

A Cross-Sectional Study of Maternal Health Literacy Among Third-Trimester Pregnant Women: Key Socio-demographic Determinants

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Abstract: Maternal health literacy is essential for positive maternal and neonatal outcomes, as it reflects the ability to access, understand, appraise, and apply health information. Limited research exists on the levels of this literacy and its key predictors. Identifying these determinants is vital for developing targeted interventions to improve maternal health literacy and enhance health outcomes. This study aimed to assess maternal health literacy levels and examine its predictors among third-trimester pregnant women at a tertiary hospital in central Thailand. A total of 349 participants were selected through purposive sampling. Data were collected using a self-reported Maternal Health Literacy Questionnaire and a Socio-Demographic Determinants Questionnaire. Descriptive statistics and multiple linear regression were used for data analysis.

The findings revealed that 47.85% of participants had sufficient maternal health literacy, 34.10% had limited maternal health literacy, and 9.45% and 8.60% demonstrated excellent and inadequate maternal health literacy, respectively. Healthcare professionals were the primary information source, with parents and husbands also providing health advice. Positive predictors of maternal health literacy included having a bachelor's degree, being married, being employed, and being older, while negative predictors were being single and later gestational age at the first prenatal visit. Income, gravidity, group health education, underlying diseases, and pregnancy complications were insignificant predictors. These factors accounted for only 15.9% of maternal health literacy variance. These findings highlight that one-third of pregnant women in the sample still have limited maternal health literacy. They also indicate the potential benefit of targeted health education programs, particularly for younger women, those with lower education, and single mothers. However, the fact that these factors only account for a small portion of the variance in maternal health literacy suggests other significant predictors that we have yet to identify. This underscores the need for more research to fully understand the factors influencing maternal health literacy and develop effective interventions. Future research should explore more factors influencing maternal health literacy, such as socioeconomic status, social support, cultural beliefs, residence area, and mode of birth. Moreover, nurses and midwives should explore the content and quality of group health education to enhance maternal health literacy levels.

Keywords: Health education, Maternal health literacy, Predictors, Pregnant women, Prenatal care, Thailand

Received 25 November 2024; Revised 20 March 2025; Accepted 21 March 2025

Author contributions:

TS: Conceptualization, method and design, tool development, translation, and validation, data analysis and interpretation, drafting, revising, and editing the manuscript, final approval of the submitted version, and corresponding with the editor

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Introduction

Maternal health literacy (MHL) is a key maternal and neonatal health outcome determinant.¹ It refers to a pregnant woman's ability to access, understand, appraise, and utilize essential health information to make informed decisions throughout pregnancy, childbirth, and postpartum care.^{1,2} Adequate MHL supports healthier maternal behaviors, encourages timely prenatal care, and reduces pregnancy-related risks.^{1,2} Conversely, insufficient health literacy is linked to poor compliance with medical recommendations, delayed prenatal visits, and increased health risks for both mother and baby.^{3,4} Studies from various countries indicate that MHL remains suboptimal, with rates of inadequate MHL reported at 71.3% in Ethiopia,⁵ 79.8% in Egypt,⁶ 80% in Laos,⁷ and 83% among rural African-American mothers in the U.S.⁸ Given its significant role in maternal and neonatal health and inadequate MHL levels across regions, it is essential to identify the key factors that influence MHL and how they vary across different populations.

Previous studies have identified multiple determinants influencing MHL, for example, higher education,^{5,7,9-11} employment,¹⁰ and social support,^{10,11} often enhance access to and comprehension of health information, while lower income,^{7,12} limited prenatal visits,^{7,10,11} and lack of social support,^{10,11} may hinder informed healthcare decision-making. Addressing these determinants through tailored health education, midwife-led literacy programs, and community-based support can significantly enhance MHL and improve pregnancy outcomes.¹³

Despite global research on MHL determinants, studies on pregnant Thai women remain limited. Although Thailand has made progress in maternal healthcare,¹⁴ no large-scale studies have systematically assessed MHL levels. Existing research primarily focuses on maternal health outcomes rather than literacy levels, and there is currently no standardized tool for evaluating MHL in the Thai context. Understanding MHL levels

and their key predictors in Thai pregnant women will provide valuable insights for designing targeted maternal health interventions. This study aimed to assess MHL levels among third-trimester pregnant women with the most exposure to maternal health information throughout pregnancy and examine key predictors that impacted MHL. Findings from this research can contribute to developing evidence-based maternal health programs tailored to the specific needs of Thai pregnant women, ultimately improving maternal and neonatal health outcomes.

