

## **Original Research Article**

# **Knowledge, Attitudes and Practices of Ramadan Fasting in Healthy Muslim Pregnant Women in Selangor**

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## **ABSTRACT**

Ramadan fasting is a significant religious observance for Muslims worldwide. While exemptions exist for pregnant women, many choose to fast, raising questions about their knowledge, attitudes, and practices regarding the health implications. This study aimed at evaluating the knowledge, attitudes, and practices of Ramadan fasting among healthy Muslim pregnant women in Selangor. This cross-sectional study conducted from March to June 2024 in Selangor involved 300 healthy pregnant women by convenience sampling. Participants completed a self-administered questionnaire via Google Forms, which collected data on demographics, medical and medication history, knowledge of Islamic fasting laws during pregnancy, attitudes towards fasting, common fasting practices, and adversities encountered during fasting. The study revealed an adequate understanding of Islamic law among both fasting and non-fasting groups, with no significant differences noted. Attitudes towards fasting were predominantly positive, though distinct differences emerged regarding beliefs about fasting's impact on foetal birth weight and concerns about weakness and fatigue. Despite these challenges, 64% of participants engaged in additional religious activities, demonstrating resilience and deep faith. While the majority of healthy Muslim pregnant women in Selangor are knowledgeable about the obligation of Ramadan fasting, many still have concerns about potential health impacts. The findings suggest that healthcare providers should offer tailored advice and support to pregnant women, ensuring they are well-informed about the obligations and potential risks associated with Ramadan fasting. This approach will help them make informed decisions while observing their religious duties.

**Keywords:** Ramadan fasting, pregnancy, Muslim women, Selangor

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## 1.0 Introduction

During the ninth lunar month of the Islamic calendar, known as Ramadan, Muslims around the world observe fasting from sunrise to sunset, meaning they refrain from eating, drinking, smoking, or engaging in sexual activity (1). The customary fasting period during Ramadan typically spans from Fajr (dawn) to Maghrib (sundown), lasting anywhere from 11 to 18 hours in tropical countries (2). The exact times can vary depending on the specific location and the time of year, as Ramadan shifts approximately 10 days earlier each year in the Gregorian calendar (3).

This fasting ritual is a core component of Islamic faith, emphasising spiritual discipline and devotion. While fasting during Ramadan is obligatory for all healthy adult Muslims, the Quran offers compassionate exemptions for certain groups, including the sick, pregnant women, breastfeeding mothers, children, and travellers (4). Islamic law thoughtfully permits pregnant women to abstain from fasting if they fear it may harm their health or the health of their unborn child. To make up for the missed fasts, they can fast at a later time and/or feed a poor person for each day missed (4). This compassionate provision underscores the importance of the well-being of both the mother and the child, reflecting the merciful and practical nature of the faith. Research by Saowanee Saro found that almost 93.3% of pregnant Thai-Muslim women choose to fast during Ramadan. This decision is influenced by their deep faith, support from family and religious authorities, and the practical difficulties of making up missed fasting days later (5). This widespread commitment highlights the profound spiritual dedication and cultural significance that fasting holds for many Muslim women around the world. Although many studies have examined the health effects of fasting in healthy pregnant

women and generally found little or no significant impact on pregnancy outcomes, it is essential to recognise that fasting can still pose risks (6). Research indicates that while fasting may lead to temporary changes in maternal metabolism and potential nutritional deficits, these changes typically do not result in adverse effects on the growth and development of the foetus in healthy pregnancies (7). For instance, studies conducted during Ramadan have observed that fasting had minimal effects on birth weight, gestational age at birth, and rates of preterm delivery (8).

However, there are evidences suggesting that fasting can contribute to negative outcomes. Fasting during Ramadan involves significant changes in daily routines, including altered meal frequency, eating patterns, physical activity, and sleep cycles (9). These changes can impact health in various ways. For pregnant women, the shift to eating only during non-daylight hours can lead to fluctuations in blood sugar levels, increasing the risk of hypoglycaemia, ketosis, and ketonuria (10). Additionally, the disruption of normal eating and sleeping patterns can affect overall metabolic balance and potentially lead to dehydration and nutritional deficiencies (10). Poor or imbalanced nutrition during pregnancy can hinder proper growth and development, potentially leading to long-term health issues for the child. Studies show that insufficient maternal nutrition is linked to adverse outcomes like cardiovascular disease, diabetes, and metabolic syndrome in the offspring (11). These conditions often stem from the imbalance between foetal nutritional demands and maternal supply, leading to metabolic and endocrine adaptations that have long-term health implications (12). Therefore, balancing religious observance with optimal nutrition is crucial for pregnant women during Ramadan.

