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Research Article

Association Between Maternal Knowledge Regarding Pregnancy Danger Signs and Antenatal Care (ANC) Visit Adherence at Papusungan Primary Health Center

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Abstract. Background : Maternal knowledge regarding pregnancy danger signs is an important determinant of health-seeking behavior during pregnancy. Adequate knowledge enables pregnant women to recognize potential complications early and encourages compliance with recommended antenatal care (ANC) visits, thereby reducing delays in obtaining appropriate medical care. However, adherence to ANC visits remains a challenge in many primary healthcare settings. This study aimed to determine the relationship between maternal knowledge of pregnancy danger signs and compliance with antenatal care visits at Papusungan Primary Health Center. Methods : This quantitative analytic study employed a cross-sectional design. A total of 60 pregnant women were recruited using consecutive sampling based on predefined inclusion criteria. Maternal knowledge was assessed using a structured questionnaire that demonstrated satisfactory validity and reliability, while ANC compliance was determined through maternal health records and the Maternal and Child Health (MCH) Handbook. Data were analyzed using descriptive statistics, Chi-square tests, and binary logistic regression, with statistical significance established at $p < 0.05$. Results : Among the respondents, 46.7% demonstrated good knowledge regarding pregnancy danger signs, while 68.3% were compliant with the recommended ANC schedule. Chi-square analysis revealed a statistically significant association between maternal knowledge and ANC compliance ($p = 0.001$). Binary logistic regression further indicated that women with good knowledge were 5.84 times more likely to comply with ANC visits than those with poor knowledge (OR = 5.84; 95% CI = 1.82–18.71; $p = 0.002$). Conclusion : Maternal knowledge of pregnancy danger signs was significantly associated with compliance with antenatal care visits at Papusungan Primary Health Center. Strengthening health education through antenatal counseling, maternal education classes, and continuous health promotion is recommended to improve maternal awareness and ANC attendance. Future studies involving larger populations, multicenter settings, and longitudinal designs are recommended to provide stronger evidence regarding factors influencing ANC compliance.

Keywords: Antenatal Care; Compliance; Maternal Knowledge; Pregnancy Danger Signs; Pregnant Women.

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1. INTRODUCTION

Pregnancy is a physiological process that requires continuous monitoring to ensure optimal maternal and fetal health. Although most pregnancies progress normally, every pregnant woman remains at risk of developing complications that may occur unexpectedly. Therefore, Antenatal Care (ANC) is recognized as one of the primary strategies for identifying risk factors, preventing pregnancy-related complications, and providing health education that enables pregnant women to recognize danger signs during pregnancy. High-quality ANC services have been demonstrated to contribute to reductions in maternal and neonatal morbidity and mortality through early detection and timely management of pregnancy complications (World Health Organization, 2020; Ministry of Health of the Republic of Indonesia, 2023).

Pregnancy danger signs refer to clinical symptoms or conditions that indicate the potential presence of complications requiring immediate medical attention. These include vaginal bleeding, severe headache, visual disturbances, swelling of the face and hands, decreased fetal movement, high fever, and premature rupture of the membranes. Adequate knowledge of these danger signs enables pregnant women to make prompt decisions to seek

appropriate healthcare, thereby minimizing delays in receiving medical treatment. Conversely, insufficient knowledge may result in delayed recognition of obstetric emergencies, consequently increasing the risk of maternal morbidity and mortality (World Health Organization, 2020; United Nations Children's Fund, 2023).

One of the key indicators of successful maternal healthcare services is adherence to the recommended ANC schedule according to established standards. ANC visits are not only intended to monitor fetal growth and development but also serve as an important platform for providing education on maternal nutrition, birth preparedness, complication prevention, immunization, iron supplementation, and the recognition of pregnancy danger signs. Women who adhere to the recommended ANC schedule have greater opportunities to obtain accurate health information, enabling them to make appropriate decisions when encountering health problems during pregnancy (Ministry of Health of the Republic of Indonesia, 2023).

