

Article

Knowledge and Attitudes of Pregnant Women Regarding Triple Elimination Screening in Buleleng Regency, Bali, Indonesia

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ABSTRACT

Background: Triple elimination screening (for HIV, syphilis, and hepatitis) is a routine part of antenatal care, aimed at preventing transmission from mother to child.

Objectives: This study investigated the relationship between pregnant women's knowledge and attitudes and their participation in triple elimination screening in Buleleng Regency, Bali.

Methods: A cross-sectional, quantitative study was conducted with 371 pregnant women recruited from 36 midwife practices using cluster random sampling. Data on knowledge, attitudes, and screening participation were collected using a questionnaire. Chi-square tests were used to analyze the data.

Results: Most participants were between 20 and 35 years old (84.6%), had a secondary education (60.1%), were multigravida (73.9%), and were in their third trimester (46.4%). Chi-square tests showed no significant relationship between knowledge and participation in screening for HIV ($p = 0.25$), syphilis ($p = 0.10$), or hepatitis ($p = 0.06$). However, a significant association was found between positive attitudes and screening participation for HIV ($p = 0.04$), syphilis ($p = 0.05$), and hepatitis ($p = 0.04$). Specifically, over 97% of women with positive attitudes underwent screening for HIV, syphilis, and hepatitis.

Conclusion: Positive attitudes are significantly associated with increased participation in triple elimination screening among pregnant women. Continued education from healthcare providers is important to improve screening rates.

Keywords: Pregnancy, Knowledge, Attitude, Triple Elimination, HIV, Syphilis, Hepatitis

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INTRODUCTION

According to the latest WHO policy document, the triple elimination framework for eliminating mother-to-child transmission of HIV, syphilis, and hepatitis B emphasizes an integrated, people-centered approach, with four main pillars covering primary prevention, integration of sexual and reproductive health services, essential maternal services, and services for infants, children, and couples (WHO, 2023). During pregnancy, examinations and care, commonly known as antenatal care (ANC), are required. ANC visits are performed at least six times during pregnancy: once in the first trimester (0–12 weeks), twice in the second trimester (13–28 weeks), and three times in the third trimester (28–42 weeks). During ANC, 10 service standards, known as '10T,' are implemented, one of which is conducting a triple elimination laboratory test for HIV, syphilis, and hepatitis B (Kemenkes RI, 2021).

More than 90% of children with HIV, syphilis, and hepatitis B are infected by their mothers. The prevalence of HIV, syphilis, and hepatitis B infections in pregnant

women is 0.3%, 1.7%, and 2.5%, respectively. The risk of mother-to-child transmission for HIV is 20–45%, for syphilis it is 69–80%, and for hepatitis B it is over 90%. Efforts to eliminate the transmission of HIV, syphilis, and hepatitis B are carried out simultaneously because the transmission patterns of these three diseases are relatively similar: through sexual intercourse, contaminated fluids/blood, and transmission from mother to child (Kemenkes RI, 2021). Triple elimination screening is carried out during the first antenatal care visit, ideally before 20 weeks of pregnancy. The purpose of triple elimination screening is to prevent transmission of HIV, syphilis, and hepatitis B from mother to fetus during pregnancy, childbirth, and breastfeeding (Kemenkes RI, 2019). However, the implementation of this program still faces various challenges, including low coverage of screening and therapy, as reported in a study in Bandung which showed that only 59.5% of HIV-positive pregnant women received antiretroviral therapy in 2020 (Azhali et al., 2023). Data from Buleleng Regency indicates that the target for pregnant women in 2022 was 10,676 people, of whom 10,298 (96.46%) were tested for HIV, 9,425 (88.28%) for syphilis, and 10,676 (95.35%) for hepatitis B. This data indicates that the 100% target has not been achieved. The low coverage of screening and treatment directly contributes to the continued occurrence of mother-to-child transmission, as demonstrated by the continued presence of cases of congenital syphilis and hepatitis B infection in children (Bell et al., 2023).