Despite these risks, fasting can also provide benefits for Muslim women,

including those who are pregnant. One significant benefit is the potential improvement in mental well-being. Many individuals report a sense of spiritual fulfilment and increased mental clarity during fasting, which can contribute to reduced stress and enhanced mood, which is beneficial during pregnancy (8). Another potential benefit of fasting is its effect on blood sugar regulation. Some studies suggest that intermittent fasting, which is similar to the fasting practices during Ramadan, can help stabilise blood sugar levels and improve insulin sensitivity (6). This can be particularly advantageous for pregnant women at risk of gestational diabetes, as better blood sugar control can lead to healthier pregnancy outcomes (13). Additionally, fasting can help improve dietary habits by promoting a more structured eating schedule during Ramadan (14). This structure can encourage healthier eating patterns, reduce the tendency to snack, and support the consumption of balanced meals (14). For pregnant women, this structured approach to eating can lead to better nutritional choices, enhancing overall health, and supporting optimal foetal development.

Muslim pregnant women's perspectives on fasting during Ramadan vary widely, influenced by cultural, religious, and personal beliefs. Some view fasting positively, seeing it as a chance for spiritual growth and a deeper connection to their cultural identity, while others express concerns about its potential harm to maternal and foetal health. These concerns highlight the need for culturally sensitive healthcare guidance (5).

The intersection of Ramadan fasting, and pregnancy presents a unique set of challenges and concerns, particularly in the context of maternal and foetal health. The limited evidence available to guide Muslim pregnant women, especially in Malaysia,

underscores the need for comprehensive studies to provide high-quality data on this topic. This study aimed at evaluating pregnant women's knowledge of the Islamic law regarding Ramadan fasting during pregnancy. Additionally, it seeks to assess their attitudes towards participating in Ramadan fasting during pregnancy and investigate the fasting practices they adopt during this period.

## 2.0 Materials and methods

The research commenced after obtaining ethical approval from the Research Ethics Committee (REC) of the Universiti Teknologi MARA (UiTM) [600-FF(RES.5/4)]. The investigation utilized a self-administered validated questionnaire adapted from a study by Saro & Tanawattanacharoen (2018) (5). This multicentered, cross-sectional descriptive study was carried out from March 2024 to May 2024, aligning with Ramadan in Selangor, Malaysia. To ensure inclusivity of pregnant women who fasted but did not attend antenatal appointments during Ramadan, data collection was extended until June. The study was conducted in Selangor due to its second highest birth rate in Malaysia in 2023, which made it an ideal setting to explore the influence of religious practices on the knowledge, attitudes, and practices related to Ramadan fasting. The target population comprised pregnant Muslim women attending antenatal care clinics across Selangor.

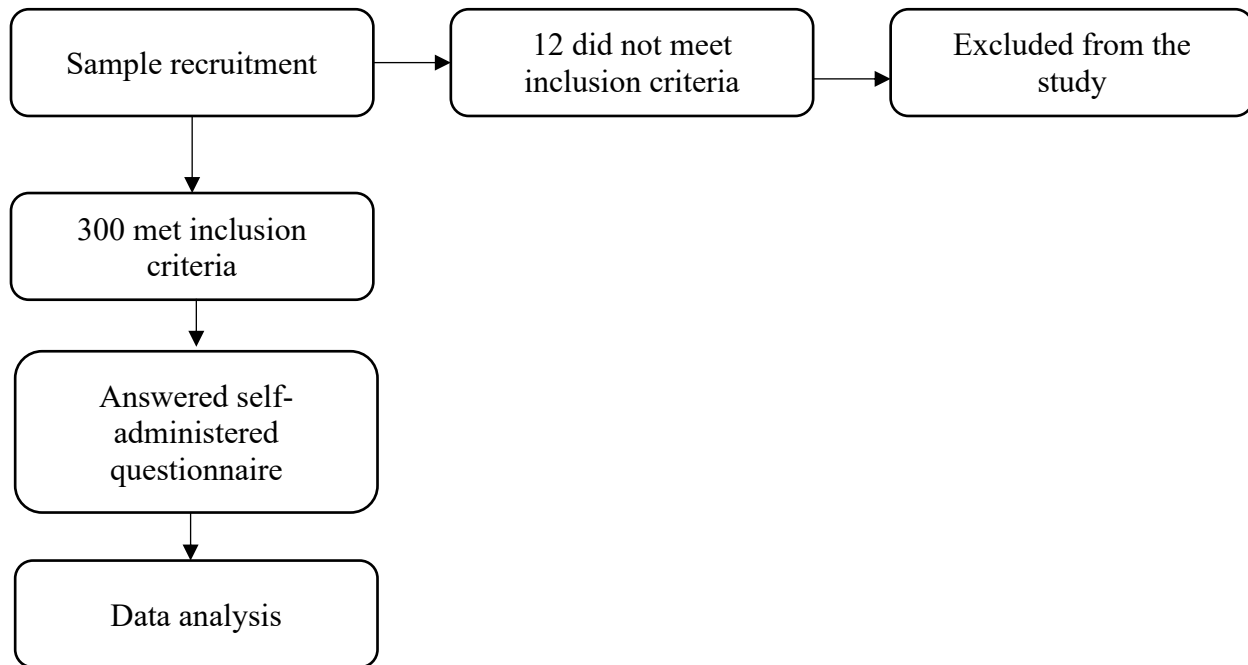
Participants were selected based on specific criteria: healthy pregnant Muslim women who were pregnant during Ramadan at least once and were able to understand, read and write either in English or Malay. Pregnant women with comorbidities or taking medications for chronic illnesses other than pregnancy supplements were excluded. A cross-sectional design facilitated

