

Educational Needs for Theory-Based Gestational Diabetes Education among High-Risk Pregnant Women in Aceh, Indonesia: A Qualitative Study

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ABSTRACT

Background: Gestational diabetes mellitus (GDM) is a prevalent pregnancy complication associated with substantial maternal and neonatal morbidity. Despite the availability of screening services, timely detection remains suboptimal because of limited maternal knowledge, low perceived susceptibility, psychological concerns, and the absence of culturally appropriate educational resources. This study aimed to identify the educational needs for developing a theory-based diabetes education model integrating the Health Belief Model (HBM) and Social Cognitive Theory (SCT) for pregnant women at high risk of GDM in Aceh, Indonesia.

Methods: A qualitative descriptive study was conducted as the needs assessment phase of a research and development project. Two focus group discussions were held in Montasik District, Aceh Besar Regency, Indonesia, in May 2026, involving six midwives and six pregnant women at high risk of GDM selected through purposive sampling. Semi-structured discussion guides were developed based on HBM and SCT constructs. Data were analysed using Braun and Clarke's thematic analysis through a combination of deductive and inductive coding.

Results: Three overarching themes and nine subthemes emerged. The first theme, *insufficient GDM literacy and risk awareness*, included limited understanding of GDM, low perceived susceptibility, and inadequate awareness of disease severity. The second theme, *behavioural and sociocultural barriers to early detection*, encompassed fear of screening outcomes and dietary restrictions, the influence of local dietary practices and social norms, and reliance on midwives, family members, and pregnancy-related symptoms as cues to action. The third theme, *requirements for culturally responsive and family-oriented educational interventions*, highlighted the absence of standardised educational materials, the importance of husband and family support in reinforcing healthy behaviours, and participants' preference for concise, visually engaging, smartphone-based educational media.

Conclusions: Early detection of GDM is influenced by interacting cognitive, emotional, sociocultural, and family-related factors. These findings provide an empirical foundation for developing the SIGAP educational model (*Aware of Risk, Seek Information, and Overcome GDM Early*), which integrates HBM and SCT constructs into culturally tailored, visually engaging, and digitally accessible educational media to enhance community-based antenatal education and facilitate timely GDM screening.

KEYWORDS: gestational diabetes mellitus; health education; Health Belief Model; Social Cognitive Theory; qualitative research; antenatal care; high-risk pregnancy.

INTRODUCTION

Gestational diabetes mellitus (GDM), defined as glucose intolerance first recognized during pregnancy, is one of the most common metabolic complications of pregnancy and remains a major public health concern worldwide[1], [2], [3]. Women with GDM are at increased risk of adverse maternal outcomes, including preeclampsia, operative delivery, and subsequent type 2 diabetes, while their infants are more likely to experience macrosomia, birth trauma, neonatal hypoglycaemia, and long-term metabolic disorders[4], [5], [6]. Consequently, timely identification and appropriate management of GDM are fundamental components of quality antenatal care and are essential for reducing preventable maternal and neonatal morbidity[3], [7], [8].

The global burden of GDM continues to increase alongside the rising prevalence of obesity and type 2 diabetes[9], [10]. According to the International Diabetes Federation, approximately 21.1 million live births (16.7%) in 2021 were affected by hyperglycaemia during pregnancy, with nearly four-fifths of these cases attributable to GDM. Using the International Association of Diabetes and Pregnancy Study Groups (IADPSG) diagnostic criteria, the pooled global prevalence of GDM is estimated at approximately 14%. Although nationally reported prevalence estimates in Indonesia remain relatively low, ranging from 1.9% to 3.6%, regional studies have demonstrated substantially higher and more variable rates.[11], [12], [13] These discrepancies likely

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reflect inconsistent screening practices, heterogeneous diagnostic criteria, and underdiagnosis rather than a genuinely low disease burden. As a result, many women with GDM remain undetected until pregnancy complications develop.

Beyond limitations in health service delivery, delayed detection of GDM is strongly influenced by behavioural and sociocultural factors. Because GDM is frequently asymptomatic during pregnancy, many women underestimate their personal risk and perceive blood glucose screening as unnecessary. Fear of receiving a diagnosis, misconceptions regarding dietary restrictions or insulin treatment, and limited understanding of the consequences of untreated GDM further reduce screening uptake. In many low- and middle-income settings, maternal health behaviours are also shaped by family influence, cultural beliefs, and the quality of communication with healthcare providers. These findings indicate that improving early detection requires educational strategies capable of changing health beliefs and preventive behaviours rather than merely increasing knowledge.

