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Association Between Pregnant Women's Knowledge and Coffee Consumption During Pregnancy at Meureubo Public Health Center, West Aceh Regency

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Abstract

Coffee drinking is deeply rooted in daily social life in Aceh, whereas high caffeine intake during pregnancy has been associated with pregnancy loss and low birth weight. Whether caffeine-related knowledge still matters for pregnant women's behavior in a setting where coffee drinking is culturally normalized has rarely been examined. This study aimed to examine the relationship between pregnant women's knowledge about coffee consumption during pregnancy and their self-reported coffee consumption at Meureubo Public Health Center, West Aceh. A correlational study with a cross-sectional design was conducted in June–July 2026 among 34 pregnant women recruited through total sampling. Knowledge and coffee consumption were measured with structured questionnaires; the outcome was any versus no self-reported coffee consumption during the current pregnancy, and the amount of caffeine was not quantified. Data were analysed using the Fisher–Freeman–Halton exact test. Most respondents had moderate knowledge (55.88%), 32.35% had poor knowledge, and 58.82% reported drinking coffee during pregnancy. Among women with poor knowledge, 90.91% reported coffee consumption, compared with 43.48% of those with good or moderate knowledge. Knowledge was significantly associated with reported coffee consumption ($p = 0.014$). Because consumption was not quantified, the findings do not indicate that coffee-drinking respondents exceeded recommended caffeine limits. Nevertheless, they suggest that, even within a coffee-drinking culture, caffeine-specific knowledge is a modifiable factor that antenatal counselling can address by explaining safe caffeine limits and common caffeine sources, alongside the social and family norms that support coffee drinking.

Keywords : *Antenatal education, caffeine, coffee consumption, knowledge, pregnant women*

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INTRODUCTION

Pregnancy is a period during which maternal dietary intake directly influences fetal growth and development, making maternal eating and drinking habits particularly important. One common habit among pregnant women is coffee consumption. Caffeine in coffee can cross the placenta, while the fetus and placenta have limited capacity to metabolize it, allowing caffeine to remain longer in fetal circulation (Wilson, 2018; Cornelis, 2019). A large prospective cohort study showed that maternal caffeine intake was associated with an increased risk of fetal growth restriction, and this risk remained evident throughout pregnancy (CARE Study Group, 2008). Caffeine intake has also been associated with lower birth weight (Sengpiel et al., 2013), while dose–response meta-analyses have shown that the risks of low birth weight and miscarriage increase with higher daily caffeine intake (Chen et al., 2014, 2016; Rhee et al., 2015). In addition, coffee inhibits the absorption of non-heme iron from food (Morck et al., 1983), potentially exacerbating the already high risk of anemia among pregnant women.

Several organizations have established limits for caffeine intake during pregnancy. The World Health Organization recommends that pregnant women with high caffeine intake, defined as more than 300 mg per day, reduce their consumption to lower the risk of miscarriage and low birth weight (World Health Organization, 2016). The American College of Obstetricians and Gynecologists (2010) and the European Food Safety Authority (EFSA Panel on Dietetic Products, Nutrition and Allergies, 2015) consider an intake of approximately 200 mg per day or less not to raise safety concerns for the fetus. This limit can easily be exceeded in Aceh. Measurements of brewed coffee served in coffee

shops in Banda Aceh found that Gayo coffee contained 51–197 mg of caffeine per serving (Riyanti et al., 2020), meaning that two cups of Gayo coffee in one day may already exceed the 200 mg limit.

This issue is particularly important in Aceh because drinking coffee is not merely a personal habit but an everyday social practice passed down through generations. In the service area of Meureubo Public Health Center, West Aceh Regency, 83 pregnant women attended antenatal examinations over the preceding three months, including 38 who visited in June 2026. The researchers' preliminary survey found that many pregnant women continued to drink coffee during pregnancy and that most were unaware that coffee contains caffeine that may affect the fetus.

Theoretically, knowledge provides the foundation for health-related attitudes and behaviors; individuals who understand the risks of a behavior tend to be better able to regulate it (Notoatmodjo, 2020). However, knowledge alone rarely explains behavior. The theory of planned behavior holds that behavior is also shaped by attitudes, subjective norms, and perceived behavioral control (Ajzen, 1991), and habit research shows that behaviors repeated frequently in stable contexts, such as a daily cup of coffee at home or in a coffee shop, can be triggered automatically with little deliberation (Wood & Neal, 2007). Evidence on knowledge and caffeine intake in pregnancy is accordingly mixed: among Polish pregnant and breastfeeding women, general nutritional knowledge was not significantly related to caffeine intake, although women had limited understanding of the safe caffeine dose specifically (Myszkowska-Ryciak, 2025). Among Indonesian pregnant women, knowledge levels have been associated with other health behaviors and outcomes, including anemia (Salsabila et al., 2025), nutritional status (Rafif et al., 2023), and chronic energy deficiency (Muliyana & Azizah, 2025), but these studies did not examine coffee or caffeine. Regarding caffeine specifically, a descriptive study in Deli Serdang found that approximately half of pregnant women had poor knowledge of caffeine's effects on pregnancy and the fetus, which was associated with limited information and counseling from health professionals (Karlinah, 2019).

