

Knowledge, attitudes, and practices regarding thyroid disorders among pregnant women: study at a primary care clinic in Surabaya

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ABSTRACT: Thyroid disorders during pregnancy are significant endocrine issues that pose risks of maternal and fetal complications, such as preeclampsia and impaired fetal neurological development. Early detection is heavily influenced by the knowledge and health behaviour of pregnant women. This study aims to evaluate the Knowledge, Attitude, and Practice (KAP) regarding thyroid disorders among pregnant women at a primary care clinic in Surabaya. An analytical observational study with a cross-sectional design was conducted on 122 pregnant women selected through consecutive sampling. Data were collected using a validated structured questionnaire and analyzed using descriptive statistics and Spearman's correlation test. The majority of participants were within the healthy reproductive age range (20–35 years) with high school level. Findings indicated that most participants possessed adequate knowledge, positive attitudes, and good practices. Inferential analysis revealed a significant correlation between knowledge and attitude ($p = 0.021$) and between knowledge and practice ($p < 0.001$), but no correlation between attitude and practice ($p = 0.424$). This study indicates that enhancing pregnant women's understanding of thyroid disorder risks directly contributes to the formation of proactive attitudes, which ultimately encourages better early detection and prevention of pregnancy complications.

KEYWORDS: Attitude; knowledge; practice; pregnant women; thyroid disorders.

INTRODUCTION

Thyroid disorders in pregnancy

Thyroid disorders are prevalent endocrine conditions affecting women during their reproductive age [1]. During pregnancy, significant physiological changes occur that influence the endocrine system, including elevated levels of human chorionic gonadotropin (hCG), increased thyroxine-binding globulin (TBG), and metabolic alterations [2]. These changes, coupled with heightened metabolic demands, substantially escalate the requirement for thyroid hormones. In women with limited thyroid reserve or underlying predisposition, such demands can precipitate the onset of hypothyroidism or hyperthyroidism, potentially compromising maternal and fetal outcomes.[3]

Impacts and screening challenges

Subclinical hypothyroidism is the most frequently encountered form of thyroid disorder during pregnancy [4]. This condition is typically asymptomatic, making it potentially undetectable without systematic laboratory screening [5]. Undiagnosed thyroid disorders can increase the risk of spontaneous abortion, anemia, preeclampsia, fetal growth restriction, preterm birth, and impaired cognitive development in children later in life [6-8]. Despite these significant impacts, thyroid function testing has not yet become a universal routine screening in all antenatal care facilities in Indonesia [9]. Currently, screening remains risk-based or indicated only by clinical suspicion, potentially leaving a substantial number of cases undiagnosed in primary care settings [3].

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The role of knowledge, attitude, and practice (KAP)

A pregnant woman's knowledge regarding the symptoms, risk factors, and impacts of thyroid disorders becomes a crucial factor in driving proactive attitudes and early detection practices[10]. According to established health behavior models, explain that knowledge influences the formation of attitudes, which subsequently determine health actions or practices.[11] The Knowledge, Attitude, and Practice (KAP) framework is thus an essential tool for evaluating maternal readiness to engage with thyroid health issues.[12] Evaluating these variables is essential for identifying information gaps that influence health behavior and for developing targeted antenatal education strategies.[11,12] This study aims to analyze KAP levels among pregnant women at a primary clinic, Surabaya, and to evaluate the correlations between these variables to provide a baseline for improved primary care interventions.

▪ MATERIALS AND METHODS

Study design and setting

This study employed a quantitative observational approach with a cross-sectional design. Descriptive and inferential analyses were conducted to evaluate sociodemographic profiles and their associations with the KAP of pregnant women regarding thyroid disorders. The study was conducted at a primary care clinic in Surabaya, Indonesia from December 2 to 22, 2025.

Population and sampling

The study population comprised all pregnant women undergoing antenatal care (ANC) at the study site during the recruitment period. Using Lwanga and Lemeshow's formula for cross-sectional studies, the minimum required sample size was calculated as 97. To account for a potential 20% drop-out rate, the sample size was increased, resulting in a total of 122 participants were recruited using a consecutive sampling technique.

Inclusion and exclusion criteria

Inclusion criteria were: (1) pregnant women attending ANC examinations; (2) aged 18–45 years; and (3) possessing effective communication skills and willingness to participate. Exclusion criteria included: (1) pregnant women referred to hospitals due to severe comorbidities (e.g., preeclampsia, eclampsia, gestational diabetes, or heart disease) or high-risk obstetric histories; and (2) participants with incomplete questionnaire submissions.

Research instrument

Data were collected using a structured, self-administered questionnaire adapted from Han et al. [12]. The instrument was tailored to the pregnancy context and consisted of three domains: knowledge (10 items), attitude (7 items), and practice (8 items). Responses for each domain were measured on a 4-point scale: Knowledge ('Very Knowledgeable' [4] to 'Not Knowledgeable at All' [1]); Attitude ('Strongly Agree' [4] to 'Strongly Disagree' [1]); and Practice ('Always' [4] to 'Never' [1]). Total domain scores were obtained by summing all item scores within each domain. Levels of knowledge, attitude, and practice were subsequently categorized using Bloom's cut-off points: 'good' (80%–100% of the maximum score), 'moderate' (60%–79%), and 'poor' (<60%). These categorized results were tabulated to facilitate interpretation.

Validation and distribution

The adaptation process involved forward-backward translation, expert judgment for content validity, and a pilot test to ensure internal consistency (Cronbach's $\alpha > 0.70$). The questionnaire was distributed via both digital (Google Forms) and printed formats, following a brief study orientation and the signing of informed consent.

Data analysis

Data were analyzed using IBM SPSS Statistics version 30. Descriptive statistics summarized participants characteristics and KAP distributions. The correlations between sociodemographic variables and KAP scores were analyzed using the Spearman Rank correlation test, with statistical significance set at ($p < 0.05$).

