

Effects of Ramadan Fasting on Neonatal Anthropometric Measurements in the Third Trimester of Pregnancy

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ARTICLE INFO	ABSTRACT
<p><i>Article type:</i> Original article</p> <hr/> <p><i>Article History:</i> received: 18 Aug 2013 revised: 24 Aug 2013 accepted: 01 Sep 2013 published: 25 Dec 2013</p> <hr/> <p><i>Keywords:</i> Fasting Neonatal outcomes Pregnancy Third trimester</p>	<p>Introduction: Ramadan Fasting is prescribed by Holy Quran for every able-bodied, adult Muslim and is considered an essential practice for all Muslims including pregnant women. The aim of this study was to determine the effect of Ramadan fasting on neonatal anthropometric measurements during the third trimester of pregnancy.</p> <p>Method: This is a cross-sectional study, carried out on 300 delivering women in 2013. All participants were divided into fasting (n=150) and non-fasting (n=150) groups. Neonatal anthropometric measurements were compared in both groups. Data were then analyzed using descriptive statistics and t-test in SPSS Ver. 11.5 at a significant level of 5%.</p> <p>Results: There were no significant differences between the two groups in the birth weight ($p=0.97$), head circumference ($p=0.09$) and height ($p=0.12$) of the neonates. Also, the prevalence of LBW was similar in fasting and non-fasting groups ($p=0.33$).</p> <p>Conclusion: Ramadan fasting in the third trimester of pregnancy has no adverse effects on neonatal anthropometric measurements.</p>

► Please cite this paper as:

Makvandi S, Nematy M, Karimi L. Effects of Ramadan Fasting on Neonatal Anthropometric Measurements in the Third Trimester of Pregnancy. J Fasting Health. 2013; 1(2):53-57.

Introduction

Ramadan is a holy festival in Muslim countries. It lasts for one month and occurs at different seasons in different years (1). In Ramadan, healthy adults abstain from eating, drinking, smoking, and sexual relations during the daylight hours, from dawn to sunset (2, 3). The physiological effects of Ramadan fasting includes weight loss, fat-free mass reductions and the decrease of systolic blood pressure, blood sugar and cholesterol (4-6).

Ramadan occurs during the majority of pregnancies (7). Fasting during pregnancy has

been always considered as a debatable condition (8). Some Muslim women prefer to do their religious duty despite their hesitations on their children's health and they fast during pregnancy. On the other hand, there are pregnant women who do not fast during pregnancy, for the sake of their children's health; however, they feel guilty because of their religious beliefs (9).

Epidemiological studies in humans have revealed that maternal undernutrition during pregnancy alters fetal growth and development, predisposing the offspring to cardiovascular,

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metabolic, and endocrine diseases in adult life (10-12).

Fetal weight gain will increase in the third trimester of pregnancy. Parretti *et al* study showed that postprandial glucose values in low-risk pregnancies were found positively correlated with fetal abdominal growth as early as 28 weeks' gestation, and this correlation was maintained through the third trimester of pregnancy (13). In a cross-sectional study, Arab *et al* evaluated the interrelationship of fasting in pregnancy and newborn birth weight in women after delivery. (14). They concluded that Ramadan fasting did not affect the mean of birth weight, regardless of pregnancy trimester. The prevalence of low birth weight (LBW) among newborns of those mothers who fasted during the second trimester showed an increase, although it was not significant. Almond *et al* found slightly and statistically insignificant decrease in birth weight of neonates in case of the occurrence of Ramadan during the third trimester of pregnancy (15).

The present study assesses the effects of Ramadan fasting in the third trimester of pregnancy on neonatal anthropometric measurements.

Methods

This was a cross-sectional study performed in Sina Academic Hospital in Ahvaz, Iran in 2013. All pregnant women within the age range of 18-35 years, who were hospitalized and had delivered their babies in this center, were included in the study. Those mothers with multiple pregnancies, history of systemic disorder, drug consumption during pregnancy (except for folic acid, iron and multivitamins), smoking, narcotic or alcohol use or those with any major anomalies based on ultrasonography, were excluded from the study.

All participants were divided into two groups, based on the history of fasting or non-fasting

during the third trimester of pregnancy.

Sample size was calculated using the formula: $n=(Z_{1-\alpha/2}+Z_{1-\beta})^2(S_1^2+S_2^2)/(M_1-M_2)^2$ for comparison of two averages. Significance level α was chosen to be 5% two-sided, leading to $z_{1-\alpha/2}=1.96$, and power was set to 80%, leading to $z_{1-\beta}=0.84$. According to a pilot study, 150 subjects per group were needed to detect significant statistical differences.

Maternal demographic and obstetric data were gathered by questionnaires. Birth weight was measured by gram, and newborns weighing less than 2500 grams were described to be LBW. Neonatal head circumference and height were measured by centimeter. For decreasing the bias, all measurements were carried out in all cases by a single investigator.

