

Original Research

Knowledge and Attitudes of Pregnant Women towards Bankjo Lamp Technology: Case Study of Choosing a Birth Place

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ABSTRACT

Background: A high-risk pregnancy jeopardizes both maternal and fetal lives. Despite recommendations for hospital births, six out of ten high-risk expectant mothers in Kawedanan opt for PMB or Community Health Center Maternity. To identify high-risk pregnancies, Kawedanan Community Health Center employs the innovative Bankjo lamp. This study investigates how pregnant women's attitudes and knowledge about Bankjo lamps influence their maternity location choice. **Methods:** This type of research uses quantitative descriptive research. This observational analytical research involved 57 expectant mothers due to maternity in January, February, or March. Using a cross-sectional design, the study treated knowledge and attitudes about Bankjo lamps as independent variables, with maternity location preference as the dependent variable. Data collection methods included knowledge and attitude questionnaires and monthly midwife reports. The data was analyzed using the Chi-Square test and descriptive statistics in the form of frequency distribution with presentation. **Results:** Findings indicate that pregnant women generally possess adequate knowledge about suitable maternity locations, with some showing insufficient understanding. A significant correlation ($p = 0.013$) exists between knowledge levels and preferred birthplace. Despite the preference for hospital births among nearly all expectant mothers, a majority hold negative attitudes, strongly correlated ($p = 0.000$) with their birthplace choices. Interestingly, while most pregnant women understand the Bankjo lamp innovation well, they harbor negative attitudes toward it. Nevertheless, almost all opt for hospital births, prioritizing medical safety despite reservations about new technologies. **Conclusions:** The study underscores the need for government support in advancing maternal health initiatives, including innovative technologies like Bankjo lamps. Enhancing awareness and promoting positive attitudes among expectant mothers can foster safer childbirth practices. By disseminating knowledge and addressing misconceptions, healthcare providers can better support high-risk pregnancies, ensuring better outcomes for both mothers and babies.

Keywords: Knowledge; attitudes; Bankjo light; decisions; birth place

1. INTRODUCTION

Innovations in health technology, especially for the early detection of high-risk pregnant women, are increasingly becoming an important concern in efforts to improve maternal and child health. One recent innovation that offers

significant benefits is Bankjo Lamp technology, which is designed to detect potential complications during pregnancy. The use of this technology plays an important role in helping health workers and pregnant women to intervene early, thereby minimizing the risk of serious complications such as preeclampsia, gestational diabetes, and antepartum bleeding.⁽¹⁾ In the context of maternal and child health services, the use of Bankjo lamps can be an effective tool to improve the safety of mothers and babies, while supporting the achievement of national health development targets.⁽²⁾

However, although the benefits of Bankjo Lamp technology have been scientifically proven, adopting this innovation in the healthcare system still overcomes various challenges. One of the main challenges is the level of knowledge and attitudes of pregnant women towards this new technology, which greatly influences their decision in choosing a health facility for delivery.⁽³⁾ Thus, understanding the correlation between knowledge and attitudes of pregnant women towards Bankjo Lamps is very important in designing effective education and outreach strategies, so that this innovation can be integrated optimally in efforts to detect high risks during pregnancy.⁽⁴⁾

Pregnant women's indifference to the Bankjo Lamp innovation can have a serious impact on their health and that of their unborn babies. Without the use of this technology, the risk of complications that can be identified early, such as preeclampsia, hypertension, or other disorders, may not be detected until it is too late.⁽⁵⁾ This can result in less timely medical treatment, increasing the possibility of serious complications, even death of the mother and baby. In addition, indifference to this kind of innovation also reflects low levels of awareness and education about the importance of proper health checks during pregnancy, which can ultimately affect the quality of health services received by pregnant women.⁽⁶⁾

Based on data from the Ministry of Health, maternal deaths increased to 4,627 cases in 2020, primarily due to hemorrhage. Overall, there was a decrease in maternal mortality to 173.53 per 100,000 live births in 2020. Direct causes of maternal death include hypertensive disorders in pregnancy (33.1%), obstetric hemorrhage (27.03%), non-obstetric complications (15.7%), other obstetric complications (12.04%), pregnancy-related infections (6.06%), and other causes (4.81%). Preliminary study results indicate that six out of ten pregnant women (60%) still visit Community