Knowledge may nevertheless remain independently relevant in a community where coffee drinking is culturally normalized. When social norms and family practices present coffee as an ordinary and harmless beverage, pregnant women have few cues to question the habit unless they know that coffee contains caffeine, that caffeine reaches the fetus, and that risks increase with the amount consumed. Caffeine-specific knowledge can therefore turn a habitual, socially supported behavior into a deliberate choice, and, unlike cultural norms, it can be directly modified through antenatal counseling. Previous Indonesian studies on caffeine and pregnancy have generally been descriptive, reporting pregnant women's knowledge levels without testing their association with coffee consumption behavior, and few studies have been conducted in coffee-producing regions with a strong coffee-drinking culture, such as Aceh. The present study contributes by examining whether caffeine-related knowledge is associated with reported coffee consumption in this cultural setting, providing initial evidence on whether knowledge-based antenatal education is a relevant entry point even where coffee drinking is a shared social practice. This study aimed to analyze the relationship between pregnant women's knowledge and coffee consumption during pregnancy at Meureubo Public Health Center, West Aceh Regency.

RESEARCH METHODS

This was a quantitative correlational study using a *cross-sectional* approach, in which the independent and dependent variables were measured at the same point in time (Nursalam, 2020). The study was conducted at the Meureubo Public Health Center (UPTD), Meureubo District, West Aceh Regency, in June–July 2026. This outpatient public health center serves 28 gampong (villages) across an area of 112.87 km², including eight villages classified as very remote. The study population comprised pregnant women attending antenatal examinations at Meureubo Public Health Center. Participants were selected using *total sampling*, whereby all pregnant women meeting the inclusion criteria were included as respondents (Nursalam, 2020). The inclusion criteria were being in the first, second, or third trimester of pregnancy and being willing to participate. A total of 34 pregnant women met the criteria and completed the study.

The independent variable was pregnant women's knowledge of coffee consumption during pregnancy, measured using a 15-item questionnaire with yes/no response options adapted from. Each correct answer was scored 1 and each incorrect answer 0, giving a total score of 0–15. Scores were categorized as good (10–15; ≥66.7% of the maximum score), moderate (7–9; 46.7–60.0%), or poor

(<7; <46.7%). The dependent variable was coffee consumption during pregnancy, assessed using a 13-item questionnaire adapted from Vinsensia (2019), which asked about [[AUTHORS: summarize item content, e.g., frequency, number of cups, and type of coffee]]. For analysis, respondents who reported drinking coffee at any time during the current pregnancy were classified as consuming coffee (yes) and the others as not consuming coffee (no). This dichotomous classification was used because the small sample did not permit stable analysis of finer consumption categories; it therefore indicates whether coffee was consumed, not the frequency, serving size, preparation method, or caffeine dose, and was not interpreted as a measure of excessive caffeine exposure. Both instruments had been tested in previous studies, with *Cronbach's alpha* reliability coefficients of 0.956 for the knowledge questionnaire and 0.908 for the coffee consumption questionnaire. [Respondent characteristics included age, gravidity, education, occupation, and income.

Data were collected by distributing questionnaires directly to respondents after the researchers explained the study objectives and the respondents signed informed consent forms. To minimize response bias, particularly social desirability bias in reporting coffee consumption, respondents were informed that there were no right or wrong answers and that their responses would not affect the antenatal services they received; questionnaires contained no names and were completed individually, and the researchers were available only to clarify item wording without suggesting answers processed through editing, coding, scoring, entry, and tabulation, followed by univariate and bivariate analyses. Univariate analysis presented the frequency and percentage distributions of each variable. The *chi-square* test was initially planned for the bivariate analysis. However, because 3 of the 6 cells (50%) in the 3 × 2 contingency table had expected frequencies below 5, the assumptions of the *chi-square* test were not met; therefore, the Fisher–Freeman–Halton exact test was used at a significance level of $\alpha = 0.05$. In an additional analysis, knowledge was grouped into poor and good–moderate categories to calculate the *odds ratio* (OR) and its 95% confidence interval.

RESULTS AND DISCUSSION

Respondent Characteristics

Respondent characteristics are presented in Table 1. Most respondents were aged 20–35 years (88.24%), were multigravida (67.65%), had completed junior high school (61.76%), worked in the private sector (47.06%), and earned less than IDR 1,385,000 per month (76.47%). The predominance of junior high school education and low income may indicate limited access to health information, although access to information was not measured directly; if so, education delivered in simple, accessible language would be important.

