



Maternal health literacy and anxiety among pregnant women receiving antenatal care: A cross-sectional study

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ABSTRACT

Background: Anxiety during pregnancy can affect maternal well-being and engagement with antenatal care. Maternal health literacy may help women understand pregnancy-related changes, evaluate health information, and make appropriate decisions, but its association with anxiety remains underexplored in Indonesian antenatal care settings.

Purpose: This study examined the association between maternal health literacy and anxiety among pregnant women receiving routine antenatal care.

Method: A cross-sectional correlational study was conducted among 140 pregnant women attending primary maternal healthcare facilities in Central Java, Indonesia. Participants were recruited using consecutive sampling. Maternal health literacy was measured using the Indonesian version of the 48-item Maternal Health Literacy Inventory in Pregnancy, while anxiety was assessed using the Indonesian version of the Generalized Anxiety Disorder-7 scale. Descriptive statistics summarized participant characteristics and study variables. The association between maternal health literacy and anxiety was analyzed using Spearman's rank correlation test.

Result: The mean maternal health literacy score was 177.3 ± 21.4 , and the mean anxiety score was 6.8 ± 4.5 . Most participants reported minimal or mild anxiety, while 23.6% experienced moderate-to-severe anxiety. Maternal health literacy was negatively correlated with anxiety scores (Spearman's $\rho = -0.412$; $p < 0.001$).

Conclusion: Higher maternal health literacy was associated with lower anxiety among pregnant women. Antenatal care should help women not only receive pregnancy information but also interpret and use it confidently. Longitudinal and intervention studies are needed to test whether nurse-led literacy and digital education programs can reduce anxiety during pregnancy.

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1. Background

Maternal health literacy is an important component of maternal care because pregnancy requires women to understand, evaluate, and use health information in a timely manner. It refers to a woman's ability to access pregnancy-related information, understand health messages, appraise the quality and relevance of that information, and apply it when making decisions about her health and pregnancy [1]. In antenatal care, maternal health literacy is not limited to knowing pregnancy facts. It also includes the ability to recognize

warning signs, follow health recommendations, ask questions during consultations, and decide when professional help is needed [2], [3], [4].

Antenatal care provides repeated opportunities for health workers to deliver information, monitor maternal and fetal conditions, and support pregnant women in preparing for childbirth. However, receiving information during antenatal care does not always mean that women understand or use it correctly. Pregnant women may receive advice from different sources,

including midwives, nurses, physicians, family members, social media, websites, mobile applications, and online communities [5], [6]. When health information is incomplete, inconsistent, or difficult to interpret, women may feel uncertain rather than reassured. This condition shows why maternal health literacy is relevant in routine antenatal care, especially in primary maternal healthcare settings where most women first seek pregnancy-related services.

From a nursing perspective, maternal health literacy is a nursing-sensitive concern because nurses are directly involved in health education, counselling, care coordination, and advocacy during antenatal contacts. Nurses can assess whether pregnant women understand pregnancy-related information, identify misconceptions, reinforce recognition of danger signs, encourage questions during consultations, and adapt education to the woman's literacy level, cultural context, family support, and preferred information sources [1], [2]. Thus, improving maternal health literacy is not only a public health priority but also a core element of antenatal nursing care that may support psychological readiness and reduce uncertainty during pregnancy [7].

Anxiety during pregnancy is another important issue in maternal health. It refers to excessive worry, fear, tension, or nervousness related to pregnancy, childbirth, fetal well-being, maternal role changes, or possible complications [8]. Although some degree of concern is common during pregnancy, persistent anxiety may interfere with sleep, daily functioning, antenatal care engagement, health behavior, and preparation for childbirth [9]. Previous studies have also linked antenatal anxiety with adverse maternal and neonatal outcomes, including poor maternal well-being, preterm birth, low birth weight, and postpartum mental health problems [10], [11], [12]. Therefore, anxiety should not be viewed as a secondary issue in antenatal care but as part of comprehensive maternal health assessment.

Maternal health literacy may influence anxiety because the way women understand and process pregnancy-related information can shape how they respond to uncertainty. Women with adequate maternal health literacy may be better able to distinguish normal pregnancy changes from warning signs, evaluate whether information is trustworthy, and seek help appropriately [1]. In contrast, limited maternal health literacy may increase confusion, misinterpretation, and fear,

especially when women encounter conflicting information from digital or informal sources [13]. Thus, maternal health literacy may be closely related not only to health behavior but also to psychological well-being during pregnancy.