Behavioural theories provide a robust foundation for designing such educational interventions. The Health Belief Model (HBM) explains preventive health behaviour through six interrelated constructs: perceived susceptibility, perceived severity, perceived benefits, perceived barriers, cues to action, and self-efficacy. Previous studies have shown that women who perceive themselves to be at risk and recognise the benefits of early diagnosis are more likely to participate in GDM screening, whereas fear, low perceived susceptibility, and practical barriers reduce adherence to recommended antenatal care[14], [15], [16] However, the HBM primarily focuses on individual cognitive processes and pays relatively limited attention to the broader social environment that shapes health behaviour.

Social Cognitive Theory (SCT) complements the HBM by conceptualising behaviour as the result of reciprocal interactions among personal factors, environmental influences, and behavioural experiences[17]. Central SCT constructs—including observational learning, reinforcement, outcome expectations, and self-efficacy—highlight the importance of social support and environmental context in sustaining behavioural change[18], [19]. In Acehese society, decisions related to pregnancy and maternal health are rarely made by women alone. Husbands, extended family members, community health volunteers, and midwives play influential roles in encouraging healthcare utilisation and adherence to recommended practices. Consequently, educational interventions that engage these social networks may be more effective than approaches targeting pregnant women alone.

Integrating the HBM and SCT offers a comprehensive theoretical framework by simultaneously addressing individual risk perception, motivation, behavioural capability, self-efficacy, and social reinforcement. Despite the recognised value of these complementary theories, few educational interventions have integrated both frameworks to improve GDM awareness and early detection, particularly within culturally diverse, resource-limited settings. In Aceh, antenatal education concerning GDM remains largely dependent on routine verbal counselling delivered by midwives, with limited availability of standardised, culturally appropriate educational media designed to enhance behavioural change. This gap highlights the need for an evidence-informed educational model that reflects both behavioural theory and the local sociocultural context.

Therefore, this study aimed to explore the educational needs of high-risk pregnant women and primary healthcare midwives as the foundation for developing a culturally tailored diabetes education model based on the Health Belief Model and Social Cognitive Theory. Specifically, the study sought to identify existing gaps in GDM knowledge, risk perception, behavioural barriers, and educational preferences related to early detection.

LITERATURE REVIEW

Burden of Gestational Diabetes Mellitus and Behavioural Challenges in Early Detection

Early detection of gestational diabetes mellitus (GDM) remains a major challenge despite the widespread availability of antenatal care services. Variations in screening protocols and diagnostic criteria across healthcare settings contribute to inconsistent case identification, while the absence of symptoms during early pregnancy often leads women to underestimate their susceptibility and postpone glucose testing until pregnancy complications occur. Consequently, current antenatal care guidelines emphasize risk assessment, counselling, and timely blood glucose screening as essential components of routine maternal care rather than optional preventive measures.[12], [20], [21]

Evidence increasingly suggests that GDM screening behaviour is shaped by behavioural and sociocultural factors in addition to healthcare accessibility. Qualitative studies conducted in low- and middle-income countries have shown that inadequate knowledge, misconceptions about GDM, fear of diagnosis, and limited provider communication reduce women's willingness to participate in screening.[13], [22] Cultural dietary practices, family decision-making, and social expectations surrounding pregnancy further influence adherence to dietary recommendations and preventive health behaviours.[2] In Indonesia, women's perceptions of susceptibility and disease severity have also been associated with their willingness to undergo early GDM screening, indicating that behavioural determinants represent modifiable targets for educational interventions[11]. Collectively, these findings demonstrate that improving GDM detection requires interventions that address not only knowledge deficits but also psychological, cultural, and social influences on maternal decision-making.