Conceptual Framework and Literature Review

Health literacy is critical in healthcare decision-making, shaping individuals' ability to access, understand, appraise, and apply health information.^{2,15} In maternal health, this is particularly vital, as MHL directly affects prenatal care engagement, adherence to medical advice, and pregnancy outcomes. High MHL promotes early antenatal care and better self-care and lowers the risk of complications like preeclampsia, gestational diabetes, and preterm labour.¹ Conversely, inadequate MHL leads to delayed prenatal visits, poor adherence to medical advice, and higher maternal and neonatal morbidity.^{3,4,13}

This study was guided by the Integrated Model of Health Literacy by Sorensen et al.,¹⁵ which categorizes health literacy determinants into distal and proximal determinants. Distal factors encompass societal and environmental influences, such as demographic conditions, cultural norms, language, political dynamics, and broader societal systems.¹⁵ Meanwhile, proximal factors are more directly related to the individual and include personal determinants such as age, gender, race, socioeconomic status, education level, occupation, employment status, income, and overall literacy.¹⁵ Additionally, situational determinants, referring to temporary or condition-specific factors such as

pregnancy, social support networks, family and peer influence, media exposure, and the surrounding physical environment, also play a crucial role in shaping health literacy levels.¹⁵ This study focused on personal and situational determinants due to their direct influence on maternal health behaviors and their feasibility for targeted interventions within prenatal healthcare settings.^{16,17} Societal and environmental determinants, such as healthcare policies, cultural norms, and language barriers, were not included in this study due to the relative homogeneity of the study's participants in these factors.

Given the framework and the importance of MHL, this study explored potential personal and situational factors influencing this literacy. Age is a key determinant of MHL, with studies indicating that older women typically have higher MHL due to accumulated life experience and greater exposure to maternal healthcare information.^{5,11-12,18-19} Similarly, education level significantly impacts MHL by improving literacy skills, access to information, critical thinking, and health-seeking behaviors, with higher education levels consistently associated with greater MHL.^{5,7,10,18-19}

Occupation also plays a substantial role, as employed women often exhibit higher MHL due to greater access to health information, healthcare resources, and workplace support systems. Prior studies have established a significant link between occupation and MHL.^{10,19} Marital status is another predictor, as women with supportive partners tend to have better access to health information and assistance in navigating healthcare systems.¹⁰⁻¹¹ Family income impacts healthcare accessibility and prenatal program participation, with evidence indicating that higher-income pregnant women are more likely to have better MHL.^{7,11-12,19}

Gestational age at the first prenatal visit is a key situational determinant, as women who begin prenatal care earlier have greater opportunities to receive health education and guidance from healthcare providers, improving MHL and reducing pregnancy-related risks.^{7,11} Similarly, participation in structured prenatal health education programs enhances MHL by increasing awareness,

improving comprehension of health recommendations, and promoting informed decision-making.^{1,11} Gravidity has also been associated with MHL, as prior pregnancy experience may contribute to improved health literacy.^{11,18} Additionally, pre-existing health conditions expose women to more health information, potentially improving MHL.^{5,7,20} Finally, pregnancy complications may reinforce health literacy by increasing interactions with healthcare providers.^{5,7}

These findings reinforce the importance of personal and situational factors in shaping MHL. Therefore, the personal determinants—including age, occupation, education level, marital status, and family income—and situational determinants—including gestational age at the first prenatal visit, health education participation, gravidity, pre-existing health conditions, and pregnancy complications—were chosen as key predictors in this study. Given the significance of these factors, the conceptual framework illustrates the key determinants influencing MHL.

While previous studies have examined MHL determinants globally, limited research has explored how these factors interact within Thailand's maternal healthcare system. Variations in healthcare access and differences in maternal education programs highlight the need for a localized study. Investigating these factors in a Thai population allows this study to expand upon existing knowledge, validate previous findings, and provide new insights into how personal and situational determinants shape MHL in different healthcare settings. Findings would contribute to developing evidence-based maternal health programs, enabling healthcare providers, policymakers, and educators to design more effective prenatal education strategies, encourage early ANC visits, and address MHL disparities to improve maternal and neonatal health outcomes.

Study Aims

This study aimed to 1) assess the level of MHL among third-trimester pregnant women in Thailand

and 2) examine the predictive factors of personal determinants (age, occupation, education level, marital status, family income) and situational determinants (gestational age at the first prenatal visit, health education, gravidity, disease prior to pregnancy, and complications during pregnancy) on MHL.

Methods

Study Design: This study employed a cross-sectional analytical design. The report followed the STROBE Statement—a checklist of items that should be included in reports of cross-sectional studies.

Sample and Setting: The study population consisted of third-trimester pregnant women receiving prenatal care at the antenatal care unit of a tertiary hospital in central Thailand between December 2023 and August 2024. The sample was selected using purposive sampling with the following inclusion criteria: gestational age of 28 weeks or more; aged 15 years or older; able to read, write, and communicate in Thai; and willing to participate in this study. The exclusion criteria included participants who chose to withdraw from the study, healthcare professionals, and pregnant women diagnosed with mental disorders, using drugs, or undergoing rehabilitation.