Previous studies have examined maternal health literacy in relation to antenatal care utilization, pregnancy preparedness, health-promoting behavior, and maternal-neonatal outcomes [3], [14], [15]. However, several gaps remain. First, psychological outcomes, particularly anxiety, have received less attention than behavioral or clinical outcomes. Second, many studies have relied on general health literacy measures, although pregnancy requires specific knowledge, appraisal skills, and decision-making abilities related to maternal and fetal health. Third, evidence from Indonesian primary antenatal care settings remains limited, especially studies using a pregnancy-specific instrument such as the Maternal Health Literacy Inventory in Pregnancy. This gap is important in Central Java, where primary maternal healthcare facilities in semi-urban districts continue to function as the main entry point for routine antenatal care, maternal education, early risk identification, and referral. Women attending these services often come from diverse educational and occupational backgrounds and are increasingly exposed to pregnancy-related information from health professionals, family members, social media, websites, and other informal sources [5], [6]. In this context, anxiety may not only arise from pregnancy-related uncertainty itself, but also from how women access, interpret, judge, and apply the information they receive. Therefore, Central Java provides a meaningful setting to examine whether maternal health literacy is associated with anxiety during routine antenatal care. Understanding this association is relevant for nursing and maternal health practice because antenatal care should not only deliver pregnancy information, but also help women use that information confidently in making decisions about their pregnancy [1], [3]. This study aimed to examine the association between maternal health literacy and anxiety among pregnant women receiving routine antenatal care in primary maternal healthcare facilities in Central Java, Indonesia.

2. Methods

2.1 Research design

This study employed an analytical correlational design with a cross-sectional approach

to examine the relationship between maternal health literacy and anxiety among pregnant women. Data on all study variables were collected simultaneously during the study period.

2.2 Setting and sample

The study was conducted from September 2025 to January 2026 at five primary maternal healthcare facilities in a semi-urban district of Central Java, Indonesia. These facilities provided routine antenatal care services, including pregnancy monitoring, maternal health education, basic laboratory screening, and referral for high-risk pregnancies. They were selected because they are common first-contact points for pregnant women in the district and provide a real-world primary care context in which maternal health information is routinely delivered and discussed. The target population consisted of pregnant women attending routine antenatal care during the data collection period.

Participants were recruited using consecutive sampling. All pregnant women who attended routine antenatal care during the data collection period were screened for eligibility. The inclusion criteria were: (1) pregnant women aged ≥ 18 years; (2) being pregnant in any trimester; (3) able to communicate in Bahasa Indonesia; (4) able to read and complete the questionnaire independently; and (5) willing to participate by providing written informed consent. The exclusion criteria were: (1) having a previously diagnosed psychiatric disorder, identified through self-report and/or antenatal care records; (2) experiencing severe obstetric complications requiring emergency treatment; and (3) returning incomplete questionnaires.

The minimum sample size was calculated using G*Power version 3.1 for bivariate correlation analysis with an effect size of 0.25, a significance level of 0.05, and a statistical power of 0.80. A small-to-moderate effect size was selected because previous evidence regarding the association between maternal health literacy and anxiety remains limited. The calculation indicated a minimum sample size of 123 participants. After adding 10% to anticipate incomplete responses, the final target sample size was 140 pregnant women.

During the recruitment period, all eligible women were invited to participate until the required sample size was achieved. The number of women assessed for eligibility, excluded, refusing participation, returning incomplete questionnaires,

and included in the final analysis was documented to describe participant flow.

2.3 Instruments and data collection

The exposure variable was maternal health literacy, measured using the total score of the Maternal Health Literacy Inventory in Pregnancy (MHELIP). The outcome variable was anxiety, measured using the total score of the Generalized Anxiety Disorder-7 (GAD-7). Higher MHELIP scores indicated higher maternal health literacy, whereas higher GAD-7 scores indicated greater anxiety symptoms.

Maternal health literacy was assessed using the Maternal Health Literacy Inventory in Pregnancy (MHELIP), a 48-item instrument consisting of four domains: maternal health knowledge, maternal health information seeking, maternal health information appraisal, and maternal health decision-making and behavior [16]. Items are rated on a five-point Likert scale, with higher scores indicating better maternal health literacy. The Indonesian version demonstrated strong content and face validity. Psychometric testing supported a dominant measurement dimension, explaining 75.0% of the total variance. The instrument also showed excellent reliability, with person and item reliability coefficients of 0.98 and 0.99, respectively.

Anxiety was assessed using the Indonesian version of the Generalized Anxiety Disorder-7 (GAD-7), a 7-item self-report instrument measuring anxiety symptoms experienced during the previous two weeks. Each item is scored on a four-point Likert scale ranging from 0 (not at all) to 3 (nearly every day), resulting in a total score ranging from 0 to 21. Scores of 5, 10, and 15 indicate mild, moderate, and severe anxiety, respectively. The Indonesian version of the GAD-7 has demonstrated good validity and reliability, with a Cronbach's alpha coefficient exceeding 0.80. Higher scores indicate greater anxiety severity [17].