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Theoretical Framework and Research Gap

Behavioural theories provide an evidence-based foundation for designing interventions that promote preventive maternal health behaviours. The Health Belief Model (HBM) explains health-related decision-making through perceived susceptibility, perceived severity, perceived benefits, perceived barriers, cues to action, and self-efficacy, and has been successfully applied in educational interventions that improve GDM self-management and screening behaviours.[12], [23] However, because the HBM primarily focuses on individual cognitive processes, it provides limited insight into the social and environmental influences that shape maternal health behaviour. Social Cognitive Theory (SCT) complements the HBM by emphasizing reciprocal interactions among personal factors, behavioural capability, and environmental influences. Constructs such as observational learning, reinforcement, self-efficacy, and social support have been shown to improve dietary behaviour and maternal health service utilization, particularly in settings where husbands and family members play important roles in healthcare decision-making.^{7, 19, 20} The integration of HBM and SCT therefore offers a more comprehensive framework for maternal diabetes education by simultaneously addressing individual risk perception and the social processes that sustain behavioural change[24], [25].

Although digital educational media have demonstrated considerable potential for improving the accessibility and consistency of maternal health promotion, effective interventions must be culturally responsive and developed using behavioural theory.[26], [27] In Aceh, where maternal health decisions are strongly influenced by family structures, community norms, and midwife-led primary care, standardized educational resources specifically designed for GDM remain limited. Existing antenatal education continues to rely predominantly on verbal counselling, with few interventions integrating both HBM and SCT into culturally appropriate educational media. This evidence gap provided the rationale for the present needs assessment, which informed the development of the **SIGAP** educational model as a theory-driven and culturally tailored intervention to strengthen early GDM detection among high-risk pregnant women.

METHODS

Study Design

This study employed a qualitative descriptive design using thematic analysis as the needs assessment phase of a broader research and development project aimed at developing a theory-based diabetes education model integrating the Health Belief Model (HBM) and Social Cognitive Theory (SCT). A qualitative descriptive approach was selected because it enables a comprehensive description of participants' experiences and educational needs while remaining close to the data, making it particularly appropriate for informing intervention development rather than generating new theory. The study is reported in accordance with the Consolidated Criteria for Reporting Qualitative Research (COREQ) to enhance methodological transparency and reporting quality.

Study Setting

The study was conducted in Montasik District, Aceh Besar Regency, Aceh Province, Indonesia, in May 2026. This district was purposively selected because maternal healthcare services are routinely delivered through primary healthcare centres, village midwives, and integrated community health posts (Posyandu), providing a suitable context for exploring educational needs related to GDM prevention and early detection within community-based antenatal care.

Participants and Sampling

Participants were recruited using purposive sampling to ensure the inclusion of individuals with direct experience relevant to GDM education and antenatal care. Two stakeholder groups participated in the study. The first group consisted of six midwives who were actively involved in providing antenatal care, maternal counselling, and routine pregnancy screening at primary healthcare facilities. The second group comprised six pregnant women identified as being at high risk of GDM, each presenting at least one recognized risk factor, including advanced maternal age, a family history of diabetes mellitus, overweight or obesity, previous GDM, or a previous macrosomic birth. The sample size was determined based on the principle of information richness, with recruitment continuing until sufficient depth and variation of perspectives had been obtained to address the study objectives. Participant characteristics are presented in Table 1.

Table 1. Characteristics of study participants

Participant group	Number	Characteristics	Codes
Midwives	6	Midwives involved in antenatal care and maternal health counselling	M1–M6
High-risk pregnant women	6	Pregnant women presenting one or more recognised risk factors for GDM	P1–P6

Data Collection

Data were collected through two separate focus group discussions (FGDs), one involving midwives and the other involving pregnant women. Conducting separate discussions allowed participants to express their experiences and perspectives openly within groups

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sharing similar roles and experiences. The FGD involving midwives explored experiences related to GDM screening practices, educational challenges, barriers to early detection, social influences on maternal health behaviour, and the need for educational resources. The discussion with pregnant women focused on participants' knowledge of GDM, perceived susceptibility and severity, perceived benefits and barriers to screening, family and social support, and preferences regarding educational media. Each FGD lasted approximately **60–90 minutes** and was facilitated by trained qualitative researchers using a semi-structured interview guide. The guide was developed from the theoretical constructs of the HBM and SCT. Questions based on the HBM explored perceived susceptibility, perceived severity, perceived benefits, perceived barriers, cues to action, and self-efficacy, whereas SCT-informed questions examined observational learning, social support, reinforcement, and interactions between individual, behavioural, and environmental factors. Examples of guiding questions included: *"What do you know about diabetes during pregnancy?"*, *"What factors encourage or discourage you from undergoing blood glucose screening?"*, and *"What type of educational material would best support you and your family during pregnancy?"* Follow-up probing questions were used to clarify responses and elicit detailed descriptions.