Sample Size: The sample size was determined using Cochran's formula for finite populations,²¹ based on a total population of 2,400 pregnant women who received prenatal care at the antenatal care unit in 2022. The calculation was conducted with a 95% confidence interval, a 5% margin of error, and a population proportion estimate of 50%. The resulting sample size was 332 pregnant women. An additional 5% (17 individuals) were included to account for potential data loss, resulting in a total sample size of 349 women. Additionally, for cross-validation, the sample size was calculated using G*Power 3.1.9.2 with 10 independent variables for multiple linear regression. Using a medium effect size of 0.15,²² an alpha error probability of 0.05, and a statistical power of 0.80, the required sample

size was 118 individuals. Therefore, a sample of 349 women was deemed representative of the population and sufficient for analyzing the influence of factors affecting the level of MHL.

Ethical Considerations: This study was approved by the Institutional Review Board (IRB) of the Royal Thai Army Medical Department (Approval No. 1463/2023, issued on 17 November 2023), with an approval period of one year. The survey emphasized that participation was voluntary and anonymous, ensuring participants' privacy was protected and data handled securely. Informed consent was obtained from all participants before data collection. Additionally, for pregnant women under 18, parental consent was required before participation. All procedures adhered to the ethical standards of national research committees and the principles outlined in the Declaration of Helsinki.

Research Instruments: There were two instruments: The Socio-demographic Factors form and the Maternal Health Literacy Questionnaire.

The Socio-demographic Factors form included age, occupation, education level, marital status, family income, gravidity, gestational age at the first prenatal visit, group health education, diseases prior to pregnancy, pregnancy complications, and health information sources.

The Maternal Health Literacy Questionnaire (MHLQ) was modified with permission from the Maternal Health Literacy Inventory in Pregnancy (MHLEIP).²³ This instrument was reviewed to identify relevant constructs, dimensions, and question formats and translated into Thai using the back-translation method.²⁴ This informed the development of the new Thai questionnaire tailored to the maternal healthcare context in Thailand.

The MHLQ Thai version consists of 44 items covering the following areas: accessing health information and maternal health knowledge (23 items, e.g., "I have knowledge about appropriate foods during pregnancy"); understanding (4 items, e.g., "I can understand instructions in documents or advice from medical personnel"); assessing (4 items, e.g., "I can evaluate the accuracy and reliability of information about

pregnancy from online sources such as websites, applications, Facebook, or Instagram”), and decision-making and behavior (13 items, e.g., “I take prenatal supplements correctly as prescribed by a doctor or advised by a nurse”).

The MHLQ utilizes a 5-point Likert scale to assess pregnant women’s perceptions, confidence, abilities, and health-related skills based on their lived experiences. The response levels were defined as follows: Level 5 most closely aligns with the respondent’s reality, Level 4 closely aligns, Level 3 moderately aligns, Level 2 slightly aligns, and Level 1 least aligns with their reality. In this study, MHL scores were classified into four categories based on total points: Inadequate (0–50 points), Limited (50.1–66 points), Sufficient (66.1–84 points), and Excellent (84.1–100 points).

The content validity of the questionnaire was evaluated by four experts in midwifery and health literacy using the content validity index (CVI), yielding an average CVI value of 0.85. The reliability of the instrument was assessed in two phases. First, a pretest was conducted with a sample of 30 individuals with characteristics similar to the study population, resulting in Cronbach’s alpha coefficient of 0.89, indicating good reliability. In the main study, Cronbach’s alpha coefficient was 0.90, demonstrating excellent reliability. These results confirm the instrument’s reliability for measuring MHL in the target population.

Data Collection: This study was conducted between December 2023 and August 2024 after the IRB approval. Registered nurses at the antenatal care unit recruited the participants based on the inclusion criteria. Participants were informed of the study’s objectives and procedures before providing written informed consent. The MHL questionnaire was administered in a paper-based format. All collected data remained confidential, with participant identities replaced by coded identifiers. The data were used solely for academic purposes and posed no risk to participants.

Data Analysis: Socio-demographic data were analyzed using descriptive statistics, including frequency, mean, median, and standard deviation. ANOVA and t-tests were employed to compare MHL across demographic subgroups, providing descriptive insights into variations among different population groups. However, since the primary objective of this study was to identify key predictors of MHL, multiple linear regression was the main analytical approach. The key socio-demographic variables relevant to MHL included age, occupation, education level, marital status, family income, gravidity, gestational age at the first prenatal visit, group health education, chronic illnesses, and pregnancy complications. To facilitate multiple linear regression analysis, all categorical variables (occupation, education level, marital status, gravidity, group health education, pre-existing conditions, and pregnancy complications) were dummy-coded, allowing their inclusion in the regression model without violating statistical assumptions. Key assumptions were assessed to validate the regression model, including autocorrelation (Durbin-Watson test), normality (Shapiro-Wilk test), and multicollinearity. Only variables that met these assumptions were retained in the final regression model. In cases where assumptions were violated, data transformations or adjustments were applied to improve model fit. Data analysis was conducted using “jamovi” version 2.5, an open-source statistical platform based on the R programming language. The “jamovi” is widely used in academic research and has been validated for accuracy and reliability in statistical computing.