Previous studies have demonstrated that adherence to ANC visits is influenced by multiple factors, including educational attainment, maternal age, parity, employment status, family support, access to healthcare facilities, socioeconomic conditions, and maternal knowledge regarding pregnancy. Among these determinants, knowledge plays a particularly important role because it serves as the foundation for the development of health-related attitudes and behaviors. Pregnant women who understand the benefits of ANC and are able to recognize pregnancy danger signs are generally more motivated to utilize maternal healthcare services regularly than those with limited knowledge (International Federation of Gynecology and Obstetrics, 2022).

According to the health behavior theory proposed by Lawrence Green, knowledge constitutes a predisposing factor that influences the formation of individual health behaviors. The higher an individual's level of knowledge regarding a health issue, the greater the likelihood of adopting behaviors that promote health. In the context of pregnancy, a comprehensive understanding of pregnancy danger signs is expected to increase maternal awareness of the importance of attending routine antenatal examinations as a preventive measure against pregnancy-related complications. Therefore, improving maternal knowledge through health education represents one of the essential strategies for enhancing adherence to ANC visits (Green & Kreuter, 2005).

Numerous previous studies have reported a positive association between maternal knowledge and adherence to ANC services. Pregnant women with higher levels of knowledge tend to be more consistent in attending scheduled ANC visits, whereas those with limited knowledge are more likely to postpone or fail to complete the recommended number of visits. Nevertheless, several studies have also reported inconsistent findings, suggesting that this relationship may be influenced by cultural factors, family support, geographical conditions, and accessibility to healthcare services. These variations indicate that the association between maternal knowledge and ANC adherence warrants further investigation across different community and regional characteristics (World Health Organization, 2020; United Nations Children's Fund, 2023).

In Indonesia, continuous efforts have been undertaken to improve ANC coverage through the strengthening of primary healthcare services. Despite these initiatives, a considerable proportion of pregnant women still do not attend ANC visits according to national recommendations, particularly in areas with limited access to healthcare services. This situation may delay the early detection of pregnancy complications, thereby increasing the risk of obstetric emergencies. Consequently, identifying the factors influencing adherence to ANC visits is essential for developing more effective maternal health education programs and intervention strategies (Ministry of Health of the Republic of Indonesia, 2023).

Papusungan Primary Health Center, as one of the first-level healthcare facilities, plays a strategic role in delivering antenatal care services. However, preliminary observations and evaluations of the maternal health program indicate considerable variation in pregnant women's adherence to the recommended ANC schedule. Furthermore, pregnant women's ability to recognize pregnancy danger signs is also presumed to vary considerably. These findings highlight the need for research examining the relationship between maternal knowledge of pregnancy danger signs and adherence to ANC visits as an evidence base for developing more effective educational strategies.

A review of the existing literature reveals a research gap regarding the relationship between maternal knowledge of pregnancy danger signs and adherence to ANC visits within the primary healthcare setting, particularly in the service area of Papusungan Primary Health Center. Most previous studies have been conducted in hospitals or urban settings, whereas investigations focusing on communities with different social and geographical characteristics remain limited. The novelty of the present study lies in its analysis of the relationship between maternal knowledge of pregnancy danger signs and adherence to ANC visits based on the actual conditions of primary healthcare services at Papusungan Primary Health Center. The findings are expected to provide more context-specific evidence to support the development of maternal health promotion programs at the primary healthcare level.

Based on the foregoing background, this study aims to analyze the relationship between maternal knowledge of pregnancy danger signs and adherence to ANC visits at Papusungan Primary Health Center. The findings are expected to provide scientific evidence regarding the importance of improving maternal knowledge as a key factor supporting adherence to antenatal care services. In addition to contributing to the advancement of midwifery and public health knowledge, this study is also expected to serve as a valuable reference for healthcare professionals and policymakers in designing more effective educational programs to improve the quality of maternal healthcare services and reduce the risk of pregnancy-related complications within the community (World Health Organization, 2020; Ministry of Health of the Republic of Indonesia, 2023).

