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Effect of Aerobic Exercise During Ramadan Fasting on Lipid Profile

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Abstract

Background: *The major religious period of the Islamic calendar is Ramadan when many millions of Muslims fast throughout the daylight hours. Research indicated that fasting in Ramadan can cause changes in body component.*

Purpose: *to investigate the effect of strict prolonged fasting combined with aerobic exercises on body composition, and lipid profile in normal subjects.*

Design: *a pre-test post-test design.*

Methods: *50 subjects of both genders, aging from 35-45 years and BMI from 30 to 34.9 kg/m^2 participated in this study. Subjects were assigned into 2 groups; group (A) 25 subjects received moderate intensity aerobic exercise during Ramadan fasting while group (B) 25 subjects were fast only. Body composition (Weight, BMI and W/H ratio) and serum lipid profile (TC, TG, LDL and HDL) were determined at 24h before and the last day of Ramadan month*

Results: *moderate intensity aerobic exercise and fasting in group A had a considerable effect on body composition and lipid profile. While in group B fasting alone had no considerable effect on W/H ratio and HDL.*

Conclusion: *Interaction between fasting and aerobic exercise was not considerable, except on W/H ratio and HDL which didn't decreased due to fasting only.*

Key words: *Fasting Ramadan, Aerobic exercises, Lipid profile and body composition.*

Introduction

Ramadan is the holy month in Islam, occurring annually, during which no ingestion of food or fluid is allowed between sunrise and sunset. Each year, Ramadan falls approximately 10 days earlier than the previous year, in accordance with the Islamic calendar. The duration of restricted food and beverage intake is approximately 12 h/day, depending on the season, for a period of 1 month, which makes Ramadan a model of prolonged intermittent fasting [(1).]

The major religious period of the Islamic calendar is Ramadan when many millions of Muslims fast throughout the daylight hours. They are not permitted to drink and eat during the days and are allowed only at nights. The duration of a daily fasting episode is influenced by seasonal and geographical conditions which may vary from 11 to 18 h/day [(2)].

The different physiological effects of Ramadan have been the interest of research for many years. There are evidenced alterations from normal lifestyle behaviors and circadian rhythms with phase shift in biological and behavioral indexes. These changes in daily habits are likely to also have effects on body weight and the body composition profile [(3)].

Literature had emerged that offers contradictory findings about Ramadan's impact on athletic capacities; the effects of Ramadan fasting on body weight and composition were widely variable. Although a reduction in body weight was reported from some studies, others showed weight gain during Ramadan [(4)].

In particular, its impact on the atherosclerosis risk varies from one case to another of practicing Muslim populations. While fasting is accompanied with an increase of antiatherogenic biochemical parameters [high-density lipoprotein (HDL) and apolipoprotein (apo) AI] and/or a decrease of atherogenic parameters [triglycerides (TG), total cholesterol (TC), apoprotein (apo) B, and low-density lipoprotein (LDL)] in certain practicing [(5)].

The majority of findings related to total TC, LDL cholesterol, and HDL cholesterol are mixed. Also, heterogeneous findings exist regarding whether Ramadan fasting decreases or increases the LDL /HDL ratio. Finally, the TC/HDL ratio appears to decrease during Ramadan [(6)].

Research indicated that fasting in Ramadan can cause changes in body component. **Salehi et al.** [(7)] noticed a significant decrease in body weight, body mass index (BMI), glucose, and serum cholesterol after a complete period of fasting in Ramadan, therefore, the problem of this study was stated in a question form: Does aerobic exercise during Ramadan fasting has an effect on body composition and lipid profile?

Methods

Subjects

Fifty subjects of both gender participated in this study selected randomly from Internal Medicine Hospital (Cairo University Hospitals). Their age ranged from 35-45 years, and their BMI ranged from 30-34.9 Kg/m² (Grade I Obesity). All volunteers provided written consent for participation. Excluded from the study subjects who suffering from unstable cardiovascular conditions, pulmonary disease and musculoskeletal disorders.

Instrumentation

Standard, calibrated scales and stadiometers were used to determine height and weight of each participant with a precision of 0.1 cm and 0.1 kg respectively; to calculate BMI.

Tape measurement was used to determine W/H ratio. An electronic treadmill was used for aerobic exercise training. Pulsometer was used to detect the pulse rate and to control exercise intensity within the pre-calculated training heart rate.