Data were collected during routine antenatal care visits. Eligible participants received information about the study and provided written informed consent before completing the questionnaires. Questionnaires were completed independently in a private area of the healthcare facility, and the research team checked each questionnaire for completeness after submission.

2.4 Data analysis

Data were analyzed using IBM SPSS Statistics version 26. Descriptive statistics were used to

summarize participants' demographic characteristics, maternal health literacy scores, and anxiety scores. Continuous variables were presented as mean and standard deviation (SD) or median and interquartile range (IQR), depending on data distribution, while categorical variables were presented as frequencies and percentages.

The normality of maternal health literacy and anxiety scores was assessed using the Shapiro-Wilk test. Because the data did not meet the assumption of normality, the association between maternal health literacy and anxiety was examined using Spearman's rank correlation test. The strength of the correlation was interpreted as negligible (<0.30), weak ($0.30-0.49$), moderate ($0.50-0.69$), or strong (≥ 0.70). Statistical significance was set at $p < 0.05$. [18], [19].

2.5 Research ethics

This study was conducted in accordance with the ethical principles of the Declaration of Helsinki and received approval from the Health Research Ethics Committee with number 094/019/XIII/EC/KEP/Lemb.Candle/2025. Prior to data collection, all participants received information regarding the study objectives, procedures, potential benefits, and their rights as research participants. Written informed consent was obtained from all participants. Participation was voluntary, and confidentiality and anonymity were maintained throughout the study.

3. Results

During the study period, 153 pregnant women were approached. Eight declined participation and five returned incomplete questionnaires. Therefore, 140 participants were

included in the final analysis. No missing data were found in the final dataset because incomplete questionnaires were excluded before analysis.

The average age of the respondents was 28.9 years (SD = 5.2 years). Most participants were between 25 and 34 years old (58.6%), had completed secondary education (52.9%), and were housewives (54.3%). More than half were multigravida (58.6%), and nearly half were in their third trimester of pregnancy (45.7%). Detailed demographic characteristics are presented in Table 1.

Most respondents had completed secondary education and were housewives. The majority were multigravida and attended antenatal care during the second or third trimester.

The mean maternal health literacy score was 177.3 (SD = 21.4), while the mean anxiety score was 6.8 (SD = 4.5). Detailed descriptive statistics of the study variables are presented in Table 2.

Further analysis showed that most participants reported minimal or mild anxiety symptoms. However, approximately one-quarter of respondents experienced moderate to severe anxiety, indicating that psychological distress remained present among a substantial proportion of pregnant women (Table 3).

Spearman's rank correlation analysis showed a significant negative association between maternal health literacy and anxiety among pregnant women ($\rho = -0.412$, $p < 0.001$) (Table 4). This finding indicates that higher maternal health literacy was associated with lower anxiety scores. The results suggest that the ability to access, understand, evaluate, and apply pregnancy-related health information may contribute to lower levels of anxiety during pregnancy.

Table 1. Demographic Characteristics of Respondents (n = 140)

Characteristics	Frequency	Percentage
Age Group		
<25 years	34	24.3 %
25-34 years	82	58.6 %
≥ 35 years	24	17.1 %
Education Level		
Primary school	18	12.9 %
Secondary school	74	52.9 %
Higher education	48	34.3 %
Occupation		
Housewife	76	54.3 %
Private employee	39	27.9 %
Self-employed	15	10.7 %
Civil servant	10	7.1 %

Parity		
Primigravida	58	41.4 %
Multigravida	82	58.6 %
Trimester		
First trimester	24	17.1 %
Second trimester	52	37.1 %
Third trimester	64	45.7 %

Table 2. Descriptive Statistics of Maternal Health Literacy and Anxiety (n = 140)

Variable	Mean $\pm$ SD	Minimum	Maximum
Maternal Health Literacy (MHELIP)	177.3 $\pm$ 21.4	121	228
Anxiety (GAD-7)	6.8 $\pm$ 4.5	0	19

Table 3. Anxiety Severity Among Respondents (n = 140)

Anxiety Category	Frequency	Percentage
Minimal (0-4)	58	41.4 %
Mild (5-9)	49	35.0%
Moderate (10-14)	25	17.9 %
Severe (15-21)	8	5.7 %

Table 4. Correlation Between Maternal Health Literacy and Anxiety Among Pregnant Women

Variable	Anxiety score	p-value
Maternal health literacy	Spearman's rho = -0.412	<0.001

* Note. Spearman's rank correlation test was used because the data were not normally distributed.