Ethical approval

This study was approved by the Research Ethics Committee of the University of Surabaya (No: 752/KE/XII/2025). All procedures were carried out in accordance with the principles of research ethics, including obtaining administrative permission from clinic management.

RESULTS

Characteristics of participants

This study involved 122 pregnant women undergoing antenatal care at a primary care clinic from December 2 to 22, 2025. The sociodemographic characteristics are summarized in Table 1. Majority of participants were within the healthy reproductive age group (20–35 years). Based on education level, most participants had completed high school level. In terms of occupational status, the majority of participants were not employed (52.46%), specifically identifying as housewives. The formal sector accounted for 34.43% of the sample, comprising civil servants, permanent employees, and registered professionals. Meanwhile, the remaining 13.11% of participants were self-employed, ranging from small-scale entrepreneurs to farmers and online business managers.. This distribution indicates a predominance of reproductive-aged women with theoretically adequate access to health information.

Table 1. Demographic characteristics.

Sociodemographic characteristics		Frequency (n=122)	Percentage (%)
Age	<20 years	1	0.82
	20-35 years	113	92.62
	>35 years	8	6.56
Education level	Junior High School	9	7.38
	Senior High School	62	50.82
	Higher Education (Diploma, Bachelor, Master, Doctoral degree)	51	41.80
Occupation	Formal (Permanent employee, Civil servant, State-owned enterprise employee, Long-term contract employee, Registered professional, Permanent medical staff)	42	34.43
	Not employed (Housewife)	64	52.46
	Self-employed (Small entrepreneur, Medium entrepreneur, Livestock farmer, Farmer, Online business manager)	16	13.11
Parity	0	46	37.70
	1	38	31.15
	≥2	38	31.15
Gestational trimester	1	36	29.51
	2	48	39.34
	3	38	31.15

The characteristic of knowledge, attitude and practice

The characteristics of maternal knowledge regarding thyroid disorders, based on participants' answers, are presented into three groups: sufficient knowledge, lower knowledge, and significant knowledge gap. 'Sufficient knowledge' combines the highest positive answers, while the latter two reflect declining levels of knowledge based on negative answers. Table 2 details the frequencies of participants' responses to specific items in the knowledge domain, categorized by the level of knowledge (n=122).

Pregnant women at a primary care clinic in Surabaya demonstrated sufficient knowledge regarding the fundamental impacts and detection methods. A majority of participants (67.2%, n=82) correctly identified that thyroid disorder, which includes both hyperthyroidism and hypothyroidism, can adversely affect fetal brain development and neonatal conditions (K1). The same proportion (67.2%, n=82) also recognized that thyroid function tests during pregnancy are crucial for timely detection and management, thereby reducing these adverse effects on the fetus (K4).

A lower level of knowledge was observed regarding the physiological changes and psychological impacts of thyroid disorder. Only 59.01% (n=72) of participants understood that increased fetal thyroid hormone demands during pregnancy lead to a corresponding increase in maternal hormone requirements (K8). Furthermore, 59.01% (n=72) were aware that thyroid disorder could influence the mother's emotional state, increasing the risk of anxiety and depression (K10).

The most significant knowledge gap concerned the postpartum management of thyroid conditions. Less than half of the participants (48.36%, n=59) knew that maternal thyroid hormone levels do not immediately return to normal after delivery, particularly in women with pre-existing hypothyroidism (K9).

Table 2. Responses to knowledge questions.

	Participants' responses n (%)			
	Very knowledgeable	Fairly knowledgeable	Not knowledgeable	Not knowledgeable at all
Thyroid disorder includes hyperthyroidism and hypothyroidism, which may affect fetal brain development and neonatal condition (K1)	11 (9.02)	71 (58.20)	34 (27.87)	6 (4.92)
Hyperthyroidism may increase the risk of pregnancy-induced hypertension (K2)	14 (11.48)	66 (54.10)	38 (31.15)	4 (3.28)
Thyroid hormones play an essential role in fetal brain development; dysfunction may lead to cognitive impairment in children (K3)	11 (9.02)	68 (55.74)	38 (31.15)	5 (4.10)
Thyroid function tests during pregnancy can timely detect and manage thyroid disorder, reducing adverse effects on the fetus (K4)	17 (13.93)	65 (53.28)	35 (28.69)	5 (4.10)
Autoimmune thyroid diseases (e.g., thyroiditis) may increase the risk of pregnancy complications (K5)	14 (11.48)	54 (44.26)	48 (39.34)	6 (4.92)
Untreated or inadequately treated thyroid disorder during pregnancy may lead to sudden hormonal imbalance during labor/surgery/infection or inappropriate discontinuation of medication, endangering maternal and fetal safety (K6)	7 (5.74)	67 (54.92)	42 (34.43)	6 (4.92)
Severe and uncontrolled thyroid disorder may cause miscarriage, preterm birth, fetal growth restriction, and fetal thyroid disorder /goiter (K7)	14 (11.48)	65 (53.28)	36 (29.51)	7 (5.74)
Increased fetal thyroid hormone demand during pregnancy increases maternal thyroid hormone requirements (K8)	17 (13.93)	55 (45.08)	45 (36.89)	5 (4.10)
After delivery, maternal thyroid hormone levels do not immediately return to normal, especially in women with prior hypothyroidism (K9)	11 (9.02)	48 (39.34)	56 (45.90)	7 (5.74)
Thyroid disorder may affect maternal emotional condition, increasing the risk of anxiety and depression (K10)	19 (15.57)	53 (43.44)	44 (36.07)	6 (4.92)

Responses in the attitude domain showed that the vast majority of participants had a positive attitude. However, regarding the question of whether thyroid disorder during pregnancy affected their postnatal emotional state (A5) and ability to breastfeed (A6), 6.56% and 5.74% were negative, respectively. Regarding negative attitudes, a minimal proportion of respondents (0.82%, n=1) expressed disagreement with each of the three key statements. Specifically, this applied to the importance of understanding thyroid disorder during pregnancy (A1), the necessity of routine thyroid function testing (A3), and the benefits of a reasonable increase in iodine-rich food intake for maternal and fetal health (A7). (Table 3).