Data were then analyzed using SPSS, version 11.5. Absolute and relative frequencies of categorical variables, the mean and standard deviation of continuous variables were calculated. Continuous variables were analyzed by t- test, and χ^2 test was used for categorical variables. The level of significance was $\alpha=0.05$.

Results

A total of 308 participants were eligible for the study, from whom 8 mothers did not meet the inclusion criteria. Three hundred women enrolled and were divided into two groups: fasting (n=150) and non-fasting (n=150).

The study results showed that there were no significant differences in baseline characteristics between both study groups (Table1).

Fasted women had a history of 1 to 30 days of Ramadan fasting with a mean of 16.60 ± 13.20 days.

Table 2 showed that there were no significant differences in the neonatal birth weight, head circumference and height between the study groups.

A total of 14 neonates (4.66%) were LBW, from whom 8(5.33%) and 6(4%) neonates were

Table1. Baseline characteristics of study groups

	Study Groups		p value
	Fasted	Non-Fasted	
Age (Years)	27.80±3.71	26.21±4.89	0.50
Gravid	2.34±1.22	2.39±1.29	0.59
Maternal weight (Kg)	75.83±8.51	76.19±10.82	0.74
Gestational age at birth (days)	271.89±12.13	278.02±10.16	0.25

Data are mean±standard deviation.

Table 2. Neonatal anthropometric measurements

	Study Groups		p value
	Fasted	Non-Fasted	
Birth weight (gr)	3174.01±538.86	3173.91±501.55	0.97
Head circumference (cm)	34.70±1.04	33.91±1.30	0.09
Height (cm)	49.40±2.60	51.08±2.04	0.12

Data are mean±standard deviation.

within groups with fasting and non- fasting, respectively. There was no significant difference in the prevalence of LBW in both groups ($p=0.33$).

Discussion

In the neonates, the classic anthropometry of weight, head circumference and height are well known to have prognostic values for postnatal mortality (16). The results of current study showed that Ramadan fasting in the third trimester of pregnancy did not alter neonatal anthropometric measurements. The results of Tehran study on 189 pregnant women showed that there were no significant differences between pregnancy outcome parameters such as weight, height, and head circumference of infants and fasting at different trimesters which is similar to our study (8). Another study in Birmingham revealed no effect of fasting during pregnancy on the mean birth weight in different stages of pregnancy (17).

An optimal diet prescription for pregnant women should provide adequate calories and nutrients to support fetal growth (18). It seems that if input calorie does not change during fasting in healthy women, weight, fat level, and bodily composition does not change either. In ziaee *et al* study which described no inappropriate effect of Islamic fasting on neonatal indices, most of fasted women in most days serve their Sahar and Eftar (even supper) meals (8). Kiziltan *et al* in another study about dietary intake and nutritional status of Turkish pregnant women during Ramadan reported that although calorie intake and weight gain in fasting mothers is lower than non-fasting ones, there are no harmful effects on mother's health (19).

LBW remains a significant public health problem in many parts of the world and is associated with a range of both short and long-term adverse consequences (20). Our results showed that the prevalence of LBW was the

same in fasted and non-fasted women. The study of Yemen demonstrated that there was no relation between the prevalence of LBW and number of fasting days during pregnancy (21). Another study indicated that the frequency of LBW during the second trimester of fasting had an increase, although not significant in comparison with the first and third trimesters and non-fasting group (14). Similarly, Cross *et al* reported a non-significant increase in the prevalence of LBW (4.5% to 8%) among infants who were born at full term, when Ramadan had occurred during the second trimester (17). During the second trimester of pregnancy, women lay down stores of fat in anticipation of later fetal demands and it seems that failure to do so is associated with lower birth weight (22-24).

One of the limitations of this study was that we did not compare pre-pregnancy BMI of women, however, their weight after delivery showed no difference between the groups. In addition, the present study had a retrospective nature and therefore we did not evaluate the nutritional status of women using nutritional outcome questionnaires during pregnancy and fasting, objectively.

Appropriate and adequate nutritional programs are necessary for fasting, pregnant women to maintain neonatal growth indices.

Conclusion

Results from this study showed that Ramadan fasting in the third trimester of pregnancy did not decrease the mean of the birth weight, head circumference, the height of neonates and the prevalence of LBW in healthy women.

Acknowledgment

We would like to thank all the staff of Sina Hospital in Ahvaz, Iran, and all dear mothers who helped us in this study.