2. LITERATURE REVIEW

Knowledge is the outcome of an individual's process of acquiring, understanding, and interpreting information through experience, formal education, and health education. In the field of healthcare, the level of knowledge is considered one of the key factors influencing how individuals make decisions and adopt behaviors related to maintaining their health. Among pregnant women, an adequate understanding of pregnancy danger signs plays an essential role in increasing awareness of potential complications and encouraging the timely utilization of healthcare services. Therefore, knowledge is regarded as the foundation for the development of health-promoting behaviors that support both maternal and fetal well-being (World Health Organization, 2020).

This study is based on the Health Behavior Theory developed by Lawrence Green through the PRECEDE–PROCEED model. This theory explains that health behavior is influenced by three groups of factors: predisposing factors, enabling factors, and reinforcing factors. Knowledge is classified as a predisposing factor that shapes an individual's beliefs, attitudes, and motivation before engaging in a particular behavior. In the context of this study, the greater the mother's knowledge regarding pregnancy danger signs, the more likely she is to adhere to the recommended antenatal care (ANC) schedule as part of efforts to maintain a healthy pregnancy (Green & Kreuter, 2005).

In addition to this theoretical framework, the present study is also supported by the Health Belief Model (HBM), which proposes that individual health behavior is influenced by perceptions of susceptibility, disease severity, perceived benefits of action, and perceived barriers. Pregnant women who understand the risks associated with pregnancy complications and recognize the benefits of regular ANC examinations are more likely to develop positive perceptions regarding the importance of maternal healthcare services and, consequently, are more motivated to attend ANC visits according to the recommended schedule. Conversely, inadequate knowledge may reduce perceived susceptibility to pregnancy-related risks, thereby decreasing adherence to ANC visits (Rosenstock, 1974).

Antenatal Care (ANC) refers to the healthcare services provided to pregnant women on a regular basis from the beginning of pregnancy until childbirth. These services aim to monitor maternal and fetal health, identify risk factors at an early stage, provide health education, and prepare women for childbirth and the postpartum period. According to maternal healthcare guidelines, adherence to the recommended ANC schedule is considered one of the key indicators in reducing maternal morbidity and mortality through the early detection and appropriate management of pregnancy-related complications (Ministry of Health of the Republic of Indonesia, 2023; World Health Organization, 2020).

Pregnancy danger signs are clinical conditions that indicate the potential occurrence of obstetric complications requiring immediate medical attention. These signs include vaginal bleeding, severe headache, visual disturbances, swelling of the extremities, high fever, decreased fetal movement, and premature rupture of the membranes. Adequate knowledge of these conditions enables pregnant women to seek healthcare promptly, thereby preventing delays in receiving appropriate medical treatment. Consequently, education regarding pregnancy danger signs constitutes one of the essential components of high-quality antenatal care services (World Health Organization, 2020).

Numerous previous studies have demonstrated that maternal knowledge is associated with adherence to ANC visits. Women with greater knowledge regarding the benefits of ANC and the recognition of pregnancy danger signs tend to be more consistent in attending scheduled antenatal examinations than those with lower levels of knowledge. Nevertheless, several studies have also reported that ANC adherence is influenced not only by knowledge but also by other factors, including educational attainment, employment status, family support, access to healthcare services, socioeconomic conditions, and sociocultural factors. These inconsistent findings indicate that the relationship between maternal knowledge and ANC adherence requires further investigation across diverse healthcare settings and community characteristics.

Research conducted by Retno Dewi Prisusanti and several other investigators has demonstrated that improving maternal knowledge through health education contributes to positive behavioral changes in the utilization of maternal healthcare services. Various health education interventions have been shown to enhance maternal awareness regarding the importance of antenatal examinations, the early detection of pregnancy complications, and adherence to healthcare providers' recommendations. Nevertheless, studies specifically examining the relationship between maternal knowledge of pregnancy danger signs and adherence to ANC visits within primary healthcare settings remain relatively limited.