exploration of Ramadan fasting knowledge, attitudes, and practices among healthy Muslim pregnant women. Convenience sampling ensured practical access to participants and streamlined data collection. The sample size was determined using Cochran's sample size formula, accounting for the estimated population of pregnant women in Selangor during Ramadan in 2022, with an additional 10% to mitigate incomplete data, resulting in a final sample size of 300, with 12 pregnant women excluded for not meeting the inclusion criteria.

The questionnaire was distributed via Google Forms through various general practitioners' clinics in Selangor. Providers and nurses at antenatal clinics introduced the study, assisting pregnant women through a QR code on study posters to access and complete the questionnaire. The study employed non-probability convenience

sampling. The questionnaire, translated into Bahasa Malaysia by UiTM language experts and a lecturer from University of Malaya, underwent validation by a panel of experts. Feedback led to necessary amendments before distribution. The questionnaire was designed using simple Malay and English language, avoiding the usage of medical terms.

The questionnaire encompassed six sections: demographic information, medical and medication history, knowledge of Islamic laws regarding Ramadan fasting during pregnancy, attitudes towards fasting during pregnancy, fasting practices during Ramadan, and challenges encountered during fasting. Data were analysed using IBM SPSS Statistics Version 28.0. Statistical analysis included descriptive statistics and Chi-square tests with statistical significance set at  $p < 0.05$ .



**Figure 1:** Methodology of the study

### 3.0 Results

This study included 300 healthy pregnant Muslim women who met the inclusion criteria, out of which 12 were excluded due to a history of chronic diseases and the use of medications other than pregnancy supplements. The excluded participants reported conditions such as hyperthyroidism, psoriasis, asthma, and major depressive disorder (MDD), which necessitated their exclusion from the study. All participants provided informed consent before data collection, ensuring ethical compliance. The flow chart of data collection is illustrated in Figure 1.

The pregnant women in this study had an average age of 32.43 years with a standard deviation of 3.704 years, and a significant 90.3% were Malay Muslim women, as shown in Table 1. Regarding education, nearly half (47.3%) were university graduates, and an impressive 99.7% had received some form of Islamic education at least once in their lives, including *Kelas Pengajian Al-Quran dan Fardhu Ain* (KAFA), fardhu ain classes, or Islamic education during their schooling.

Additionally, 32.3% of the participants were employed in government positions.

A significant portion of respondents, 45.3%, were in their second trimester of pregnancy and 42.0% were in their third trimester, and a remarkable 93.8% had no history of gestational diabetes mellitus (GDM) in previous pregnancies. Among those who fasted, 40% completed all 29 to 30 days of Ramadan, while 49.7% fasted intermittently, around 8 to 20 days. In total, 89.7% of participants fasted during pregnancy, either frequently or occasionally, while 10.3% did not fast at all. The study sample comprised a slightly higher percentage of multigravida (54.0%) compared to primigravida (46.0%).

The demographic characteristics of the participants are detailed in Table 1. These tables present comprehensive information on the pregnant women, including their age, height, weight, race, religion, highest education level, receipt of Islamic education, occupation, weeks of pregnancy, gravida, and history of gestational diabetes mellitus (GDM).

**Table 1:** Demographic characteristics of participants

| Characteristics                | Frequency<br>n=300 | Percentage<br>(%) | Range   | Mean<br>(SD) |
|--------------------------------|--------------------|-------------------|---------|--------------|
| <b>Age (year)</b>              | -                  | -                 | 22 - 41 | 32.43 (3.70) |
| <b>Race</b>                    |                    |                   |         |              |
| Malay                          | 271                | 90.3              | -       | -            |
| Indian                         | 26                 | 8.7               | -       | -            |
| Other                          | 3                  | 1                 | -       | -            |
| <b>Highest education level</b> |                    |                   |         |              |
| Primary school                 | 1                  | 0.3               | -       | -            |
| Secondary school               | 64                 | 21.5              | -       | -            |
| Certificate                    | 90                 | 30                | -       | -            |
| University education           | 142                | 47.3              | -       | -            |
| Others                         | 3                  | 1                 | -       | -            |

