Thai Pregnant Women's Perceptions Regarding Fetal Brain Development: A Qualitative Descriptive Study

Khajit Boonpradit, Nantaporn Sansiriphun, Kasara Sripichyakan, Nonglak Chaloumsuk*

Abstract: Fetal brain development is a complex process that continues throughout pregnancy. Women need to ensure good brain development throughout their pregnancy, but a deep understanding of their perception of this issue exists. This qualitative descriptive study aimed to describe the perceptions of pregnant women regarding fetal brain development. Data were collected from 15 pregnant women living in a southern province of Thailand between August 2020 and January 2022 through in-depth interviews. In addition, analysis of qualitative data was performed using thematic analysis.

From the data analysis, three themes emerged. The first theme was a Discrepancy between the significance and understanding of fetal brain development with two subthemes: 1) Perceiving the significance of fetal brain development and 2) Unclear understanding of fetal brain development. The second theme was Unrecognized harms of suboptimal fetal brain development with two subthemes: 1) Expectations for fetal brain development and 2) Understanding of harms. The third theme was Promoting fetal brain development with two subthemes: 1) Practices for nourishment and 2) Avoidance of harm. We concluded that pregnant women had a limited understanding of fetal brain development and harms that could jeopardize fetal brain development, leading to difficulty promoting fetal brain development. Therefore, nurses should be trained to educate pregnant women, emphasizing the accurate understanding of fetal brain development, nourishment, and harm avoidance based on pregnant women's context.

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Introduction

The brain is a vital body organ with a complex structure and functions.[1] It is fundamental to all physical, psychological, emotional, cognitive, intellectual, linguistic, communicative, social, and interpersonal development. Disrupted fetal brain development results in structural, behavioral, functional, and metabolic

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disorders.[2] The United Nations Children's Fund (UNICEF) recommends that the first 1,000 days of life is a golden opportunity to influence a child's brain outcomes from conception to two years of age, and this has been adopted by Thailand's Ministry of Public Health as well.[3] However, 250 million children under five cannot reach their full development potential, particularly in nations with poor and medium incomes.[4] In Thailand, there were 235,025 cases of congenital anomalies or congenital disabilities in 2021.[5] Long-term, Thailand has faced delayed child development, with 27.5% of children aged under five having age-inappropriate development in 2014.[6] In a recent national survey in 2021, 21.7% of Thai first graders had the intelligence quotient (IQ) score of under 90, indicating a low average level, while 4.2% had an IQ score of under 70, indicating an impaired level.[7] In particular, the southern region of Thailand was among the regions with the lowest IQ, where the surveyed children had IQs that fell below the average standard.[8] This implies that fetal brain development remains a significant issue needing to be addressed urgently.

Pregnancy is a crucial period for fetal brain development. The most active period of fetal brain development occurs during the second trimester when 250,000 neurons are created every minute up to the eighth month of pregnancy, which begins the period of cognitive development.[2] Unfortunately, fetal brain development is poorly understood by pregnant women, who have an essential role in behaviors that promote fetal development. There is evidence that Thai pregnant women have had suboptimal behaviors in promoting fetal brain development, particularly regarding how to promote this development in auditory, sensory, and perception domains.[9] In southern Thailand, reproductive-age women's intake of minerals crucial to fetal development, such as iron and folate, was far below the daily recommendations.[10] Moreover, a lack of understanding limits pregnant women's behavior to prevent harms that may compromise fetal brain development. For example, organophosphate, a synthetic pesticide harmful to fetal neurological development, was detected in 98% of meconium samples in infants whose mothers lived in agricultural areas in Thailand.[11] Additionally, survey results in southern Thailand found that 54.49% of pregnant women had an incorrect practice of washing fruit and vegetables by soaking them in non-running water, and 45.51% had a moderate knowledge of the pesticide-free vegetable and fruit consumption practices.[12] Furthermore, some pregnant women were exposed to secondhand smoke at home[13] and self-medicated.[14] Such deprivations in understanding and practices by women in southern Thailand can hinder children's potential for the future. However, studies regarding fetal brain development based on pregnant women's perspectives are scarce.

Moreover, distinct perceptions of pregnant women in different socio-cultural contexts may influence their practices related to fetal brain development. Thus, this phenomenon was worth exploring since there is a gap in the literature regarding such perceptions.