Results

Participant characteristics: Table 1 presents the socio-demographic characteristics of the 349 pregnant women in this study and their corresponding MHL scores. The participants had a mean age of 29.78 years (SD = 5.52), with the majority employed as company employees (44.13%). Most participants held a bachelor’s degree (40.11%) and were married (63.1%). The mean

monthly family income was 32,743.37 THB (970.13 USD), with an SD of 17,454.60 THB (517.15 USD). The mean gestational age at the first prenatal care visit was 13.43 weeks (SD = 8.23). However, when applying a cut-off of 12 weeks to define late prenatal care visits, approximately one-third of pregnant women (34.67%) were classified as having a late prenatal visit. Additionally, 42.98% of participants were experiencing their first pregnancy. Most reported no underlying diseases (88.54%) and complications during pregnancy (70.20%).

A significant difference in MHL scores was observed across subgroups of several variables. Statistical analysis indicated significant differences in MHL scores based on occupation, education level, and marital status. Furthermore, participation in group health education classes was significantly associated with MHL scores. However, no significant differences in MHL scores were observed across gravidity subgroups, the presence of underlying diseases, or complications during pregnancy. Full details are provided in **Table 1**.

Table 1. Socio-demographic characteristics

Variable	N (%) or	MHL	p-value ^a	
	Mean ± SD	Mean ± SD		
Age	29.78 ± 5.52			
Occupation				
Housewife/unemployed	66 (18.91)	63.9 ± 11.70	0.039	
Student	10 (2.87)	64.0 ± 10.30		
Company employee	154 (44.13)	67.9 ± 11.40		
Government officer/ State enterprise employee	54 (15.47)	71.1 ± 11.10		
Business/merchant	34 (9.74)	69.6 ± 14.70		
Hired laborer	21 (6.02)	68.8 ± 10.50		
Other	10 (2.87)	68.9 ± 11.60		
Education level				
Elementary school	9 (2.58)	62.9 ± 9.63		0.002
Junior high school	44 (12.61)	63.9 ± 13.52		
Senior high school	95 (27.22)	66.3 ± 12.94		
Vocational diploma/associate degree	47 (13.47)	66.1 ± 12.54		
Bachelor's degree	140 (40.11)	71.1 ± 10.12		
Higher than a bachelor's degree	14 (4.01)	65.9 ± 5.32		
Marital status				
Married	222 (63.61)	69.6 ± 11.50	< 0.001	
Divorced/widowed	1 (0.29)	76.1 ± N/A		
Single/not married	50 (14.33)	63.4 ± 12.50		
Prefer not to disclose	76 (21.78)	65.3 ± 11.30		
Monthly family income (THB)	32,743.37 ± 17,454.60			
GA at the first prenatal care visit	13.43 ± 8.23			
Before or at GA 12 weeks	228 (65.33)	68.20 ± 12.00	0.312	
After GA12 weeks (Late ANC)	121 (34.67)	66.9 ± 11.60		
Gravida				
First pregnancy	150 (42.98)	66.8 ± 11.56	0.570	
Second pregnancy	115 (32.95)	70.1 ± 11.93		
Third pregnancy	52 (14.90)	69.8 ± 11.95		
Fourth pregnancy	21 (6.02)	69.0 ± 14.72		
Fifth or more pregnancy	11 (3.15)	66.8 ± 8.82		

Table 1. Socio-demographic characteristics (Cont.)

Variable	N (%) or	MHL	p-value ^a
	Mean ± SD	Mean ± SD	
Group health education			
Never attended the class	54 (15.47)	64.2 ± 10.50	0.040
Attending one class	63 (18.05)	67.5 ± 11.50	
Attending two classes	232 (66.48)	68.7 ± 12.10	
Underlying disease before pregnancy			
Yes	40 (11.46)	69.6 ± 9.16	0.268
No	309 (88.54)	67.5 ± 12.16	
Complication during pregnancy			
Yes	104 (29.80)	69.0 ± 10.70	0.275
No	245 (70.20)	67.2 ± 12.30	

Note. GA = Gestational age, THB = Thai Baht, ANC = Antenatal care

^aStatistical comparison between sub-categories of each variable were performed using ANOVA or t-tests as appropriate.

Sources of health information: Table 2 summarizes the health information sources reported by participants. Healthcare professionals were the most frequently cited source of health information (27.74%), followed by

antenatal care (ANC), books (25.83%), and the Internet (22.59%). Among family members providing health advice, parents were the primary source (34.95%), closely followed by husbands (33.01%).

