THE EFFECT OF RAMADAN FASTING ON PREGNANCY OUTCOMES DURING THE SECOND AND THIRD TRIMESTER

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ABSTRACT

Background

Fasting during pregnancy has always been considered a debatable condition. Some Muslim women do not fast during pregnancy for their children's health; however, they feel uncomfortable because of their religious beliefs. On the other hand, some pregnant mothers prefer to fast despite their anxiety about their children's health, and they fast during pregnancy.

Objectives

To evaluate Ramadan fasting effects in the second and third trimesters of pregnancy on maternal health, fetal growth and early neonatal outcome.

Patients and Methods

An observational case-control study carried out in Sulaymaniyah City/Kurdistan region/Iraq within a period between April to October 2021, involving 220 healthy pregnant women presented one week before and within the first week of Ramadan in their second or third trimester of pregnancy, they are grouped into two groups (fasting and non-fasting) according to their choice. Both groups followed 4-8 weeks after the first visit and at the delivery time.

The parameters observed in the first and second visits were maternal age, weight, residency, maternal job, maternal blood pressure, haemoglobin (Hb), random blood glucose (RBS), gestational age measured by ultrasound, amniotic fluid index (AFI), fetal growth measured by ultrasound.

The mode of delivery with an indication of cesarean section(C/S) was recorded in addition to the above parameters at the time of delivery. In addition, birth weight and 5 minutes APGAR score were also recorded.

Results

Of 220 women, 77 were not fasting, and 143 were fasting. About 87 women presented in the second trimester (57 cases were fasting), while 133 women presented in the third trimester (86 cases were fasting), and no significant changes in the evaluated parameters were observed. There was no significant difference between the fasting and non-fasting groups. Three babies from the fasting group were delivered during the preterm period, while two were delivered preterm in the non-fasting group. This study recorded neither intrauterine fetal death (IUFD) nor stillbirth. No significant difference in APGAR scores at 5 minutes and birth weight was observed between the two groups.

Conclusion

Ramadan fasting does not increase the risk of maternal, fetal and early neonatal complications. Most Muslim pregnant women do not recognize their right to be excused from fasting Ramadan by the Islamic religion, and they have a high rate of fasting with very strong desire and happiness

Keywords: *Ramadan fasting, Pregnancy, Paternal outcome, Neonatal outcome.*

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INTRODUCTION

According to Islamic beliefs, all adults and healthy Muslims must fast during the holy month of Ramadan. The routine of Ramadan fasting obligates abstinence from all food and liquid items from sunrise until sunset. Seasonal and geographical variations may influence daily fasting duration ranging from 11 to 18 hours per day [1]. Although various behavioural changes may occur among pregnant Muslim women, meal frequencies are usually reduced to two times per 24 hours; one large meal at the end of the fast in the evening and another smaller meal during Sahoor at dawn. Many seasonal meals, including sugary and fatty foods, are commonly served during Ramadan. Physical activities and sleeping patterns are also affected, as people tend to be more active at night. According to the Islamic lunar calendar, Ramadan lasts for 29-30 days and shifts forward by approximately 11 days each year [2].

Three out of every four pregnant Muslim women experienced Ramadan fasting. According to Islamic rule, pregnant women and breastfeeding mothers are excused from the obligation to fast during Ramadan. They are permitted to postpone fasting until after delivery or to feed one poor person each day they do not fast. However, many women fast during pregnancy to share their spiritual experiences with their families. Therefore, most Muslim pregnant women fast during the holy month of Ramadan. Consequently, diet restriction and fasting could adversely affect pregnancy outcomes, especially if Ramadan falls during the summer months with long days of fasting [2,3,4].

Fetal development and the life-long health of the offspring may be affected by exposure to a restricted or suboptimal diet during pregnancy. In addition, preterm delivery and reduced birth weight are more frequent in women who had diet restrictions during pregnancy, suggesting that pregnant women who fast during Ramadan may be more likely to give birth to premature or underweight babies [5].