Review of Literature and Conceptual Framework

Brain development is a protracted process that begins in the third gestational week with the differentiation of neural progenitor cells.[2] Normal brain development depends on environmental factors, and disturbance of either can significantly change the way the brain develops.[15] The critical period of fetal brain development is the embryonic period, from the third to the eighth weeks of development, where the most crucial organs develop and form, along with the primary development of the embryo, making it the most susceptible phase for structural malformation, major defects, and brain abnormality.[2] Disrupted fetal brain development can cause structural or functional anomalies, such as defective closure of neural tube,[2] mental retardation[16] and low intelligence that results in lasting impacts on adult psychological well-being, employment prospects, and education.[16]

Pregnant women need to perform various practices to achieve optimal fetal brain development. The framework for environmental factors of congenital disabilities proposes aspects of fetal brain development that include maternal malnutrition (e.g., protein and iron deficiency), pollutants in the air and food, infections, substance abuse (e.g., methamphetamine, cocaine, and nicotine), and medication (e.g., retinoic acid).[17] Pregnant women are recommended to consume essential nutrients for fetal brain development, including protein, iron, folic acid, iodine, and docosahexaenoic acid (omega-3 fat). They should also maintain food safety through hygiene, cooking food thoroughly, separating cooked and raw food and utensils, storing food at an appropriate temperature, and choosing foods free from chemical substances.[18] Moreover, pregnant women should adopt safe working behavior by distancing themselves from harmful substances. If impossible, they should comply with safety measures such as wearing masks with air filtration, goggles, appropriate shoes, changing clothes, and showering as soon as possible after work.[19] Additionally, in the case of environmental pollutants, pregnant women should wear N95 masks or masks that effectively prevent particulate matter PM2.5),[19] close doors and windows, use a fan and air purifier, wash clothes, and shower.[19] Infection prevention includes food safety behavior and viral infection prevention behavior by wearing masks, washing hands, avoiding crowded or infected areas, physical distancing, and eating hot, newly cooked, and well-cooked food.[20] Moreover, pregnant women should avoid over-the-counter medicines and use drugs under the supervision of a physician.[21] Finally, fetal sensory stimulation behavior through visualizing, auditory, tactile, and movement stimulations can promote fetal brain development. Musical sensory stimulation, for example, could promote fetal brain development by improving the maternal emotional state and increasing fetal movement and heart rate, leading to greater oxygenated blood exchange between the fetus and the placenta.[22]

A literature search found that research focusing on fetal brain development based on pregnant women's perceptions is lacking. In the Western context, qualitative research has shown that becoming pregnant motivates women to make several lifestyle changes to promote fetal development, such as adopting a healthier diet, avoiding harmful habits, getting enough sleep, and maintaining a good mood.[23] Concerning the brain, a qualitative study revealed that mothers stimulated infant brain development by singing lullabies, talking, and telling stories but had limited knowledge of how infants' brains developed, causing a fair amount of ambiguity surrounding their daily care practices to stimulate brain development.[24] In Thailand, most studies have employed a quantitative approach to investigate pregnant women's knowledge and behaviors on safe vegetable and fruit consumption free from pesticides,[12] behaviors to promote fetal brain development,[9] and intake of minerals for fetal brain development.[10] A recent qualitative study revealed that the importance of the fetal brain was understood by Thai parents as being linked to intelligence, which could be promoted by eating a nutritious diet and talking. Based on parents' understanding, fetal brain development could be observed through fetal movements.[25] Notably, the studies above investigated pregnant women's understanding and behaviors to promote fetal development in general, focusing on an understanding of mothers on the infant, not fetal brain development or parents' perceptions, and not pregnant women. Since pregnant women's beliefs and perspectives influence how they care for fetal brain development, their perceptions should be taken into account and can be explored qualitatively.

Study Aim

To describe the perceptions of Thai pregnant women regarding fetal brain development

Methods

Study design: This study employed a qualitative descriptive design and naturalistic inquiry principles

to elicit individuals' unique experiences concerning practices to discover the nature of specific events. Qualitative descriptive research requires little interpretation of the data.[26] Therefore, this approach can give a straightforward description[26] of the pregnant women's perceptions regarding fetal brain development. This study is reported here according to the Consolidated Criteria for Reporting Qualitative Research (COREQ).[27]

Study setting and participants: The research setting was Nakhon Si Thammarat Province in the South of Thailand. Participants were selected from women visiting antenatal departments of four hospitals, including one urban 1,000-bed hospital and three 30-bed community hospitals located 22-40 kilometers from the city center, to try to ensure heterogeneous geographic characteristics to cover urban, suburban, and rural communities. All four hospitals had the same standard antenatal care protocol for pregnant women. First, the primary investigator (PI) trained antenatal nurses to screen potential participants based on the inclusion criteria. Then, by reviewing the mother and child health handbook that showed the demographic and obstetric data of the women, antenatal nurses selected the participants using purposive sampling based on the inclusion criteria: pregnant Thai women aged 18 to 35, of 12-34 gestational weeks without complications, able to communicate in Thai, and willing to participate. Next, eligible participants were approached by the PI, who provided study information. If they demonstrated participation interest, the PI requested permission to review their handbook to recheck eligibility.

