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ASSESSING MATERNAL AND FETAL HEALTH OUTCOMES DURING RAMADAN FASTING: A COHORT STUDY IN IRAQ

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ABSTRACT

Background: There is little evidence that Ramadan fasting during pregnancy can negatively impact pregnancy and birth outcomes. Several epidemiologic studies have attempted to investigate this issue, yielding conflicting results. **Aim of study:** To determine the effects of maternal intermittent fasting during Ramadan on a range of pregnancy outcomes. **Methods:** A cohort study conducted at an Obstetrics and Gynecology private clinic, Kirkuk, Iraq during a period of two year from January 2023 to January 2025. It included all pregnant women who visited the private clinic for antenatal care and follow up of pregnancy. They were divided into two groups: Fasting group included 496 pregnant women who fasted during Ramadan during one of the pregnancy trimesters and non-fasting group included 260 pregnant women who didn't fast during the pregnancy. Women were followed up till delivery and recorded the outcome parameters as fetal maturity, birthweight, Apgar score at 5th mint., and head circumference. **Results:** No statistically significant differences detected ($P \geq 0.05$) between fasting and non-fasting women regarding amniotic fluid index, urinary tract infection, fetal maturity, birthweight, Apgar score, and head circumference. The duration of fasting didn't show significant effect on amniotic fluid index, urinary tract infection, fetal maturity, birthweight, Apgar score, or head circumference. **Conclusion:** Pregnant women may successfully fast during Ramadan with proper care and careful consideration of their individual health circumstances.

KEYWORDS: Ramadan, pregnancy, fasting, outcome, fetal, Iraq.

INTRODUCTION

Nearly 1.8 billion people, or over 25% of the global population, identify as Muslims. The Islamic calendar's holiest month is Ramadan, which falls in the ninth lunar month. Countless Muslims observe a daily fast from sunrise to sunset throughout this month.[1] During the Islamic holy month of Ramadan, individuals who are in good health refrain from eating, drinking, and participating in certain activities, such smoking and sexual activity, from sunrise to sunset. It is around this time that Muslims usually have their two main meals of the day, Suhoor (during the night) and Iftar (during the day).[2] During this time, you are not to consume anything by mouth, including food, water, smoke, have sexual relations, or take any drugs.[3] Worldwide, people also follow a number of different intermittent fasting regimens, such as total alternate day fasting or the 5:2 diet, which has people fast twice a week and eat normally the remaining three days.[4] No woman should fast when she is pregnant or nursing if she fears for her health or the health of her unborn child.[5] However, for religious, cultural, and social reasons, many women continue to fast during Ramadan while they are pregnant or nursing.[6] Approximately 75% of infants born to Muslim mothers may experience fasting during Ramadan.[7] In order to keep energy levels sufficient while fasting, metabolic compensation takes place. The breakdown of lipids and carbs like glucose is a part of this process. The lipid profile will be affected, and weight reduction will follow this approach. People who are otherwise healthy and who fast will see improvements in their lipid profiles and a decrease in

their body mass index (BMI).[8] There is a risk of hypoglycemia and ketoacidosis in diabetic patients who fast. How may fasting be used for health benefits while minimizing its risks? This is a crucial point that this poses.[9, 10] Research on the effects of Ramadan fasting on fetal health has been mixed, with some studies finding positive effects and others finding negative ones. Additionally, study sizes are typically too small to draw firm conclusions about these rare but significant consequences. There is a lack of clarity on the trimester in which a fetus is exposed to fasting during Ramadan, which raises the possibility that the timing of this exposure affects the outcome.[11] Muslims should consult their doctors or midwives about whether or not fasting during Ramadan is safe for pregnant women, although there is a lack of consensus on the subject and conflicting information currently accessible.[12] Hence, it is necessary to assess the existing data concerning links between Ramadan fasting and the results of pregnancies. The aim of this study is to determine the effects of maternal intermittent fasting during Ramadan on a range of pregnancy outcomes.

PATIENTS AND METHODS

Study design, setting and time: This was a cohort study conducted at an Obstetrics and Gynecology private clinic, Kirkuk, Iraq during a period of two year from January 2023 to January 2025.

Study Population and sample size: The study included all pregnant women who visited the private clinic for antenatal care and follow up of pregnancy.

The sample size was calculated for examining the relationship between Ramadan fasting and adverse pregnancy outcomes and estimated for a comparison of proportions by using the following formula.