FGDs were conducted in Indonesian, with participants permitted to use the local Acehnese language when expressing their experiences. Field notes documenting non-verbal interactions, group dynamics, and contextual observations were completed during and immediately after each discussion. Structured discussion summaries were prepared following each session, and representative participant quotations were retained verbatim to support data interpretation.

Researcher Reflexivity

The research team comprised academics in midwifery and nursing with extensive experience in maternal and community health in Aceh. While this background facilitated rapport with participants and enhanced contextual understanding, the researchers acknowledged the potential influence of prior assumptions on data interpretation. To minimise interpretive bias, the researchers documented their initial assumptions before analysis, discussed coding decisions throughout the analytic process, and continuously compared emerging interpretations with participants' original narratives. Reflexivity was therefore incorporated throughout data collection and analysis to ensure that findings remained grounded in participants' perspectives rather than researchers' expectations.

Data Analysis

Data were analysed using Braun and Clarke's six-phase thematic analysis.¹¹ Analysis began with repeated reading of field notes, discussion summaries, and participant quotations to achieve familiarity with the data. Initial codes were then generated across the dataset before being grouped into broader categories and candidate themes. Themes were subsequently reviewed, refined, and defined through iterative comparison between coded extracts and the complete dataset until conceptual coherence was achieved.

A hybrid analytical approach combining deductive and inductive coding was employed. Deductive coding was guided by the theoretical constructs of the HBM and SCT, whereas inductive coding allowed context-specific issues emerging from participants' narratives—including local dietary customs, family decision-making, community traditions, and preferences for digital educational media—to be incorporated into the analysis. Throughout the analytic process, attention was also given to divergent or contradictory cases to ensure that the resulting themes reflected the complexity and variation of participants' experiences.

Trustworthiness

The trustworthiness of the study was established according to the criteria proposed by Lincoln and Guba.¹⁴ Credibility was enhanced through source triangulation by comparing perspectives from both pregnant women and midwives, together with regular discussions among the research team during data analysis. Dependability was supported by maintaining a transparent record of methodological decisions and analytical procedures throughout the study. Confirmability was strengthened by ensuring that all themes were supported by representative participant quotations and grounded in the original data. Transferability was facilitated through detailed descriptions of the study setting, participant characteristics, and healthcare context, enabling readers to assess the applicability of the findings to similar settings.

Ethical Considerations

Ethical approval was obtained from the Research Ethics Committee of the Health Polytechnic of the Ministry of Health, Aceh, Indonesia (Approval No. DP.04.03/12.7/136/2026), valid from 16 March 2026 to 16 March 2027. Before participation, all participants received verbal and written information regarding the study objectives, procedures, confidentiality, voluntary participation, and their right to withdraw from the study at any time without consequence. Written informed consent was obtained from all participants before data collection commenced.

RESULTS AND DISCUSSION

A total of 12 participants were included in the study, comprising six primary healthcare midwives and six pregnant women identified as being at high risk of gestational diabetes mellitus (GDM). The midwives had extensive experience providing antenatal care and maternal health counselling, while the pregnant women represented diverse GDM risk profiles, including advanced maternal age,

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overweight or obesity, family history of diabetes, previous GDM, and previous macrosomic birth (Table 1).

Table 1. Characteristics of study participants

Code	Participant group	Relevant characteristics
M1–M6	Midwives	Primary healthcare midwives involved in antenatal care, maternal counselling, and GDM screening
P1–P6	High-risk pregnant women	Pregnant women presenting one or more recognised GDM risk factors, including advanced maternal age, overweight or obesity, family history of diabetes mellitus, previous GDM, or previous macrosomic birth

Thematic analysis generated three overarching themes and nine interconnected subthemes describing participants' educational needs for improving early detection of GDM. Across both participant groups, the findings revealed that limited GDM literacy, behavioural and sociocultural barriers, and insufficient educational resources constrained women's engagement with preventive screening. These themes subsequently informed the development of the SIGAP educational model (Table 2).