The level of knowledge and attitudes of pregnant women towards triple elimination examinations are critical factors influencing participation in this program (Bell et al., 2023; WHO, 2018). Krisnawati et al. (2018) reported that pregnant women had insufficient knowledge regarding triple elimination: 86.7% of 90 respondents in the Seririt II Community Health Center work area had insufficient knowledge. A lack of information from midwives, the surrounding environment, or other sources such as social media is one of the factors contributing to the low level of knowledge among pregnant women (Krisnawati et al., 2018). Petralina's study (2020) found that 82% of 40 respondents had a low level of knowledge (Petralina, 2020). Kundaryanti and Suciawati (2022) found that not all pregnant women had undergone triple elimination examinations; 55.7% had not done so. This study also found that some pregnant women had negative attitudes regarding triple elimination examinations — 40.2% of pregnant women reported negative attitudes toward carrying out triple elimination examinations (Kundaryanti & Suciawati, 2022).

The purpose of this study was to analyze the knowledge and attitudes of pregnant women regarding triple elimination screening in Buleleng Regency, Bali. The urgency of this study lies in the persistently high number of pregnant women with HIV, syphilis, and hepatitis B (triple elimination diseases), who can transmit these diseases to their children. Pregnant women are key to achieving the triple elimination screening target, so it is important to understand their knowledge and attitudes, which can influence their behavior regarding triple elimination screening. Pregnant women who have undergone triple elimination screening are aware of their disease status and can therefore take steps to prevent transmission to their unborn children.

METHODS

Research Design and Location

This study used a quantitative cross-sectional design to analyze the relationship between pregnant women's knowledge and attitudes and the implementation of triple elimination screening in Buleleng Regency. The study was conducted at 36 independent midwife practices (PMB) across Buleleng Regency.

Target Population and Eligibility Criteria

The population consisted of all pregnant women undergoing antenatal care (ANC) in Buleleng Regency, Bali, totaling 10,676 pregnant women. Inclusion criteria encompassed pregnant women in their first, second, or third trimester registered in the registration books at the 36 PMBs, who were willing to participate by signing an informed consent form and able to communicate in Indonesian or Balinese. Exclusion criteria included pregnant women previously diagnosed with HIV, syphilis, or hepatitis B, those with a medical condition that prevented them from being interviewed, and those refusing to participate or not signing informed consent.

Sampling Technique and Sample Size

The sampling technique used was probability sampling with a cluster random sampling method. The sample size was calculated using the Lemeshow formula with a 95% confidence level ($\alpha = 0.05$) and 80% power via a web-based calculator (Dean & Sullivan, 2013), yielding a final sample size of 371 respondents.

Data Collection and Research Instruments

The data collected in this study were primary data obtained directly from respondents regarding their knowledge, attitudes, and participation in triple elimination screening, using a validated and reliable questionnaire. The instrument gathered demographic characteristics including age, education level, gravida status, and gestational age. The knowledge questionnaire consisted of 20 multiple-choice items on triple elimination (HIV, syphilis, and hepatitis B), scored 1 for correct answers and 0 for incorrect answers (range 0–20), categorized into good knowledge (11–20; 55–100%) and poor knowledge (0–10; <55%). The attitude questionnaire consisted of 15 items on a Guttman scale (Yes/No), scored 1/0 for positive statements and 0/1 for negative statements (range 0–15), categorized into positive attitudes (8–15; >50%) and negative attitudes (0–7; ≤50%). Participation in triple elimination screening was assessed using a binary Yes/No response structure.

Validity and Reliability Testing

Instrument validity was established through content validity testing and construct validity using the Pearson Product Moment correlation test with an r -table threshold of 0.361. Reliability testing was conducted using Cronbach's Alpha, which demonstrated acceptable internal consistency, with $\alpha = 0.78$ for the knowledge questionnaire and $\alpha = 0.72$ for the attitude questionnaire.

