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THE EFFECT OF REGULAR AEROBIC EXERCISE ON THE FBS, HOMA INDEXES AND LIPID PROFILES IN NON-ACTIVE OBESE MEN; WITH EMPHASIS ON RAMADAN FASTING

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ABSTRACT

Background: We designed this study to evaluate the effect of aerobic exercise and Ramadan fasting on plasma lipids profile and serum glucose among non-active obese men. So, purpose of the study was to survey the effect of regular aerobic exercise and Ramadan fasting on the on plasma lipids profile and serum glucose in non-active obese men. **Methods**: In this study, 18 obese men aged 50-40 with a BMI over 30 kg per square meter as a public call among the 70 subjects were selected randomly and after it were divided in to fasting (N=9) and fasting and exercise (N=9) groups. Then while the first group would do only fasting, fasting and exercise group in addition to the intervention fasting group, exercise to be carried out in 27 sessions. We evaluated blood glucose, triglycerides (TG), cholesterol, low-density lipoprotein (LDL-c), high-density lipoprotein (HDL-c), and Triglycerides at 7 day before, at week 2th and 4th of the Ramadan month and after two weeks after the end of Ramadan. Also, for check the desired changes in the month of Ramadan, blood samples were taken from four different times. Finally, using repeated measures analysis of variance in the level of p <0/05 theories were put to the test. **Results**: All parameters at 4 week of Ramadan were significantly lower than pre-Ramadan values (p<0/05). It was found that high-density lipoprotein (HDL) cholesterol increased significantly during Ramadan (p<0/05). The LDL-c was significantly reduced at the end of fasting (p<0/05). **Conclusion**: It seems that the regular aerobic exercise and Ramadan fasting has a beneficial effect on the Serum Glucose and Lipid Profiles in non-active obese men.

Keywords: regular aerobic exercise, Ramadan fasting, high-density lipoprotein (HDL-c) and obese man

INTRODUCTION

Obesity is one of the problems in this century. Obesity caused by inactivity and lack of adherence to dietary patterns. In addition, obesity itself is associated with a variety of diseases including those areas that affect the risk of insulin resistance and atherosclerosis that associated with increased risk factors from lipid profiles. Fasting is obligatory for all adults and healthy Muslims during the day hours for the whole month every year. Ramadan month occurs 11 days earlier every year due to the difference between the solar and lunar years, and may occur in any of the four seasons, making the length of fasting hour's variable from 11-18 hours in tropical countries [1]. Ramadan is the month during which Muslims refrain from food, liquids and tobacco smoking during daylight hours and eat a main meal after

sundown. Free eating is allowed from sunset to dawn. Ramadan teach Muslims self –restraint and remind them of the feelings of the impoverished. Ramadan is observed by over 400 million of Muslims who spread across the globe; and live under various geographical, climatic, social, cultural and economic conditions. This provides a unique opportunity to study the hematological and biochemical changes over Ramadan time. Because the lunar calendar determines the month of Ramadan and is about 11 days shorter than the solar year, Ramadan is not fixed to any season. The timing of daily fasting varies from country to country and with the season in which the month of Ramadan falls. Thus, depending upon the season and the geographical position of the country, the length of the fast varies from 12 to 19 hours per day [2]. During Ramadan, Muslims abstain from food and drink from dawn until sunset. Traditionally the practice is to eat 2 meals, 1 before dawn, Sahar, and 1 just after sunset, iftar. Often Muslims eat a greater variety of foods in their meals during Ramadan than in other months. As a result, the Ramadan fast provides an excellent opportunity to study the effects of various diets on the human body and can serve as an excellent research model for metabolic and behavioral studies [3]. Ramadan fasting and starvation are not synonymous. Many physiological and psychological changes take place during Ramadan, most probably due to the changes in eating patterns, eating frequency and sleep patterns [4]. Some studies in the eastern Mediterranean area have indicated improved high-density lipoprotein cholesterol (HDL-c) during Ramadan fasting [5, 6]. Few studies have shown the effect of Ramadan fasting on serum glucose [7-11]. One study has shown a slight decrease in serum glucose in the first days of Ramadan, followed by normalization by the twentieth day and a slight rise by the twenty-ninth day of Ramadan [12]. The lowest serum glucose level in this study was 63 mg/dl. Others have shown a mild increase or variation in serum glucose concentration, but all of them fell within physiological limits [10]. From the foregoing studies, one may assume that the stores of glycogen, along with some degree of gluconeogenesis, maintain normal limits of serum glucose when a fast follows a large pre-dawn meal. However, slight changes in serum glucose may occur in individuals depending upon food habits and individual differences in metabolism and energy regulation. Weight losses of 1.7 kg, 1.8 kg, 2.0 kg, and 3.8 kg have been reported in normal weight individuals after they have fasted for the month of Ramadan [13, 14, 15]. In one study that was over-represented by females, no change in body weight was seen [16]. More studies show no change or a slight decrease in concentrations of total cholesterol and triglycerides [16-18]. Increase in total cholesterol levels during Ramadan seldom occurs [19]. Few studies have reported increases in high-density-lipoprotein cholesterol (HDL-c) in diabetics during Ramadan [20, 21, 23]. One report indicates an increase in low-density-lipoprotein cholesterol (LDL-c) and a decrease in HDL-c [22, 23]. So, purpose of the study was to survey the effect of regular aerobic exercise and Ramadan fasting on the on plasma lipids profile and serum glucose in non-active obese men.