Regarding the metabolic risk, it is thought that fat distribution in the body is more important than fatty mass. The abdominal fat storage, especially in the visceral compartment, is riskier than in another body area. It has been declared that the positive metabolic effects of diet change specific to Ramadan occur by reducing the amount of visceral fat. Studies show that the reduced visceral fat thickness (VFT) due to Ramadan fasting is more among female volunteers [6].

Maternal malnutrition and fasting can affect maternal metabolism. Fasting for 13 hours or more leads to an increase in the amount of corticotrophin-releasing hormone in maternal serum compared to those women who fast for less than 13 hours. The corticotrophin-releasing hormone is a stress hormone associated with preterm delivery and fetal growth restriction. As a result of fasting, blood sugar levels can decline, leading to a change in lipid metabolism and subsequent increasing levels of blood ketones- this can result in decreased blood pH or ketoacidosis [7].

Ramadan fasting could affect the health of the mother and fetus, although no consensus was established on the matter. Some studies showed that prenatal exposure to Ramadan fasting might result in low birth weight, increased risk of hyperemesis gravidarum, urinary tract infections, and reduced fetal breathing movements. On the other hand, many studies showed no effect of fasting on intrauterine growth, birth weight, birth time indices, and amniotic fluid index. It has been suggested that fasting during pregnancy may also have long-term implications for the health of the offspring. For example, it may be associated with children's lower cognitive test and math scores and fewer working hours in adulthood [3].

Justification for the study: there is great conflict among the people of the Islamic religion about Ramadan fasting during pregnancy. We aimed to find maternal and fetal outcomes in fasting pregnant women compared to non-fasting pregnant women.

PATIENTS AND METHODS

This study is an observational case-control study, carried out in Sulaymaniyah City/Kurdistan region/ Iraq, in three private obstetrical clinics in a period between April 2021 till September 2021, starting exactly before Ramadan. The delivery notes were taken from a maternity teaching hospital and private hospitals in Sulaymaniyah.

The decision to fast was according to the pregnant woman's wish and belief; the sample size was 220 pregnant women; 143 cases were fasting during Ramadan, and 77 were not fasting. The length of fasting during this study was about 16-17 hours per 24 hours.

Participants were chosen by convenience sampling method; about 220 women were followed one week before Ramadan or within the first week of Ramadan until their delivery.

The inclusion criteria for the studied group were singleton, healthy pregnant ladies. In contrast, exclusion criteria were women's refusal to participate in the study, missed cases for follow-up, those who had a medical complication during pregnancy or had a chronic disease, recurrent miscarriages, previous IUGR, and history of infertility before the current pregnancy.

The constructed questionnaire was used for data collection; it was composed of general characteristics and features for the studied group, including age, residency, job and the trimesters of the pregnancy. Also, it was included the necessary parameters regarding the mother in the first visit, which was before or early Ramadan and in the second visit, which was after the first visit, about 4-8 weeks; those parameters include the gestational age measured by ultrasound, amniotic fluid index, maternal weight, random blood glucose, haemoglobin level and blood pressure. In addition, at the time of the delivery, the delivery route, indications of the caesarean section, time of the delivery (gestational age), maternal weight, neonatal weight, APGAR score at 5 minutes, maternal random blood glucose and haemoglobin level were recorded.

The direct interview method was used for collecting data by a researcher from the participants. The data were entered in to excel sheet, then transferred into SPSS-22(Statistical package for social science-version22) was used to analyze data. First, descriptive statistics were used for all variables, and then statistical tests like Chi-square and t-tests were used to find a significant relationship between variables. P-value of less than 0.05 was regarded as a significant value.

The scientific and ethical committee of the College of Medicine, University of Sulaymaniyah, approved the proposal for the study. Although ethical consent was taken from women involved in the study groups, all information related to the participants was kept confidential.