Data Management and Analysis

Data management was conducted using Microsoft Excel 2019, while statistical analyses were performed using SPSS Statistics version 25.0. Data normality was assessed using the Kolmogorov–Smirnov test to verify statistical assumptions. Descriptive univariate analysis was performed to describe respondent characteristics through frequency distributions and percentages. Inferential bivariate analysis was conducted using the chi-square (χ^2) test to evaluate the relationship

between the independent variables (knowledge and attitudes) and the dependent variable (participation in triple elimination screening) at a significance level of $\alpha = 0.05$.

Ethical Considerations

This study received ethical approval from the Health Research Ethics Committee of STIKES Bina Usada Bali (No. 616/EA/KEPK_BUB-2023) prior to data collection. Each respondent received a comprehensive explanation regarding the purpose, benefits, risks, and procedures of the study. Participation was entirely voluntary, with respondents retaining the right to withdraw at any point without penalty, and written informed consent was formally obtained before interviews were conducted.

RESULTS

Demographic Characteristics and Clinical Profile of Respondents

Based on Table 1, the majority of respondents in this study were in the 20–35-year age range (84.6%), representing a healthy reproductive age group with optimal organ function and lower risk for pregnancy complications. Conversely, 8.1% of respondents were under 20 years of age and 7.3% were over 35 years of age, placing them in high-risk categories for adverse outcomes such as preeclampsia, low birth weight, and premature birth. In terms of educational attainment, the majority of pregnant women had completed secondary education (60.1%), followed by primary education (31.8%), a factor that directly impacts their capacity to comprehend prenatal health information and early detection measures. Furthermore, most respondents were multigravida (73.9%), indicating previous pregnancy experience and greater prior exposure to antenatal care routines. Regarding gestational timing, most participants were in their third (46.4%) or second (40.4%) trimester at the time of data collection, suggesting a tendency toward delayed screening despite clinical recommendations emphasizing triple elimination screening before 20 weeks of gestation.

Relationship Between Maternal Knowledge and Triple Elimination Screening

Based on Table 2, high knowledge levels were consistently observed among respondents regardless of screening uptake, but statistical analysis demonstrated no significant association between maternal knowledge and screening completion. Among pregnant women who underwent testing, good knowledge was recorded in 91.2% for HIV, 91.5% for syphilis, and 91.5% for hepatitis. Among those who did not undergo testing, high knowledge rates remained substantial, at 81.1% for HIV, 80.0% for syphilis, and 79.2% for hepatitis. Chi-square analysis yielded non-significant results across all three screening categories: HIV ($p = 0.25$), syphilis ($p = 0.10$), and hepatitis B ($p = 0.06$). Although descriptive trends suggest higher screening rates among knowledgeable mothers, the absence of statistical significance ($p > 0.05$) indicates that knowledge alone is not a primary determinant of triple elimination screening uptake.

Table 1. Socio-demographic characteristics of pregnant women respondents.

Characteristic	Frequency (n = 371)	Percentage (%)
Age		
< 20 years	30	8.1
20–35 years	314	84.6
> 35 years	27	7.3
Education level		
Did not complete elementary school	1	0.3
Primary education	118	31.8
Secondary education	223	60.1
Higher education	29	7.8
Gravida status		
Primigravida	97	26.1
Multigravida	274	73.9
Gestational age		
First trimester	49	13.2
Second trimester	150	40.4
Third trimester	172	46.4

Table 2. Association between knowledge and triple elimination screening among pregnant women respondents.

Screening	Knowledge		Total	p-value
	Poor	Good		
HIV				
Not screened	10 (18.9%)	43 (81.1%)	53 (100%)	0.25
Screened	28 (8.8%)	290 (91.2%)	318 (100%)	
Syphilis				
Not screened	11 (20.0%)	44 (80.0%)	55 (100%)	0.10
Screened	27 (8.5%)	289 (91.5%)	316 (100%)	
Hepatitis				
Not screened	11 (20.8%)	42 (79.2%)	53 (100%)	0.06
Screened	27 (8.5%)	291 (91.5%)	318 (100%)	