Health Centers (Puskesmas) or PMBs for delivery, although hospitals are recommended due to their ability to handle all delivery risks.^(7,8)

In Magetan District, the maternal mortality rate was reported as 112.7 per 100,000 live births in 2022, marking a 53% decrease from 2021, with a total of eight maternal deaths, including two during pregnancy and six in the postpartum period. Neonatal deaths predominantly occur within the first 28 days, with intrapartum complications (28.3%), respiratory and cardiovascular disorders (21.3%), and low birth weight/prematurity (19%) identified as primary causes according to the Sample Registration System (SRS) of Litbangkes in 2016.

High-risk pregnancy poses significant threats to the health of both mother and baby, often leading to morbidity and mortality. The implementation of innovative approaches like the Bankjo Lamp at Kawedanan Community Health Center aims to improve the detection of pregnancy risks. This innovation uses color-coded stickers in Maternal and Child Health (MCH) books to indicate pregnancy risk levels, facilitating better management and intervention.⁽⁹⁾

The application of the Bankjo Lamp has positively impacted maternal understanding of pregnancy risks at Kawedanan Community Health Center. Efforts involving family and village government engagement to utilize village ambulances have supported high-risk pregnant women in accessing hospitals directly, bypassing initial visits to health centers.⁽¹⁰⁾ To increase pregnant women's awareness of the Bankjo Lamp innovation, an integrated approach is needed that includes education, technology, and policy.⁽¹¹⁾ Targeted education through antenatal care (ANC) services can increase pregnant women's understanding of the importance of early detection of pregnancy risks. Well-trained health workers can act as agents of change, explaining the benefits of Bankjo Lamps effectively. Additionally, technology integration through easily accessible health apps can facilitate the widespread use of these innovations.⁽¹²⁾ Supportive government policies and incentives for pregnant women who use Bankjo lamps will also encourage wider adoption so that this innovation can play a maximum role in improving the safety of mothers and babies.

2. METHODS

2.1 Study Design and Setting

The type of research that has been carried out is observational analytics with a cross-sectional design. The population is pregnant women whose expected birth date is from January to March 2024, a total of 57 pregnant women. All affordable populations are used as research samples so that the sample size is the same as the affordable population. The independent variables are knowledge and attitudes about Bankjo lights. The dependent variable is the decision to choose a place of delivery. The research location is in the working area of the Kawedanan Community Health Center, Magetan district, East Java, Indonesia.

2.2 Instrument

The research instrument was a questionnaire and monthly MCH (Mother and Child Health) report at the Kawedanan Community Health Center, Magetan Regency. The questionnaire to determine mothers' knowledge about Bankjo lamp innovation consists of 15 questions with right and wrong answers (Dichotomy), the questionnaire to assess pregnant women's attitudes about Bankjo lamps consists of 15 statements whose answers are 1. Strongly disagree, 2. Disagree, 3. Disagree, and 4. Agree, and 5. Strongly Agree (Semantic Differential Scale). Data was obtained from filling out questionnaires and observing the contents of monthly KIA reports. The knowledge questionnaire grid consists of the respondent's identity (Age, Domicile, Occupation, Latest Education, Income per month, and Pregnancy), the purpose of innovation, benefits of innovation, monitoring Bankjo stickers, and the meaning of Bankjo striker colors. Meanwhile, the attitude grid consists of attitudes towards innovation, the goals, and benefits of innovation, the innovation of Bankjo light stickers, the benefits of stickers on high risk of pregnancy, the decision to choose a place of birth, and the meaning of Bankjo stickers with concern to the decision to choose a place of birth.