4. Discussion

This study found that pregnant women with higher maternal health literacy tended to report lower levels of anxiety. Although the correlation was moderate, the finding supports the view that maternal health literacy is not solely related to health behaviors but also plays an important role in psychological well-being during pregnancy [13], [20]. In other words, understanding health information may help women feel more prepared to face the physical and emotional changes that occur throughout pregnancy.

Most participants demonstrated moderate-to-high maternal health literacy. This is encouraging, particularly considering the increasing availability of pregnancy-related information through antenatal care services and digital platforms. However, being exposed to information is not the same as being health literate. Pregnant women are often surrounded by an overwhelming amount of information from healthcare providers, social media, websites, and online communities [1]. Without the ability to judge whether that information is trustworthy and relevant, greater access may simply create confusion rather than confidence. Nutbeam describes health literacy as a set of functional,

interactive, and critical skills, suggesting that the ability to interpret and apply information is just as important as obtaining it [7], [21].

Anxiety was generally mild across the study population, yet almost one in four women experienced moderate-to-severe symptoms. This proportion should not be overlooked. Pregnancy is often portrayed as a joyful period, but it also brings uncertainty. Concerns about fetal development, childbirth, financial responsibilities, and changes in family roles are common, even among women who attend routine antenatal care [3], [10]. The findings therefore reinforce the idea that psychological needs remain an important component of maternal care and deserve the same attention as physical health.

The inverse relationship observed between maternal health literacy and anxiety offers a plausible explanation for this pattern. Women who understand what is happening during pregnancy are likely to interpret bodily changes more accurately, recognize warning signs appropriately, and know when professional advice is needed. As uncertainty decreases, confidence in managing pregnancy tends to increase, making anxiety less overwhelming.

Our findings are generally in line with previous studies showing that health literacy is associated with better maternal health behaviors, greater engagement in antenatal care, and improved pregnancy outcomes [3], [13], [14], [22]. Nevertheless, evidence specifically linking maternal health literacy with anxiety remains relatively limited. Some studies have even reported that women with higher health literacy experience greater anxiety because they become more aware of potential pregnancy risks [6], [22], [23]. This apparent contradiction is understandable. Health literacy does not simply increase awareness; it changes the way women process information. Whether that information reduces or increases anxiety may depend on how it is delivered, the surrounding social support, and the woman's ability to cope with uncertainty. These contextual factors may explain why findings differ across populations and healthcare settings.

These findings have practical nursing implications for antenatal care. First, routine maternal health literacy screening can be introduced during antenatal visits to identify women who may have difficulty understanding, appraising, or applying pregnancy-related information. Second, antenatal education should be tailored to each woman's literacy level, pregnancy stage, cultural background, and main source of information rather than delivered as uniform counselling. Third, anxiety screening should be integrated into routine antenatal care, particularly for women with low maternal health literacy or difficulty interpreting pregnancy symptoms. Fourth, nurse-led digital education programs may be developed to provide simple, consistent, and interactive pregnancy information, including danger-sign recognition, self-care guidance, myth clarification, and referral advice. Such programs should complement face-to-face counselling and allow nurses to reinforce key messages, monitor understanding, and provide follow-up support for women who remain anxious or uncertain.

This study has several limitations. First, the cross-sectional design prevents causal interpretation; therefore, the findings only indicate an association between maternal health literacy and anxiety. Second, participants were recruited using consecutive sampling from primary maternal healthcare facilities in one district of Central Java, which may limit the generalizability of the findings to pregnant women in other settings. Third, anxiety was measured using a self-report screening

instrument rather than a clinical diagnostic interview. Fourth, women who were unable to read and complete the questionnaire independently were not included, which may have underrepresented those with lower literacy levels. Finally, potential confounding factors such as income, family support, obstetric risk status, previous pregnancy complications, and access to digital health information were not fully examined.

5. Conclusion

This study found a significant negative relationship between maternal health literacy and anxiety among pregnant women, indicating that higher maternal health literacy was associated with lower anxiety levels. These findings suggest that maternal health literacy is an important and potentially modifiable factor influencing maternal psychological well-being during pregnancy. For nursing practice, routine antenatal care should include maternal health literacy assessment, tailored antenatal education, and early anxiety screening so that nurses can identify women who need additional explanation, reassurance, or referral. Nurse-led digital education and follow-up support may also help pregnant women interpret pregnancy information more confidently and reduce uncertainty. Future longitudinal and intervention studies are needed to evaluate whether strategies to enhance maternal health literacy, including complementary nursing interventions and digital health education, can effectively reduce anxiety and improve maternal outcomes.

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