Where:

$$n = \frac{(Z_{\alpha/2}+Z_{\beta})^2 \, (p_0(1-p_0) + p1(1-p1))}{(p1-p0)^2}$$

$Z_{\alpha/2}$ = Z-score for the significance level (Typically 1.96 for α=0.05).
Z_{β} = Z-score for power (Typically 0.84 for 80% power).
p_0 = Proportion of pregnancy adverse outcome in the non-fasting group.
p1= Proportion pregnancy adverse outcome in the fasting group.

According to a previous study, the rate of pregnancy adverse outcome among women who fasted was approximately 15% compared to 10% in non-fasting women.[13] According to the formula, the total sample size required is 681, then by anticipating a dropout rate of 10%, we adjusted the sample size to be 756.

They were divided into two groups according to fasting during one of the pregnancy trimesters or not,

- **Fasting Group:** Included 496 pregnant women who fasted during Ramadan during one of the pregnancy trimesters.
- **Non-fasting Group:** Included 260 pregnant women who didn't fast during the pregnancy.

Any smoker women, had history of chronic systemic diseases, drug consumption during pregnancy, not having an appropriate weight during the pregnancy before fasting period, and the presence of any major anomaly under ultrasound were excluded from the study.

Data collection: The data was gathered by a self-administered questionnaire to collect the following information: Age, educational level, residence, gestational age when fasting, parity, chronic medical diseases, duration of fasting (< 10 days, 10 – 19 days, and ≥ 20 days), amniotic fluid index (AFI), and urinary tract infection (UTI) (Before and after fasting for women who fasted in Ramadan). Then, we followed up all women till delivery and recorded the outcome parameters as fetal maturity, birthweight, Apgar score at 5th mint., and head circumference. Preterm labor is determined with the presence of contractions of uterus with sufficient intensity and frequency to cause progressive effacement and cervix dilation before term gestation, occurring at 20–37 weeks' gestation.[14] A normal AFI ranges from 5 to 24 cm in singleton pregnancies, with deviations indicating oligohydramnios (low fluid) or polyhydramnios (excess fluid).[15] UTIs during pregnancy were detected through urinalysis and urine cultures. Urinalysis can reveal the presence of bacteria, white blood cells, and red blood cells, while urine cultures help identify the specific bacteria causing the infection and determine the most effective antibiotics. Preterm birth is defined as birth at <37 weeks of gestation or at <259 days since the first day of a woman's last menstruation.[16]

Ethical considerations: The research was executed in compliance with the Helsinki Declaration of 1975, as amended in 2013. All participants were verbally approved of the study and requested grant consent to participate in it. All personal information was kept anonymous. Data was utilized solely for the purposes of this investigation.

Statistical analysis: Statistical Package for Social Sciences (SPSS) version 26 was used to analyze the data. The data is displayed as mean, standard deviation, and ranges. Categorical data displayed as frequencies and percentages. Independent t-test (two tailed) was used to compare the continuous variables between study groups. The X^2 test was employed to evaluate the association between fasting in Ramadan and certain variables. A P-value threshold of less than 0.05 was deemed significant.

RESULTS

The study included 756 pregnant women with mean age 27.63 ± 6.4 years (range 19 - 43 years). Regarding

fasting group, 47.5% were fasting during 3rd trimester and 57.9% of them were fasting for period between 10 – 19 days in Ramadan. Baseline characteristics were well-balanced between groups with no significant differences in age or anthropometric parameters (Table 1).

Table 1: Anthropometric parameters among study groups.

Variable	Study group		P - Value
	Fasting Mean ± SD	Non-fasting Mean ± SD	
Age (Year)	27.16 ± 6.0	28.06 ± 6.7	**0.071**
n= 496 (%)	**n= 260 (%)**		
Residence			
Urban	384 (77.4)	194 (74.6)	**0.388**
Rural	112 (22.6)	66 (25.4)	
Educational level			
Illiterate	77 (15.5)	32 (12.3)	**0.001**
Primary school	164 (33.1)	75 (28.8)	
Secondary school	188 (37.9)	69 (26.5)	
Higher education	67 (13.5)	84 (32.3)	
Gravidity			
Primigravida	178 (35.9)	75 (30.4)	**0.129**
Multigravida	318 (64.1)	185 (69.6)	
GA during fasting			
First trimester	32 (6.5)	-	**-**
Second trimester	228 (46.0)	-	
Third trimester	236 (47.5)	-	
Duration of fasting (Days)			
< 10	89 (17.9)	-	**-**
10 – 19	287 (57.9)	-	
≥ 20	120 (24.2)	-	

As shown in table 2, no statistically significant differences detected ($P \geq 0.05$) between fasting and non-fasting women regarding AFI, UTI, fetal maturity, birthweight, Apgar score, and head circumference.

Table 2: Comparison between fasting and non-fasting women in certain outcome parameters.