RESULTS

After analyzing the data of the current study, the results were as follows:

Table 1 clarifies that 85 pregnant women were from rural areas, while 135 were from urban areas. 87(39.5%) pregnant ladies were in the second trimester of pregnancy at the first visit, while 133 (60.5%) of them were in the third trimester (13-26 weeks represents the second trimester, 27 weeks and above representing the third trimester) , Table 2. Maternal weight at presentation ranged from 45 to 115 kg, with a mean of 74.8 kg. The maternal age mean was 29.09 with a range of 19-41 years, while the gestational age means at presentation was 28.9 weeks. The systolic blood pressure means for the non-fasting group was 110.13 mmHg, and for the fasting, the group was 110.28 mmHg. The diastolic blood pressure mean for the non-fasting group was 72.4 mmHg, and for the fasting, the group was 72.06 mmHg. The Hb (g/dl) level mean for the non-fasting group was 11.54 g/dl, and for the fasting was 11.6 g/dl. While RBS mean for non-fasting was 102.78 mg /dl and for fasting was 102.1 mg /dl, Table3. After Ramadan (second visit), about 77 (35%) cases were non-fasting, and 143 (65%) were fasting. Regarding the occupation of the fasting and non-fasting groups, most women were homemakers with ordinary work. There was no significant difference between the two groups, as shown in Table4. All the parameters (maternal weight, HB level, blood glucose level, systolic and diastolic blood pressure, amniotic fluid volume and fetal growth as gestational age measured by ultrasound) before Ramadan for non-fasting and fasting groups were normal.

In the second visit after Ramadan, about 4-8 weeks from the first visit, the valued parameters were as follows: most of the fetuses had normal growth; just one case from each group was small for gestational age, but this was not significant. Regarding the Hb level in the fasting group, in 39% of them, the Hb level did not change; in 39% of women in the non-fasting group, their Hb level decreased, which was not significant. In most cases in both groups, the glucose level was not changed, and AFI was normal in most cases from both groups after Ramadan; all of the above findings are shown in the Table 5. Regarding the maternal weight and systolic with diastolic blood pressure difference between fasting and non-fasting groups after Ramadan, there was no significant difference, as shown in Table 6. Regarding the mode of delivery in the studied groups, most of the ladies were delivered by C/S. Just 3 cases in the fasting and 2 in the non-fasting groups were preterm, but those findings were insignificant, as shown in Table 7. Table no. 8 shows indications of C/S in the studied groups, 51 % of the fasting group were due to repeated C/S, and just 2 cases were due to antepartum haemorrhage. In comparison, 49 % of the non-

fasting group was due to patient requests; those findings were insignificant, as shown in Table 8. Table no. 9 shows the mean of the maternal weight and blood pressure with early neonatal APGAR score at the time of delivery, with no significant difference between the two groups in all three parameters. 100% of the delivered babies were alive and had no stillbirth or intrauterine fetal death, so no significant difference was present between the fasting and non-fasting groups.

Neonatal weight after delivery results were clarified in Table no. 10; about 95 % of the babies born for fasting women had normal birth weight, while six babies were low birth weight, and just one baby was macrosomic; in the non-fasting group, just two babies had low birth weight, and the others had normal birth weight; the difference between two groups was not significant.

Most cases showed no difference in blood glucose level after delivery; Hb level was not changed in 56% of the fasting group, while about 50% of the non-fasting group got low Hb level after delivery; those results were not significant, as shown in Table 11.

Table 1. The residency of the studied group.

Residency	Fasting (143)(%)	No-fasting (77) (%)	Total (%)	P value
Urban	90 (66.6)	45 (33.4)	135 (100)	**0.56**
Rural	53 (62)	32 (38)	85 (100)	

Table 2. The gestational age of the studied group.

		Fasting status		Total (%)	P value
		Non-fasting (%)	Fasting (%)		
Gestational Age (Years)	Second trimester	30 (39)	57 (39)	87(100)	**0.8**
	Third trimester	47 (61)	86 (61)	133(100)	
Total	Count	77	143		

Table 3. General characteristics of the studied groups.

	Fasting status	N	Mean
Weight kg	Non-fasting	77	74.44
	Fasting	143	74.99
Age groups	Non-fasting	77	28.81
	Fasting	143	29.24
Gestational Age	Non-fasting	77	29.12
	Fasting	143	28.92
SYSTOLIC BP	Non-fasting	77	110.13
	Fasting	143	110.28
DIASTOLIC BP	Non-fasting	77	72.40
	Fasting	143	72.06
HB (g/dl)	Non-fasting	77	11.54
	Fasting	143	11.60
RBS (mg /dl)	Non-fasting	77	102.78
	Fasting	143	102.10

Table 4. Occupation of the pregnant ladies about Fasting status.