Table 2. Themes and subthemes generated from thematic analysis

Theme	Subtheme	Interpretation
Gaps in GDM literacy and risk perception	Limited understanding of GDM	Pregnant women demonstrated inadequate knowledge of GDM and its risk factors.
	Low perceived susceptibility	Women commonly perceived themselves to be at low risk because they were asymptomatic.
	Limited awareness of disease severity	Maternal and neonatal consequences of GDM were poorly understood.
Behavioural barriers and sociocultural influences on early detection	Fear of screening outcomes and lifestyle changes	Fear of diagnosis, dietary restrictions, and medical treatment discouraged screening.
	Influence of dietary culture and social environment	Traditional food practices and community gatherings limited healthy dietary behaviour.
	External cues to action	Screening decisions were strongly influenced by advice from midwives, family members, and pregnancy-related symptoms.
Need for contextual and family-centred educational models	Lack of standardized educational materials	Midwives relied primarily on verbal counselling because structured educational resources were unavailable.
	Family as behavioural reinforcement	Husbands and family members played central roles in encouraging preventive behaviour.
	Preference for digital visual media	Participants preferred concise, visual, smartphone-based educational resources delivered through commonly used social media platforms.

THEME 1. GAPS IN GDM LITERACY AND RISK PERCEPTION

Participants consistently described inadequate knowledge of GDM, indicating that awareness of the condition remained limited among pregnant women. Most participants had never received specific information regarding GDM and frequently associated diabetes exclusively with excessive sugar consumption or older age rather than pregnancy itself. This limited understanding reduced awareness of personal risk and diminished motivation to undergo screening.

One participant explained:

“I had never heard about diabetes during pregnancy.” (P1)

Another participant associated GDM solely with dietary sugar intake:

“I think women who consume too many sweet foods are at greater risk.” (P1)

Midwives similarly acknowledged that educational activities concerning GDM were constrained by the absence of standardized educational materials, resulting in counselling that depended largely on brief verbal explanations during routine antenatal consultations.

“We provide counselling for pregnant women at risk of GDM, but education remains limited because no specific educational media are available.” (M5)

Participants also demonstrated low perceived susceptibility. Many interpreted the absence of symptoms as evidence that screening was unnecessary, despite the fact that GDM often develops without noticeable clinical manifestations.

“Pregnant women often do not recognize their risk because they feel healthy and have no obvious symptoms.” (M5)

Although several women acknowledged that diabetes during pregnancy could be serious, they possessed only a superficial understanding of its consequences for maternal and neonatal health.

“I think diabetes during pregnancy is a serious condition, but I do not clearly understand how it affects mothers and babies.” (P4)

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Overall, these findings suggest that educational interventions should strengthen both basic GDM literacy and women's understanding of their individual susceptibility and the potential consequences of delayed diagnosis.

THEME 2. BEHAVIOURAL BARRIERS AND SOCIOCULTURAL INFLUENCES ON EARLY DETECTION

Participants identified several behavioural and sociocultural factors that discouraged participation in GDM screening. Fear emerged as the most prominent psychological barrier. Women expressed concerns about receiving an abnormal diagnosis, being required to modify their diets, or undergoing additional medical procedures.

One participant stated:

"I am afraid that the test will show high blood sugar because then I may no longer be allowed to eat certain foods." (P2)

Some participants also associated screening with injections, additional healthcare costs, and increased anxiety during pregnancy. Beyond individual concerns, participants described the influence of local dietary traditions and social gatherings. Community celebrations, family events, and religious gatherings commonly involved foods rich in sugar and fat, making adherence to healthy dietary recommendations difficult.

"When attending community celebrations or religious gatherings, the food is usually sweet and high in fat." (P5)

Screening behaviour was frequently initiated through trusted external influences rather than personal risk perception. Advice from midwives, encouragement from family members, and pregnancy-related symptoms served as important triggers for healthcare utilisation.

"If the midwife advises me to have the test, I usually follow her recommendation." (P3)

This finding represented an important divergent pattern from the classical Health Belief Model, as some participants accepted screening despite expressing little personal perception of susceptibility, suggesting that trusted healthcare providers may substitute for individual risk appraisal in motivating preventive behaviour.