| <b>Islamic education</b>                 |     |      |   |   |
|--|-----|------|---|---|
| Received Islamic education               | 299 | 99.7 | - | - |
| Did not receive Islamic education        | 1   | 0.3  | - | - |
| <b>Occupation</b>                        |     |      |   |   |
| Self employed                            | 57  | 19   | - | - |
| Government sector employee               | 97  | 32.3 | - | - |
| Private sector employee                  | 78  | 26   | - | - |
| Never been employed                      | 3   | 1    | - | - |
| Housewife                                | 65  | 21.7 | - | - |
| <b>Weeks of pregnancy during Ramadan</b> |     |      |   |   |
| Trimester 1<br>(Week 1- Week 12)         | 38  | 12.7 | - | - |
| Trimester 2<br>(Week 13- Week 27)        | 136 | 45.3 | - | - |
| Trimester 3<br>(Week 28- Week 40)        | 126 | 42   | - | - |
| <b>Gravida</b>                           |     |      |   |   |
| Primigravida                             | 138 | 46   | - | - |
| Multigravida                             | 162 | 54   | - | - |
| <b>History of gestational diabetes</b>   |     |      |   |   |
| Yes                                      | 18  | 6    | - | - |
| No                                       | 274 | 91.3 | - | - |

A detailed summary of the participants' knowledge about the Islamic law of Ramadan fasting during pregnancy is presented in Table 2. The comparison between the fasting and non-fasting groups revealed no significant differences across the knowledge statements. Specifically, for four out of the six statements, the p-values exceeded the significance threshold of 0.05, indicating that both groups had similar levels of knowledge.

A notable 92.0% of participants understood that Ramadan fasting is a religious obligation for healthy pregnant women. Additionally, a remarkable 98.7%

were aware of the Islamic law that provides a clear exemption from fasting for pregnant women under certain concerns, but they are required to make up the missed days later. The majority of the respondents demonstrated correct knowledge about the specific conditions under which they could be exempted from fasting during pregnancy. However, significant differences were observed between the fasting and non-fasting groups regarding the exemption from fasting due to concerns about foetal weight ( $p < 0.001$ ) and feelings of weakness during fasting ( $p < 0.042$ ).

**Table 2:** Knowledge of Islamic law and fasting during pregnancy among healthy pregnant women

| Statement   | Pregnant women fasting group | Islamic law knowledge |           | P* value |
|---|------------------------------|-----------------------|-----------|----------|
|   |                              | Yes (%)               | No (%)    |          |
| 1. Ramadan fasting is a religious obligation for healthy pregnant women.  | Fasted                       | 247 (91.8)            | 22 (8.2)  | 0.737    |
|   | Non-fasted                   | 29 (93.5)             | 2 (6.5)   |          |
| 2. Islamic law clearly mentioned exemption from fasting is permitted for pregnant women, then must make up for the missed days later. | Fasted                       | 265 (98.5)            | 4 (1.3)   | 0.494    |
|   | Non-fasted                   | 31 (100.0)            | 0 (0.0)   |          |
| 3. If you are worried that fasting may increase the risk of malnutrition, you can be exempted from Ramadan fasting.                   | Fasted                       | 264 (98.1)            | 5 (1.9)   | 0.444    |
|   | Non-fasted                   | 31 (100.0)            | 0 (0.0)   |          |
| 4. If you are worried that fasting may increase the risk of low foetal weight gain, you can be exempted from Ramadan fasting.         | Fasted                       | 177 (65.8)            | 92 (34.2) | <.001    |
|   | Non-fasted                   | 31 (100.0)            | 0 (0.0)   |          |
| 5. If you abstain from the pre-dawn meal, it will make you tired due to a longer period of fasting.                                   | Fasted                       | 237 (88.1)            | 32 (11.9) | 0.042    |
|   | Non-fasted                   | 31 (100.0)            | 0 (0.0)   |          |
| 6. If the foetal movement decreases, you should stop fasting, and see the doctor.   | Fasted                       | 258 (95.9)            | 11 (4.1)  | 0.251    |
|   | Non-fasted                   | 31 (100.0)            | 0 (0.0)   |          |

\*Analysed using a Chi Square test

The summary of participants' attitudes towards Ramadan fasting during pregnancy is presented in Table 3. Notably, four out of six statements revealed no significant differences between the fasting and non-fasting groups. However, two statements showed significant differences, with p-values less than 0.05, as mentioned below.