		Fasting status		P value
		Non-fasting (%)	Fasting (%)	
Occupation	Housewife & ordinary work	65 84.4	120 83.9	0.46
	Housewife & hard work	0 0.0	1 0.7	
	Teacher	3 3.9	11 7.7	
	Employee	9 11.7	11 7.7	
Total		77 100.0	143 100.0	

Table 5. Changes in the studied parameters in the second visits.

		Non–fasting group (%)	Fasting Group (%)	P-value
Gestational age measured by ultrasound	Normal	76 (98)	142 (99.3)	
	Small	1(1.3)	1 (1.7)	0.6
	Large	0(0)	0 (0)	
HB level	Increased	19(24.7)	41(27.7)	
	Decreased	30(39)	46(32.2)	0.58
	Same	28(36.4)	58(39.2)	
Random blood sugar	Increased	11(14.3)	21(14.7)	
	Decreased	9(11.7)	24(16.8)	0.58
	Same	57(74)	98(68.5)	
Amniotic fluid index	Normal	75(97.4)	138(98.5)	
	Increased	1(1.3)	2(1.4)	0.91
	Decrease	1(1.3)	3(2.1)	

Table 6. The difference between maternal weight and blood pressure in the studied groups on the second visit.

	Fasting status	Mean	P value
Systolic BP	Non-fasting	110.35	0.68
	Fasting	111.06	
Diastolic BP	Non-fasting	73.71	0.70
	Fasting	73.27	
Weight by KG	Non-fasting	77.73	0.84
	Fasting	78.15	

Table7. Characteristics of the studied groups at the time of delivery.

		Fasting status		P value
		Non-fasting (77) (%)	Fasting (143) (%)	
GEST age at delivery	Term	75(97.3)	139(97.1)	**0.74**
	Preterm	2(2.7)	3(2.2)	
	Post-term	0(0.0)	1(0.7)	
Mode of delivery	Vaginal delivery	20(26)	60(42)	**0.01**
	Caesarean section	57(74)	83(58)	

Table 8. Indications of the C/S.

		Non-fasting (%)	Fasting (%)	P value
Indication of CS	Patients request	28(49.1)	31(36.9)	**0.42**
	Poor progress	1(1.8)	3(3.6)	
	Fetal distress	0(0.0)	2(2.4)	
	Abnormal presentation	3(5.3)	3(3.6)	
	Repeated C/S	25(43.9)	43(51.2)	
	Anti-partum haemorrhage	0(0.0)	2(2.4)	
Total		**57(100.0)**	**84(100.0)**	

Table 9. Neonatal early APGAR score and maternal weight with blood pressure at the time of delivery.

	Fasting status	Mean	P value
Maternal wt	Non-fasting	71.91	**0.27**
	Fasting	73.66	
Systolic BP	Non-fasting	110.40	**0.72**
	Fasting	109.92	
Diastolic BP	Non-fasting	71.69	**0.91**
	Fasting	71.85	
APGAR score	Non-Fasting	7.2	**0.53**
	Fasting	8.08	

Table 10. Neonatal weight at the time of delivery.

		Non fasting(%)	Fasting (%)	P value
Birth wt	Normal	75(97.3)	136(95.0)	**0.63**
	Low birth weight	2(2.7)	6(4.3)	
	Macrosomia	0(0.0)	1(0.7)	
Total		**77(100.0)**	**143(100.0)**	

Table 11. Changes in the HB level and RBS level after delivery.

Parameter		Non-fasting	Fasting	P value
RBS	Increased	1(1.3%)	3 (2.2%)	**0.7**
	Decreased	9 (12%)	15(10.8%)	
	No change	67(86.7)	125(87.1%)	
HB	increased	4(5.3%)	4(2.9%)	**0.17**
	Decreased	40(50.7%)	56(40.3%)	
	No change	33(44%)	83(56%)	

DISCUSSION

There are some controversies about the effect of Ramadan fasting on the mother and fetus. Also, there are differences between the studies regarding this subject.