Ethical considerations: Approval for this study was granted by the Research Ethics Committee, Faculty of Nursing, Chiang Mai University (Research ID 2020-078 study code: 2020-FULL014), and the research ethics committees and the directors of the participating hospitals. The PI gave the potential participants documents about research objectives and procedures, confidentiality, risks, benefits, and their contribution. Participants were informed of their rights to refuse and withdraw participation without consequences on their services. After that, the PI asked for their willingness to participate and requested written consent. Confidentiality was achieved by using identification numbers instead of participants' names. Digital voice recording was used with their permission. All transcripts were kept in a securely locked cabinet and were deleted after the study completion. The PI assessed their physical and mental discomfort, such as labor pain, minor discomfort, or distress, before and during each interview. If the participants showed discomfort, the PI would refer them to the antenatal staff for professional assistance. The participants obtained a compensation of 100 baht (2.93 USD) per interview for their time and transportation expenses.

Data collection: After ethics approval, the PI met the director of the nursing department and head nurses of the participating hospitals' antenatal department to explain the research and ask for cooperation. In-depth interviews were the primary technique for data collection. Rapport was developed throughout until the closure of interviews. The interviews began with conversations to create a relaxing and trusting atmosphere. Then, the PI performed an in-depth interview in private places at the participants' homes, workplaces, or hospitals, using questions in the semi-structured interview guide, such as: *"From your understanding, speaking of the fetal brain, what do you think of it, or how would you describe it?" "What are the functions of the fetal brain*?" and *"Please describe how the fetal brain develops or changes." "In daily life, what is it like when there is good fetal brain development?" "How would you know, or what makes you think so?" "What is harmful to the fetal brain? How does it happen?"* Then, probing techniques were employed for depth and breadth of interpretations, such as *"What do you mean by that?" "Could you tell me more about that?" "Could you give an example?"* In total, data were saturated at 15 participants.[28] Each interview was 40-60 minutes, with a 30-minute break, and each participant was interviewed 2-3 times. The total number of interviews was 34.

Data analysis: Thematic analysis[29] was used for data analysis. The PI 1) listened to participants' voices repeatedly; 2) transcribed the interviews verbatim; 3) read and re-read the transcriptions many times for an understanding of the entire transcriptions; 4) described data into codes; 5) classified codes into sub-themes; 6) identified similar sub-themes within the themes; and 7) reviewed and refined sub-themes and themes by relating to the research questions to ensure the themes and sub-themes captured what the research questions aimed to discover.

Rigor and trustworthiness: Trustworthiness was achieved based on credibility, transferability, dependability, and confirmability.[30] Credibility was obtained through member checking with three participants who agreed with the data and peer debriefing with qualitative experts. Transferability was attained by thoroughly describing the study design and findings for readers to apply when replicating the study in a similar population. To ensure dependability, the PI practiced interviewing skills by conducting pilot interviews and discussing data analysis, findings, and interpretation with qualitative experts. Finally, confirmability was established through a reflexive journal and field notes for every interview, before and after data collection, and during data analysis. The findings were discussed and examined for accuracy with the research team members to avoid bias and guarantee correct data interpretation.

Findings

Of the 15 participants, most were Buddhist (n = 14), aged 19 to 34, nine held a diploma or lower, and six had a bachelor's degree. All participants had the same occupation during and before pregnancy, with a mean monthly family income of 30,867 Thai baht (around USD 905.46). They considered they had sufficient income. Most lived in urban (n = 5), and rural areas (n = 5), and seven were multigravida. None of them had received health education about fetal brain development (**Table 1**).

