains to nutrition. Participants highlighted the importance of understanding the components of a healthy diet, appropriate portion sizes based on

individual needs and nutritional status, the necessity of supplements such as iron (Fe) and multiple micronutrient supplements (MMS), as well as prevention and management of chronic energy deficiency (CED). Information about foods and beverages that are safe to consume is also frequently asked about by pregnant women (B1, B2, B5, H1-H6, M3). Additionally, concerns about activities potentially harmful to pregnancy—such as smoking, long-distance travel, exposure to chemicals, and the use of certain cosmetics—are common (B4, B5, B6, H4, H2).

Other essential educational topics include understanding the physiological changes during pregnancy, how to manage common pregnancy complaints, recognizing danger signs, and strategies for pain and anxiety relief before childbirth. Support for mental health is also a frequently expressed need (B2, B3, B6, M1, M6, M2, M3, H2, H3). Some participants emphasized that alternative approaches, such as complementary therapies and hypnobirthing, can help mothers feel more relaxed and comfortable during pregnancy (M4, B2). Issues related to myths and facts about pregnancy, herbal medicine use, and breastfeeding often arise in everyday conversations, highlighting the need for evidence-based and reliable information (B4, B5, B3, M1, M2, M3, K1, H2, H4).

Educational information for husbands in supporting pregnancy

Both health worker and husband participants emphasized the importance of involving husbands in pregnancy. Midwives highlight the active role of husbands in supporting the mother's psychological well-being, including through participation in family education classes (B2 and B6). A student participant also added that education about preparing to become parents is necessary so that husbands are ready to take on their roles from pregnancy through postpartum. Interviews with husband participants revealed a need for information about fetal development stages, pregnancy conditions, and common complaints experienced by pregnant women. This indicates that not only health workers recognize the importance of husband support, but the husbands themselves also express a desire to learn and support their partners more actively.

Theme 3: Interactive digital roadmap preferences

This theme discusses pregnant women's preferences for interactive digital roadmaps to improve health literacy. It is supported by four subthemes, as follows:

Opportunities for the benefits of interactive digital roadmaps

The findings indicate that interactive digital roadmaps present a significant opportunity to serve as an innovative educational medium that is comprehensive, accessible, and engaging for pregnant women. Participants assessed that this educational tool could address the limitations of KIA books and conventional educational media, which are rarely utilized by pregnant women. Midwives emphasized the importance of an interactive digital roadmap, as it can make the educational process more targeted, facilitate evaluation, and be aligned with current technological trends.

"It is very important that the education we provide is structured. Later, with structured education, the pregnant woman will also understand. I can learn again at home. When we meet, we can evaluate. My imagination is already so wow." - B1

"For the patient... Facilitate. Surely now it's all too... Digital. All patients also hold cellphones. Right. They're happier..." - B3

Midwifery student participants also stated that interactive digital roadmaps are a practical solution to attract the interest of pregnant women who do not enjoy reading.

"It's very helpful, ma'am, it's very helpful, especially if women who are pregnant women who don't like to read books. A book that has never been read... So if they are given a digital roadmap, they are interested in that." - M3

"This can be very helpful, in my opinion. Because if the video is like before, it can be repeated again, and the visualization will be more interesting." - M6

A pregnant woman considers an interactive digital roadmap important, especially for those with little experience and who need comprehensive information.

"I think it's something that can really make people want to do that, ma'am. The problem is that now we also need information, and we don't all know either, ma'am. Sometimes it feels like I don't have experience, and many people don't know, so if there is a complete media, then it's good, ma'am." - H5

Visual design of interactive digital roadmaps

Participants emphasized that the visual design of the digital roadmap should be attractive, bright, and use contrasting colors to make the information easier to understand (B1-6, M1, M4, M5, H6, S3, K2). The color pink is considered appropriate because it is associated with pregnant women (H1, H4, H5, M1, M3, M5), while red is seen as effective for highlighting important points (B2). The roadmap should not be monotonous but interactive (M3, M4, S5). Additionally, some participants stated that it is better to incorporate local symbols or ornaments that reflect cultural identity, such as Banyuwangi's typical elephant Oling Batik (B2, B5, H2, H3, H6, M3, M1, K1).

Types and variations of media

Most participants believed that the digital roadmap should not only consist of text but also incorporate various other media, such as images, infographics, short videos, or animated videos (B1-6, M2-6, H1-6, S2-5). Videos that include sound or narration are considered more engaging because they stimulate curiosity and are easier to follow (M2, B1). Interactive infographics and visual illustrations are also important to prevent boredom and enhance understanding (S5, M2). Furthermore, participants emphasized that the sources of information presented must be clear and credible, considering that much information on social media is often unreliable (B5, B1).

Accessibility and ease of use

Ease of access was a recurring theme among participants. The digital roadmap is expected to be an interactive PDF that is simple to use, clickable without the need for additional applications, and does not consume much smartphone memory (B1, B3, S5, H1, M1-4). This is considered crucial to ensure that the roadmap can be utilized by various groups, including

pregnant women and their families who may face technological limitations.

The findings align with previous research indicating that digital education is a primary information source for pregnant women. Reliable digital platforms provided by health workers offer valuable educational opportunities covering topics such as physical and mental health, lifestyle, pregnancy care, breastfeeding, neonatal care, and fetal development (Gourounti *et al.*, 2022). Additionally, (Fitzpatrick, 2023) state that digital educational media assist health workers in providing patient education, enhancing self-care skills, and empowering pregnant women and their families. The use of technology also improves clinical decision-making, health literacy, and the quality of healthcare services.

Further studies support the importance of digital educational innovations, such as web-based medication courses, mobile prenatal education apps, and e-health interventions for early detection of pregnancy emergencies. These tools have positively impacted literacy, decision-making efficacy, and pregnancy outcomes (Li *et al.*, 2025). Another study found that pregnant women who completed mobile-based education courses experienced lower risks of complications such as gestational diabetes, postpartum infections, fetal distress, and neonatal malformations (Hao *et al.*, 2023). These findings reinforce the subtheme that literacy serves as a foundation for decision-making and achieving long-term health goals. Improving literacy enables pregnant women to make rational decisions, such as choosing the appropriate delivery method or understanding the necessity of certain medical interventions.

Limitations

This study has several limitations. First, as with many qualitative studies, social desirability bias may have influenced participants' responses. Participants might have provided answers they perceived as socially acceptable or aligned with the researchers' expectations. Second, participants likely had varying levels of digital literacy, which could have affected their ability to use digital technology, meaning their perspectives on the digital roadmap may not represent all pregnant women. Third, the study was

conducted in Banyuwangi, East Java, a region with distinct cultural and social characteristics. Consequently, the visual preferences, cultural symbols, and information needs identified may not fully reflect those of pregnant women from other regions or cultural backgrounds. Therefore, caution should be exercised when generalizing these findings beyond this specific context.

CONCLUSION

The study underscores the urgent need to enhance pregnancy health literacy through innovative educational tools. Guided by the Health Literacy Instructional Model—which emphasizes the development of knowledge, numeracy, navigation, communication, and decision-making skills—the findings indicate that the interactive digital roadmap effectively supports these competencies. Pregnant women, families, and health workers agree that interactive digital roadmaps can serve as comprehensive, accessible, and culturally sensitive mediums that facilitate decision-making, adaptation, and the prevention of misinformation. This roadmap is envisioned as a practical solution to improve maternal knowledge and skills, reduce risks, and empower pregnant women and their families to achieve better maternal and newborn health outcomes. Therefore, it is recommended that the development of this digital roadmap be integrated into maternal health education programs, with ongoing evaluation and active user involvement.

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