Overall, the attitudes of the fasting group did not differ significantly from the non-fasting

group in most respects. Exceptions were found in beliefs regarding the impact of fasting on foetal birth weight ( $p < 0.001$ ) and feelings of weakness and fatigue ( $p < 0.001$ ) during pregnancy. A significantly higher percentage of participants (76.2%) in the fasting group believed that fasting could not cause low foetal birth weight. Additionally, 69.5% of the fasting group felt that fasting would make a pregnant woman weak and fatigued.

**Table 3:** Attitudes of healthy pregnant women about Ramadan fasting during pregnancy

| Statement  | Pregnant women fasting group | Attitudes on Ramadan fasting |            | P* value |
|--|------------------------------|------------------------------|------------|----------|
|  |                              | Yes (%)                      | No (%)     |          |
| 1. By fasting in Ramadan month, you will get better merit than another month.              | Fasted                       | 243 (90.3)                   | 26 (9.7)   | 0.070    |
|  | Non-fasted                   | 31 (100)                     | 0 (0.0)    |          |
| 2. I want to fast with my family because I do not want to make up the fasting later alone. | Fasted                       | 204 (75.8)                   | 65 (24.2)  | 0.158    |
|  | Non-fasted                   | 27 (87.1)                    | 4 (12.9)   |          |
| 3. Ramadan fasting gives you peace of mind.  | Fasted                       | 267 (99.3)                   | 2 (0.7)    | 0.630    |
|  | Non-fasted                   | 31 (100)                     | 0 (0.0)    |          |
| 4. Ramadan fasting during pregnancy is not harmful.  | Fasted                       | 250 (92.9)                   | 19 (7.1)   | 0.417    |
|  | Non-fasted                   | 30 (96.8)                    | 1 (3.2)    |          |
| 5. The fasting during pregnancy, may cause of foetal low birth weight                      | Fasted                       | 64 (23.8)                    | 205 (76.2) | <.001    |
|  | Non-fasted                   | 30 (96.8)                    | 1 (3.2)    |          |
| 6. I feel weak and fatigue from the fast during pregnancy                                  | Fasted                       | 187 (69.5)                   | 82 (30.5)  | <.001    |
|  | Non-fasted                   | 4 (12.9)                     | 27 (87.1)  |          |

\*Analysed using a Chi Square test

A detailed summary of participants' practices related to Ramadan fasting during pregnancy is shown in Table 4. A significant majority of pregnant women (99.7%) broke their fast immediately upon hearing the Azan, either frequently (4-5 times per week) or sometimes (1-2 times per week). Many of these women also broke their fast with sweet foods (66.0%) and ensured they drank at least 6-8 glasses of water daily (100%).

In terms of dietary habits, 60.7% of the pregnant women occasionally ate leftover foods (1-2 times per week). Sleep patterns during Ramadan varied, with 10.3% frequently sleeping less at night, 34.0% sometimes

getting reduced sleep, and 55.7% never experiencing reduced night-time sleep. Meanwhile, 24.3% often compensated by sleeping more during the day, while 50.7% never increased their daytime sleep. Despite the challenges of fasting, only 10.4% of the women occasionally or frequently missed antenatal care appointments due to feeling weak. Additionally, 51.7% sometimes forgot to take their iron supplements.

Religious activities remained a priority, with 64.0% of the pregnant women continuing their religious practices 1-5 times per week during Ramadan.



**Table 4:** Practices of Ramadan fasting among healthy pregnant women

| Statement  | Frequency                                 |   |            |
|--|---|---|------------|
|  | Frequently<br>(4-5 times per<br>week) (%) | Sometime<br>(1-2 times per<br>week) (%) | Never (%)  |
| <b>Characteristics of fasting</b>                        |   |   |            |
| • Fasting during pregnancy                               | 120 (40.0)                                | 149 (49.7)                              | 31 (10.3)  |
| • Eat a pre-dawn meal                                    | 191 (63.7)                                | 108 (36.0)                              | 1 (0.3)    |
| • Break fast immediately after hearing the Azan sound    | 141 (47.0)                                | 158 (52.7)                              | 1 (0.3)    |
| • Break fast late because of work                        | 105 (35.0)                                | 58 (19.3)                               | 137 (45.7) |
| • Break fast because of feeling weak, hungry and thirsty | 68 (22.7)                                 | 206 (68.7)                              | 26 (8.7)   |
| <b>Eating pattern</b>                                    |   |   |            |
| • Break fast with sweet foods                            | 198 (66.0)                                | 68 (22.7)                               | 34 (11.3)  |
| • Eat leftover foods                                     | 222 (74.0)                                | 69 (23.0)                               | 9 (3.0)    |
| • Overeat at breaking of fast                            | 60 (20.0)                                 | 182 (60.7)                              | 58 (19.3)  |
| • Drink at least 6-8 glasses of water per day            | 216 (72.0)                                | 84 (28.0)                               | 0 (0.0)    |
| <b>Sleep cycle</b>                                       |   |   |            |
| • Sleep less at night                                    | 31 (10.3)                                 | 102 (34.0)                              | 167 (55.7) |
| • Sleep more during daytime                              | 73 (24.3)                                 | 75 (25.0)                               | 152 (50.7) |
| <b>Other behaviours</b>                                  |   |   |            |
| • Forget to take iron-supplement drugs                   | 10 (3.3)                                  | 155 (51.7)                              | 135 (45.0) |
| • Miss antenatal care appointments because feel weak     | 2 (0.7)                                   | 29 (9.7)                                | 269 (89.7) |
| • Stop working because body is exhausted                 | 86 (28.7)                                 | 50 (16.7)                               | 164 (54.7) |
| • Do religious activity                                  | 81 (27.0)                                 | 111 (37.0)                              | 108 (36.0) |