Procedure of the study

All subjects had full explanation of the objectives of the study, demonstration on equipments, and procedures. Data concerning the subjects' characteristics including height, weight, BMI were collected the day before Ramadan fasting and in the last day of Ramadan fasting. In addition to blood samples which were taken 12 h overnight fast in the any two trials.

The subjects were then randomly divided into two groups. Group A consisted of 25 subjects, attended physical activity sessions only during Ramadan, i.e. their practical sessions ended by the end of the fasting month. Group B consisted of 25 subjects, had their physical activity sessions postponed to the end of Ramadan, i.e. they did not had any formal and regular practical sessions during the fasting month.

Training procedure

Instructions were given to each subject about exercising on treadmill and to breathe normally, avoid holding respiration. There were instructed about exercise limiting symptoms including any fatigability, breathlessness and chest pain or leg cramp to report immediately. Maximum heart rate (HR_{max}) was determined for each subject {$HR_{max} = 0.7 - 208 \times age$} [8].

Each session was consisted of warm up (5minutes) in the form of pace walking (walking at low speed 1.5 km/h. at 0 inclination) with heart rate was reached 30-40% of HR_{max} to adjust cardiopulmonary system, minimize formation of lactic acid, to decrease the risk of hypotension, musculoskeletal and cardiovascular complications.

Then an aerobic exercise (stimulus) phase (20 minutes of moderate intensity aerobic exercise) during which the speed was increased gradually until subject was reached the range of 65-75% of HR_{max} and cool down (5minutes) in a form of pace walking (walking at low speed 1.5 km/h. at 0 inclination) in slow rhythm to readjust the

circulatory system and prevent pooling of the blood in the lower limbs. The total session was consisted of 30 minutes [9, 10]. The heart rate was monitored on the treadmill screen throughout the session to ensure the maintenance of required training heart rate. The session was done 9 hours after Sahour meal.

Results

The mean of subjects' age, height, body composition and lipid profile of both groups were identical before fasting Ramadan (Table 1).

As shown in table 2 and table 3, it was observed that the mean of subjects' weight decreased after Ramadan by 2.53 kg and 1.13 kg in groups A and B, respectively. Also the mean of BMI decreased after Ramadan by 1.06 kg/m^2 and 0.47 kg/m^2 in groups A and B, respectively. W/H ratio mean decreased significantly in group A after Ramadan by 0.02, while in group B remained constant. TC mean decreased in both groups after Ramadan, particularly in group A. TG mean decreased after Ramadan in group A by 23.5 mg/dl and group B by 14.2 mg/dl. The mean of LDL level decreased after Ramadan in both groups particularly in group A. The mean of HDL decreased significantly in group A after Ramadan but not significantly decreased in group B.

Table 1. Subject's characteristics before fasting Ramadan (mean ± SD)

	Group A (n=25)	Group B (n=25)	P value
Age (years)	37.53±6.02	36.20±5.39	0.528
Height (cm.)	156.87±6.81	158.20±4.86	0.543
Weight (Kg.)	85.53 ± 7.42	86.13 ± 6.39	0.814
BMI (kg/m^2)	34.33 ± 0.98	33.8 ± 1.70	0.303
W/H ratio	0.88 ± 0.039	0.86 ± 0.069	0.309
TC (mg/dl)	197.2 ± 37.7	184.8 ± 39.7	0.388
TG (mg/dl)	130.7 ± 60.6	114.8 ± 53.6	0.452
LDL (mg/dl)	124.5 ± 28.9	116.1 ± 47	0.564
HDL (mg/dl)	45.8±10.9	45.3±10	0.890

Table 2. Comparison between subjects in group A before and after the study (mean ± SD)

	Pre-test	Post-test	P value
Weight (Kg.)	85.53 ± 7.42	83 ± 7.11	0.000
BMI (kg/m^2)	34.33 ± 0.98	33.27 ± 0.96	0.027
W/H ratio	0.88 ± 0.0.039	0.86 ± 0.025	0.046
TC (mg/dl)	197 ± 37.65	174.1 ± 31.7	0.002
TG (mg/dl)	130.7 ± 60.6	107.2 ± 37.9	0.006
LDL (mg/dl)	124.47 ± 28.9	105.2 ± 27	0. 001
HDL (mg/dl)	45.8 ± 10.94	41.13±4.7	0.036

Table 3. Comparison between subjects in group B before and after the study (mean ± SD)