Table 2. Health information sources

Health information sources	Number (%)
Healthcare professionals	291 (27.74)
ANC book	271 (25.83)
Internet	237 (22.59)
Television/radio	36 (3.43)
Mother/baby magazine	155 (14.78)
Family members/friends	37 (3.35)
Mother/father	216 (34.95)
Sister/brother	214 (20.06)
Grandmother/grandfather	23 (3.72)
Husband	204 (33.01)
Relatives	33 (5.34)
No family member advising	18 (2.91)
Leaflet	21 (2.00)
No health information resource	1 (0.10)

Maternal health literacy level: Table 3 summarizes the distribution of MHL scores across the study participants. The overall mean MHL score was 67.8 (SD = 11.9). Nearly half of the participants (47.85%) were categorized as having sufficient MHL, while approximately one-third (34.10%)

demonstrated limited MHL, highlighting a substantial proportion in this lower category. A smaller percentage of participants fell into the excellent and inadequate MHL categories. Significant differences were observed across all MHL categories ($p < 0.001$).

Table 3. Maternal health literacy level

Level of MHL	Number (%)	p-value ^a
Excellent	33 (9.45)	< 0.001
Sufficient	167 (47.85)	
Limited	119 (34.10)	
Inadequate	30 (8.60)	
Overall MHL (Mean ± SD)	67.8 ± 11.9	

Note. MHL = Maternal health literacy, ^aStatistical comparison between levels of MHL were performed using ANOVA.

Predictors of maternal health literacy: Table 4 presents the multiple linear regression analysis identifying predictors of MHL. Age was a significant positive predictor of MHL. Occupational categories, including company employees, business/merchant, and hired labourers, were also significantly associated with higher MHL scores. Additionally, participants with a bachelor's degree demonstrated significantly higher MHL scores. Marital status was another notable predictor, with

single or unmarried participants showing significantly lower MHL scores. Gestational age at the first prenatal care visit was another significant predictor, with later visits associated with lower scores. However, monthly family income, gravidity, the number of group health education sessions attended, underlying diseases before pregnancy, and pregnancy complications did not have statistically significant effects on MHL in this model.

Table 4. Multiple linear regression for analysis of predictors of maternal health literacy

Predictor	Estimate (β)	Standard error (SE)	95% Confidence interval		t-value	p-value
			Lower	Upper		
Intercept ^a	47.7809	6.444	35.1025	60.4593	7.4144	< 0.001
Age	0.3228	0.144	0.0403	0.6053	2.2481	0.025
Occupation						
Student/unemployed	4.7741	4.273	-3.6319	13.1800	1.1173	0.265
Company employee	4.2319	1.777	0.7365	7.7273	2.3819	0.018
Government officer/ State enterprise employee	4.1289	2.269	-0.3345	8.5923	1.8199	0.070
Business/merchant	5.9867	2.471	1.1252	10.8481	2.4227	0.016
Hired laborer	8.9739	3.091	2.8924	15.0554	2.9030	0.004
Other	4.4558	4.090	-3.5902	12.5018	1.0895	0.277
Housewife/unemployed	Ref					
Education Level						
Junior high school	5.6787	4.583	-3.3386	14.6960	1.2390	0.216
Senior high school	7.3735	4.426	-1.3341	16.0812	1.6659	0.097
Vocational diploma/associate degree	6.4374	4.599	-2.6113	15.4861	1.3996	0.163
Bachelor's degree	9.7789	4.497	0.9312	18.6266	2.1744	0.030
Higher than bachelor's degree	5.7247	5.594	-5.2812	16.7307	1.0233	0.307
Elementary school	Ref					
Marital status						
Divorced/widowed	10.8636	12.491	-13.7111	35.4384	0.8697	0.385
Single/not married	-4.6001	1.949	-8.4337	-0.7666	-2.3608	0.019
Prefer not to disclose	-2.0993	1.721	-5.4855	1.2868	-1.2197	0.223
Married	Ref					

Table 4. Multiple linear regression for analysis of predictors of maternal health literacy (Cont.)

Predictor	Estimate (β)	Standard error (SE)	95% Confidence interval		t-value	p-value
			Lower	Upper		
Monthly family income	-2.01e-6	4.02e-5	-8.10e-5	7.70e-5	-0.0501	0.960
GA at 1st prenatal care visit	-0.3245	0.134	-0.5890	-0.0600	-2.4135	0.016
Gravida						
Second pregnancy	0.3167	1.528	-2.6894	3.3229	0.2073	0.836
Third pregnancy	1.8711	2.056	-2.1743	5.9165	0.9100	0.364
Fourth pregnancy	2.5904	3.077	-3.4624	8.6432	0.8420	0.400
Fifth or more pregnancy	0.2532	3.706	-7.0375	7.5439	0.0683	0.946
First pregnancy	Ref					
Group health education						
Attending one class	1.9613	2.184	-2.3351	6.2578	0.8981	0.370
Attending two classes	2.4476	1.843	-1.1773	6.0725	1.3284	0.185
Never attended the class	Ref					
Disease in prior pregnancy						
Yes	0.5949	1.996	-3.3315	4.5214	0.2981	0.766
No	Ref					
Complication(s) during Pregnancy						
Yes	-0.0835	1.419	-2.8746	2.7076	-0.0588	0.953
No	Ref					

Model Fit Measures: R = 0.398, R² = 0.159, Adjusted R² = 0.0906, F = 2.33, p-value < 0.001

Note. ^a Represents reference level, Ref = Reference level, GA = Gestational age

The F-statistic of 2.33 and a p-value less than 0.001 indicated that the model is statistically significant, suggesting that the predictors have a statistically significant relationship with the outcome variable. However, the R² value of 0.159 indicates that the predictors explain only 15.9% of the variance in MHL.