Table 1. Characteristics of Respondents at Meureubo Public Health Center, West Aceh Regency, 2026 (n = 34)

Characteristics	n	%
Age (years)		
<20	0	0.00
20–35	30	88.24
>35	4	11.76
Gravidity		
Primigravida	11	32.35
Multigravida (including grand multigravida)	23	67.65
Education		
Elementary school	4	11.76
Junior high school	21	61.76
Senior high school	9	26.47
Occupation		
Homemaker	12	35.29
Private-sector employee	16	47.06
Other	6	17.65
Monthly income		
<IDR 1,385,000	26	76.47

Characteristics	n	%
≥IDR 1,385,000	8	23.53

Source: Primary data, 2026

Pregnant Women's Knowledge and Coffee Consumption

Table 2 shows that more than half of respondents had moderate knowledge (55.88%), approximately one-third had poor knowledge (32.35%), and only 11.76% had good knowledge. A total of 20 respondents (58.82%) consumed coffee during pregnancy.

Table 2. Distribution of Pregnant Women's Knowledge and Coffee Consumption (n = 34)

Variable	n	%
Knowledge of coffee consumption during pregnancy		
Good	4	11.76
Moderate	19	55.88
Poor	11	32.35
Coffee consumption during pregnancy		
Yes	20	58.82
No	14	41.18

Source: Primary data, 2026

Relationship Between Knowledge and Coffee Consumption During Pregnancy

Table 3 demonstrates a clear gradient. The proportion of pregnant women who consumed coffee increased as knowledge levels decreased: 25.00% among those with good knowledge, 47.37% among those with moderate knowledge, and 90.91% among those with poor knowledge. The Fisher–Freeman–Halton exact test indicated a statistically significant association between knowledge and coffee consumption during pregnancy ($p = 0.014$). When knowledge was divided into two groups, 90.91% of women with poor knowledge consumed coffee, compared with 43.48% of women with good or moderate knowledge (OR = 13.0; 95% CI: 1.42–119.1).

Table 3. Relationship Between Pregnant Women's Knowledge and Coffee Consumption During Pregnancy

Knowledge	Coffee consumption: Yes n (%)	Coffee consumption: No n (%)	Total n (%)	p-value
Good	1 (25.00)	3 (75.00)	4 (100)	0.014[a]
Moderate	9 (47.37)	10 (52.63)	19 (100)	
Poor	10 (90.91)	1 (9.09)	11 (100)	
Total	**20 (58.82)**	**14 (41.18)**	**34 (100)**	

Fisher–Freeman–Halton exact test; 3 of 6 cells (50%) had expected frequencies <5. Source: Primary data, 2026

This study found a significant association between pregnant women's knowledge and reported coffee consumption during pregnancy, with a graded pattern: the lower the knowledge level, the higher the proportion of women who reported drinking coffee. Almost all women with poor knowledge (10 of 11) reported coffee consumption. This pattern is consistent with Notoatmodjo's (2020) view that knowledge provides a foundation for health behavior: women who are unaware that coffee contains caffeine, or who do not understand its potential dose-dependent effects on the fetus, may have little reason to reconsider their consumption. The finding differs from that of Myszkowska-Ryciak (2025), who found no significant association between nutritional knowledge and caffeine intake among Polish pregnant and breastfeeding women. The difference may partly reflect the type of knowledge measured: the present instrument focused specifically on coffee and caffeine in pregnancy,

whereas general nutritional knowledge may not capture awareness of caffeine risks. Indonesian studies linking maternal knowledge with anemia (Salsabila et al., 2025) and chronic energy deficiency (Muliyana & Azizah, 2025) support the broader relevance of knowledge to maternal health, but they concern different behaviors and outcomes and therefore cannot be taken as direct confirmation of the present result.

Alternative explanations should also be considered. Because knowledge and coffee consumption were measured at the same time, the direction of the association cannot be established; women who habitually drink coffee may, for example, pay less attention to or discount information about caffeine, rather than drinking coffee because they lack knowledge. The association may also be confounded by education, income, gravidity, or household coffee-drinking practices, which were not controlled in the analysis. In addition, the very wide confidence interval for the odds ratio (1.42–119.1) indicates that the strength of the association was estimated imprecisely, so the result should be regarded as preliminary.