Table 1. Characteristics of participants (n = 15)

ID	Age	Religion	Education	Occupation	Family income TBH(USD)	Living area	Gravida	Health education
1	34	Buddhist	Bachelor's degree	Teacher	35,000 (1,026.69)	Urban	3	BT, DP
2	28	Buddhist	Diploma	Fruit farmer	25,000 (733.35)	Rural	3	OA, DP, CFM
3	28	Buddhist	Bachelor's degree	Nurse	100,000 (2933.41)	Urban	1	PFD, OA
4	25	Buddhist	Bachelor's degree	Nurse	30,000 (1,063.18)	Rural	1	PFD, OA
5	20	Buddhist	Diploma	Dessert vendor	21,000 (616.02)	Sub-urban	1	PFD, BT, RP
6	34	Buddhist	Secondary	Cleaning staff	18,000 (528.01)	Rural	4	PFD, OA
7	22	Buddhist	Primary	Mushroom forager	7,000 (205.34)	Sub-urban	2	Could not remember
8	31	Muslim	Bachelor's degree	Pharmacist	30,000 (1,063.18)	Rural	1	PFD, BT, RP
9	27	Buddhist	Diploma	Cosmetics sales	24,000 (704.02)	Urban	2	PFD, BT, RP, BF
10	31	Buddhist	Bachelor's degree	Dressmaker	25,000 (733.35)	Rural	1	PFD, BT, RP
11	25	Buddhist	Secondary	Gold leaf factory worker	20,000 (586.68)	Sub-urban	1	PFD
12	31	Buddhist	Diploma	Aquaculture farmer	25,000 (733.35)	Sub-urban	3	PFD

Table 1. Characteristics of participants (n = 15) (Cont.)

ID	Age	Religion	Education	Occupation	Family income TBH(USD)	Living area	Gravida	Health education
13	26	Buddhist	Secondary	Furniture maker	28,000 (821.35)	Rural	4	DP, RP
14	33	Buddhist	Diploma	Wall artist	40,000 (1,173.36)	Urban	1	PFD
15	23	Buddhist	Bachelor's degree	Veterinarian assistant	35,000 (1,026.69)	Sub-urban	2	None

Note: BF = breastfeeding, CFM = counting fetal movement, BT = blood testing, DP = diet during pregnancy, RP = rest during pregnancy, PFD = promotion of fetal development, OA = observing abnormalities

Three themes emerged from participants' perceptions regarding fetal brain development: 1) Discrepancy between significance and understanding of fetal brain development; 2) Unrecognized harms of suboptimal fetal brain development with two subthemes; and 3) Promotion of fetal brain development. The themes and subthemes emerging are described in **Table 2.**

Table 2. Themes and subthemes

Theme	Subtheme
Theme 1: Discrepancy between significance and understanding of fetal brain development	Subtheme 1.1: Perceiving the significance of fetal brain development
	Subtheme 1.2: Unclear understanding of fetal brain development
Theme 2: Unrecognized harms of suboptimal fetal brain development	Subtheme 2.1: Expectations for fetal brain development
	Subtheme 2.2: Understanding of harms
Theme 3: Promotion of fetal brain development	Subtheme 3.1: Practices for nourishment
	Subtheme 3.2: Avoidance of harms

Theme 1: Discrepancy between significance and understanding of fetal brain development

Discrepancy existed between participants' perceptions of the importance of the fetal brain and their understanding of fetal brain development. They believed that the fetal brain was highly vital. However, they felt a lack of clear understanding of the fundamental knowledge of the fetal brain, especially the particular aspects of its development.

Subtheme 1.1: Perceiving the significance of fetal brain development

Participants perceived that the fetal brain was highly significant. They regarded the brain as indicative of life; the baby would die if the brain were abnormal. The brain was also thought to control and give orders to the body system. Moreover, it was believed that the brain determines intelligence and was the origin of other organs' formation.

"If there's no brain, the baby will possibly die." (P11)

"The brain's the center, ordering and controlling various body parts to work. Controlling the body to grow and develop, to have various organs work normally." (P4)

Subtheme 1.2: Unclear understanding of fetal brain development

Participants had a vague knowledge of several aspects of fetal brain development. They stated that the fetal brain was too complicated for pregnant women generally to imagine how it worked.

"How does an unborn baby's brain work? I can't imagine. I can't give you the answer because I don't know at all. I don't know anything about it." (P1)

> *"How the baby's brain develops, I can't tell because I can't see what it looks like. I've heard about baby's brain on social media but the terms were medical and hard to understand."* (P7)

Theme 2: Unrecognized harms of suboptimal fetal brain development

Harms from suboptimal fetal brain development were unlikely recognized due to their expectation for fetal brain development and understanding of the damage to fetal brain development.

Subtheme 2.1: Expectations for fetal brain development

Regarding expectations for the babies regarding brain development, the participants' main goal was to have a strong, healthy baby without disability. Concerning fetal brain development, participants wanted to have a baby without any brain abnormality or mental retardation. Therefore, they did not prioritize intelligence or other aspects of fetal brain development.