**Table 5:** Adversities encountered by healthy pregnant women during Ramadan fasting.

| Statement                        | Frequency                                 |   |            |
|----------------------------------|---|---|------------|
|                                  | Frequently<br>(4-5 times per<br>week) (%) | Sometime<br>(1-2 times per<br>week) (%) | Never (%)  |
| Weakness, Fatigue                | 31 (10.3)                                 | 77 (25.7)                               | 192 (64.0) |
| Dizziness                        | 13 (4.3)                                  | 75 (25.0)                               | 212 (70.7) |
| Abdominal pain/ Nausea/ Vomiting | 12 (4.0)                                  | 33 (11.0)                               | 255 (85.0) |
| Abnormal vaginal bleeding        | 0 (0.0)                                   | 60 (20.0)                               | 240 (80.0) |
| Decreased foetal movement        | 2 (0.7)                                   | 67 (22.3)                               | 231 (77.0) |
| Fever                            | 0 (0.0)                                   | 33 (11.0)                               | 267 (89.0) |

The findings on the adversities faced by pregnant women during Ramadan fasting are detailed in Table 5. The most prevalent complications reported were feelings of weakness and fatigue, dizziness, and diarrhoea. Other adversities, such as abdominal pain, abnormal vaginal bleeding, decreased foetal movement, and fever, were less common among our participants.

#### 4.0 Discussion

The Islamic practice of fasting during Ramadan mandates that healthy adults abstain from food and drink between sunrise and sunset (1). This obligation, known as "*wajib*," or compulsory, applies to healthy Muslims but includes exceptions for pregnant women who are concerned about risking their own health or the health of their baby (15). According to the *Mufti of Wilayah Persekutuan*, if a pregnant woman fears harm to herself or both herself and her child, she is required to make up the missed fasts on other days, similar to the exemptions given to a sick person (15). If the concern is solely for the child's health, she is permitted to break the fast but must compensate by making up the missed fasts and paying *fidyah* (compensation) equivalent to one *mud* (cup) for each missed fast (16). This guidance aims to balance religious

obligations with health considerations for pregnant women.

Our study found that an overwhelming 89.6% of pregnant Muslim women in Selangor participated in fasting during pregnancy, whether frequently or occasionally. In contrast, 10.3% of the participants were unable to maintain their fasts throughout Ramadan. Most of these women managed to fast for 2-5 days per week. This is consistent with studies in Thailand, which also indicated that most Muslim women choose to fast during pregnancy (5). Similarly, research in Singapore found that 87% of pregnant Muslim women fasted for at least one day during Ramadan (17). In contrast, nearly half (43%) of pregnant women in Pakistan observed fasting for the entire month (18).

The high adherence rate to fasting among pregnant Muslim women in Selangor can be attributed to a variety of factors. These include spiritual motivations, a strong sense of religious obligation, a positive perception of fasting, cultural influences, and significant familial support. Other factors that contribute include the ease and sense of togetherness felt when fasting together as a family during Ramadan, compared to the difficulties of fasting alone outside of Ramadan when there may be less social support and external pressures from society (5).

A significant 90.3% of these women were Malay Muslims, reflecting the ethnic composition of the population in Selangor. This demographic aligns with the cultural and religious context of the region, where Islamic education significantly influences beliefs and practices among Malay Muslims. It underscores how Islamic teachings, deeply embedded in Malay culture, emphasise religious duties such as fasting during Ramadan. Besides, a significant 99.7% of pregnant women agreed that they had received Islamic education, which instilled in them a strong faith and deep respect for religious obligations. Islamic education, including KAFA, *fardu ain* classes, or Islamic lessons during schooling, motivates them to observe fasting during pregnancy (19).