Midwives likewise emphasized that supportive and reassuring communication was more effective than fear-based counselling.

"The most successful approach is to communicate in a simple and reassuring way without frightening pregnant women." (M4)

Collectively, these findings indicate that interventions should address emotional barriers while simultaneously strengthening supportive communication and leveraging existing social networks to encourage screening participation.

THEME 3. NEED FOR CONTEXTUAL, FAMILY-CENTRED, AND DIGITAL EDUCATIONAL MODELS

Participants consistently expressed the need for educational resources that were culturally relevant, visually engaging, and easily accessible within routine antenatal care. Midwives reported that current educational practice relied almost exclusively on verbal counselling because standardized educational materials were unavailable.

One midwife suggested that educational resources should include:

"The definition of GDM, risk factors, warning signs, benefits of screening, and preventive strategies." (M3)

Pregnant women preferred educational materials that were concise, visually attractive, and accessible through smartphones and social media applications routinely used in daily life.

"Information is easier to understand through social media such as TikTok." (P5)

Family support emerged as a central facilitator of preventive behaviour. Participants consistently described husbands as the most influential individuals in decisions regarding screening attendance, dietary modification, and adherence to health recommendations.

"Support from my husband is the most important." (P6)

Midwives further highlighted that educational messages incorporating storytelling and testimonials from women with previous GDM experiences would enhance understanding by providing relatable examples.

"Testimonials and real-life stories can be effective learning tools." (M5)

Together, these findings indicate that future educational interventions should move beyond conventional verbal counselling by integrating culturally responsive content, family participation, and concise digital educational media capable of supporting both individual learning and community-based antenatal education.

Table 3. Educational needs identified from participants' perspectives and implications for the development of the SIGAP educational model

Educational need identified	Evidence from thematic analysis	Implications for the SIGAP educational model
Improve awareness of GDM risk	Limited knowledge and low perceived susceptibility	Introduce simple explanations of GDM risk factors, asymptomatic presentation, and indications for early screening.

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Improve understanding of disease consequences	Poor awareness of maternal and neonatal complications	Provide visual illustrations explaining maternal and fetal complications associated with untreated GDM.
Reduce emotional barriers to screening	Fear of diagnosis, injections, and dietary restrictions	Deliver supportive, reassuring educational messages emphasizing the benefits of early detection and effective management.
Address sociocultural influences	Dietary customs and community traditions affected preventive behaviours	Incorporate culturally appropriate dietary guidance reflecting local eating practices and social contexts.
Strengthen family participation	Husbands and family members strongly influenced maternal decisions	Include educational components specifically targeting husbands and family members as behavioural supporters.
Improve accessibility of educational resources	Participants preferred concise visual learning through smartphones	Develop smartphone-compatible educational materials using visual content suitable for WhatsApp, TikTok, and primary healthcare counselling.
Promote observational learning	Participants valued testimonials and real-life experiences	Integrate storytelling and patient testimonials to strengthen self-efficacy and reinforce preventive behaviours.

The synthesis of these findings provided the empirical foundation for developing the **SIGAP** educational model. Rather than focusing exclusively on increasing knowledge, participants emphasized the importance of an educational intervention capable of improving risk perception, addressing emotional barriers, strengthening family support, and delivering culturally appropriate information through accessible digital media. These user-informed educational requirements subsequently guided the design and theoretical integration of the SIGAP prototype.

DISCUSSION

This study explored the educational needs of high-risk pregnant women and primary healthcare midwives to inform the development of a culturally appropriate educational model for early GDM detection. Three key findings emerged. First, participants demonstrated limited knowledge of GDM and low perception of personal risk. Second, emotional and sociocultural factors—including fear of diagnosis, dietary practices, and family influence—substantially affected screening behaviour. Third, participants highlighted the need for concise, culturally appropriate, family-centred, and digitally accessible educational resources. Together, these findings indicate that effective GDM education should address behavioural and social determinants in addition to improving knowledge.