> *"I want my baby to be healthy, strong, no disability, no mental retardation."* (P12)

> *"I expect my baby to be born physically healthy. I don't expect my baby to grow up very intelligent like others."* (P5)

Subtheme 2.2: Understanding of harms

Several harms to fetal brain development remained unknown to participants. They could not explain the causes and consequences of the abnormality and suboptimal development of the fetal brain, which hindered their behaviors to prevent harm. Some substances such as seasoning powder, beta-agonists, formalin in seafood, mobile phone waves, and microwave and photocopy machine radiation were perceived as harmful. Some participants knew about specific harms but overlooked these, as there was no overt abnormality in the health of their other children or family members.

> *"Chemicals may harm the baby's brain, but I can't tell. I have no knowledge. My two babies were born normally. I think chemicals are harmful but not much; otherwise, it would have affected my two babies. We've used it since our grandpa, grandma. I don't see anyone has health problems."* (P12)

Considering the consequences of harm to the fetal brain, many participants believed that hazardous substances endangered the baby and fetal brain development but could not precisely explain how. However, they understood that the first three months of pregnancy were important.

> *"Pollutants are dangerous to the baby's brain. The brain doesn't obtain adequate air, making the baby deformed. I can't explain. It probably happens by collecting continuously inside the baby."* (P2)

> *"Brain development... It may be the first three months. That's when the brain will get damaged if the baby's exposed to something harmful. The doctor told me not to take any drug or potentially dangerous things at all in the first three months [of pregnancy]."* (P2)

Theme 3: Promotion of fetal brain development

Caring for an unborn baby's brain was not performed in isolation. Instead, participants took good care of themselves and their unborn babies in an overall picture through nourishment and avoidance of harm.

Subtheme 3.1: Various practices for nourishment

Based on participants' perspectives, nourishment practices to promote fetal development needed to be performed, with a particular aim on the fetal brain. Participants ate food that was nutritious for both them and the baby. They consumed food enriched with protein, such as milk, eggs, meat, and fish, which are believed to be very useful to fetal brain development.

They also mentioned various benefits of different nutrients, such as iron for increased blood supply to the fetal brain, and those rich in omega-3, milk, folate and iodine for preventing abnormal brain development and abnormality of the neural tube.

> *"Eggs, livers, all five principal food groups are useful for both the mother and the baby. They probably nourish the brain too."* (P5)

> *"I think vitamin and mineral supplements help with nourishment because some days we don't eat enough. These supplements prevent our body from being pale, and the baby can get to build the complete body."* (P15)

Moreover, nourishment could aid in stress reduction and adequate rest. Participants believed mental stress led to an unhappy baby, which could cause some psycho-emotional problems later. From participants' observation of fetal movement and older children, the baby's emotion was presumably linked to the fetal brain.

> *"The baby's mood and brain are linked. When I'm stressed and deprived of sleep, the baby moves strongly or sometimes slightly."* (P6)

> *"Emotion certainly involves the brain. My eldest baby was moody because I was moody. Emotion's a hormone that reduces blood supply to the whole body, causing the baby's brain to obtain insufficient blood."* (P15)

Participants shared that they also were nourished by interacting with their unborn babies. Various interactions were performed with the unborn baby, mainly by talking with them, touching the belly, listening to music, and reading stories. These were done to promote bonding and the baby's development, possibly for intelligence. Furthermore, some activities were performed, such as shining light on the belly, exposing it to sunshine, and sitting on a rocking chair. In addition, a Muslim participant listened to the Holy Quran chanting because the rhythm was relaxing and the content involved teaching about good deeds, which helped to shape positive thoughts. The benefits from these activities included maternal relaxation and happiness when the baby responded by moving.

> *"Talking with the baby and touching the belly promote the baby's brain in terms of memory and learning, like bonding. I believe the baby can remember, and it helps the baby's brain develop."* (P15)

> *"Music helps brain development and the baby's intelligence since inside the womb. I like to listen to Mozart's music or any music on YouTube. The baby's intelligent because the baby has good concentration. Both the baby and mom feel relaxed."* (P10)

Subtheme 3.2: Avoidance of harms

Potential harms to fetal brain development were recognized according to participants' backgrounds and experiences, such as witnessing their family members, a colleague's daughter, and friends who experienced poor fetal outcomes due to exposure to harm. They avoided several conditions that were perceived to be harmful to the baby. Different kinds of harm were avoided through various practices to attain safety in food, work, and air. Damage from drugs, illicit substances, contaminated food, and toxic household products was avoided by refusing them. Participants also avoided taking medications without a physician's prescription. They avoided consuming pesticide contamination in vegetables and fruits by choosing chemical-free vegetables, washing them, and soaking them in vinegar or salt. They also mentioned not eating unhygienic, raw or uncooked food or food left overnight. Participants opted for cooking utensils made of stainless steel to avoid lead contamination and avoided not consuming caffeine and alcohol.