Table 3. Responses to attitude questions.

	Participants' responses n (%)			
	Strongly agree	Agree	Disagree	Strongly disagree
I believe it is important to understand thyroid disorder during pregnancy (A1)	46 (37.70)	75 (61.48)	1 (0.82)	0 (0.00)
I am willing to undergo routine thyroid function testing during pregnancy (A2)	23 (18.85)	97 (79.51)	2 (1.64)	0 (0.00)
I believe thyroid disorders during pregnancy may affect fetal health (A3)	33 (27.05)	88 (72.13)	1 (0.82)	0 (0.00)
I am willing to actively comply with medical treatment plans to manage thyroid disorder during pregnancy (A4)	23 (18.85)	94 (77.05)	5 (4.10)	0 (0.00)
I believe thyroid disorder during pregnancy may affect my emotional condition after childbirth (A5)	18 (14.75)	96 (78.69)	8 (6.56)	0 (0.00)
I believe thyroid disorder during pregnancy may affect my ability to breastfeed (A6)	13 (10.66)	102 (83.61)	7 (5.74)	0 (0.00)
I believe increasing iodine-rich food intake during pregnancy is beneficial for both mother and fetus (A7)	53 (43.44)	68 (55.74)	1 (0.82)	0 (0.00)

In terms of related practices, 58.20% of participants never undergo thyroid function testing at every antenatal visit (P1). Furthermore, answers regarding specific postpartum practices (P2 and P3) were omitted by a substantial proportion of respondents. These participants indicated they were not applicable (N/A) for these items because they never took thyroid hormone medication regularly during pregnancy (P2), and never proactively consulted doctors about abnormal thyroid function during pregnancy for knowledge and information (P3). (Table 4).

Table 4. Responses to practice questions.

	Participants' responses n (%)			
	Always	Often	Rarely	Never
I undergo thyroid function testing at every antenatal visit (P1)	2 (1.64)	4 (3.28)	45 (36.89)	71 (58.20)
I regularly take thyroid hormone medication during pregnancy (if diagnosed) (P2)	-	-	-	-
I proactively consult my doctor regarding thyroid disorders during pregnancy (if diagnosed) (P3)	-	-	-	-
I follow medical advice regarding diet and lifestyle during pregnancy (P4)	84 (68.85)	34 (27.87)	4 (4.92)	-
I regularly monitor my weight during pregnancy (P5)	81 (66.39)	35 (28.69)	6 (4.92)	-
I actively participate in pregnancy exercises (e.g., prenatal exercise, yoga, light walking) as recommended (P6)	29 (23.77)	39 (31.97)	44 (36.07)	10 (8.20)
I try to reduce stress and anxiety during pregnancy (P7)	65 (53.28)	41 (33.61)	14 (11.48)	2 (1.64)
I avoid overexertion and fatigue, maintain a healthy daily routine (P8)	66 (54.10)	44 (36.07)	11 (9.02)	1 (0.82)

Note: Items P2 and P3 were applicable only to respondents with a history or diagnosis of thyroid disorders. 'Not Applicable' (N/A) responses were excluded from the total practice score calculation.

Distribution of total knowledge, attitude, and practice (KAP) scores

The overall assessment of Knowledge, Attitude, and Practice (KAP) among the 122 pregnant women is summarized in Table 5.

Table 5. Levels of knowledge, attitude, and practice among participants.

Domain	Category	<20 years n(%)	20-35 years n(%)	>35 years n(%)	Total n(%)
Knowledge	Poor	1 (100.0)	31 (21.4)	4 (50.0)	36 (295)
	Moderate	0 (0.0)	65 (57.5)	2 (25.0)	67 (549)
	Good	0 (0.0)	17 (15.0)	2 (25.0)	19 (156)
Attitude	Poor	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)
	Moderate	1 (100.0)	64 (56.6)	5 (62.5)	70 (57.4)
	Good	0 (0.0)	49 (43.4)	3 (37.5)	52 (42.6)

Domain	Category	<20 years n(%)	20-35 years n(%)	>35 years n(%)	Total n(%)
Practice	Poor	0 (0.0)	7 (6.2)	0 (0.0)	7 (5.7)
	Moderate	1 (100.0)	66 (58.4)	4 (50.0)	71 (58.2)
	Good	0 (0.0)	40 (35.4)	4 (50.0)	44 (36.2)

In the knowledge domain, the majority of respondents possessed a moderate level of knowledge (54.9%, n=67). However, a significant nearly one-third of the participants (29.5%, n=36) were categorized as having poor knowledge, while only 15.6% (n=19) demonstrated a good knowledge of thyroid disorders.

Regarding attitudes, the results were notably more positive. None of the respondents (0%) fell into the poor category. Most participants exhibited a moderate attitude (57.4%, n=70), and a substantial 42.6% (n=52) showed a good attitude toward thyroid health management.

The practice domain mirrored the moderate trend, with 58.2% (n=71) of respondents achieving a moderate score. While 36.2% (n=44) demonstrated good practices, a small fraction (5.7%, n=7) still showed poor proactive behaviors regarding their thyroid health.

Interestingly, a specific case analysis of the youngest demographic revealed that the single participant aged under 20 years exhibited a poor knowledge level. Despite this cognitive gap, she demonstrated moderate scores in both attitude and practice domains.

Correlation analysis of knowledge, attitude, and practice

Inferential analysis was performed to test the relationships between variables using Chi-Square and Spearman Rank tests. The Chi-Square test (Table 4) showed a significant association between education level and attitude ($p = 0.021$). Furthermore, the Spearman correlation test (Table 5) revealed significant relationships between knowledge and attitude ($r = 0.208$; $p = 0.02$) and knowledge and practice ($r = 0.386$; $p < 0.001$). The correlation coefficients indicate weak to moderate strength, confirming that knowledge is a key determinant in shaping health behaviors.

