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The effect of ramadan fasting on some basic components of blood and anthropometric parameters among female students of the college of sports sciences at the university of Jeddah

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Abstract

This study aims to highlight the influence of fasting on variations in anthropometric and biochemical parameters among young female students at the University of Jeddah. Twenty-four female students aged 20 to 26 consented to participate in our study. They were tested twice: during and after the month of fasting. For this, we took blood samples and anthropometric measurements. The analysis and interpretation of the results showed no significant change in anthropometric parameters despite the variations observed after the fasting month ($P>0.05$). However, we could mention substantial increases in the levels of biochemical parameters testifying to a phenomenon of organism adaptation after a month of fasting ($P<0.05$). Fasting has no adverse effect on the various parameters studied. Thus, fasting appears to be a beneficial means for the health of the human body.

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Introduction

The Ramadhan fast is a short fast lasting around 11 hours in winter and 17 hours in summer. It is characterized by a change in dietary rhythms, with the main meal being eaten when the fast is broken at sunset, and a change in the sleep-wake cycle, with a more pronounced nightlife (Chiha, 2008).

Every year, when Ramadan approaches, perpetual concerns arise in the world of sports. Is intermittent fasting during Ramadan compatible with the practice of sport? Everyone has their own convictions, ideas, and experiences when it comes to interpreting the effects of fasting on the body. From the point of view of doctors and trainers, many declare that fasting is an excellent risk for the individual performing intense efforts (Hakoumi, 2016). Others claim the complete opposite (Zerguini *et al.*, 2007). For athletes, Ramadan fasting is a real dilemma.

Various studies have disputed the effects of fasting. Some found a weight reduction (Husain *et al.*, 1987; Bouhlel *et al.*, 2006; Ziaee *et al.*, 2006; Al-Hourani and Atoum, 2007), while others reported no significant change in weight or body composition (Ramadan, 2002; Karli *et al.*, 2007; Meckel *et al.*, 2008).

Some researchers report that body fat decreases during fasting (Chiha, 2008; Bouhlel *et al.*, 2006; Chaouachi *et al.*, 2009). While others report an increase in fat mass (Güvenç, 2011; Maughan *et al.*, 2008). In contrast, Norouzy *et al.* (2013) and Bouhlel *et al.* (2006) showed a significant decrease in weight, BMI, and lean mass between one week before and one week after Ramadan fasting. At the time, Syam *et al.* (2016) reported a decrease in fat while preserving protein mass. Similarly, Aybak *et al.* (1996) recorded increased total protein.

Such contrasting variations have been found in studies of biochemical parameters (Ziaee *et al.*, 2006; Maughan *et al.*, 2008; Ibrahim *et al.*, 2008; Lamri-Senhadji *et al.*, 2009). Some authors have reported reduced blood glucose levels (Nomani *et al.*, 1989; Whitley *et al.*, 1998; Haghdoost and Poorranjbar, 2009). While others have reported an increase (Bouhlel *et al.*, 2006; Ba *et al.*, 2004). On the other hand, Rocky *et al.*, 2004 and Chiha, 2008 reported stable blood glucose levels. Resting serum glucose levels decreased during Ramadan fasting in moderately trained runners (Aziz *et al.*, 2010) soccer and basketball players Aziz *et al.*, 2012 and runners Faye *et al.*, 2004 but not elite rugby players Bouhlel *et al.*, 2006 and active men (Haghdoost and Poorranjbar, 2009; Trabelsi *et al.*, 2012).

In fact, several studies have concluded that this fasting method is highly beneficial and has long been used for its dietary and therapeutic virtues. A diet lasting several days can regenerate the body, purify the skin, and improve well-being, provided a few rules are observed. Other results, however, have reported an adverse effect on the human organism, particularly on athletes.

Questions may be asked. Does Ramadan fasting positively or negatively influence the body of athletes? As some authors report, is it incompatible with sport, and does it contribute, among other risks, to putting the body in energy conditions unfavorable to physical activity? Our aim is to monitor the dynamics of variations in several biochemical and anthropometric parameters in young athletes before, during, and after the Ramadan fast. More specifically, we aim to study the variation in these parameters during fasting relative to the non-fasting period.

Materials and methods

Subjects of the study

The sample of our research includes 24 female students from the Department of Physical Activity of the College of Sports Sciences at the University of Jeddah. Their ages range from 20 to 26 years. All the subjects are healthy, non-smokers, and have no contraindications for sports practice. They were reassured that the study data would be collected while respecting their confidentiality and anonymity. Each subject included in this study was informed about the purpose, protocol, and potential risks of the study and

then asked to sign a written consent. The subjects participating in the study underwent anthropometric measurements and blood sampling during and after the month of fasting.

Conduct of the study

Under the same climatic conditions of temperature and humidity, blood samples were performed during two periods: half of the fasting time (end of the second week of fasting), and two weeks after fasting. The study was conducted as follows:

Anthropometric measurements

This concerns the body weight (BW), height (H), body mass index (BMI), fat mass (FM), and lean weight (LB):

The height (in cm) is measured with a measuring tape,

The BW (in Kg) is measured with a scale (Kuhen and Fleichel),

The adult body fat percentage (% BF) is calculated using the equations of (Deurenberg *et al.*, 1991): %BF = (1.20×IMC) + (0.23×Age) – (10.8×Sex) – 5.4

For women, the "Sex" value is equal to 0.