"I won't self-medicate because I'm afraid that self-medication will affect the baby brain." (P2)

"I choose vegetables that are not contaminated with pesticides, with wormholes or vegetables grown in the local areas. Before eating, I wash and soak vegetables in salt water for about 5-10 minutes." (P8)

Moreover, the prevention of infectious diseases was performed. Mostly, the participants narrated various preventive practices for COVID-19, such as putting on N95 masks and hand-washing. Putting on protective equipment, such as facial masks, gloves, and socks, was performed to prevent air pollutants in the form of smoke and chemical substances, such as pesticides and cleansing solutions, and thinner. Some participants avoided breathing in tobacco smoke by staying away from people smoking and avoiding cars and burning smoke. They put on a face mask in case of passive smoking, removed the smell by taking a shower and shampooing, cleaned contaminated clothes and surfaces, and applied an air refresher.

"If it's about working, it can be color and thinner for coating. Its smell is so strong. It hurts the baby's brain. I smell it almost every day. It probably hurts the baby's brain cells. It damages the brain. So I try to wear a mask to prevent the smell." (P13)

"When my husband's applying thinner and painting the windows, I always wear N-95 masks and stay away from the area." (P1)

However, participants shared that sometimes they could not avoid harm due to the lack of knowledge/recognition, underestimating harms because of the unobservable abnormalities, being unaware of the pregnancy and, therefore, not receiving antenatal care until late pregnancy, the working barriers and difficulty in lifestyle changes, and having little time as they were busy working or taking care of older children.

"I know the chemicals are harmful, and I should avoid these by wearing a mask, boots, and gloves, but I can't do it because this protective gear is inconvenient for my work. Moreover, as seen by my parents and grandparents, there have been no observed harms." (P12)

Yet, they tried to avoid harm for several reasons, including for the baby's sake, strong willingness and commitment to the baby's protection, family support, and advice from health professionals.

"I took my dad, who's alcoholic, to the hospital. They showed us the video about dangers of alcohol. I'm afraid the baby will be like my dad." (P13)

"I have willpower. I told my husband about quitting everything, beers, coffee, and smoking ... I have high willpower. I'm a person who actually does what I want to do... My husband, his parents, and my parents always ask me if I need anything. My family always understands me and gives me the courage to go on." (P14)

Discussion

This study revealed 15 pregnant women's perceptions regarding fetal brain development. Participants perceived the fetal brain as extremely important because it was indicative of life, functioned in controlling and ordering the body system, determined intelligence, and was the origin of other organs' formation. Participants' recognition of the significance of the fetal brain might be influenced by the fact that almost all participants received health education that described the importance of fetal brain development and how to promote it. These perceptions were partially consistent with scientific notions. Interrupted fetal brain development results in morphological or functional defects, such as congenital disorders and low intelligence.[2] The findings also resonated with a

study in Brazil where mothers perceived the fetal brain as significant because it contributed to the baby's ability.[24] Parents in northern Thailand considered the fetal brain vital since it was related to intelligence.[25] However, we found a discrepancy between participants' perception of the fetal brain's significance and their understanding of fetal brain development. Participants expressed a lack of clear understanding of the baby's brain. This discrepancy was similar to a qualitative study among Brazilian mothers who recognized that the brain was a vital organ but had uncertainty over the daily processes involved in children's brain development.[24] This indicates the need to enhance pregnant women's understanding of fetal brain development and to transform the complexity of this issue through simple and understandable forms of health education.

The findings revealed the unrecognized harms of suboptimal fetal brain development caused by expectations for fetal brain development and understanding of harm to fetal brain development. Their main goal was to have a strong, healthy baby without brain abnormalities or disabilities. Consistently, parents' main expectation and desire during pregnancy were reassurance that their unborn baby was healthy and developing without abnormality.[25,31] Participants did not prioritize intelligence or any other aspects of fetal brain development, which might have hindered their attempts to promote their baby's intelligence to optimal levels. The problem of a normal baby with suboptimal intelligence was hidden and unseen. Correspondingly, parents considered the baby's intelligence as a less important priority.[25]