Based on the existing theoretical framework and previous empirical studies, a research gap remains regarding the relationship between maternal knowledge of pregnancy danger signs and adherence to ANC visits among pregnant women in the working area of Papusungan Primary Health Center. Most previous investigations have been conducted in hospitals or urban settings; therefore, their findings may not adequately represent communities receiving maternal healthcare services at primary healthcare facilities. Differences in social characteristics, educational backgrounds, healthcare accessibility, and cultural contexts provide a strong rationale for conducting the present study.

Conceptually, this study is based on the assumption that maternal knowledge of pregnancy danger signs functions as a predisposing factor influencing adherence to ANC visits. The greater a mother's understanding of pregnancy-related risks and the benefits of antenatal examinations, the more likely she is to attend ANC visits in accordance with the recommended standards of care. Accordingly, this study is expected to provide scientific evidence regarding the relationship between maternal knowledge and adherence to ANC visits while also serving as a foundation for the development of more effective maternal health education programs at the primary healthcare level.

3. RESEARCH METHODS

This study employed a quantitative analytical approach using a cross-sectional design, in which all study variables were measured simultaneously to examine the relationship between maternal knowledge of pregnancy danger signs and adherence to antenatal care (ANC) visits. This design was selected because it is appropriate for analyzing relationships between variables within a population at a single point in time without implementing any intervention among the participants (Creswell & Creswell, 2018; Polit & Beck, 2021).

The study was conducted at Papusungan Primary Health Center, Manado City, North Sulawesi Province, Indonesia, from March to May 2026. The study population comprised all pregnant women who attended antenatal care services at Papusungan Primary Health Center during the study period. The sample size was determined using the analytical observational sample size formula for correlational studies, resulting in a total of 60 participants. Respondents were recruited using a consecutive sampling technique, whereby all eligible

pregnant women meeting the inclusion criteria were enrolled consecutively until the required sample size was achieved.

The inclusion criteria were pregnant women who were willing to participate in the study, able to communicate effectively, possessed a Maternal and Child Health (MCH) Handbook, and attended antenatal care services at Papusungan Primary Health Center during the study period. Participants with communication difficulties, cognitive impairment, or incomplete data collection were excluded from the final analysis to ensure data quality.

The study included two principal variables: maternal knowledge of pregnancy danger signs as the independent variable (X) and adherence to ANC visits as the dependent variable (Y). Maternal knowledge was assessed using a structured questionnaire consisting of questions related to the definition, types, symptoms, and appropriate responses to pregnancy danger signs. Adherence to ANC visits was evaluated based on the consistency between the number of ANC visits completed and the national antenatal care standards through a review of the Maternal and Child Health (MCH) Handbook and medical records maintained at Papusungan Primary Health Center. In addition to the primary variables, descriptive data on respondents' characteristics, including maternal age, educational level, employment status, parity, gestational age, and family support, were also collected.

Data were collected through face-to-face interviews using structured questionnaires, document review of the Maternal and Child Health (MCH) Handbook, and examination of antenatal medical records. Before implementation, the knowledge questionnaire underwent content validity assessment by experts in midwifery, public health, and research methodology. Subsequently, empirical validity testing was conducted among 30 respondents outside the study setting. The results demonstrated that all questionnaire items had correlation coefficients exceeding the critical value, indicating satisfactory validity. Reliability testing produced a Cronbach's alpha coefficient of 0.91, indicating excellent internal consistency and confirming that the instrument was appropriate for use in this study.

Data analysis was performed in several stages. Univariate analysis was used to describe respondents' characteristics and the distribution of each study variable using frequencies, percentages, means, and standard deviations. The association between maternal knowledge and adherence to ANC visits was analyzed using the Chi-square test because both variables were categorized as nominal data. When expected cell counts were less than five, Fisher's Exact Test was applied. To determine the strength of the association after controlling for potential confounding variables, binary logistic regression analysis was subsequently performed. All statistical analyses were conducted using a significance level of $\alpha = 0.05$ with statistical software commonly used in health research (Field, 2018).