The MM is calculated from the body mass according to the equation:

LB=BM-[BM× (%BF/100)].

Analysis of biochemical parameters

Qualified personnel took blood samples. It should be noted that these samples were taken under the same conditions for all study subjects in the morning (at 10:00 a.m.). Each blood sample was 25 ml in a heparinized tube.

All analyses were performed via an automated process at the biochemistry laboratory of Yasser Medical Center in Jeddah (Saudi Arabia). The biological tests were performed during and after the month of fasting.

The biochemical assays concerned the following parameters: blood glucose, White blood cells (WBCs), neutrophils, Monocytes, and Lymphocytes.

Statistical analysis

For descriptive statistics, we calculated the arithmetic mean and standard deviation. For analytical statistics, we used the Student's T-test to study the variance between the different periods, with a significance level of ($p<0.05$). Statistical analysis was carried out on a computer using SPSS 20 software.

Results

The results are presented in two parts: results of anthropometric parameters and results of biochemical parameters. All parameters are expressed in descriptive (mean± standard deviation) and analytical results.

Anthropometric parameters

Table 1 shows the mean values and standard deviations of anthropometric parameters, as well as the results of statistical comparisons between measurement periods.

The results show no significant changes were observed for anthropometric parameters during either evaluation period despite a slight increase in values after the fasting month ($P>0.05$). This means that the fasting month does not seem to affect anthropometric parameters.

Analysis of biochemical parameter

The results show no significant changes were observed for anthropometric parameters during either evaluation period despite a slight increase in values after the fasting month ($P>0.05$). This means that the fasting month does not seem to affect anthropometric parameters.

Table 2 shows the variations in the immune system during the two measurement periods. Analysis of the results shows significant differences ($p<0.001$). After the month of fasting, we observe an increase in the levels of immune parameters of the blood compared to the month of fasting, particularly lymphocytes (36.04±4.24) vs. (41.08±9.83); Monocytes (3.5±1.91) vs. (3.83±1.94); Neutrophils (54.08 ± 9.93) vs. (56.16 ± 11.69). Fasting in Ramadan affects the immune parameters of the blood.

Table 1. Variation of anthropometric parameters after and during the month of fasting

Parameters	During fasting	After fasting	Student's T
Weight BW (kg)	54.79±5.744	55,03±5,53	0.53 NS
BMI (kg/m2)	21.26±1.51	22,16±1,58	0.18 NS
Fat mass FM (kg)	14.48±2.21	14,61±2,07	-0.63 NS
Lean weight LB (kg)	46.74±3.76	46,89±3,65	1.4 NS

*Significant per 5%, NS: not significant

Table 2. Biochemical variation of blood immune parameters after and during the month of fasting

Parameters	During fasting	After fasting	Student's T
WBCs (x106/mm3)	5.71±1.45	8.18±5.86	1.87*
Neutrophiles (%)	54.08±9.93	56.16±11.69	2.6*
Monocytes (%)	3.5±1.91	3.83±1.94	4.27*
Lymphocytes (%)	36.04±4.24	41.08±9.83	8.54*

* Significant per 5%, NS: not significant

Table 3. Blood glucose variation after and during the month of fasting

Parameters	During fasting	After fasting	Student's T
Glycémie (gr/l)	99.61±4.85	102.32±8.15	-0.98 NS

*significant per 5%, NS: not significant

The result shows no significant change in Blood glucose during the two measurement periods ($p>0.05$) (Table 3). It should be noted, however, that blood sugar levels are slightly lower during the fasting period than after the fasting month, but the results do not show significant differences. This means that the month of fasting does not affect blood sugar levels.

Discussion

Anthropometric parameters were measured twice. Our results confirm that the beneficial effects of the fasting month are transient, and despite the non-significant difference after fasting, the upward trend and recovery of values after the fasting month can be seen (Norouzy *et al.*, 2013; Sow *et al.*, 2016).

These results concur with the work of El Ati *et al.*, 1995, who found that after a month of fasting, and despite non-significant differences, anthropometric parameters measured, during and after the month of fasting returned to their initial weight is an index that is highly influenced by the dietary factor and is very sensitive to it through its fat mass component and food quantity and quality (Sadiya *et al.*, 2011) (Attarzadeh Hosseini *et al.*, 2014). Despite fasting (absence of food and water intake), body weight did not change significantly. The weight stability observed during fasting is consistent with the findings of Chiha, 2008; Karli *et al.*, 2007; Meckel *et al.*, 2008; Graham *et al.*, 2007; Abdelmalek *et al.*, 2007; Kara *et al.*, 2020 and contrast with those of Hussain *et al.*,1987; Bouhelal *et al.*, 2006; Ziae *et al.*, 2006; Al-Hourami and Atoum, 2007 and Sweileh *et al.*, 1992. This weight stability could possibly be explained by the balance between energy intake and expenditure (Chiha, 2008).