The associations between sociodemographic variables and KAP domains were evaluated using the Chi-Square test. As shown in Table 6, the Chi-Square test revealed a statistically significant association between education level and attitude ($p = 0.021$). This indicates that the distribution of attitude levels differs significantly across educational levels.

Table 6. The association between sociodemographic characteristics and knowledge, attitude, and practice levels.

Sociodemographic characteristics	Knowledge	Attitude	Practice
Age	0.230	0.652	0.780
Education Level	0.666	0.021*	0.914
Occupation	0.721	0.993	0.983
Parity	0.909	0.224	0.374
Gestational Trimester	0.316	0.123	0.490

*Significant at $p < 0.05$ (Chi-square test)

Furthermore, the Spearman Rank correlation analysis (Table 7) identified significant positive relationships across the KAP domains. A significant correlation was found between **knowledge and attitude** ($r = 0.208$, $p = 0.02$), indicating that as maternal knowledge increases, attitudes toward thyroid care become more favorable. More importantly, a stronger correlation was observed between **knowledge and practice** ($r = 0.386$, $p < 0.001$). Although these correlation coefficients (r) indicate weak to moderate strength, the high level of significance ($p < 0.001$ for practice) confirms that knowledge serves as a foundational determinant in shaping maternal health behaviors.

Table 7. Correlation analysis between knowledge, attitude, and practice.

Variable	r_s	p-value	Interpretation
Knowledge - Attitude	0,208	0,021*	Significant
Knowledge - Practice	0,386	<0,001*	Significant
Attitude - Practice	0,073	0,424	Not significant

*Significant at $p < 0.05$ (Spearman's rank correlation test).

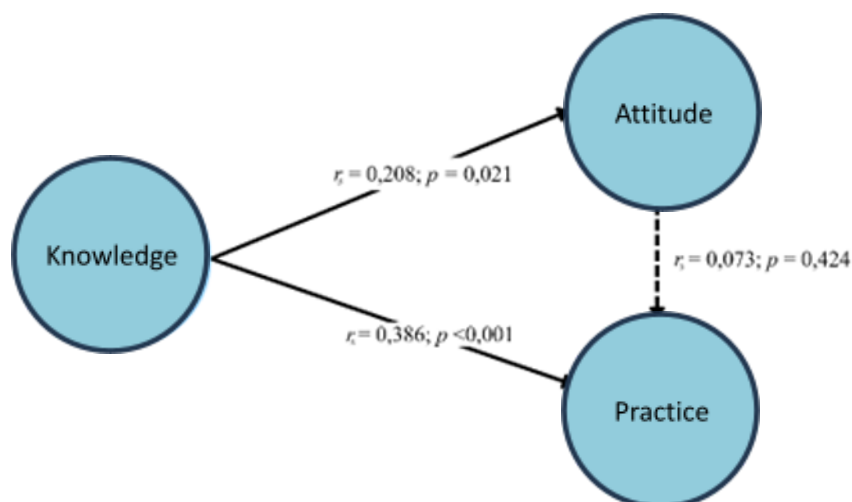


Figure 1. Correlation between knowledge, attitude, and practice.

DISCUSSION

Sociodemographic profile: high receptivity and potential for health literacy

This study involved 122 pregnant women undergoing antenatal care (ANC) at a primary care clinic in Surabaya. The sociodemographic characteristics of the study population, summarized in Table 1, reveal several key factors that are instrumental in understanding their collective health behaviors regarding thyroid disorders.

A profound finding is the maternal age distribution, with the overwhelming majority of participants falling within the prime reproductive age group of 20–35 years. This age bracket is not only theoretically associated with optimal health outcomes but also represents a demographic that is typically more receptive to health information and digital literacy [48]. Similar maternal age profiles have been reported in other urban primary care studies in Indonesia, reflecting a population that is increasingly engaging with modern healthcare services [46]. The theoretical adequacy of access to health information among this group suggests a high potential for successful implementation of targeted thyroid health education.

Furthermore, the majority of participants had completed high school, indicating a robust baseline level of formal education. Education is a well-established determinant of health literacy; women with higher educational attainment are generally more equipped to understand complex medical concepts, such as the implications of asymptomatic subclinical hypothyroidism on fetal development [45, 49]. In the context of thyroid health, this baseline education suggests that the study population possesses the cognitive foundation required to process and apply nuanced health information, provided it is communicated effectively by healthcare providers.

The occupational status of the respondents provides additional insight into their health-seeking environment. A significant majority (52.46%) were not employed, specifically identifying as housewives. This high proportion of non-employed participants may imply a greater availability of time for healthcare utilization, including attendance at ANC sessions and potential participation in health education programs [50]. However, occupational status is also intrinsically linked to socioeconomic position, which can either facilitate or hinder access to diagnostic services, especially when specialized thyroid function tests are not universally covered in routine primary care packages [40]. These factors indicate a high potential for receptivity to thyroid health promotion and the subsequent development of proactive KAP, reinforcing the urgency for primary care clinics to capitalize on this demographic strength.

Maternal knowledge gaps: from physiological understanding to postpartum care

Our study reveals a diverse spectrum of maternal knowledge regarding thyroid disorders in a primary care setting in Surabaya. The finding that the highest score (67.2%) was achieved in the category relating to fetal impacts and the utility of screening tests is encouraging. This suggests that basic health promotion

messages regarding the "what" (harm to fetus) and "how" (screening tests) of thyroid health have reached a majority of the study population.

This level of awareness is higher than that reported in a similar study in Saudi Arabia, where only 43.8% of pregnant women had good knowledge of thyroid impact [39], but lower than studies in China, which benefit from more robust universal screening programs [12]. The moderate awareness observed here may reflect the localized efforts of the primary care clinic in general antenatal education, even in the absence of a universal national screening policy for thyroid function in Indonesia [40].