Relationship Between Maternal Attitudes and Triple Elimination Screening

Based on Table 3, maternal attitudes exhibited a strong and statistically significant association with the uptake of triple elimination screening across all three conditions. Among respondents who completed screening, positive attitudes were reported by 97.2% for HIV testing, 97.1% for syphilis testing, and 97.2% for hepatitis B testing. In contrast, among non-tested respondents, positive attitudes were lower, at 88.7% for HIV, 89.1% for syphilis, and 88.7% for hepatitis B, with higher rates of negative attitudes recorded in this un-screened group (10.9–11.3%). Chi-square testing confirmed significant associations between positive attitudes and screening participation for HIV ($p = 0.04$), syphilis ($p = 0.05$), and hepatitis B ($p = 0.04$). These findings highlight that favorable maternal attitudes significantly drive compliance with triple elimination screening guidelines.

Table 3. Association between attitudes and triple elimination screening among pregnant women.

Screening	Attitudes		Total	p-value
	Poor	Good		
HIV				
Not screened	6 (11.3%)	47 (88.7%)	53 (100%)	0.04
Screened	9 (2.8%)	309 (97.2%)	318 (100%)	
Syphilis				
Not screened	6 (10.9%)	49 (89.1%)	55 (100%)	0.05
Screened	9 (2.9%)	307 (97.1%)	316 (100%)	
Hepatitis				
Not screened	6 (11.3%)	47 (88.7%)	53 (100%)	0.04
Screened	9 (2.8%)	309 (97.2%)	318 (100%)	

DISCUSSION

Respondent characteristics are factors that can influence the results of a study. Age-based characteristics of respondents are factors that can influence knowledge, attitudes, or triple elimination examinations. Table 1 shows that most respondents are in the 20–35-year age range. This age range is considered a healthy reproductive age because during this period, women's reproductive organs function well and are ready for pregnancy. Pregnant women under 20 and over 35 years of age are at risk of pregnancy complications, which can include low birth weight, hypertension, preeclampsia, and other risks. According to research by Marniarti et al. (2019), several factors contribute to preeclampsia, one of which is age. At age 20, the uterus has not yet reached its normal size, potentially causing problems during pregnancy, such as preeclampsia. At age 35 and over, degenerative cellular processes occur, which can lead to decreased organ function, including in the

peripheral blood vessels. This decreased function causes changes in blood pressure, increasing susceptibility to preeclampsia. Respondent characteristics based on gravida status showed that the majority — 274 (73.9%) respondents — had multigravida status, and most respondents, 172 (46.4%), were in the third trimester, meaning that for most participants this pregnancy was their second or a later pregnancy. Gravida status and current gestational age are also factors that can affect the condition of pregnant women and are among the factors that can cause preeclampsia. Marniarti et al.'s research found that primigravida women have a 5.564 times greater risk of experiencing preeclampsia compared to multigravida women, and that pregnant women in the third trimester have a 4.429 times greater risk of experiencing preeclampsia compared to those in the first or second trimester (Marniarti et al., 2019).

Knowledge is a person's understanding or awareness of facts, concepts, or skills acquired through experience, learning, or study (Sulyastini & Duarsa, 2023). This study found that most pregnant women have good knowledge about triple elimination screening; however, some still have insufficient knowledge. Pregnant women with insufficient knowledge may be less likely to undergo prenatal screening, whereas those with good knowledge are more likely to act on that knowledge by undergoing triple elimination screening.

The analysis of the relationship between knowledge and HIV, syphilis, and hepatitis B screening yielded p-values of 0.25, 0.10, and 0.06, respectively. As these p-values are all greater than 0.05, they indicate no statistically significant relationship between knowledge and HIV, syphilis, or hepatitis B screening in this study. This contrasts with research by Liliana and Sauw (2021), who found a significant relationship between knowledge and pregnant women's behavior regarding iron consumption: pregnant women with good knowledge behaved in accordance with that knowledge (Liliana & Sauw, 2021). Similarly, research by Munna et al. (2020) found a correlation between pregnant women's knowledge and their behavior in utilizing the maternal and child health (KIA) handbook, with more knowledgeable women more engaged with their child's health, growth, and development (Munna et al., 2020). Pregnant women's knowledge about triple elimination screening is influenced by several internal and external factors. Petralina's (2020) research identified age, education, occupation, parity, and information sources as contributing factors, and also found that environmental factors influence the process of knowledge acquisition through reciprocal interactions that individuals then internalize as knowledge (Petralina, 2020). This indicates that although knowledge is an important prerequisite, interventions must go beyond providing information to address the behavioral, social, and systemic barriers that hinder the translation of knowledge into concrete action (Mohammed et al., 2024).