Variable	Study group		P - Value
	Fasting n= 496	Non-fasting n= 260	
AFI			
Normal	467 (94.2)	238 (91.5)	**0.173**
Abnormal	29 (5.8)	22 (8.5)	
UTI			
Yes	177 (35.7)	87 (33.6)	**0.542**
No	319 (64.3)	173 (66.4)	
Fetal maturity			
Term	348 (70.2)	198 (76.2)	**0.08**
Preterm	148 (29.8)	62 (23.8)	
Birthweight (gms)	3122.5 ± 433.2	3027.9 ± 312.3	**0.072**
Apgar Score	8.47 ± 0.87	8.58 ± 1.1	**0.133**
Head Circumference (cm)	33.71 ± 3.2	34.11 ± 3.4	**0.11**

Among fasting women, we noticed that the duration of fasting didn't show a significant effect on AFI, UTI, fetal maturity, birthweight, Apgar score, or head circumference (Table 3).

Table 3: Comparison in certain outcome parameters according to duration of fasting.

Variable	Duration of fasting (Days)			P - Value
	< 10 n= 89	10 – 19 n= 287	≥ 20 n= 120	
AFI				
Normal	82 (17.6)	272 (58.2)	113 (24.2)	**0.65**
Abnormal	7 (24.1)	15 (51.7)	7 (24.1)	
UTI				
Yes	36 (20.3)	92 (52)	49 (27.7)	**0.141**
No	53 (16.6)	195 (61.1)	71 (22.3)	
Fetal maturity				
Term	69 (19.8)	204 (58.6)	75 (21.6)	**0.055**
Preterm	20 (13.5)	83 (56.1)	45 (30.4)	
Birthweight (gms)	3162.5 ± 563.8	3099.8 ± 311.1	3087.2 ± 336.2	**0.112**
Apgar Score	8.65 ± 0.76	8.48 ± 1.0	8.22 ± 0.66	**0.166**
Head Circumference (cm)	34.86 ± 3.1	33.61 ± 3.2	33.59 ± 3.0	**0.32**

DISCUSSION

In order to help clinicians provide educated guidance, this study sought to examine the effects of Ramadan fasting on pregnancy outcomes, particularly maternal and newborn health indices. Our findings indicate that while a significant number of pregnant women reported fasting during Ramadan, most experienced no adverse outcomes. This aligns with some previous studies as Glazier JD et al in 2018[12], Chen YE et al in 2023[17], Noshili AI et al in 2022[18] and Zoukal S et al in 2019[19] indicating that due to adequate nutritional reserves to sustain fetal growth, fasting during Ramadan does not harm pregnant women, particularly if they are in good nutritional condition before fasting. In contrast, other studies as Mahanani MR et al in 2021[20] and Ong AK et al in 2023[21] found negative impacts of Ramadan fasting on health outcomes of women or fetal health indices. Fasting during pregnancy is safe for both mother and child when done under the supervision of a medical professional, according to our study. Actually, a pregnant woman's prenatal nutrition and general health can influence any possible mechanism by which Ramadan fasting impacts the pregnancy and delivery. Possible explanations for the disparity in results between the studies include variations in prenatal care and geographical variations in Ramadan eating habits. In addition, the conflicting findings from the main research studies might be explained by the absence of a theoretical framework that considers important elements that can influence the outcomes. In our sample, for example, women made sure to stay hydrated and eat enough food during the times they weren't fasting, which could help reduce the negative consequences. Accordingly, the effects of fasting during pregnancy are highly dependent on cultural norms and the availability of healthcare. In other way, our results support the conclusions drawn by Kana MA et al in 2025 when highlighted that the health outcomes of offspring born to mothers who fasted during Ramadan were generally positive when mothers adhered to nutritional guidelines. This consistency reinforces the notion that maternal health practices during fasting periods significantly influence outcomes.

Despite these encouraging findings, our study has several limitations. The sample represents the local community; it might not be representative of all pregnant women who fast during Ramadan. We also run the risk of recollection bias if we depend on self-reported data about fasting behaviors. To confirm our results, future studies should use bigger, multi-regional samples and objective metrics of fetal and maternal health. In light of our study, we urge healthcare professionals to offer tailored guidance to pregnant women considering fasting during Ramadan. This might include nutritional counseling to ensure adequate caloric and nutrient intake during non-fasting hours, as well as monitoring for any complications.

In conclusion, based on the findings of this study and other relevant literature, it appears that pregnant women can safely fast during Ramadan as long as they take special care and take their unique health conditions into account. Public health policy and clinical practices can be better informed by further study on the effects of Ramadan fasting on pregnancy.

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