In the current study, 77 (35%) pregnant ladies were not fasting, and 143 (65%) ladies were fasting; this result is near to that obtained by Ziaee V et al., Sultan et al. and jossoph J et al., this because most pregnant women perceived fasting as obligatory in different Muslim living countries [8-10]. Eighty-seven pregnant ladies were in the second trimester of pregnancy, while 133 were in the third trimester.

Regarding the mean age and mean weight (at the beginning of Ramadan) of pregnant ladies, there was no significant difference between the two groups; this goes with the studies done by Safari K et al., Parveen R et al., Ziaee V et al., Ghazal K et al., Karateke A et al. [1, 7, 8, 11, 12].

90 (66.6%) of pregnant women from urban areas were fasting, and 53 (62%) from rural areas were not. Although the difference between the two areas was insignificant, fasting was more in urban areas; it is not going with a study done by Ghazal K et al. [11], in which all cases from the rural area were fasting compared to 85% from urban areas. This may be because of geographical variation between the two studies that may affect weather and the kind of work these women do in that holey month.

Regarding maternal jobs in the current study, there was no significant difference between the two groups, which goes with the study done by Ghazal K et al. While it is not going with studies done by Safari K et al., and Parveen R et al. [1,7,11], as fasting was less in employed pregnant women, this may be explained because Ramadan was in hot weather in their countries and cities.

U/S measured fetal growth in the second visit after Ramadan; it was normal in all cases except for one case in each group who were small for gestational age; this goes with the study done by Karateke A et al. and Dikesoy E et al. who also showed that fetal growth would not be affected by fasting [12, 13]. However, a study by Sakar MN et al. showed a contrary result [16].

The difference in amniotic fluid index changes in the studied groups was not significant. However, Karateke A et al. said that the difference in AFI changes was seen in the second trimester, while there was no significant difference in the third trimester [12]. This difference between the compared study and our study may be because most of the fetuses in this study showed normal growth after Ramadan.

The change in the Hb level, random blood glucose, and blood pressure after Ramadan were not significantly different between the two groups, which is going with results conducted by Ghazal K et al., Parveen R et al, and Hossain N et al [7,11,14].

There was no significant difference in the maternal weight change between the two groups in the second visit, this is going with the study done by Hossain N et al [14]. But Karateke A et al concluded that maternal weight change difference was significant in second and third trimesters [12].

Most cases were delivered at term in both groups in this study, which is going with studied conducted by Savitri A I et al and Hossain N et al [2,14]. The rate of preterm deliveries was not significantly affected by maternal fasting in our study which agree with studies conducted by Glazier JD et al and Hossain N et al [5,14], While the rate was higher in non-fasting group in Ghazal K et al study [11].

Regarding the mode of delivery, C/S was high in both groups, while vaginal delivery was more in fasting group and the difference between them was significant. This is going with study done by Hossain N et al [14], while Karateke A et al concluded that NVD was more in both groups and the difference between fasting and non-fasting groups was not significant [12]; this may be because C/S on request is high in our community.

In the current study neonatal weight at delivery with APGAR score at 5 minutes have no significant difference between the two groups, it's going with studies done by Ghazal K et al and Karateke A et al [11,12]. While study done by Almond D et al shows that neonatal weight was less in fasting group [15].

In conclusion, Ramadan fasting did not increase the risk of maternal, fetal and early neonatal complications. Most of Muslim pregnant women did not recognize their right to be excused from fasting Ramadan by the Islamic religion, and they have high rate of fasting with very strong desire and happiness; however, they should be examined by obstetrician before they decide to fast and appropriate nutritional program should be recommended and followed. They should adequately get breakfast (Sohoor) before starting fast, and after fasting to take a meal containing adequate calorie and to have good hydration.

More randomized studies are needed to explain the effect of fasting on pregnancy and fetal outcomes.

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