	Pre-test	Post-test	P value
Weight (Kg.)	86.13 ± 6.39	85 ± 6.51	0.000
BMI (kg/m^2)	33.8 ± 1.69	33.33 ± 1.76	0.004
W/H ratio	0.85 ± 0.0.069	0.85 ± 0.020	0.138
TC (mg/dl)	184.8 ± 39.7	172.9 ± 35.2	0.024
TG (mg/dl)	114.8 ± 53.6	100.6 ± 47.4	0.008
LDL (mg/dl)	116.1 ± 47	107.9 ± 42.6	0. 014
HDL (mg/dl)	45.27 ± 10.03	44.8±8.06	0.559

Table 4. Comparison between both groups in body composition and lipid profile after fasting Ramadan (mean ± SD)

	Group A (n=25)	Group B (n=25)	P value
Weight (Kg.)	83 ± 7.11	85 ± 6.51	0.429
BMI (kg/m^2)	33.25 ± 0.93	33.33 ± 1.76	0.872
W/H ratio	0.865 ± 0.025	0.849 ± 0.065	0.388
TC (mg/dl)	174.1 ± 31.7	172.9 ± 35.2	0.927
TG (mg/dl)	107.2 ± 37.9	100.6 ± 47.4	0.677
LDL (mg/dl)	105.2 ± 27	107.9 ± 42.6	0. 840
HDL (mg/dl)	41.13±4.7	44.3±8.06	0.142

Table 4 demonstrated no significant difference between body composition and lipid profiles in both groups before and after the study.

Discussion

This study was conducted to investigate the effect of Ramadan fasting on body composition and lipid profile in 50 subjects. Body composition (weight, BMI and W/H ratio) and the lipid profile blood tests (TC, TG, LDL and HDL) were performed in the day before Ramadan fasting and in the last day of Ramadan. The results of the current study showed that there were no significant differences between fasting Ramadan only and practicing physical exercises during Ramadan fasting on body composition and lipid profile.

The recurrent study did not find a considerable effect of combination between fasting and physical activity on the body composition and lipid profile. Overall, concurrent physical activity and fasting in group A had a considerable effect on body composition and lipid profile. While in group B fasting alone had no considerable effect on W/H ratio and HDL.

This study is one of a few which explored the interaction between fasting and physical activity on the lipid profile in an interventional study. Nonetheless, the sample size was enough to detect only a strong effect, which is the main limitation in our study. The patterns of changes in both groups (fasting and physical activity, and fasting alone) were more or less comparable. Many authors such as **Ziaee et al.** [3] explained that the changes in lipid profile during Ramadan might be due to the changes in physical activity, although they did not have any explicit findings to support their hypothesis [11, 12, 13].

Although there are a large number of observational studies on the changes of dietary habits during Ramadan, there is a need for more well-designed and interventional studies to assess the interactions between the nutritional status and fasting on the body metabolisms and lipid profile in healthy individuals, as well as in special subgroups, such as obese or diabetic patients [14].

Heterogeneous findings exist regarding the effect of Ramadan fasting on body mass and body composition of physical activity practitioners. Several studies indicated that physically active men can lose weight via aerobic training during Ramadan month [14, 15, 16, 17]. In contrast, other studies indicated the absence of change in body weight during Ramadan in football players [18, 19], middle distance runners [20].

The decrease in body mass was explained by several factors such as dehydration, the decrease

in caloric intake while maintaining the training schedule and the increase of the utilization of stored body fat as energy substrate [21, 15].

Studies on the effect of Ramadan fasting on blood lipids have produced variable results. Physically active men practicing aerobic exercise in fasted state can lose body fat percentage during Ramadan [15]. The same finding has been reported in Judokas [22]. Serum cholesterol may decrease in the first days of fasting and rise to prefasting values. Some studies have reported raised concentrations of cholesterol, which may be related to weight loss during Ramadan fasting [23]. However, others have found no change, or only decreased levels of cholesterol during fasting [24].

The evidence that a marked increase in plasma HDL occurs after Ramadan fasting is promising [25]. This is in contrast to our current study, which found a significant decrease in HDL and LDL. Changes in blood lipids seem to be variable and depend probably on the quality and quantity of food.

Conclusion

In conclusion, the body composition and serum lipid profile in healthy fasting individuals are considerably altered during Ramadan, but the interaction between fasting and physical activity was not considerable, except on W/H ratio and HDL which didn't decreased due to fasting only.

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