Limited GDM literacy was the predominant finding. Most pregnant women had little understanding of GDM as a pregnancy-specific condition and commonly assumed that the absence of symptoms indicated the absence of disease. Similar findings have been reported in previous qualitative studies showing that inadequate knowledge and low perceived susceptibility contribute to delayed GDM screening among pregnant women. [28], [29]. Within the Health Belief Model (HBM), limited knowledge weakens perceived susceptibility and perceived severity, thereby reducing motivation to engage in preventive screening. [29], [30] These findings suggest that educational interventions should personalise GDM risk and explain its asymptomatic nature to improve early detection. Fear also emerged as an important barrier to screening. Participants expressed concerns about receiving an abnormal diagnosis, dietary restrictions, and additional medical procedures. Midwives consistently reported that supportive communication was more effective than fear-based messages in encouraging women to undergo screening. These findings support educational approaches that strengthen self-efficacy and perceived benefits while reducing psychological barriers, consistent with previous research on maternal health behaviour [31], [32]

The study further demonstrated that GDM-related behaviours were strongly influenced by sociocultural factors. Traditional dietary practices, communal gatherings, and family decision-making affected women's ability to adopt healthier lifestyles during pregnancy, consistent with earlier studies highlighting the influence of cultural food practices and family support on maternal health behaviours.^{17,18} Husbands were identified as the most influential source of encouragement for screening and lifestyle modification, while recommendations from trusted midwives frequently motivated women to accept screening despite limited personal risk perception. These findings reinforce the relevance of Social Cognitive Theory (SCT), which emphasises social support and environmental influences as important determinants of behaviour change [33], [34]

Participants also consistently preferred educational materials that were brief, visually engaging, culturally relevant, and accessible through smartphones and social media. Such preferences align with evidence suggesting that digital health education can improve the accessibility and consistency of maternal health promotion when tailored to local contexts. These findings informed the development of the **SIGAP** educational model, which integrates HBM constructs addressing individual risk perception with SCT constructs emphasising family reinforcement, observational learning, and supportive communication through digital educational

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media. This study contributes to the existing literature by demonstrating that educational needs for GDM extend beyond knowledge deficits to include emotional, social, and cultural factors influencing screening behaviour. The integration of HBM and SCT provides a comprehensive theoretical foundation for developing culturally responsive educational interventions that reflect the realities of maternal healthcare decision-making in community settings. Several limitations should be acknowledged. The study involved a small purposive sample from a single district, limiting the transferability of the findings to other settings. In addition, the findings reflect participants' perceived educational needs rather than the effectiveness of the proposed educational model. Future studies should evaluate the feasibility and effectiveness of the SIGAP model using larger and more diverse populations to determine its impact on GDM knowledge, screening uptake, and maternal health outcomes.