The distribution of respondents' knowledge, dominated by moderate and poor categories, resembles findings from Deli Serdang, where approximately half of pregnant women had poor knowledge of caffeine's effects (Karlinah, 2019), and from Poland, where women had limited understanding of the safe caffeine dose despite good general nutritional knowledge (Myszkowska-Ryciak, 2025). These similarities suggest that information about caffeine may not yet be a prominent component of antenatal education. The small proportion of women with good knowledge may also relate to the respondents' characteristics, as most had only junior high school education and low incomes; however, the relationship between these characteristics and knowledge was not tested in this study, so this explanation remains tentative.

Aceh's cultural context may help explain why poor knowledge was so closely associated with coffee consumption, although cultural norms, family practices, and previous pregnancy experiences were not measured in this study; the following explanations are therefore possible interpretations rather than empirical findings. In Aceh, coffee is part of daily social interactions, family gatherings, and visits to coffee shops; in such a setting, drinking coffee may be perceived as normal and harmless. Because most respondents were multigravida, women who drank coffee during previous pregnancies without noticeable problems may also have come to regard the habit as safe. Such a perception would not be well founded, because effects associated with high caffeine intake, such as fetal growth restriction and lower birth weight, do not necessarily cause symptoms that mothers can directly perceive (CARE Study Group, 2008; Sengpiel et al., 2013). At the same time, coffee consumption should not be equated with excessive caffeine exposure: current guidance does not require complete avoidance, and an intake of approximately 200 mg of caffeine per day or less is not considered a safety concern for the fetus (American College of Obstetricians and Gynecologists, 2010; EFSA Panel on Dietetic Products, Nutrition and Allergies, 2015). Because the caffeine content of Gayo coffee may approach 200 mg per serving (Riyanti et al., 2020), two servings a day could exceed this level, particularly if combined with tea and other caffeinated beverages. However, as the number of cups and daily caffeine intake were not measured, this study cannot determine how many of the coffee-drinking respondents actually exceeded the recommended limit.

These findings have several practical implications for antenatal counseling at Meureubo Public Health Center and similar primary care settings, although they should be applied cautiously given the single-facility design. First, because poor knowledge was concentrated among women who reported drinking coffee, midwives could routinely ask about coffee and other caffeinated beverages during antenatal visits and use the answer as an opportunity for brief, targeted education. Second, counseling, which has generally focused more on physical examinations and general nutrition, should address caffeine explicitly: safe daily intake limits, estimated caffeine content per cup of locally prepared coffee, other caffeine sources such as tea and energy drinks, and advice to avoid drinking coffee or tea at the same time as iron supplements because these beverages can inhibit iron absorption (Morck et al., 1983). Third, because coffee drinking is a shared social practice, a realistic message emphasizing a reduction in the number or strength of servings rather than complete prohibition may be more acceptable, and involving husbands and family members in prenatal classes may help address household norms that knowledge alone cannot change. Whether such counseling actually reduces caffeine intake should be tested in intervention studies.

This study has several limitations. The sample was small and drawn from a single public health center, resulting in a very wide confidence interval for the odds ratio; the findings therefore describe the situation at this facility and cannot be generalized to pregnant women in Aceh or Indonesia without further studies. The cross-sectional design precludes causal inference, and potential confounding factors such as education, income, and pregnancy history were not statistically controlled. Coffee consumption was self-reported and classified dichotomously, so neither frequency, serving size, preparation method, other caffeine sources, nor daily caffeine intake in milligrams was determined, and social desirability may have led to under-reporting. Cultural norms, family influence, and habit strength, which may shape coffee consumption independently of knowledge, were not measured. Future research should use larger samples from multiple health centers, quantify caffeine exposure from all sources using tools such as beverage diaries or validated caffeine intake questionnaires, incorporate culturally informed measures of social norms, family influence, and habit, adjust for confounders using multivariable analysis, and evaluate the effectiveness of caffeine education interventions in antenatal care.

CONCLUSION

At Meureubo Public Health Center, West Aceh Regency, pregnant women's knowledge of coffee consumption during pregnancy was predominantly moderate or poor, and more than half of the women reported drinking coffee during pregnancy. Knowledge was significantly associated with reported coffee consumption, following a graded pattern: almost all women with poor knowledge reported drinking coffee, whereas the proportion was substantially lower among those with good or moderate knowledge. These findings concern self-reported coffee consumption rather than objectively measured caffeine intake or pregnancy outcomes; they do not show that coffee-drinking respondents exceeded safe caffeine limits or experienced adverse effects. Because they come from a single facility with a small sample, they should be regarded as preliminary local evidence rather than a basis for broad maternal health policy. Within these limits, the results support including brief, caffeine-specific information, namely safe intake limits, the caffeine content of local coffee, other caffeine sources, and the timing of coffee consumption relative to iron supplements, in routine antenatal counseling at this facility. Future studies should measure caffeine exposure from all sources more comprehensively and use culturally informed behavioral assessments that capture social norms, family influence, and habit alongside knowledge.

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