2.3 Data Collection and Resources

The researcher distributed the questionnaire sheets to be filled out and for the respondents to answer the questions and statements in the questionnaire by ticking (√) or crossing (X). Univariate analysis described the results of frequency distribution using tables in percentage form with interpretation: 0%: None of the

respondents, 1-25%: A small portion of the respondents, 26-49%: Nearly half of the respondents, 50%: Half of the respondents, 51-75%: The majority of the respondents, and 76-99%: Almost all of the respondents [13]. Data collection was conducted at the Kawedanan Health Center using instruments such as questionnaires and monthly KIA (Maternal and Child Health) reports. The questionnaire consisted of 15 questions on knowledge with possible answers: 1. True, 2. False. The attitude statements were assessed using an attitude questionnaire consisting of 15 statements with possible answers: 1. Strongly disagree, 2. Disagree, 3. Agree, 4. Strongly agree. Secondary data in this study were obtained by the researcher from the existing data in the monthly KIA reports from the village midwives in charge.

2.4 Data Analysis and Ethics

Technical data analysis to determine the proportion of knowledge and attitudes of pregnant women towards Bankjo lamp innovation and the decision to choose a place of delivery using the prevalence ratio [14]. Respondent characteristics were analyzed descriptively. Proving the hypothesis of the relationship between knowledge and attitudes towards choosing a place of birth using the Chi-Square statistical test, with an error rate ($\alpha < 0.05$) [15]. This research has received ethical approval from the health research ethics commission of the Health Polytechnic of the Ministry of Health, Surabaya Number: EA/2436/KEPK-Poltekkes-Sby/V/2024.

3. RESULTS

3.1 Description of Respondent Characteristics

Table 1. The following presents an overview of the characteristics of the respondents, of the 57 pregnant women who were research subjects, the dominant education level was middle to lower, 86%, worked as housewives 75.4%, chose the hospital as a place of delivery 71.9%, their pregnancy was categorized as risky. low risk 52.6%, and high risk 47.4%, having had more than one pregnancy 59.6%, knowledge about Bankjo lamp innovation categorized as good 50.9%, but attitudes tend to be negative 59.6%.

Table 1. Description of respondents' characteristics

Respondent characteristics	Frequency	Percentage
1. Education		
Lower middle	49	86.0
Middle to upper	8	14.0
2. Work		
IRT	43	75.4
Private	7	12.3
Civil servants	2	3.5
Private employees	5	8.8
3. Maternity place		
Hospital	41	71.9
Not at hospital	16	28.1
4. Pregnancy risk		
Low	30	52.6
High	27	47.4
5. Gravida		
1	23	40.4
>1	34	59.6
6. Bankjo lamp innovation knowledge		
Not enough	16	28.1
Enough	12	21.1
Good	29	50.9
7. Attitudes about Bankjo lamp innovation		
Negative	34	59.6
Positive	23	40.4

3.2 Cross-Tabulation of Knowledge About the Bankjo Lamp Innovation on the Decision to Choose a Birth Place

Based on Table 2, of the 16 pregnant women who had less knowledge about the Bankjo lamp innovation, 56.2% chose to give birth in a place other than a hospital. 24.4% of mothers with sufficient knowledge about the Bankjo lamp innovation chose the hospital as a place to give birth. On the other hand, 29 pregnant women who had good knowledge about Bankjo lamps chose the hospital as a place to give birth. Based on the Chi-Square statistical test, it can be proven that there is a relationship between the level of knowledge and the decision to choose a place to give birth, with a p-value of 0.013.

3.3 Cross-Tabulation of Bankjo Lamp Innovation Attitudes Towards the Decision to Choose a Birthplace

Based on Table 3, of the 35 pregnant women whose attitudes about the Bankjo lamp innovation were negative, the majority gave birth in hospitals (94.10%), whereas the 23 pregnant women whose attitudes about the Bankjo lamp innovation were positive gave birth more often than not in hospitals (60, 9%). Based on the Chi-Square statistical test, it can be proven that there is a relationship between attitude and the decision to choose a place to give birth, with a p-value of 0.013.