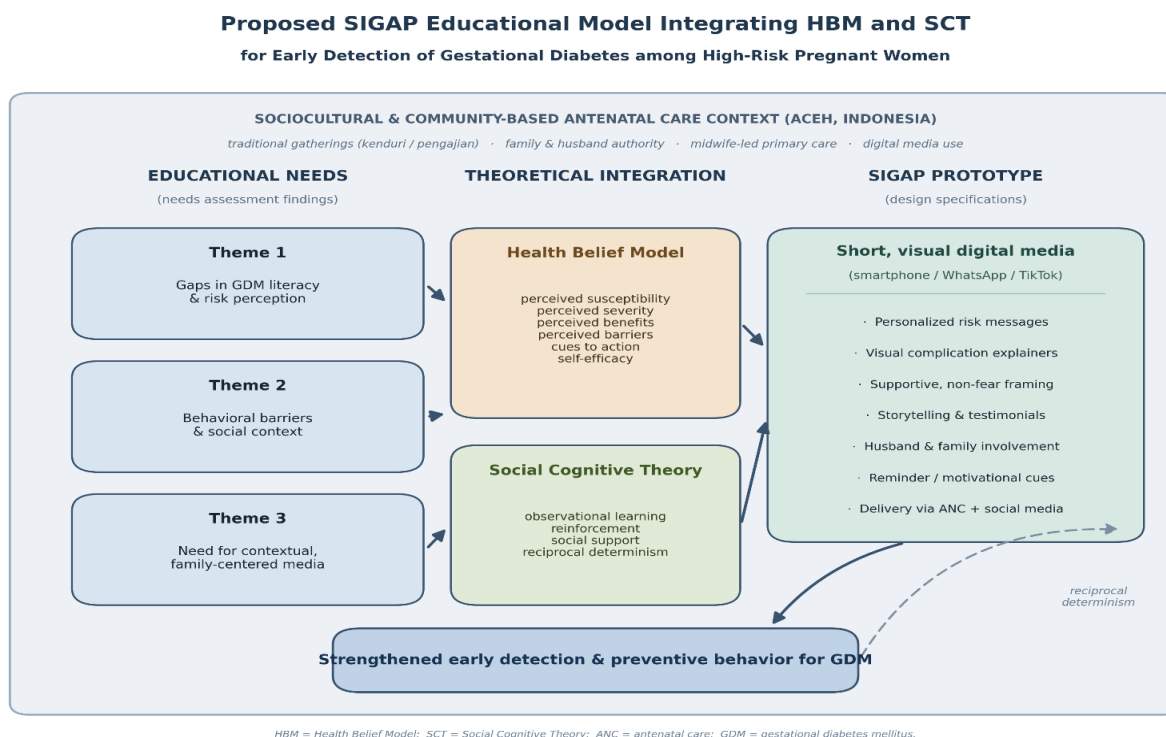


Figure 1. Proposed SIGAP educational model integrating HBM and SCT constructs and the three educational-need themes into prototype components for early GDM detection.

IMPLICATIONS

Practice and Policy Implications

The findings suggest that GDM education in primary antenatal care should move beyond conventional verbal counselling toward theory-informed, culturally appropriate educational approaches. Standardised educational media that are concise, visually engaging, and tailored to women's risk profiles may strengthen GDM awareness, improve risk perception, and reduce psychological barriers to screening. Given the influential role of husbands and family members in maternal health decision-making, educational interventions should also incorporate family participation as a core component rather than focusing exclusively on pregnant women. At the health system level, the SIGAP educational model could be integrated into routine antenatal services delivered through primary healthcare centres and community health posts. Digital dissemination using widely accessible smartphone platforms may improve the consistency, accessibility, and continuity of health education while supporting midwives with standardised counselling materials. These findings also support the incorporation of culturally adapted, theory-based digital education into maternal health programmes and antenatal care policies to strengthen early GDM detection in community settings.

Limitations and Future Research

Several limitations should be considered when interpreting these findings. First, the study involved a small purposive sample from a single district in Aceh, limiting the transferability of the findings to other settings. Second, the study explored participants' perceived educational needs rather than evaluating behavioural outcomes or the effectiveness of the proposed educational model. Third, data were collected through focus group discussions, and participants' responses may have been influenced by group dynamics and social desirability. Future research should refine and pilot the SIGAP educational model in collaboration with end users before evaluating its feasibility, acceptability, and effectiveness using larger and more diverse populations. Mixed-methods or

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experimental studies are needed to determine whether the model improves GDM knowledge, risk perception, screening uptake, and maternal health outcomes.

CONCLUSIONS

This study demonstrates that early detection of gestational diabetes mellitus is influenced not only by women's knowledge but also by the interaction of risk perception, emotional responses, family support, and sociocultural context. These findings highlight the limitations of conventional information-based counselling and underscore the need for educational interventions grounded in behavioural theory and adapted to local contexts. By integrating the Health Belief Model and Social Cognitive Theory, the proposed SIGAP educational model provides a theory-informed and culturally responsive framework that addresses both individual and social determinants of preventive behaviour. As a user-informed prototype, SIGAP has the potential to strengthen community-based antenatal education and promote timely GDM screening among high-risk pregnant women. Future implementation and effectiveness studies are warranted to determine its impact on maternal health behaviours and pregnancy outcomes.

DECLARATIONS

Authors' contributions. Yusnaini (Y) served as principal investigator and corresponding author, developed the concept, coordinated the study, interpreted findings, and drafted the manuscript. Cut Yuniwati (CY) contributed to midwifery content review, interpretation, and revision. Nurlaila Ibrahim (NI) contributed to FGD documentation and data management. Teuku Tahlil (TT) contributed to behavioural theory interpretation and scientific review. Iin Fitrianiar (IF) contributed to data collection and needs assessment analysis. Kartinazahri (K) contributed community midwifery perspectives and revision. All authors approved the final manuscript.

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