However, the significant reduction in correct responses (to 59.01%) regarding the physiological basis of hormone demands highlights a deeper issue. Pregnant women may comply with testing recommendations without fully understanding the underlying reasons (the dynamic change in maternal-fetal hormone need). Understanding this physiological shift is crucial for patient compliance, especially in managing subclinical hypothyroidism, which is often asymptomatic but requires strict adherence to medication to avoid metabolic complications [4], [6].

Furthermore, the gap concerning the connection between thyroid disorder and mental health (59.01%) is a critical oversight. Maternal emotional stability is a fundamental component of antenatal care. Untreated thyroid disorder is a known risk factor for gestational anxiety and postpartum depression [41]. Failing to recognize this link reduces a patient's proactive attitude toward seeking care for emotional symptoms, misattributing them solely to common pregnancy fatigue.

The most profound knowledge deficit observed (48.36%) regarded the postpartum normalization of thyroid hormones. This finding points to a critical systemic flaw: the termination of specialized monitoring once pregnancy concludes. Postpartum thyroiditis occurs in 5–10% of women globally and often manifests silently after a transient euthyroid state [42]. Without knowledge of the need for postpartum follow-up, women with gestational dysfunction, particularly those with pre-existing hypothyroidism or high anti-TPO antibodies, are at high risk of developing permanent hypothyroidism later in life [43]. In a primary care setting like Surabaya, where long-term patient-provider relationships are common, this lack of postpartum knowledge represents a missed opportunity for preventive lifelong care.

Maternal attitudes: high receptivity amidst knowledge gaps

A striking finding of this study is the overwhelmingly positive attitude observed among pregnant women toward thyroid health interventions, contrasting sharply with the previously identified knowledge gaps. While knowledge levels regarding physiological hormone demands and postpartum care were suboptimal, nearly all respondents (99.18%, with only 0.82% $n=1$ expressing disagreement) recognized the importance of understanding thyroid disorder (A1), valued routine testing (A3), and acknowledged the benefits of dietary iodine optimization (A7).

This high level of receptivity indicates that the study population possesses a strong intrinsic motivation for health-seeking behavior, a critical asset for primary care interventions. Similar positive attitudes, despite varying knowledge levels, have been reported in pregnant populations in Saudi Arabia [39] and Ethiopia [44]. In the context of Surabaya, this positive disposition may stem from a general cultural emphasis on maternal-fetal well-being and trust in healthcare provider recommendations, which are common in Indonesian primary care settings [45].

The near-unanimous agreement on the importance of testing (A3) and dietary adjustment (A7) provides a robust foundation for implementing targeted educational programs. When patients possess a positive attitude, they are more likely to internalize health messages and adhere to clinical recommendations [45]. Therefore, future interventions at Cita Sehat Clinic should focus not on persuading women of the importance of thyroid health, but rather on filling the specific knowledge deficits identified (e.g., postpartum monitoring and the physiological rationale for testing).

Maternal practices: the reality of risk-based screening

In stark contrast to the positive attitudes, actual practices regarding proactive thyroid health management were limited. This disparity between high receptivity (Attitude) and low engagement (Practice) is a common phenomenon in health behavior research [45]. Our study found that proactive thyroid screening was not a universal practice among the respondents, with many relying solely on healthcare provider initiatives.

Furthermore, a significant proportion of respondents were classified as Not Applicable (N/A) for items relating to specific, proactive management practices, such as taking thyroid medication Regularly (P2) or proactively consulting doctors about abnormal function (P3). This indicates that the vast majority of pregnant women in this primary care setting are not actively engaged in managing thyroid conditions, likely because they do not perceive themselves as having an active dysfunction.

This passive practice is heavily influenced by the current health policy framework in Indonesia. National guidelines do not mandate universal routine thyroid screening in all antenatal care facilities [40]. Instead, screening is typically risk-based or indicated only by clinical suspicion [3]. Consequently, pregnant women who are not explicitly identified as high-risk by their providers are not offered screening, reinforcing a reactive rather than proactive approach to thyroid health.

The lack of proactive consultation (N/A in P3) also directly correlates with the "Fair" to "Poor" knowledge levels observed regarding the urgency and timing of thyroid function tests (Results Section, 67.2%). When patients do not fully comprehend the critical windows for fetal brain development [6, 47] or the asymptomatic nature of subclinical hypothyroidism [4], they are unlikely to independently seek testing or information, even if their attitude toward testing is positive.

Therefore, bridging the gap between positive attitudes and proactive practices requires a dual approach. First, primary care providers must be equipped to implement consistent risk-based screening. Second, maternal education must transcend basic awareness, empowering women with specific knowledge about why and when testing is crucial, thus fostering the proactive health behaviors observed in regions with comprehensive universal screening programs [12].

The disparity between cognitive awareness and health disposition

The distribution of KAP scores in this study reveals a critical "knowledge-practice" gap common in primary care settings. The finding that 54.9% of women have moderate knowledge while 29.5% have poor knowledge suggests that although thyroid health is not an entirely foreign concept, deep-seated understanding of its clinical nuances—such as the difference between hyper- and hypothyroidism—remains elusive for many. This aligns with findings by Al-Mousa et al. [39], who noted that maternal education often focuses on general obstetric risks, frequently bypassing specific endocrine disorders unless a clinical symptom arises.

In contrast, the Attitude scores were remarkably high, with 42.6% in the 'good' category and zero respondents in the 'poor' category. This suggests that pregnant women in Surabaya have a high level of trust in medical interventions and a strong desire for a healthy pregnancy outcome, even when they do not fully understand the underlying pathology. This "positive disposition" is a valuable clinical asset; it implies that if healthcare providers at the primary clinic were to offer more comprehensive thyroid education, the patients are likely to be highly receptive [45].

The Practice scores (36.2% good) were higher than the Knowledge scores (15.6% good), which is an unusual but positive finding. This may be attributed to the "paternalistic" nature of Indonesian primary healthcare, where patients often follow doctor-led protocols (e.g., routine blood tests) as part of a standard ANC package without necessarily knowing exactly what each test is for. Thus, good practice in this context might be driven by clinician guidance rather than individual maternal initiative.