The conceptual framework of this study proposes that maternal knowledge regarding pregnancy danger signs serves as a determinant influencing adherence to antenatal care visits. Greater knowledge is expected to enhance maternal awareness of pregnancy-related risks, thereby increasing motivation to utilize antenatal care services and ultimately encouraging adherence to the ANC schedule recommended by healthcare providers.

Conceptual Framework

Independent Variable (X)
Maternal Knowledge of Pregnancy Danger Signs
↓
Awareness of Pregnancy-Related Risks
↓
Motivation to Utilize Antenatal Care (ANC) Services
↓
Dependent Variable (Y)
Adherence to Antenatal Care (ANC) Visits

Description of the Conceptual Framework: The independent variable (X) is maternal knowledge regarding pregnancy danger signs, measured using a structured questionnaire and subsequently categorized into good, moderate, and poor levels of knowledge. The dependent variable (Y) is adherence to antenatal care (ANC) visits, determined based on the consistency between the number of completed ANC visits and the national antenatal care service standards. The relationship between these variables was analyzed using the Chi-square test and

further examined using binary logistic regression analysis to control for the influence of potential confounding variables.

4. RESULTS

The study was conducted at Papusungan Primary Health Center, Manado City, North Sulawesi Province, Indonesia, from March to May 2026. Prior to data collection, ethical approval was obtained from the Health Research Ethics Committee, research permission was obtained from the Health Office, and authorization was granted by the Head of Papusungan Primary Health Center. All respondents received an explanation regarding the objectives, benefits, procedures, and their rights as research participants before signing the informed consent form.

Data collection began with the identification of pregnant women attending antenatal examinations at the Maternal and Child Health (MCH) clinic. Respondents who met the inclusion criteria were selected using consecutive sampling until the required sample size of 60 participants was achieved. Subsequently, respondents were interviewed using a questionnaire assessing knowledge of pregnancy danger signs, while ANC adherence data were obtained through a review of the Maternal and Child Health (MCH) Handbook and medical records. All collected data were examined for completeness (editing), coded (coding), entered into statistical software, and analyzed according to the research objectives.

Respondent Characteristics

Table 1. Characteristics of Respondents (n = 60).

Characteristics	Frequency	Percentage (%)
Age		
<20 years	5	8.3
20–35 years	46	76.7
>35 years	9	15.0
Education		
Primary/Junior High School	12	20.0
Senior High School	34	56.7
Higher Education	14	23.3
Parity		
Primigravida	27	45.0
Multigravida	33	55.0

Source: Research data, 2026.

Based on Table 1, most respondents were within the healthy reproductive age group (20–35 years), had a senior high school education level, and were multigravida. These characteristics indicate that the majority of respondents were within a group that biologically has relatively favorable opportunities to participate in antenatal care services, although the role of knowledge requires further analysis.

Maternal Knowledge Level Regarding Pregnancy Danger Signs

Table 2. Distribution of Respondents' Knowledge Levels.

Knowledge Level	Frequency	Percentage (%)
Good	28	46.7
Moderate	20	33.3
Poor	12	20.0

Source: Research data, 2026.

Table 2 demonstrates that nearly half of the respondents had good knowledge regarding pregnancy danger signs. However, some pregnant women still had moderate and poor levels of knowledge, indicating the need to strengthen health education during ANC services.

ANC Visit Adherence

Table 3. Distribution of ANC Visit Adherence.

ANC Adherence	Frequency	Percentage (%)
Adherent	41	68.3
Non-adherent	19	31.7

Source: Research data, 2026.

Based on Table 3, the majority of respondents had completed ANC visits according to the recommended service standards. However, approximately one-third of respondents had not fulfilled the recommended number of visits, indicating the need for continuous efforts to improve adherence through education and ongoing support.