MATERIALS AND METHODS

We recruited 18 obese men with non-insulin dependent type 2 diabetes mellitus who were recently discovered (less than 3 years). None of our patients had documented coronary artery disease or history of myocardial infarction. There were 18 (age range 40-50 years) obese men. None of our patients were hypertensive and none of our patients were smokers. Test samples were collected from all patients five and one week before Ramadan fasting and then one week after the beginning of Ramadan so that patients acted as their own control. Ethical Committee in the hospital approved the study. All patients were educated about medications, hypoglycemia and hyperglycemia complications. They were asked to fill out a questionnaire about their meals, quantity,

quality and they were advised to avoid the common practice of overfeeding with sweets. They were asked to adopt a protein-low fat-energy restricted three meals before fasting (Iftar at sunset and Sahar before dawn). In that session, we measured the subjects' weight and height, and obtained blood samples to quantify their LDL-c, HDL-c and fasting blood sugar (FBS), insulin hormone and homeostasis model of insulin resistance or HOMA (that computing from HOMA = [FBS × Fasting insulin hormone (FIH) ÷ 22.5] to establish their baseline values. This study was performed during Ramadan of May – July 2011 (Hijri year 1433). The project was approved by the Ethics Committee for Scientific Research at the Academy of Physical Education in Ferdowsi university of Mashhad, IRAN. Venous blood was taken one week before Ramadan (T1), second week of Ramadan (T2), and last week of Ramadan (T3), and two week after of Ramadan (T4) after an average fast of eight hours. Anthropometric measurements were performed at the same time of blood sampling. Blood was collected in plain and EDTA tubes. Serum was obtained by low speed centrifugation at 1000g for 15 minutes, and samples were immediately separated into aliquot and stored at -20C until analysis. All serum samples were analyzed in a single batch to avoid day-to-day laboratory variation. Hematological and biochemical measurements took place in the Research Laboratory for the department of medical laboratories at The Hashemite University. Fresh EDTA blood was used to determine hematological parameters using Cell – Tac α (Nihon- Kohden, Japan) Serum total cholesterol (TC) and high density lipoprotein– cholesterol (HDL-C) were measured by an enzymatic colorimetric method using cholesterol oxidase, perioxidase, and the chromogen 4-aminophenazone/phenol [24]. Serum triacylglycerols (TG) levels were determined by an enzymatic colorimetric method using lipoprotein lipase glycerokinase, glycerphosphate oxidase, and the chromogen 4-aminophenazone/N-ethyl-N (3-sulphopropyl)-nramisidine [25]. Low-density lipoprotein – cholesterol (LDL–C) was calculated using Friedwald et al. equation [26]. Then, all subjects were then randomly divided into two groups; fasting group not had physical activity sessions during the Ramadan month and exercise and fasting group attended physical activity sessions in during of Ramadan month in addition the Ramadan fasting. Our subjects had three practical sessions per week, each lasting 60 minutes. Their activities were under the supervision of a coach who was familiar with the objectives of the study. He was requested to ensure that students in both groups exercise comparably and follow a similar course plan. Each session started with a warm-up phase lasting ten minutes. We took their blood samples between 4 to 6 pm to make sure they were fasting for around eight hours. Questions regarding the subjects' diets were also raised during their first visits. We excluded students with any acute or chronic disease or medication during the study. Blood samples were collected from all subjects in tubes 7 day before, at week 2th and 4th of the Ramadan month and after two weeks after the end of Ramadan, serum separated from samples through centrifugation and assays were immediately done or the serum stored at less than or equal to -20C. Serum total cholesterol (TC), high density lipoprotein cholesterol (HDL-C), low-density lipoprotein cholesterol (LDL-C) triglycerides (TG) and serum glucose and insulin hormone of all the subjects were measured using the commercially available kits (Enzymatic colorimetric method according to Trinder method).