Young maternal age and health behavior

The case of the participant aged under 20 years provides a unique insight into the influence of age on health literacy. Her poor knowledge score is consistent with global literature suggesting that younger, first-time mothers often lack exposure to specialized health information [23]. However, her moderate attitude and practice despite poor knowledge highlight the role of external support systems. In many Indonesian families, young pregnant women are closely guided by older female relatives and healthcare providers, which can "bridge the gap" between a lack of personal knowledge and the execution of proper health practices [46]. This underscores the importance of involving the family unit in antenatal education programs at primary clinics.

The path from education to proactive practice

The significant association between education level and attitude ($p = 0.021$) underscores the role of formal schooling as a catalyst for health receptivity. Women with higher educational backgrounds are generally more exposed to health promotion and possess the critical thinking skills necessary to internalize the long-term benefits of endocrine screening [49]. This finding aligns with the Health Belief Model, which posits that "cues to action" (such as health information) are more effectively processed by individuals with higher literacy levels [45].

The Spearman correlation results provide empirical evidence for the Knowledge-Attitude-Practice (KAP) theory (Figure 1), which suggests a linear progression from cognitive awareness to behavioral change. The weak but significant correlation between knowledge and attitude ($r = 0.208$) suggests that while knowledge influences a mother's perspective, other external factors—such as family influence or cultural beliefs—also play a role in shaping her attitude in the Surabaya primary care context [46].

However, the moderate correlation between knowledge and practice ($r = 0.386$, $p < 0.001$) is perhaps the most clinically relevant finding. It demonstrates that knowledge is a more direct predictor of *action* (practice) than it is of *feeling* (attitude). When a pregnant woman understands the specific risks of fetal cognitive impairment associated with thyroid disorder, she is significantly more likely to undergo screening or adhere to medication. Similar correlations have been observed in studies across Asia, where health literacy was found to be the strongest intervention point for improving maternal outcomes [12].

These findings imply that at a primary care clinic in Surabaya, interventions should not merely aim to create "positive feelings" about thyroid health, but should focus on delivering actionable knowledge. By increasing the depth of understanding regarding *when* and *how* to test, healthcare providers can effectively bridge the gap to proactive practice.

Several limitations of this study should be acknowledged. First, the cross-sectional design inherently precludes establishing causal relationships between knowledge, attitude, and practice domains. Second, the study was conducted at a single primary care clinic in Surabaya using a non-probability, consecutive sampling method, which may limit the generalizability of the findings to broader populations. Third, data were collected via self-reported questionnaires, introducing potential recall bias and social desirability bias, where participants might overreport positive attitudes or proactive practices. Finally, practice items P2 and P3 contained 'Not Applicable' responses for participants without a thyroid diagnosis, which were excluded from the total practice score calculation; while mathematically necessary, this adjustment reduced the total item pool for these specific respondents. Despite these constraints, this study provides valuable preliminary insights into thyroid disorder management in primary care settings.

CONCLUSION

This study concludes that pregnant women at a primary care clinic in Surabaya exhibit a moderate level of knowledge regarding thyroid disorders, with significant gaps identified in their understanding of physiological hormone demands and the necessity of postpartum monitoring. Despite these cognitive deficits, the study found an overwhelmingly positive attitude among respondents, with nearly 100% demonstrating a high receptivity toward thyroid health interventions and dietary optimizations. However, this positive disposition has not fully translated into proactive health practices, which remain largely passive and dependent on healthcare provider initiatives. The inferential analysis confirms that while education level significantly shapes maternal attitudes ($p = 0.021$), knowledge serves as the primary determinant for both attitudes and, more crucially, proactive practices ($p < 0.001$). These findings underscore the urgent need for targeted antenatal education that empowers women with actionable knowledge, alongside a potential re-evaluation of current risk-based screening policies to better utilize the high maternal receptivity in Indonesian primary care settings.