Table 3 shows that the p-values for the relationship between attitudes and HIV, syphilis, and hepatitis testing are 0.04, 0.05, and 0.04, respectively — all ≤ 0.05 , indicating a significant association between pregnant women's attitudes and triple elimination screening. In a study by Sulastrini and Kurniasari (2022), a relationship was found between maternal attitudes and the incidence of low birth weight (LBW), with positive attitudes contributing to positive behavior. This supports a broader relationship between attitudes and the behavior of pregnant women. In a study by

Fauziani et al. (2020), factors influencing pregnant women's participation in triple elimination screening included maternal knowledge, employment status, maternal attitudes, facilities and infrastructure, support from health workers, and husbands' support. The high variation in utilization between regions is due to inequalities in access and implementation of services, which can be influenced by factors such as the availability of HIV commodities, the capacity of health facilities, and the level of community knowledge about HIV/AIDS (Atlaw et al., 2022). Multiple logistic regression testing also yielded a p-value of 0.004 (< 0.05), indicating that these four variables have a significant relationship with the implementation of HIV/AIDS screening in pregnant women. Respondents who were employed were 29 times more likely to receive HIV/AIDS testing; those with good facilities and infrastructure were 27 times more likely; those with husband's support were 13 times more likely; and those with health worker support were 18 times more likely to receive HIV/AIDS testing (Fauziani et al., 2020). Low utilization of antenatal screening for HIV, syphilis, and hepatitis B in Asia is influenced by a complex interaction of factors at the individual, social, and health system levels. Stigma toward people with STIs, especially HIV, is the strongest barrier consistently identified across countries such as Indonesia, Afghanistan, and India (Sabin et al., 2024). Enabling factors such as higher levels of education, better knowledge about HIV and mother-to-child transmission, support from health workers, a strong health system, and external support have been shown to be key drivers of increased utilization of screening services (Alege et al., 2025; Sabin et al., 2024).

Limitations of this study include its cross-sectional design, which cannot determine causal relationships or examine the development of pregnant women's knowledge and attitudes over time. The study focused on knowledge and attitudes but did not investigate other potentially influential barriers and enablers from a health system perspective, such as the availability of test kits, health facility policies, or deeper socioeconomic factors.

CONCLUSION

The results of the analysis showed no significant relationship between the level of knowledge and the implementation of triple elimination examinations, as indicated by a p-value > 0.05 for all types of examinations. However, there was a significant relationship between attitude and triple elimination screening implementation, with a p-value < 0.05 for HIV and hepatitis tests, and a p-value of 0.05 for syphilis. The results of this study indicate that the majority of pregnant women have good knowledge and positive attitudes regarding triple elimination screening; however, some pregnant women still do not undergo this screening. Recommendations are therefore directed at pregnant women, their families, and the community to undergo prenatal checkups before 20 weeks of gestation. Health workers are expected to provide routine and ongoing information regarding triple elimination screening to pregnant women. Practical recommendations include: promotive efforts should focus on fostering positive attitudes through empathetic and persuasive communication, involving husbands and families in the education process, and enhancing the role of midwives as counselors trained to provide information repeatedly and without stigma. It is also important to create a comfortable and

confidential service environment, utilize peer education from pregnant women who have had positive experiences, collaborate with community leaders, and use digital media to reach younger age groups.

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CONFLICT OF INTEREST

The authors declare no conflict of interest.

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