Moreover, from the participants' understanding, they did not know some harmful substances, such as those contaminated in work environments or food, and some substances were misperceived as dangerous. They should have a comprehensive understanding of risks associated with various harmful substances in terms of their quantity, frequency, exposure pathways, and duration of exposure during pregnancy,[2] all of which could impact the fetal brain. The fact that they could not explain this might indicate that they did not know about the harms, as none of the 15 participants had been educated about harm to fetal brain development. Pregnant women consistently drew upon their life experiences and previous pregnancies when deciding about the harms of alcohol to the fetus.[32] This indicates that nurses should educate pregnant women to eliminate misconceptions and corresponds to another qualitative study in Iran where healthcare providers stressed the need to remove pregnant women's misconceptions about the fetal brain derived from daily life.[33]

Additionally, we found that caring for fetal brain development was not performed in isolation. Still, participants cared for themselves and their babies through nourishment and avoiding harm. This finding resonates with other results that pregnant women aimed to promote both the baby's and their own health.[34] Our participants performed various nourishment practices through consuming nutritious food, vitamins/minerals supplements, stress reduction and adequate rest, and interactions with the baby. These practices were congruent with other findings that pregnant women ate a nutritious diet, took vitamins and folic acid supplements, and had enough sleep and rest.[23,34] Consistently, interactions by talking, singing, touching, and reading stories were performed by Brazilian mothers of infants under one year of age[24] and southern Thai pregnant adolescents.[35] Since these nourishment practices vary across individual pregnant women, nurses should assess pregnant women's understanding of self-care to promote fetal brain development and facilitate their self-care practices based on their contexts and needs.

Participants avoided different kinds of harm through various practices to attain safety in food, work, and air environment. They expressed varying perceptions of the harm based on their backgrounds, experiences, and witnessing harm to others, especially their family members. Therefore, family members' understanding of harm to fetal brain development might also influence pregnant women's perception, particularly in southern Thailand, where people mainly live in extended

households with a spouse, children, and other relatives.[36] Similar to other findings,[33] social media was a channel that could be easily accessed and thus used by many participants to find out about harm. However, social media did not cover fetal brain development and harmful substances that could affect this. The development of social media as a reliable and effective source of information would lead to optimal understanding and practices of pregnant women in avoiding harm to fetal brain development.

In our study, participants performed various food safety, work safety, and air environment safety strategies to avoid recognized harm. Yet, not all harms were known, potentially exposing them to some unrecognized harms. Consistent with previous research, pregnant women with inadequate perception and knowledge about secondhand smoke were more exposed to secondhand smoke.[37] Thus, greater effort is required to increase the understanding and practice of pregnant women regarding harm. Our findings showed that participants avoided harm for the baby's sake, which was motivated by observing the health issues in their close ones. Some were motivated by strong willingness and commitment. In contrast, others received family support, particularly emotional and instrumental support, in line with another study[34] highlighting a culture of caring for each other within the family. Being reminded by healthcare providers also emerged as a factor to help many participants avoid harming their unborn babies. Our findings corroborate previous research that found that support from a partner or healthcare providers enabled pregnant women to prevent harm to their fetuses.[38]

Unfortunately, participants revealed some issues which made them unable to avoid harm. Other studies reported similar obstacles, such as unawareness of pregnancy[37] and limited knowledge.[39] When harms were unavoidable, they were replaced with less harmful things, such as replacing coffee with cocoa drinks and tea with less caffeine. Healthcare providers suggested that they avoid harm, such as visiting a quit-smoking clinic to prevent tobacco harm. Reducing anxiety was performed by self-consoling when finding out about the normal from ultrasound and antenatal check-up findings and when unobserving no abnormality in older babies. However, these practices might underestimate and hinder harm awareness. Hence, turning these covert harms to the fetal brain and intelligence into explicit harm is necessary. Various kinds of prenatal harm, including any harm to the baby's intelligence, needed to be the topic of health education, showing the actual cases of observable abnormality. Our findings complement the existing knowledge that will help nurse-midwives plan women-centered care to promote the comprehensive practices of pregnant women toward optimal fetal brain development and prevent harm in the daily context of pregnant women.

Limitations and Recommendations

The participants were pregnant women living in a province in the southern region and mainly were Buddhists. Thus, our findings may differ from pregnant women in other religions or contexts in Thailand. However, the interview questions were primarily closed, which might limit the opportunity to obtain in-depth insights. Moreover, only three participants were asked to validate the findings.

Conclusions and Implications for Nursing Practice

The meaning of fetal brain development as perceived by pregnant women emerged into three themes. First, participants recognized the significance of fetal brain development but still did not understand it. Second, the harms of suboptimal fetal brain development remained unrecognized due to expectations for fetal brain development and an understanding of harm to the fetal brain. Nevertheless, participants shared that fetal brain development was promoted through practices for nourishment and avoidance of harm. Third,

antenatal nurses should educate pregnant women about fetal brain development, emphasizing the golden period from fertilization to two years of life. Finally, nurses should also be trained to educate pregnant women about the potential risk to the fetal brain from pollutants, maternal nutrition deficiency, infectious diseases, substance abuse, medications, and maternal illness.