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REFERENCES

- [1] T. I. M. Korevaar, M. Medici, T. J. Visser, and R. P. Peeters, "Thyroid disease in pregnancy: new insights in diagnosis and clinical management," *Nat. Rev. Endocrinol.*, vol. 16, no. 10, pp. 610–622, Oct. 2020, doi: 10.1038/s41574-020-0398-9.
- [2] W. E. Visser and R. P. Peeters, "Interpretation of thyroid function tests during pregnancy," *Best Pract. Res. Clin. Endocrinol. Metab.*, vol. 34, no. 4, Art. no. 101431, Jul. 2020, doi: 10.1016/j.beem.2020.101431.
- [3] E. K. Alexander et al., "2017 guidelines of the American Thyroid Association for the diagnosis and management of thyroid disease during pregnancy and the postpartum," *Thyroid*, vol. 27, no. 3, pp. 315–389, Mar. 2017, doi: 10.1089/thy.2016.0457.
- [4] R. E. Sheldon, S. J. Brown, K. D. Croft, and J. P. Walsh, "Prevalence of thyroid dysfunction in pregnancy: a systematic review and meta-analysis," *Front. Endocrinol.*, vol. 14, Art. no. 997654, 2023, doi: 10.3389/fendo.2023.997654.
- [5] K. K. Abadi, A. H. Jama, A. Y. Legesse, and A. K. Gebremichael, "Prevalence of hypothyroidism in pregnancy and its associations with adverse pregnancy outcomes," *Int. J. Womens Health*, vol. 15, pp. 1481–1490, 2023, doi: 10.2147/IJWH.S429611.
- [6] M. S. Rahman et al., "Pregnancy outcomes among women with thyroid dysfunction: a population-based cohort study," *BMJ Open*, vol. 12, Art. no. e055051, 2022, doi: 10.1136/bmjopen-2021-055051.
- [7] C. Torres et al., "Maternal thyroid status and neonatal outcomes: a cohort study," *Endocrine*, vol. 73, no. 2, pp. 395–403, Aug. 2021, doi: 10.1007/s12020-021-02748-z.
- [8] V. J. Pop et al., "Low maternal free thyroxine concentrations during early pregnancy are associated with impaired neurodevelopment in children," *J. Clin. Endocrinol. Metab.*, vol. 107, no. 8, pp. 2220–2228, Aug. 2022, doi: 10.1210/clinem/dgac287.
- [9] World Health Organization, WHO recommendations on antenatal care for a positive pregnancy experience, Geneva, Switzerland: World Health Organization, 2016. [Online]. Available: <https://iris.who.int/bitstream/handle/10665/250796/9789241549912-eng.pdf> [Accessed Oct. 28, 2025]
- [10] Y. Gan, Q. Wan, H. Lin, Y. Zhang, and X. Bai, "Pregnant women's knowledge, attitudes and practices regarding hypothyroidism during pregnancy," *BMJ Open*, vol. 15, Art. no. e096674, 2025, doi: 10.1136/bmjopen-2024-096674.
- [11] K. Glanz, B. K. Rimer, and K. Viswanath, Eds., *Health behavior: theory, research, and practice*, 6th ed. San Francisco, CA, USA: Jossey-Bass, 2024. [Online]. Available: <https://catalog.nccu.edu/trln/UNCb12000542>
- [12] L. Han et al., "Knowledge, Attitude and Practice Regarding Thyroid Disorders in Pregnant Women: A Cross-Sectional Study in Guangdong, China," *Int. J. Womens Health*, vol. 17, pp. 2001–2013, 2025, doi: 10.2147/IJWH.S530418.
- [13] S. Y. Lee and E. N. Pearce, "Testing, Monitoring, and Treatment of Thyroid Dysfunction in Pregnancy," *J. Clin. Endocrinol. Metab.*, vol. 106, no. 3, pp. 883–892, Mar. 2021, doi: 10.1210/clinem/dgaa945.
- [14] S. Y. Lee and E. N. Pearce, "Hyperthyroidism: A Review," *JAMA*, vol. 330, no. 15, pp. 1472–1483, Oct. 2023, doi: 10.1001/jama.2023.19052.
- [15] R. Kumar, R. Bansal, H. K. Shergill, and P. Garg, "Prevalence of thyroid dysfunction in pregnancy and its association with fetal-maternal outcomes: a prospective observational study," *Clin. Epidemiol. Glob. Health*, vol. 19, Art. no. 101201, 2023, doi: 10.1016/j.cegh.2022.101201.
- [16] Y. W. Yap, E. Onyekwelu, and U. Alam, "Thyroid disease in pregnancy," *Clin. Med.*, vol. 23, no. 2, pp. 125–128, Mar. 2023, doi: 10.7861/clinmed.2023-0018.

- [17] F. J. K. Toloza et al., "Association of maternal thyroid function with gestational hypertension and preeclampsia: a systematic review and meta-analysis," *Lancet Diabetes Endocrinol.*, vol. 10, no. 4, pp. 243–252, Apr. 2023, doi: 10.1016/S2213-8587(22)00007-9.
- [18] A. Patrizio et al., "Hypothyroidism and metabolic cardiovascular disease," *Front. Endocrinol.*, vol. 15, Art. no. 1408684, 2024, doi: 10.3389/fendo.2024.1408684.
- [19] J. Köhrle, "Selenium, Iodine and Iron-Essential Trace Elements for Thyroid Hormone Synthesis and Metabolism," *Int. J. Mol. Sci.*, vol. 24, no. 4, Art. no. 3393, Feb. 2023, doi: 10.3390/ijms24043393.
- [20] L. C. Hatting et al., "Screening for thyroid disease in pregnancy: a study of Danish clinical practice," *Thyroid Res.*, vol. 16, no. 1, pp. 1–9, 2023, doi: 10.1186/s13044-023-00151-x.
- [21] D. Darsini, F. Fahrurrozi, and E. A. Cahyono, "Pengetahuan: artikel review," *J. Keperawatan*, vol. 12, no. 1, Jan. 2019. [Online]. Available: <http://lppmdianhusada.ac.id/e-journal/index.php/jk/article/view/96>
- [22] F. A. Diaz-Quijano et al., "Association between the level of education and knowledge, attitudes and practices," *BMC Public Health*, vol. 18, Art. no. 5055, 2018, doi: 10.1186/s12889-018-5055-z.
- [23] S. Bashir and A. H. Ansari, "Knowledge, Attitude, and Practice on Antenatal Care Among Pregnant Women," *SAGE Open Med.*, vol. 10, Art. no. 23743735231183578, 2023, doi: 10.1177/23743735231183578.
- [24] N. M. P. N. Pratiwi, K. A. P. Dewi, and P. A. R. Darmayanti, "Hubungan pengetahuan dan sikap ibu hamil tentang antenatal care terhadap ketepatan kunjungan selama pandemi Covid-19," *J. Ilmu Kesehatan MAKIA*, vol. 13, no. 1, Feb. 2023. [Online]. Available: <https://www.researchgate.net/publication/391844351> [Accessed Oct. 28, 2025]
- [25] N. Rohmawati et al., *Pedoman pelayanan antenatal terpadu*, 3rd ed. Jakarta, Indonesia: Kementerian Kesehatan RI, 2020. [Online]. Available: <https://repository.kemkes.go.id/book/147> [Accessed Dec. 21, 2025]
- [26] Kementerian Kesehatan RI, *Laporan tematik survei kesehatan Indonesia (SKI) tahun 2023: potret Indonesia sehat*, Jakarta, Indonesia: Badan Kebijakan Pembangunan Kesehatan, 2024. [Online]. Available: <https://www.badankebijakan.kemkes.go.id/laporan-tematik-ski/> [Accessed Dec. 21, 2025]
- [27] World Health Organization, "Maternal mortality," World Health Organization, Apr. 07, 2025. [Online]. Available: <https://www.who.int/news-room/fact-sheets/detail/maternal-mortality> [Accessed Dec. 21, 2025]
- [28] M. Syairaji et al., "Trends and causes of maternal mortality in Indonesia: a systematic review," *BMC Pregnancy Childbirth*, vol. 24, Art. no. 6687, 2024, doi: 10.1186/s12884-024-06687-6.
- [29] D. K. Mulyantoro, I. Kusri, T. Hidayat, and C. Puspitasari, "Assessment of thyroid function among pregnant women in iodine deficiency areas," *J. Nutr. Sci. Vitaminol.*, vol. 66, pp. S474–S478, 2020, doi: 10.3177/jnsv.66.S474.
- [30] F. R. Wihandi and T. Y. Iqbal, "Krisis tiroid dalam kehamilan," *Inovasi Kesehat. Glob.*, vol. 2, no. 2, pp. 151–158, 2025, doi: 10.62383/ikg.v2i2.1597.
- [31] C. Wongkar and W. S. Ilmiah, "Hubungan tingkat pendidikan dengan pengetahuan ibu hamil tentang bahaya kehamilan di UPTD Puskesmas Ongkaw," *J. Ilm. JKA*, vol. 11, no. 2, pp. 195–201, Sep. 2025. [Online]. Available: <https://doi.org/10.58550/jka.v11i2.325>
- [32] A. N. Yuliaty, N. K. Taman, H. D. Arini, and P. M. D. Ratnasari, "Knowledge, attitude, and practice of contraception methods in pregnant women also the affecting factors," *Pharmakon*, vol. 12, no. 2, pp. 145–156, 2023, doi: 10.35799/pha.12.2023.44301.
- [33] T. M. Ostrom, "The relationship between the affective, behavioral, and cognitive components of attitude," *J. Exp. Soc. Psychol.*, vol. 5, no. 1, pp. 12–30, Jan. 1969, doi: 10.1016/0022-1031(69)90003-1.
- [34] H. Ismainar, *Model perilaku kepatuhan ibu hamil*, 1st ed. Bandung, Indonesia: Widina Bhakti Persada, 2020.
- [35] M. S. Natalia and R. Faraswati, "Perubahan Perilaku Pada Ibu Hamil Primigravida Trimester III Di Puskesmas Leces," *Pengemb. Ilmu dan Praktik Kesehat.*, vol. 2, no. 2, pp. 82–89, 2023, doi: 10.56586/pipk.v2i2.270.
- [36] Kementerian Kesehatan Republik Indonesia, *Rencana strategis Kementerian Kesehatan tahun 2025–2029*, Jakarta, Indonesia: Kemenkes RI, 2024.
- [37] L. Persani et al., "European Thyroid Association Guidelines on diagnosis and management," *Eur. Thyroid J.*, vol. 13, no. 4, 2024, doi: 10.1530/ETJ-24-0125.
- [38] H. S. Taylor, L. Pal, and E. Seli, *Speroff's Clinical Gynecologic Endocrinology and Infertility*, 9th ed. Philadelphia, PA, USA: Lippincott Williams & Wilkins, 2020. [Online]. Available: <https://shorturl.at/yq1j2> [Accessed Dec. 21, 2025]

