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The Effects of Ramadan Fasting on Growth Parameters: A Narrative Review

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ABSTRACT

Ramadan fasting is prescribed by Quran for every able-bodied, adult Muslim and is considered an obligatory act of worship. During Ramadan, the majority of Muslims eat two major meals- one before dawn (Sahar) and another immediately after the sunset (Iftar). Islamic fasting, due to its particular nature, may cause metabolic and hormonal changes in the body, which are different from those in regular fasting. To the best of our knowledge, no comprehensive study has been conducted on changes in growth parameters during fasting periods. Therefore, the aim of this review, which is based on scientific literature review, was to describe the effects of fasting on growth parameters in humans.

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Introduction

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

During Ramadan, the majority of Muslims eat two major meals- one before dawn (Sahar) and another immediately after sunset (Iftar). Islamic fasting, due to its particular nature, may cause metabolic and hormonal changes in the body, which are different from those in regular fasting (8). Therefore, we review some related studies to describe the impact of Ramadan fasting on growth parameters.

Khoshdel *et al* conducted a study to determine the impact of maternal Ramadan fasting on the growth parameters of exclusively breast-fed infants (9). This cohort study was carried out during, and five months after the month of Ramadan on 116 healthy, exclusively breast-fed infants, aged 15 days to 6 months. Thirty-six infants, whose mothers fasted throughout Ramadan (case group) and 80 infants of non-fasting mothers (control group), were enrolled in the study. All infants underwent periodic physical examinations twice in Ramadan, 3 times in the following month, and twice monthly during the next 4 months. They reported that all growth parameters increased during the study period ($P<0.05$), with the same rate for both groups ($P>0.05$).

As to the findings of the aforementioned study, there is an obvious increasing trend for

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all growth parameters, which depends on age and is almost similar for both groups. They concluded that Ramadan fasting of breastfeeding mothers does not adversely affect the growth parameters of exclusively breast-fed infants in the short run.

The second study was conducted by Makvandi *et al* to determine the effects of Ramadan fasting on neonatal anthropometric measurements during the third trimester of pregnancy (10). This was 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. They reported that there were no significant differences between the two groups in terms of birth weight (P=0.97), head circumference (P=0.09), and the height (P=0.12) of the neonates. In addition, the prevalence of low birth weight (LBW) was similar in fasting and non-fasting groups (P=0.33). They concluded that Ramadan fasting in the third trimester of pregnancy has no adverse effects on neonatal anthropometric measurements.

The third study was conducted by Bahrayni *et al* to evaluate the feasible changes in the serum levels of thyroxine (T3), tetraiodothyronine (T4), and thyroid-stimulating hormone (TSH), and body composition in pre-menarche female adolescents (11). This cohort study was performed during Ramadan 2012, and fifty eight 9-13-year-old females (weight 34.20±7.96 kg, height 142.01±7.76 cm) were assessed in two groups (31 and 27 subjects in fasting and non-fasting groups, respectively) prior to Ramadan and after it.

They reported that Ramadan fasting leads to a significant decrease in the body mass index (BMI) and the weight of the fasting group (P=0.005, P=0.044, respectively), while a significant increase was observed in the non-fasting group (P<0.001). They also indicated that although T3 significantly decreased by fasting (P<0.001), it remained in the normal range. Hence, T4 decreased and TSH increased slightly in both groups. According to their findings, despite the significant reduction of T3 in the fasting group, the variations in the level of thyroid hormone remained in the normal range during Ramadan fasting.

The objective of the fourth study conducted by Haratipour was to determine the impact of maternal Ramadan fasting on the growth parameters of exclusively breast-fed infants (12). This cohort study, performed during and three months after Ramadan, included 55 healthy, exclusively breastfed infants, aged 1 to 6 months. Twenty infants, whose mothers fasted throughout Ramadan (case group), and 35 infants of non-fasting mothers (control group), were enrolled in this study. All infants underwent periodic physical examinations twice in Ramadan and 3 times in the first, second, and the third months after Ramadan.

In this study, the mean age of the participants was 3.43±1.38 and 2.31±1.45 months in the case and control groups, respectively (not significantly different). In total, 23 cases (41.8%) were males and the rest were females. All growth parameters increased during the study period (P<0.05), with the same rate for both groups (P=0.125). Finally, they concluded that Ramadan fasting by breastfeeding mothers does not adversely affect the growth parameters of exclusively breastfed infants in the short run.

Moreover, Ziaee *et al* performed a study to evaluate the effect of fasting on pregnancy outcomes (13). This historical cohort study was conducted on patients referring to a hospital in Tehran, Iran, in 2004. All pregnant women (in one of the pregnancy trimesters) were included in the study during the holy month of Ramadan. The women were divided into four groups: non-fasting, 1-10-day fasting, 11-20-day fasting, and 21-30-day fasting groups.

In the mentioned study, 189 cases were evaluated and their mean age, weight, and BMI were 25.9 years, 61.7 kg, and 23.9 kg/m2, respectively. The mean number of fasting days was 13 days, and 66 cases (34.9%) avoided fasting. There was no significant difference between the groups in terms of BMI at the beginning of pregnancy, maternal age, number of pregnancies, and history of abortion. In addition, there was no significant association between the number of fasting days and the mean of infants' weight, height, and head circumference. Furthermore, there was no

significant correlation between pregnancy outcomes and fasting in different trimesters.

Other studies have demonstrated that fasting has no impact on the fetus. Cross *et al* (14) found that maternal fasting during Ramadan does not affect the birth weight of full-term newborns. In another study, maternal fasting during Ramadan did not affect neonatal birth weight (15). Moreover, in another research, Ramadan fasting of mothers during the second trimester did not have a significant effect on maternal oxidative stress, fetal development, or fetal birth weight (16).

Dikensoy *et al* (17) found that maternal fasting does not lead to ketonemia or ketonuria in pregnant women; it also does not affect intrauterine fetal growth or the fetus's health. No statistically significant difference was observed between fasting and non-fasting pregnant women in terms of Doppler indices of uterine or umbilical arteries, growth parameters, and amniotic fluid index (2).

In addition, some studies evaluated growth parameters in short-term fasting. Maccario *et al* studied growth hormone (GH) and leptin secretion in eight male subjects (age: 29.3±1.2 yrs, BMI: 22.2±0.5 kg/m2) and seven normal female participants (age: 28.0±0.8 yrs, BMI: 20.1±0.7 kg/m2) before and after 36 hours of fasting (18). They concluded that the gender-related differences in GH and leptin levels are no longer present after short-term fasting; females showed a slighter increase in GH but a more significant decrease in leptin in comparison with male subjects.

In addition, Koutkia *et al* characterized the relatedness of GH and ghrelin in a model of acute caloric deprivation in 10 healthy women (age: 26.7±1.6 yrs) during a 4-day fasting in the early follicular phase (19). GH, ghrelin, and cortisol were assessed every hour over a 24-hr period during an isocaloric diet and after a 4-day complete fasting. They demonstrated that ghrelin actually decreases in response to short-term caloric deprivation, in a reciprocal relationship with GH increase.

Moreover, Norrelund *et al* investigated the possible stimulatory effect of endogenous GH on Insulin-like growth factor (IGF) and IGF-binding protein (IGFBP) levels during fasting (20). In conclusion, they stated that GH hypersecretion observed during short-term fasting is not merely secondary to a reduction in IGF bioactivity.

Conclusion

In summary, it can be concluded that fasting does not have any significant impact on growth factors and parameters including the mean of the neonates' birth weight, head circumference, height, and also thyroid hormones during growth years.

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