Discussion

The key findings indicated that while most pregnant women had sufficient MHL, approximately one-third exhibited limited MHL. Significant factors influencing MHL levels included age, employment, educational level, marital status, and the timing of the first prenatal visit. In contrast, monthly household income, gravidity, participation in group health education, pre-existing conditions, and pregnancy complications were not significant predictors of MHL.

Maternal health literacy level

The findings showed that the majority of pregnant women had sufficient MHL, and approximately one-third exhibited limited MHL. These findings align with a previous study on term-pregnant women in urban Thailand, which also reported high MHL levels.¹¹ Furthermore, MHL was even higher during the COVID-19 pandemic,²⁵ supporting the Integrated Model of Health Literacy,¹⁵ identifying situational factors—such as public health crises—as influential in shaping health literacy levels. MHL in this study was higher than in low-income countries but lower than in high-income countries. In low-income countries, 83% of African American pregnant women and 80% of pregnant women in Laos had inadequate MHL,⁷ while in high-income countries like the United Arab Emirates, 71.6% had adequate MHL.¹² Although Thailand shows relatively high MHL, one-third of

pregnant women in this study still had limited MHL, even in urban areas. These disparities emphasize the need for targeted interventions to bridge gaps and improve MHL.

We found that healthcare professionals were the primary source of maternal health information, consistent with previous research indicating that pregnant women trust healthcare providers due to their expertise and direct involvement in prenatal care.⁷ This reliance may stem from interactions during group antenatal care sessions. Given their pivotal role, healthcare providers must deliver accurate, accessible, and culturally appropriate information to ensure effective communication with expectant mothers. The ANC book, as the second most common source, provides a structured and standardized form of health education, aligning with studies indicating that printed materials enhance maternal health literacy.²⁶ However, the effectiveness of the book depends on readability and relevance, particularly for populations with varying literacy levels. The Internet is an increasingly popular source of health information, reflecting the growing accessibility and convenience of digital platforms.²⁷ However, not all online sources are reliable, and misinformation may lead to poor health decisions during pregnancy. Directing pregnant women to credible, evidence-based online resources is essential to mitigate misinformation risks and support informed decision-making.

Regarding family members providing health information, parents were the primary source of health advice, followed by husbands, reflecting the central role of the family in health-related decision-making in Thailand. This finding aligns with a systematic review of perinatal health information-seeking behavior, identifying mothers and husbands as the most trusted sources.²⁸ The results underscore the influence of familial support on maternal health behaviors and highlight the need to involve family members in maternal health education to reinforce accurate information and promote positive health practices.

Personal determinants of maternal health literacy

MHL in this study was significantly influenced by age, employment, education level, and marital status. Pregnant women with a bachelor's degree,²⁹ those who were employed,³⁰ and those who were older,^{23,31} exhibited higher MHL scores while being single was a negative predictor.^{11,25,32} These findings align with studies showing that higher education enhances literacy skills,^{7,11,29,30} employment improves access to health information,^{30,33} and older individuals benefit from accumulated healthcare interactions.³¹ A study in Tehran found that age was positively associated with health literacy among pregnant women.³⁴ Similarly, research suggests that older individuals have greater health literacy due to accumulated life experiences and more frequent interactions with healthcare systems.³¹ However, some studies report a negative association between age and health literacy,^{11,29} possibly due to younger individuals' greater digital literacy,¹⁵ which facilitates access to maternal health resources.²⁷⁻²⁸ This contradiction underscores the importance of digital tools,^{31,35} and age-specific education programs to support younger or less-educated pregnant women in improving MHL.