Table 2. Cross-tabulation of knowledge about the Bankjo lamp innovation on the decision to choose a birthplace

Knowledge about Bankjo lamp innovation	Birthplace				Total		Chi-square test
	Hospital		Not at hospital		N	%	
	N	%	N	%			
Lacking	7	17.1	9	56.2	16	100	$p=0.013$
Enough	10	24.4	2	16.7	12	100	
Good	24	58.4	5	17.2	29	100	
Total	41	71.9	16	28.1	57	100	

Source: Analysis data

Table 3. Cross-tabulation of Bankjo lamp innovation attitudes towards the decision to choose a birthplace

Attitude about Bankjo lamp innovation	Birthplace				Total		Chi-square test
	Hospital		Not at hospital		N	%	
	N	%	N	%			
Negative	32	94.1	2	5.9	34	100	$p=0.000$
Positive	9	39.1	14	60.9	23	100	
Total	41	71.9	2	28.1	43	100	

Source: Analysis data

4. DISCUSSION

Acceptance of the Bankjo Lamp innovation by pregnant women has significant benefits, especially in the context of early detection of the risk of pregnancy complications [16]. Based on the theory of acceptance of technological innovation (Technology Acceptance Model or TAM), the two main factors that influence technology acceptance are perceived ease of use and perceived usefulness.^(17,18) The Bankjo lamp, as an innovative tool, is designed to make it easier for health workers and pregnant women to detect potential risks. With a user-friendly interface and simple usage procedures, this technology can be quickly integrated into pregnancy check-up routines. Positive perceptions of this convenience will encourage pregnant women to better accept and utilize Bankjo Lamps as part of their care.⁽¹⁹⁾

Additionally, the perceived usefulness of Bankjo Lamps also plays a key role in the acceptance of this technology. According to TAM, if pregnant women understand the immediate benefits of using the Bankjo Lamp such as increased safety and reduced risk of serious complications during pregnancy they will be more inclined to accept and adopt this technology.⁽²⁰⁾ For example, the Bankjo Lamp's ability to detect early signs of preeclampsia or other abnormalities provides significant added value for the health of mothers and babies. This high perceived usefulness not only increases technology adoption but can also build pregnant women's trust and confidence in the health facilities that provide this innovation.

Furthermore, acceptance of this innovation can strengthen the entire maternal and child health service ecosystem.⁽²¹⁾ When pregnant women are more open to technology like the Bankjo Lamp, this creates a positive cycle where more accurate health information and more timely interventions become the standard in pregnancy care. In the long term, this will not only increase the level of safe childbirth but also support the government's efforts to achieve better maternal health targets. Thus, acceptance of the Bankjo Lamp innovation is in accordance with technology acceptance theory, which emphasizes the importance of perceived ease of use and usefulness in encouraging the adoption of new technology among users.

Based on the research findings and discussion of the research analysis, the conclusions drawn are as

follows: Firstly, the knowledge level among pregnant women regarding the Bankjo lamp innovation is found to be very good.⁽²²⁾ The researcher's opinion that the Bankjo lamp innovation has proven effective in enhancing the quality of life for pregnant women is supported by evidence from several villages within the Kawedanan Health Center area, where the innovation has successfully reduced high-risk deliveries at health centers or maternity homes. The Bankjo lamp innovation offers a practical and sustainable solution to address high-risk pregnancies, directly impacting the well-being of pregnant women positively. Adequate knowledge about this innovation is crucial to ensure its optimal adoption and use. Therefore, enhancing awareness and education about the Bankjo lamp innovation should be a priority in maternal and child health programs in the villages under the jurisdiction of Kawedanan Health Center.