Relationship Between Knowledge Level and ANC Visit Adherence

Table 4. Relationship Between Knowledge Level and ANC Adherence.

Knowledge Level	Adherent n (%)	Non-adherent n (%)	Total
Good	25 (89.3)	3 (10.7)	28
Moderate	12 (60.0)	8 (40.0)	20
Poor	4 (33.3)	8 (66.7)	12

Chi-Square test =14.82
p-value = 0.001

Source: Research data, 2026.

The analysis presented in Table 4 indicates a statistically significant relationship between maternal knowledge of pregnancy danger signs and ANC visit adherence ($p = 0.001$). Mothers with good knowledge demonstrated a higher proportion of adherence compared with mothers with moderate or poor knowledge. Therefore, the research hypothesis stating that there is an association between knowledge level and ANC visit adherence was accepted.

Logistic Regression Analysis

Table 5. Factors Associated with ANC Adherence.

Variable	OR	95% CI	*p-value*
Good Knowledge	5.84	1.82–18.71	0.002
Education	1.74	0.89–3.95	0.108
Parity	1.29	0.61–2.83	0.314

Source: Research data, 2026.

The logistic regression analysis demonstrated that knowledge level was the most dominant factor associated with ANC visit adherence. Mothers with good knowledge had approximately 5.8 times greater odds of completing ANC visits according to recommended standards compared with mothers with poor knowledge.

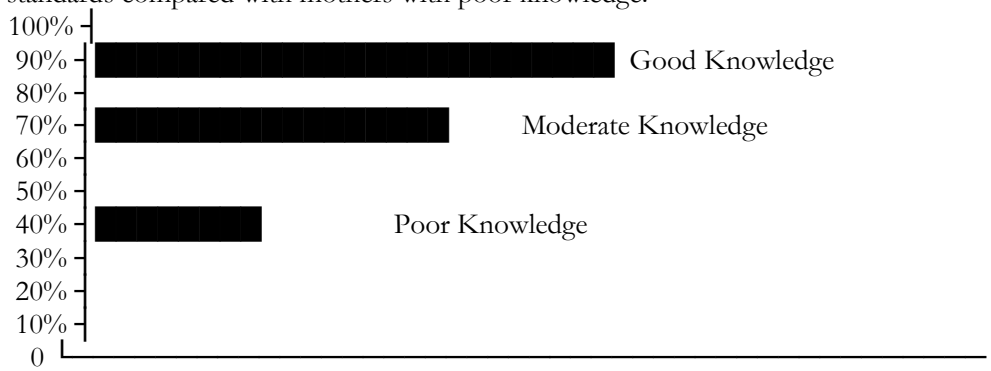

Figure 1. Percentage of ANC Adherence Based on Knowledge Level.

Source: Research data, 2026.

Figure 1 illustrates that ANC adherence increased along with higher maternal knowledge regarding pregnancy danger signs. This visualization strengthens the statistical findings demonstrating a positive relationship between the two study variables.

Interpretation of Research Findings

The findings indicate that pregnant women with better knowledge levels tend to demonstrate higher adherence to ANC visits. This finding supports the Health Behavior Theory, which explains that knowledge functions as a predisposing factor influencing the formation of health behaviors. Understanding pregnancy danger signs increases maternal awareness regarding the importance of regular antenatal examinations, thereby encouraging adherence to antenatal care services.

The findings are also consistent with the Health Belief Model, which states that individuals are more likely to undertake preventive actions when they have appropriate perceptions regarding health risks and the benefits of health-related actions. Mothers who understand the consequences of pregnancy complications tend to be more motivated to utilize ANC services as an early detection measure.

These findings are consistent with previous studies reporting a positive relationship between maternal knowledge and ANC visit adherence. Nevertheless, this study also revealed that some mothers with good knowledge were not fully adherent. This finding indicates that ANC adherence is not solely determined by knowledge but is also influenced by other factors, such as family support, healthcare accessibility, economic conditions, employment status, and community culture.