- [39] R. S. Al-Mousa et al., "Knowledge, Attitude, and Practice toward Thyroid Disorders among Pregnant Women in Riyadh, Saudi Arabia," *J. Family Med. Prim. Care*, vol. 10, no. 12, pp. 4404–4410, Dec. 2021.
- [40] Ministry of Health of the Republic of Indonesia, *National Guidelines for Antenatal Care*, Jakarta, Indonesia: MoH RI, 2022.
- [41] S. Nazarpour et al., "Effects of Thyroid Dysfunction on Maternal and Fetal Outcomes and Psychosocial Health," *Clin. Endocrinol. (Oxf.)*, vol. 92, no. 1, pp. 15–26, Jan. 2020.
- [42] A. Stagnaro-Green, "Postpartum Thyroiditis," *Best Pract. Res. Clin. Endocrinol. Metab.*, vol. 18, no. 2, pp. 303–316, Jun. 2004.
- [43] I. Lazúrová et al., "Long-term Follow-up of Women with Postpartum Thyroiditis," *Physiol. Res.*, vol. 64, no. Suppl 2, pp. S119–123, 2015.
- [44] S. Gebremedhin et al., "Knowledge, Attitude, and Practice towards Thyroid Disorders among Pregnant Women in Adiegrat, Northern Ethiopia," *BMC Pregnancy Childbirth*, vol. 21, no. 1, Art. no. 507, 2021.
- [45] I. M. Rosenstock, "The Health Belief Model and Preventive Health Behavior," *Health Educ. Monogr.*, vol. 2, no. 4, pp. 354–386, Dec. 1974.
- [46] R. Febriani et al., "Determinants of Antenatal Care Utilization in Indonesia: A Systematic Review," *J. Public Health Res.*, vol. 10, no. 4, Art. no. 2308, Oct. 2021.
- [47] M. Moleti et al., "Thyroid Hormone and Brain Development: A Critical Review of the Effects of Subclinical Hypothyroidism during Pregnancy," *J. Clin. Endocrinol. Metab.*, vol. 106, no. 6, pp. 1588–1600, Jun. 2021.
- [48] R. Smith et al., "Digital Health Literacy among Pregnant Women: A Systematic Review," *J. Med. Internet Res.*, vol. 22, no. 10, Art. no. e18917, Oct. 2020.
- [49] M. Kutner et al., *The Health Literacy of America's Adults: Results from the National Assessment of Adult Literacy*, Washington, DC, USA: National Center for Education Statistics, 2006.
- [50] M. M. Rahman et al., "Socio-economic Determinants of Antenatal Care Utilization in Bangladesh: A Cross-sectional Study," *BMC Pregnancy Childbirth*, vol. 21, no. 1, Art. no. 651, 2021. [51] C. Sialubanje et al., "Young Mothers' Knowledge and Attitudes toward Pregnancy Complications," *BMC Pregnancy Childbirth*, vol. 20, no. 1, Art. no. 48, 2020.