Employment strongly predicted higher MHL, with women working in companies, business ownership, or merchant roles exhibiting significantly higher scores.³⁰ Structured employment settings provide access to health insurance and employer-provided health resources, contributing to higher MHL levels.³³ Community-based maternal health education, mainly through subsidized programs and partner involvement, may help address these disparities.³⁰

Education level was another significant predictor, with higher levels of education strongly linked to improved MHL. Previous studies found that education level and years of schooling significantly predicted MHL.^{7,29} Education enhances functional health literacy,² improving reading comprehension and the ability to interpret health-related information. Additionally,

higher education levels enhance digital literacy, allowing women to distinguish between credible information and misinformation.³⁵ To address disparities, maternal health programs should incorporate simplified language, visual aids, and interactive formats.^{2,7,11,25,32}

Marital status also played a key role, as married women benefited from more substantial social and emotional support,^{11,25,32} improving their access to maternal health information. In contrast, single pregnant women may struggle with limited financial and caregiving support, impacting their ability to access maternal health information. A study on ethnic minority women in Vietnam found that family networks play a crucial role in knowledge-sharing and decision-making during pregnancy.³⁶ Community-based programs can help strengthen social networks and provide targeted education for single mothers.³⁷⁻³⁸

Situational determinants of maternal health literacy

The timing of the first prenatal care visit significantly affected MHL, with later visits linked to lower MHL scores.³⁷ Early prenatal care ensures timely access to essential health information,³⁸ as women initiating care earlier receive more guidance from healthcare providers. A study in Thailand found that early prenatal care—defined as the first visit before 12 weeks—was strongly correlated with improved MHL.³⁸ Delayed visits reduce exposure to vital health education, often due to financial constraints, limited awareness, or cultural beliefs. Community outreach programs, family education, and telehealth consultations can improve early prenatal engagement and enhance MHL and accessibility to healthcare services.

Family income, gravidity, participation in group health education, pre-existing diseases, and pregnancy complications were not significant predictors of MHL. This contrasts with prior studies where these factors influenced MHL.^{7,11,34} However, Thailand's Universal Health Coverage may have minimized income-related disparities by providing free or affordable maternal healthcare.³⁹ The lack of association with group health

education suggests that quality and delivery methods are more critical than attendance alone. This finding highlights that interactive antenatal programs for specific literacy levels may improve maternal health outcomes.^{1,40}

Limitations

This study has some limitations. Firstly, using purposive sampling within a single tertiary hospital may limit the generalizability of the results. Secondly, the study relied on a self-reported questionnaire to assess MHL and predictor variables, which may introduce response bias and affect measurement accuracy. Self-reported sociodemographic data, such as family income, may be particularly susceptible to misreporting or recall bias, impacting the reliability of the findings. Thirdly, the multiple linear regression model explains only 15.9% of the variance in MHL. This suggests that additional unmeasured factors, such as social support, cultural beliefs, digital literacy, or healthcare system barriers, may significantly influence MHL. Moreover, the findings highlight the complexity of MHL, where multiple factors interact to influence literacy levels. Single-variable analyses should, therefore, be approached with caution, as they may not fully capture the interplay of sociodemographic and health-related factors. Thus, a causal model with a strong theoretical foundation and literature review should be developed and tested.

Conclusion and Implications for Nursing and Midwifery Practice

MHL among third-trimester pregnant women is influenced by age, occupation, education level, marital status, and the gestational age at the first prenatal visit. About one-third of women in this study exhibited inadequate MHL, highlighting the need for targeted interventions to address disparities. Antenatal education programs should focus on younger mothers, women with lower education levels, and

single mothers, as these groups are at higher risk for inadequate MHL. Healthcare providers should emphasize early prenatal visits to ensure timely health education and intervention. While group health education sessions are a critical component of prenatal care, their effectiveness may be enhanced by tailoring content and teaching methods better to address the needs of pregnant women with lower MHL. However, the limited variance in maternal health literacy explained by these factors indicates the presence of other influential predictors that remain unidentified. Future nursing research could explore broader models incorporating social support, cultural factors, and digital engagement, given that the current model explains only a fraction of MHL variance. Additionally, studies should include more extensive and diverse samples across multiple healthcare settings and employ probability sampling methods to improve generalizability.

Acknowledgments

The authors would like to express their sincere gratitude to the Royal Thai Army Nursing College for funding this research and to the participants in the study. Additionally, we extend our appreciation to the Antenatal Care Unit, Phramongkutklo Hospital, for serving as the data collection setting.

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การศึกษาแบบตัดขวางความรอบรู้ด้านสุขภาพในหญิงตั้งครรภ์ไตรมาสที่สาม : ปัจจัยทำนายด้านสังคมและประชากรที่สำคัญ