Similarly, fat mass, the parameter most influenced by diet, did not change significantly, which is attributed to the efficient use of body fat (Nomani *et al.*, 1989; El Ati *et al.*, 1995). In the fasting state, the body substitutes its energy source from glucose for fatty acids. Fatty acids are released from adipocytes, which can reduce body fat. These results concur with the work of several authors who found no significant change in body composition (Chiha, 2008; Ramadan, 2002; Karli *et al.*, 2007; Meckel *et al.*, 2008; (El Ati *et al.*, 1995)

In the same respect, lean mass, or active mass, did not change during the two measurement periods despite the variations recorded. Our results are in perfect agreement with the work of Ramadan, 2002 and run counter to those of Bouhlel *et al.*, 2006 who

reported a significant decrease in body components in their studies.

The effect of fasting on anthropometric parameters is influenced by eating habits, socio-economic and cultural differences, and the sleep-wake cycle (Syam *et al.*, 2016).

The study of the effect of fasting on the immune system shows significant fluctuations in performance according to the two periods of blood sampling. In the fasting state, we register a decrease in the levels of the immune system and then an increase. These results perfectly agree with the work of Khazaei *et al.*, 2014 who asserted that fasting would have considerable health benefits. Indeed, being deprived of food, the body tries to save up on energy expended and, for this purpose, recycles many immune system cells that are not essential, especially those that are damaged. The body forces the bone marrow to produce large quantities of white blood cells, which fight infections. "This gives the bone marrow the green light to rebuild the entire immune system," explains Valter Longo, a University of Southern California professor. "The good news is that the body gets rid of damaged or aged and ineffective parts of the immune system while young. Fasting cycles can help create a new immune system (Longo and Mattson, 2014). The level of white blood cells thus varies according to the periods of fasting and feeding, decreasing and increasing according to the person's feeding rhythm. Recent studies on non-Muslims have proven the effectiveness of fasting on the immune system, even in older people, and have shown that fasting helps the body produce new white blood cells, which stimulate the immune system to fight infections. As a result of these changes, the stem cells renew the cells of the immune system, and the rate of white blood cells subsequently increases (Raffaghello *et al.*, 2010).

For the evolution of blood sugar levels, it is usual to see a blood sugar imbalance at the end of the fasting month because of the diet deviations often seen during this period. This trend was not observed in the subjects of this study. The results show no significant changes during the two measurement periods despite the variations in the level observed during the fasting month. The decrease in blood glucose recorded during Ramadan can be attributed to the physical effort spent consuming blood glucose (Chiha, 2008). The stock of blood glucose is never the same as in the initial state. It is probably also due to a lack of carbohydrate intake in the nightly food rations, which may have led to a decrease in carbohydrate oxidation and an increase in fat oxidation (Trabelsi *et al.*, 2011). After the month of fasting, there is a slight increase in blood glucose levels that is not significant because of the rehabilitation period after the disruption of the biological rhythm, as found in studies by Dowood (2004). The results align with those of Chiha, 2008 who found stability in blood glucose levels. On the other hand, an increase in blood glucose levels was reported by Ba *et al.*, 2004; Bouhlel *et al.*, 2006; Kamel Boulos and Wheeler, 2007. Resting serum glucose levels decreased during Ramadan in moderately trained runners (Aziz *et al.*, 2010) soccer and basketball players (Güvenç, 2011), but not elite rugby players Bouhlel *et al.*, 2006 and active men (Trabelsi *et al.*, 2012).

Conclusion

The literature review has allowed us to understand the mechanisms and effects of fasting on the body. Still, the results of the different studies remain controversial, and it seems that socioeconomic, cultural, and geographical differences may influence dietary practices and daily habits, thus contributing to the inconsistency of results in the different studies. Our work is based on a study that aimed to highlight the influence of fasting on variations in anthropometric and biochemical parameters among young female students at the University of Jeddah. Considering the results obtained at the end of our experiment, we came to the following conclusions: Fasting affects the biochemical due to changes in the biological rhythm. This decrease is apparent in the first two weeks, with a return to normal and stabilization after that, testifying to a phenomenon of adaptation by the body. Fasting has no adverse effects on the biochemical parameters. Thus, fasting seems

to be a beneficial means for the health of the human organism. This study is limited to certain biochemical elements in fewer subjects, opening opportunities for more detailed perspectives. Further investigation of hematological, urinary, lactate, enzymatic, hydric, hormonal, and other parameters would provide more information on the specificities of various metabolisms in fasting.

1. A more comprehensive range of discipline-specific tests (physical, technical, tactical) would undoubtedly be of considerable value.
2. Dietary surveys over several days would allow for objectively planning the athlete's diet in terms of quantity, quality, and water.
3. Correlations could elucidate the interactions and interdependencies between the different parameters and their impact on the body.
4. A larger sample and, if possible, a comparison between young and non-young athletes and between athletes and sedentary people will clarify certain metabolic variations.

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