In our study, 54% of multigravida women tended to fast more than 46% of primigravida women, although this difference was not statistically significant. This trend aligns with findings from studies in Thailand and Singapore, suggesting that multigravida women are more inclined to fast during pregnancy compared to primigravida women (5, 17). It is hypothesised that primigravida women, experiencing pregnancy for the first time, may feel more apprehensive and cautious about fasting due to their unfamiliarity with the physiological changes and potential risks associated with pregnancy. Meanwhile, during the third trimester of pregnancy, more women adhere to fasting, possibly because morning sickness has typically subsided and they feel more confident about their babies' health based on their previous pregnancy experiences (4). This increased adherence reflects a sense of maternal assurance and physical comfort as pregnancy progresses.

Besides, our study revealed a robust understanding among participants in Selangor, where 91.8% recognised Ramadan fasting as obligatory for healthy pregnant women, and the majority were aware of

exemptions for health concerns like malnutrition, foetal growth, or reduced foetal movement, with requirements for makeup fasting. This indicates a high level of Islamic knowledge on Ramadan fasting among both fasting and non-fasting groups. This marks a stark contrast with previous research, where only 67.0% of participants correctly understood these laws, with some mistakenly believing that fasting during pregnancy was optional (4). The remaining 30% of pregnant women in Thailand perceived fasting during pregnancy as optional, considering it either recommended ("*sunat*") or permissible ("*harus*") (5). The discrepancy likely stems from higher levels of Islamic education among our participants, underscoring its pivotal role in disseminating accurate knowledge. This coherence underscores how Islamic education empowers pregnant women to navigate fasting decisions.

However, significant differences emerged regarding the exemption from fasting due to concerns about foetal weight and feelings of weakness during fasting. One possible reason the non-fasting group disagrees with this exemption could be differences in the perceived severity or understanding of the specific concern. They might view low foetal birth weight as less immediately dangerous or less directly impacted by fasting compared to other health issues. Additionally, there might be a lack of awareness or understanding about the potential impacts of fasting on foetal development, leading to less concern about this issue compared to other more obvious health problems. Some might also believe that fasting is a duty that should be maintained unless there's a very clear and severe health risk, and they might not perceive low foetal birth weight as meeting that threshold.

Overall, the attitudes towards fasting showed minimal variation between the fasting and non-fasting groups. However,

distinct differences emerged regarding beliefs about the impact of fasting on foetal birth weight and concerns related to weakness and fatigue during pregnancy. A higher percentage of fasting groups maintained positive attitudes that fasting would not result in low foetal birth weight. This perception aligns with research indicating that fasting during Ramadan does not negatively affect foetal growth or birth weight among healthy pregnant women (20). This is due to the limited evidence linking fasting to low foetal weight outcomes, as pregnant women who fast adapt their eating behaviours to ensure they consume enough nutrients during non-fasting hours, thereby mitigating potential risks to foetal development. Therefore, further study on the impact of fasting on the foetal birth weight needs to be conducted to support this concern.

Nonetheless, 69.5% of the fasting group expressed concerns about feeling weak and fatigued due to fasting. These symptoms can arise due to changes in blood sugar levels, dehydration, or insufficient nutrient intake during fasting hours (21). Research and medical literature often document these concerns among fasting individuals. For instance, a study by Cross-Sudworth (2007) (19) on pregnant women fasting during Ramadan also found that fatigue and weakness were common complaints among participants. These symptoms were linked to changes in sleep patterns, dehydration, and dietary changes during fasting (21). Hence, close monitoring of maternal health and providing adequate nutritional guidance are crucial for pregnant women who choose to fast during Ramadan.

Breaking the fast with sweet foods is a prevalent practice among Ramadan observers, with 66.0% opting for this tradition. However, this practice may increase the risk of pregnant women developing gestational diabetes (GDM), as hormonal changes during

pregnancy can interfere with the body's ability to use insulin effectively (22). When pregnant women consume sweet foods, their blood sugar levels spike (23). Normally, insulin helps regulate these levels, but pregnancy hormones such as oestrogen, progesterone, cortisol, and human placental lactogen can cause increased insulin resistance (24). This means the body's cells don't respond as well to insulin, causing higher blood sugar levels. If the pancreas cannot produce enough insulin to overcome this resistance, GDM can develop, posing risks to both mother and baby (24).

Meanwhile, 60.7% of participants occasionally consumed leftover foods during Ramadan. While eating leftovers is generally safe, ensuring proper storage and reheating to avoid foodborne illnesses is crucial, especially since pregnant women are at higher risk for certain foodborne illnesses (25). A research by Oosterwijk in 2021 suggests that pregnant women fasting during Ramadan should prioritise nutrient-dense foods during non-fasting hours to meet their increased nutritional demands (26). This approach helps in avoiding excessive intake of sugary and processed foods, promoting overall health and well-being.