Health education should be given to all pregnant women regardless of their backgrounds. Health education on fetal brain development should be performed through various modern social media channels using easy-to-understand language for people of all education levels with engaging illustrations to promote understanding. Further research is recommended to explore perceptions regarding fetal brain development of pregnant women in other religions, settings, or age groups, such as adolescents. Studies with different samples are recommended to validate the findings to increase trustworthiness.

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การรับรู้ของสตรีตั้งครรภ์ไทยเกี่ยวกับพัฒนาการด้านสมองของทารกในครรภ์: การวิจัยพรรณนาเชิงคุณภาพ

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บทคัดย่อ: พัฒนาการด้านสมองของทารกในครรภ์เป็นกระบวนการที่ซับซ้อนซึ่งดำเนินต่อเนื่องตลอดการตั้งครรภ์ สตรีควรมั่นใจว่ามีพัฒนาการด้านสมองที่ดีตลอดการตั้งครรภ์ แต่ยังขาดความเข้าใจอย่างลึกซึ้งเกี่ยวกับการรับรู้ของสตรีตั้งครรภ์ในประเด็นดังกล่าว การวิจัยพรรณนาเชิงคุณภาพนี้มีวัตถุประสงค์เพื่ออธิบายการรับรู้ของสตรีตั้งครรภ์เกี่ยวกับพัฒนาการด้านสมองของทารกในครรภ์ ดำเนินการเก็บรวบรวมข้อมูลจากสตรีตั้งครรภ์ 15 ราย ที่อยู่ในจังหวัดในภาคใต้ของประเทศไทย ระหว่างเดือนสิงหาคม 2563 ถึง เดือนมกราคม 2565 โดยการสัมภาษณ์เชิงลึก และวิเคราะห์ข้อมูลเชิงคุณภาพด้วยการวิเคราะห์ประเด็นหลัก

จากการวิเคราะห์ข้อมูล พบประเด็นหลักทั้งหมด 3 ประเด็น ได้แก่ ประเด็นหลักที่หนึ่งคือความย้อนแย้งระหว่างความสำคัญและความเข้าใจเกี่ยวกับพัฒนาการด้านสมองของทารกในครรภ์ โดยมีประเด็นย่อย 2 ประเด็น: 1) การรับรู้ถึงความสำคัญของพัฒนาการด้านสมองของทารกในครรภ์ และ 2) ความเข้าใจที่ไม่ชัดเจนเกี่ยวกับพัฒนาการด้านสมองของทารกในครรภ์ ประเด็นหลักที่สองคือการไม่ตระหนักถึงอันตรายของพัฒนาการด้านสมองของทารกในครรภ์ที่ต่ำกว่าเกณฑ์ โดยมีประเด็นย่อยสองประเด็น: 1) ความคาดหวังต่อพัฒนาการด้านสมองของทารกในครรภ์ และ 2) ความเข้าใจที่เกี่ยวกับอันตราย ประเด็นหลักที่สามคือการส่งเสริมพัฒนาการสมองของทารกในครรภ์ โดยมีประเด็นย่อยสองประเด็น: 1) การปฏิบัติเพื่อการบำรุง และ 2) การหลีกเลี่ยงอันตราย สรุปได้ว่าสตรีตั้งครรภ์มีความเข้าใจจำกัดเกี่ยวกับพัฒนาการด้านสมองของทารกในครรภ์ และอันตรายที่อาจส่งผลต่อพัฒนาการด้านสมองของทารกในครรภ์ ซึ่งนำไปสู่ความยากลำบากในการส่งเสริมพัฒนาการทางสมองของทารกในครรภ์ ดังนั้น พยาบาลควรได้รับการฝึกเพื่อให้ความรู้แก่สตรีตั้งครรภ์ โดยเน้นที่ความเข้าใจที่ถูกต้องเกี่ยวกับพัฒนาการด้านสมองของทารกในครรภ์ การบำรุง และการหลีกเลี่ยงอันตรายตามบริบทของสตรีตั้งครรภ์

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คำสำคัญ: พัฒนาการด้านสมองของทารกในครรภ์ การรับรู้ สตรีตั้งครรภ์ การวิจัยพรรณนาเชิงคุณภาพ ประเทศไทย

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