References

1. Alwasel S, Abotalib Z, Aljarallah J, Osmond C, Alkharaz S, Alhazza I, et al. Changes in placental size during Ramadan. *Placenta*. 2010;31(7):607-10.
2. Moradi M. The effect of Ramadan fasting on fetal growth and Doppler indices of pregnancy. *Journal of research in medical sciences: the official journal of Isfahan University of Medical Sciences*. 2011;16(2):165.
3. Bogdan A, Bouchareb B, Touitou Y. Ramadan fasting alters endocrine and neuroendocrine circadian patterns. Meal-time as a synchronizer in humans? *Life sciences*. 2001;68(14):1607-15.
4. Larijani B, Zahedi F, Sanjari M, Amini M, Jalili R, Adibi H, et al. The effect of Ramadan fasting on fasting serum glucose in healthy adults. *Medical Journal of Malaysia*. 2003;58(5):678-80.
5. Norouzy A, Salehi M, Philippou E, Arabi H, Shiva F, Mehrnoosh S, et al. Effect of fasting in Ramadan on body composition and nutritional intake: a prospective study. *Journal of Human Nutrition and Dietetics*. 2013.
6. Nematy M, Alinezhad-Namaghi M, Rashed MM, Mozhdehifard M, Sajjadi SS, Akhlaghi S, et al. Effects of Ramadan fasting on cardiovascular risk factors: a prospective observational study. *Nutrition journal*. 2012;11(1):69.
7. Robinson T, Raisler J. Each one is a doctor for herself: Ramadan fasting among pregnant Muslim women in the United States. *Ethn Dis*. 2005;15(1 Suppl 1):S1-99.
8. Ziaee V, Kihanidoost Z, Younesian M, Akhvirad M-B, Bateni F, Kazemianfar Z, et al. The effect of Ramadan fasting on outcome of pregnancy. *Iranian journal of pediatrics*. 2010;20(2):181-6.
9. Joosop J, Abu J, Yu S. A survey of fasting during pregnancy. *Singapore medical journal*. 2004;45(12):583.
10. Godfrey KM, Barker DJ. Fetal nutrition and adult disease. *The American Journal of Clinical Nutrition*. 2000;71(5):1344s-52s.
11. Godfrey K, Robinson S, editors. *Maternal nutrition, placental growth and fetal programming*. Proceedings-Nutrition Society of London; 1998: Cambridge Univ Press.
12. O'Brien PS, Wheeler T, Barker D. *Fetal programming: influences on development and disease in later life*: RCOG Press London; 1999.
13. Parretti E, Mecacci F, Papini M, Cioni R, Carignani L, Mignosa M, et al. Third-trimester maternal glucose levels from diurnal profiles in nondiabetic pregnancies correlation with sonographic parameters of fetal growth. *Diabetes Care*. 2001;24(8):1319-23.
14. Arab M, Nasrollahi S. Interrelation of Ramadan fasting and birth weight. *Med J Islamic Academy Sci*. 2001;14(3):91-5.
15. Almond D, Mazumder B. Health capital and the prenatal environment: The effect of maternal fasting during pregnancy. *National Bureau of Economic Research*, 2008.
16. Koo WW, Walters JC, Hockman EM. Body composition in neonates: relationship between measured and derived anthropometry with dual-energy X-ray absorptiometry measurements. *Pediatric research*. 2004;56(5):694-700.
17. Cross J, Eminson J, Wharton B. Ramadan and birth weight at full term in Asian Moslem pregnant women in Birmingham. *Archives of disease in childhood*. 1990;65(10 Spec No):1053-6.
18. Artal R, Lockwood CJ, Brown HL. Weight gain recommendations in pregnancy and the obesity epidemic. *Obstetrics & Gynecology*. 2010;115(1):152-5.
19. Klziltan G, Karabudak E, Tuncay G, Avsar F, Tuncay P, Mungan O, et al. Dietary intake and nutritional status of Turkish pregnant women during Ramadan. *Saudi medical journal*. 2005;26(11):1782-7.
20. Ramakrishnan U. Nutrition and low birth weight: from research to practice. *The American Journal of Clinical Nutrition*. 2004;79(1):17-21.
21. Makki AM. Impact of Ramadan fasting on birth weight in 4 hospitals in Sana'a city, Yemen. *Saudi medical journal*. 2002;23(11):1419-20.
22. Bissenden J, Scott P, King J, Hallum J, Mansfield H, Wharton B. Anthropometric and biochemical changes during pregnancy in Asian and European mothers having light for

- gestational age babies. BJOG: An International Journal of Obstetrics & Gynaecology. 1981;88(10):999-1008.
23. Viegas O, Cole T, Wharton B. Impaired fat deposition in pregnancy: an indicator for nutritional intervention. The American Journal of Clinical Nutrition. 1987;45(1):23-8.
24. Hytten FE. Nutritional aspects of human pregnancy. Maternal Nutrition during Pregnancy and Lactation(Aebi H & Whitehead, R, eds). 1980:66-71.