Additionally, more than half (51.7%) of participants sometimes forgot to take their iron supplements. This negative practice can lead to iron deficiency among pregnant women, which may cause anaemia, resulting in fatigue, weakness, and an increased susceptibility to infections (27). Severe anaemia can increase the risk of complications during pregnancy and delivery, such as preterm birth or low birth weight (28). Inadequate iron intake can affect foetal development, potentially leading to impaired growth and development (28). Pregnant women should take 30 mg of iron per day, which can be obtained through a combination of dietary sources and supplements (29). Therefore, ensuring

consistent iron intake is crucial for the health of both the mother and the baby.

Concerns about weakness and fatigue were expressed by 69.5% of the fasting group, highlighting prevalent challenges associated with fasting during pregnancy. Our study also revealed other adversities experienced by fasting pregnant women, including diarrhoea, dizziness, abdominal pain, nausea, and vomiting, though these were less common among our participants. These findings are consistent with previous research, which also identifies weakness and fatigue as the most common complications (4). This underscores the potential impact of fasting-related symptoms on maternal and foetal health. Therefore, it is imperative for healthcare providers to address these challenges and offer tailored guidance that respects religious practices while safeguarding maternal and foetal well-being.

Despite its low prevalence, 0.7% of respondents frequently experienced reduced foetal movement, and an additional 22.3% reported experiencing it occasionally. This is a major concern, highlighting the need for proper education among pregnant mothers. Reduced foetal movement can indicate potential issues with foetal health and should prompt immediate medical attention to prevent complications such as foetal distress and stillbirth (27).

Despite these difficulties, positive attitudes towards fasting, strong familial support, and a sense of religious duty often enabled participants to overcome these obstacles. Many pregnant women remained committed to their religious practices, demonstrating resilience and devotion. Throughout Ramadan, religious activities continued to be a priority for many participants, with 64.0% maintaining their practices 1-5 times per week. This dedication often included participating in *Tarawih* prayers, which many were able to perform either at the mosque or individually at home.

The ability to engage in these spiritual practices, despite the physical challenges of fasting, highlights the importance of religious and familial support in helping pregnant women navigate the demands of Ramadan.

This study has the potential in equipping healthcare practitioners with invaluable insights into the fasting practices of pregnant women during Ramadan. By gaining a deeper understanding of how these women navigate fasting, we expect this study will help healthcare practitioners educate their patients more effectively. This research not only bridges the gap between religious practice and medical advice but also fosters a more empathetic and informed healthcare environment for pregnant Muslim women during Ramadan.

### **Limitations and suggestions**

The present study had several limitations. First, the samples were taken exclusively from private general practitioners' clinics, potentially recruiting a specific population who were more educated and families with a more stable income. This might limit the generalizability of the findings to the broader population of pregnant women, including those who attended government antenatal care clinics. It is suggested that future studies can include government hospitals. Another limitation was the sample size; we initially aimed to obtain responses from 388 participants but were only able to secure 312, with 12 pregnant women excluded due to comorbidities. This shortfall may have affected the robustness of our results. By extending the data collection period, we might be able to collect more samples. Additionally, our study included women with previous pregnancy experiences during Ramadan. This inclusion may present a limitation, as some participants might have been pregnant a long time ago and could not accurately recall their exact practices and

experiences. Other potential limitations include the self-reported nature of the data, which might introduce recall bias or inaccuracies, and the lack of a longitudinal approach to track changes over multiple Ramadan periods. Despite these limitations, the study provides valuable insights into the fasting practices and experiences of pregnant women, underscoring the need for tailored healthcare guidance that respects religious practices while ensuring maternal and foetal well-being.

## 5.0 Conclusion

Most pregnant women in the study had adequate knowledge of Islamic fasting laws, with no significant difference between fasting and non-fasting groups. Islamic education positively influenced fasting practices, including engagement in additional religious activities. Fasting women generally believed that fasting posed no harm to maternal health, whereas non-fasting women showed more concern, highlighting differing attitudes between the groups. However, the impact of fasting on pregnancy outcomes remains unclear and warrants further investigation.

Healthcare providers must engage in open and supportive discussions with pregnant women about fasting, providing clear information on potential risks, and encouraging informed decision-making. For those who choose to fast, strategies to mitigate adverse effects, such as maintaining proper hydration, consuming balanced meals, and taking adequate rest, should be emphasised.

Our study underscores the importance of continued educational efforts to ensure all pregnant women are well-informed about their religious obligations and the conditions that warrant exemptions. This approach can help alleviate guilt or misunderstanding among pregnant women who need to break

their fast for health reasons, ultimately supporting both maternal and foetal health during Ramadan.

## Authorship contribution statement

**NSMS:** Data analysis, Methodology, Formal analysis, Writing—original draft. **SA:** Visualization, Resources, Methodology, Writing—review & editing, Draft corrections. **NWZ:** Supervision, Visualization, Resources. **NANNMS:** Writing—review & editing.

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## Conflict of Interest

The authors have no competing interests to declare.

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