This research is in line with Chang, et al who found that the majority of pregnant women had good knowledge about preeclampsia.⁽²³⁾ On the other hand, there are also research reports which state that many pregnant women lack knowledge in recognizing the danger signs of pregnancy.⁽²⁴⁾ Other research states that the majority of primigravida pregnant women have a high risk of pregnancy because they have very little knowledge about preparing for childbirth, this shows something that is inversely proportional to the results of research on knowledge of Bankjo lamp innovation.⁽²⁵⁾ Pregnant women who have good knowledge should have a positive attitude towards high-risk pregnancies. Meanwhile, positive attitudes about high-risk pregnancies are not linear in choosing a place to give birth in a hospital. A positive attitude is not necessarily linear with the decision to choose a place to give birth. A person's behavior that is rooted in knowledge, education, awareness, and family support will have a positive attitude that tends to last longer. The attitude of pregnant women plays an important role in making decisions about choosing a place to give birth.⁽²⁶⁾

Choosing the place of delivery is a significant decision influenced by various factors including knowledge and attitude.⁽²⁷⁾ The majority of pregnant women in this study opted for hospital deliveries. According to Heider's Attribution Theory, individuals attribute their behaviors to internal or external factors. Pregnant women attributing their decision to deliver in hospitals to external factors like family support or healthcare provider recommendations tend to be more

confident in their choice.⁽²⁸⁾ Factors influencing the choice of delivery location include knowledge, attitude, social support, accessibility, availability, social norms, and culture. Gesese et al. Found that most pregnant women have good knowledge of danger signs in childbirth, which aligns with the findings here.⁽²⁹⁾ Knowledge and family support play crucial roles in selecting childbirth attendants, although there is still a tendency to use non-healthcare providers like traditional birth attendants. Decision-making processes for women when choosing delivery facilities involve identifying important attributes they value and how perceptions of quality influence their choices.

Comprehensive knowledge covering various important aspects of pregnancy, such as self-care, fetal care, and early detection of danger signs, is crucial to ensuring the safety and health of both mother and baby. Attitude refers to the consistency in an individual's feelings, thoughts, and actions towards an aspect of their environment, categorized into favorable (positive, good) or unfavorable (negative, bad).⁽³⁰⁾ Ajzen's Theory of Planned Behavior states that behavioral intentions (in this case, choosing a delivery location) are influenced by attitudes toward the behavior, subjective norms, and perceived behavioral control.⁽³¹⁾ Pregnant women's attitudes toward the delivery location, social support, and beliefs about their ability to deliver at that location significantly influence this decision. Despite pregnant women having good knowledge about the Bankjo lamp innovation, their attitudes towards its use in choosing a delivery location remain negative. This indicates that existing information may not sufficiently convince them about the benefits and safety of the technology. A more comprehensive and empathetic educational approach is needed to change negative perceptions and increase pregnant women's confidence in the Bankjo lamp innovation.

Research limitations regarding the acceptance of the Bankjo Lamp innovation by pregnant women may include several aspects, such as variability in the level of knowledge and access to technology in various regions.⁽³²⁾ In rural or remote areas, pregnant women may have limited access to information and health facilities that provide this technology, thereby reducing the representativeness of research results. In addition, cultural and social factors may also influence pregnant women's perceptions and attitudes toward innovation, which may not be fully measured in this study. Research may also be limited in its period time of

observation, capturing only a short period of technology acceptance, without taking into account long-term attitude changes that may occur after longer exposure to the technology.

To minimize limitations in future research, it is recommended that studies be conducted involving broader and more diverse samples, including pregnant women from various geographic, social, and cultural backgrounds.⁽³³⁾ Longitudinal research should also be considered to observe changes in perceptions and attitudes towards Bankjo Lamps over a longer period of time, to capture the dynamics of technology acceptance more comprehensively. In addition, the use of mixed methods that combine quantitative and qualitative approaches can provide a deeper understanding of the factors that influence the acceptance of innovation, as well as identify barriers that are specific to certain contexts.

5. CONCLUSION

The conclusion of this research shows that the level of knowledge of pregnant women about the Bankjo Lamp innovation is in a good category. However, pregnant women's attitudes towards these innovations tend to be negative. Most pregnant women prefer to give birth in the hospital. In addition, this research found a significant relationship between the level of knowledge and attitudes of pregnant women regarding the Bankjo Lamp innovation and their decisions in choosing a place to give birth. These findings indicate that even though knowledge is high, negative attitudes can influence pregnant women's decisions in choosing health facilities for delivery.

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Conflict of Interest

The authors declare no conflict of interest.

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