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บทคัดย่อ: ความรอบรู้ด้านสุขภาพของหญิงตั้งครรภ์มีความสำคัญต่อผลลัพธ์ด้านสุขภาพที่ดีของมารดาและทารก ซึ่งสะท้อนถึงความสามารถในการเข้าถึง เข้าใจ ประเมินและประยุกต์ใช้ข้อมูลด้านสุขภาพ ในระหว่างการตั้งครรภ์ การคลอดและหลังคลอด แต่อย่างไรก็ตาม งานวิจัยเกี่ยวกับระดับและปัจจัยที่มีอิทธิพลต่อความรอบรู้ด้านสุขภาพหญิงตั้งครรภ์ยังมีไม่มากนัก การศึกษาปัจจัยเหล่านี้มีความสำคัญต่อการพัฒนาแนวทางเพื่อส่งเสริมความรอบรู้ด้านสุขภาพของหญิงตั้งครรภ์และเสริมสร้างผลลัพธ์ด้านสุขภาพของมารดาและทารก การศึกษาแบบตัดขวางนี้มีวัตถุประสงค์เพื่อประเมินระดับความรอบรู้ด้านสุขภาพของหญิงตั้งครรภ์ไตรมาสที่สามและศึกษาปัจจัยที่มีอิทธิพลต่อระดับความรอบรู้ด้านสุขภาพในหญิงตั้งครรภ์ การศึกษานี้ใช้การสุ่มตัวอย่างแบบเจาะจงเพื่อเลือกผู้เข้าร่วมตามเกณฑ์การคัดเลือก ผู้ร่วมวิจัยคือหญิงตั้งครรภ์ไตรมาสที่สามจำนวน 349 คน ที่มารับบริการฝากครรภ์ ณ โรงพยาบาลระดับตติยภูมิแห่งหนึ่งในประเทศไทย แบบสอบถามความรอบรู้ด้านสุขภาพของหญิงตั้งครรภ์ซึ่งพัฒนาโดยผู้วิจัยถูกนำมาใช้ในการเก็บรวบรวมข้อมูล วิเคราะห์ข้อมูลใช้สถิติพรรณนาและการวิเคราะห์การถดถอยเชิงเส้นพหุคูณ

ผลการศึกษา พบว่า ร้อยละ 47.85 ของหญิงตั้งครรภ์มีระดับความรู้ด้านสุขภาพที่เพียงพอ ร้อยละ 34.10 มีระดับความรู้ด้านสุขภาพที่จำกัด ขณะที่ร้อยละ 9.45 และ 8.60 มีระดับความรู้ด้านสุขภาพในระดับดีเยี่ยมและไม่เพียงพอ ตามลำดับ บุคลากรทางการแพทย์เป็นแหล่งข้อมูลหลักด้านสุขภาพ รวมถึงมีพ่อแม่และสามีเป็นผู้ให้คำแนะนำด้านสุขภาพ ปัจจัยที่ส่งผลเชิงบวกต่อความรอบรู้ด้านสุขภาพ ได้แก่ การมีวุฒิการศึกษาในระดับปริญญาตรี การสมรส อาชีพ อายุ ส่วนปัจจัยที่ส่งผลเชิงลบต่อความรอบรู้ด้านสุขภาพ ได้แก่ การเป็นโสด การมาฝากครรภ์เมื่ออายุครรภ์ที่มาก ขณะที่ปัจจัยอื่นๆ เช่น รายได้ จำนวนครรภ์ การเข้าร่วมการให้ความรู้ด้านสุขภาพแบบกลุ่ม โรคประจำตัว และภาวะแทรกซ้อนระหว่างตั้งครรภ์ ไม่พบว่ามีอิทธิพลต่อระดับความรู้ด้านสุขภาพอย่างมีนัยสำคัญทางสถิติ โดยปัจจัยเหล่านี้สามารถอธิบายความแปรปรวนของระดับความรอบรู้ด้านสุขภาพได้เพียงร้อยละ 15.9 ผลการวิจัยนี้ชี้ให้เห็นว่าหนึ่งในสามของหญิงตั้งครรภ์ยังคงมีระดับความรู้เท่าทันสุขภาพมารดาที่จำกัด ดังนั้น พยาบาลควรให้ความสำคัญกับการพัฒนาโปรแกรมให้ความรู้ด้านสุขภาพที่มุ่งเน้นกลุ่มเป้าหมาย โดยเฉพาะในหญิงตั้งครรภ์ที่อายุน้อย มีระดับการศึกษาที่ไม่สูงและไม่สมรส อย่างไรก็ตามปัจจัยเหล่านี้สามารถอธิบายความแปรปรวนของความรอบรู้ด้านสุขภาพมารดาได้เพียงเล็กน้อย บ่งชี้ว่ายังมีปัจจัยสำคัญอื่น ๆ ที่ยังไม่ได้ศึกษา ดังนั้นการวิจัยในอนาคตควรศึกษาปัจจัยอื่น ๆ ที่มีอิทธิพลต่อความรอบรู้ด้านสุขภาพมารดา เช่น สถานะทางเศรษฐกิจและสังคม การสนับสนุนทางสังคม ความเชื่อทางวัฒนธรรม พื้นที่อยู่อาศัย และวิธีการคลอด นอกจากนี้พยาบาลและผดุงครรภ์ควรพิจารณาเนื้อหาและคุณภาพของการให้ความรู้ด้านสุขภาพแบบกลุ่มเพื่อเสริมสร้างระดับความรอบรู้ด้านสุขภาพมารดาให้ดียิ่งขึ้น

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คำสำคัญ: การให้ความรู้ ความรอบรู้ด้านสุขภาพของหญิงตั้งครรภ์ ปัจจัยทำนาย หญิงตั้งครรภ์ การฝากครรภ์ ประเทศไทย

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