Research Implications

Theoretically, the findings strengthen the concept that knowledge is an important determinant in shaping maternal health behaviors during pregnancy. These results provide empirical support for health behavior models that position knowledge as a key factor influencing decision-making regarding healthcare utilization.

Practically, the findings can serve as a basis for Papusungan Primary Health Center to strengthen communication, information, and education (IEC) activities regarding pregnancy danger signs through pregnant women classes, individual counseling, and utilization of the Maternal and Child Health (MCH) Handbook. These efforts are expected to improve ANC visit adherence, optimize early detection of pregnancy complications, and ultimately contribute to reducing the risk of maternal and neonatal morbidity and mortality.

DISCUSSION

The findings of this study demonstrated a significant relationship between maternal knowledge regarding pregnancy danger signs and adherence to antenatal care (ANC) visits at Papusungan Primary Health Center. The Chi-Square analysis resulted in a *p*-value of 0.001, indicating that pregnant women with higher levels of knowledge tended to have better adherence to ANC visits according to the recommended service standards. Furthermore, logistic regression analysis revealed that knowledge was the most dominant factor associated with ANC visit adherence after controlling for other variables. According to the researchers, this finding indicates that maternal understanding of pregnancy danger signs represents an important factor in encouraging timely healthcare-seeking behavior (World Health Organization, 2020).

This relationship can be explained through the Health Behavior Theory developed by Lawrence Green. This theory explains that knowledge is a predisposing factor influencing the formation of individual behavior. Individuals with adequate knowledge regarding a health problem are more capable of understanding the benefits of preventive actions and are more likely to adopt behaviors that support their health. In the context of this study, mothers who understand pregnancy danger signs have greater awareness regarding the importance of regular antenatal examinations, resulting in higher adherence to ANC visit schedules (Green & Kreuter, 2005).

The findings of this study are also consistent with the Health Belief Model, which states that individual behavior is influenced by perceptions regarding the risks and benefits of health-related actions. Pregnant women who recognize various pregnancy danger signs are more likely to perceive that pregnancy may involve complications if not monitored routinely. This perception encourages the development of motivation to attend ANC examinations as an effort for early detection of potential pregnancy-related problems. According to the researchers, increased perception of the benefits of healthcare services represents one of the mechanisms explaining the higher adherence among mothers with good knowledge levels (Rosenstock, 1974; World Health Organization, 2020).

The majority of respondents in this study had good knowledge levels and were categorized as adherent to ANC visits. This condition indicates that health education obtained through antenatal services, the Maternal and Child Health (MCH) Handbook, health counseling, and previous pregnancy experiences may have contributed to improving maternal knowledge. According to the researchers, the more frequently mothers receive accurate health information, the greater the likelihood of developing health-supportive behaviors, including continuous utilization of ANC services (Ministry of Health of the Republic of Indonesia, 2023).

The findings of this study are consistent with previous studies reporting that maternal knowledge is an important determinant of ANC visit adherence. Studies conducted in various regions have shown that pregnant women who understand the benefits of ANC and are able to recognize pregnancy danger signs are more likely to complete all recommended visits compared with women with lower knowledge levels. These findings strengthen the evidence that health education is an essential component of antenatal care services to improve timely healthcare-seeking behavior (World Health Organization, 2020; United Nations Children's Fund, 2023).

Nevertheless, this study also identified that a small proportion of mothers with good knowledge were still non-adherent to ANC visits. This finding indicates that adherence is not solely influenced by knowledge but is also affected by other factors, including access to healthcare facilities, socioeconomic conditions, employment status, family support, previous pregnancy experiences, and community culture. According to the researchers, these factors may become barriers that prevent mothers from utilizing healthcare services despite having a

good understanding of the importance of ANC. Therefore, improving maternal knowledge should be accompanied by efforts to address structural and social barriers experienced by pregnant women (World Health Organization, 2020).

The findings of this study also support the results of research conducted by Retno Dewi Prisusanti, which demonstrated that improving knowledge through health education contributes to changes in maternal behavior in utilizing maternal healthcare services. Various health education interventions have been proven to increase maternal awareness regarding early detection of pregnancy complications and adherence to healthcare providers' recommendations. According to the researchers, these findings indicate that continuous communication, information, and education (IEC) programs play an important role in improving the quality of maternal healthcare services at the primary healthcare level.

Overall, the findings of this study provide important implications for the development of promotive and preventive maternal healthcare services. Improving knowledge regarding pregnancy danger signs should become an integral component of ANC services through individual counseling, pregnancy classes, utilization of the MCH Handbook, and community-based educational media. Although this study successfully demonstrated a significant relationship between maternal knowledge and ANC visit adherence, the findings should be interpreted cautiously because the cross-sectional design does not allow determination of causal relationships and the study was conducted in only one primary health center with a limited number of respondents. Therefore, future studies are recommended to employ longitudinal or cohort designs, involve broader research areas, and incorporate psychosocial, cultural, and healthcare accessibility factors to obtain a more comprehensive understanding of the determinants influencing ANC visit adherence (Polit & Beck, 2021).

5. CONCLUSION, RECOMMENDATIONS, AND ACKNOWLEDGMENTS

Conclusion and Recommendations

The findings of this study demonstrated a significant relationship between maternal knowledge regarding pregnancy danger signs and adherence to antenatal care (ANC) visits at Papusungan Primary Health Center. Pregnant women with better levels of knowledge tended to demonstrate higher adherence to ANC visits according to the recommended healthcare service standards. Based on the statistical analysis, the research hypothesis was accepted, indicating that the objective of this study, namely to analyze the relationship between maternal knowledge of pregnancy danger signs and ANC visit adherence, was achieved. These findings indicate that knowledge is one of the factors associated with healthcare utilization behavior during pregnancy.

Nevertheless, the findings of this study should be interpreted with caution because the cross-sectional design does not allow causal relationships to be established. Furthermore, ANC visit adherence is a behavior influenced by various other factors, including family support, socioeconomic conditions, educational level, access to healthcare facilities, employment status, previous pregnancy experiences, and the quality of healthcare services. Therefore, knowledge is not the sole determinant of maternal adherence to routine antenatal examinations.

Based on the study findings, improving maternal knowledge regarding pregnancy danger signs should become one of the priorities in antenatal care services through communication, information, and education (IEC) activities, individual counseling, pregnancy classes, and the utilization of the Maternal and Child Health (MCH) Handbook as an educational medium. These efforts are expected to enhance maternal awareness regarding the importance of early detection of pregnancy complications, encourage adherence to ANC visits, and support the achievement of more optimal maternal healthcare services. Strengthening the roles of healthcare providers, community health workers, and families is also necessary to ensure that health education can be implemented sustainably in daily life.

This study has several limitations that should be considered when interpreting the findings. The number of respondents was relatively limited, and all data were collected from a single primary healthcare facility; therefore, the findings cannot be generalized to all pregnant women populations with different characteristics. In addition, maternal knowledge was measured using a questionnaire, which may have introduced information bias due to differences in respondents' understanding and interpretation of the questions. This study also did not comprehensively evaluate the influence of other factors, such as family support, healthcare accessibility, economic conditions, and cultural aspects, which may potentially affect ANC visit adherence.

Therefore, future studies are recommended to involve larger sample sizes, include multiple healthcare facilities with diverse regional characteristics, and apply longitudinal or cohort study designs to obtain a more comprehensive understanding of the relationships among variables. Future research should also incorporate psychosocial factors, family support, healthcare service quality, healthcare accessibility, and cultural factors as analytical variables to develop a more comprehensive model of ANC visit adherence determinants. The findings from future studies are expected to serve as a foundation for developing more effective policies and intervention programs to improve antenatal care quality and support the reduction of maternal morbidity and mortality in Indonesia.

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