All data were expressed as mean ± standard deviation (SD). Paired t-test was used to compare pre and during Ramadan fasting variables. ANOVA was used to analyze repeated measures. Differences were considered significant when p values were less than 0.05. All analysis was performed using the statistical package (SPSS) version 18.0 (Chicago, IL, USA).

RESULTS AND DISCUSSION

The effect of regular aerobic exercise and Ramadan fasting on the on plasma lipids profile and serum glucose was studied on 18 non-active obese men. Their mean age was 40-50 years. All biochemical parameters at 4 week of Ramadan were significantly lower than pre-Ramadan values (p<0/05), 2 weeks after Ramadan fasting, body weight and other parameters had a trend to recoup to pre-Ramadan status; however, they were still lower than the pre- Ramadan values. Serum high-density lipoprotein (HDL-c) cholesterol increased significantly during Ramadan in both groups (p<0/05) (Table 2). In our study there was a significant reduction in LDL-c an effect that was observed in the study conducted by [27] who reported significant reduction in LDL-c, which was maintained one month after Ramadan (p<0/05). A reduction in the average TC value was observed at the end of fasting that the difference was statistically significant and significant reduction in the TG and blood sugar values at the end of fasting similar to the effect observed in the other studies [28, 29].

Table1- Differences between variables and Differences within variables for lipid profile in fasting group (N=9) and fasting and exercise group (N=9)

anthropometric indexes	Groups	Stages*				Differences between variables†		Differences within variables†	
		T1	T2	T3	T4	F	P	F	P
Total cholesterol (mg.dl $^{-1}$)	**F**	198 ±49/1	193/1 ±38/5	189/6 ±42/06	196/5 ±32/2	0/49	0/68	198/79	0/000
	F-E	204 ±30/7	202/7 ±32/3	201 ±23	181/1 ±41/6	1/51	0/23		
TG (mg.dl $^{-1}$)	**F**	142 ±10/43	140/5 ±82/6	116 ± 50/25	169/5 ±12/67	0/92	0/44	13/62	0/006
	F-E	297/7 ±39	257/5 ±25	213/2 ±16/66	214 ±20/42	2/32	0/1		
HDL-c (mg.dl $^{-1}$)	**F**	44/37 ±4/8	44/5 ±7/07	42/14 ±2/35	50/37 ±5/6	4/73	0/011	199/63	0/000
	F-E	40/22 ±6/2	41/11 ±8/06	42/11 ±14/52	43/77 ±10/36	0/58	0/63		
TC to HDL-c ratio	**F**	4/98 ±0/99	4/96 ±1/18	4/37 ±1/33	4/5 ±0/99	3/73	0/027	92/34	0/000
	F-E	4/96 ±1/69	5/78 ±3/16	5/02 ±1/0	4/61 ±1/32	1/01	0/405		
VLDL (mg.dl $^{-1}$)	**F**	28/5 ±2/86	25/0 ±5/41	23/12 ±9/99	35/37 ±8/1	0/97	0/425	29/63	0/001
	F-E	37/75 ±9/4	29/68 ±2/66	35/77 ±13/8	32/88 ±7/46	0/70	0/560		
LDL (mg.dl $^{-1}$)	F	113/8 ±38	117/6 ±32/0	113/37 ±32/7	103/13 ±49/0	0/82	0/495	82/78	0/000
	F-E	100/1 ±28	101/6 ±36/1	105/25 ±40/9	93/1 ±46/77	0/34	0/797		
LDL-c to HDL-c ratio	F	2/61 ±0/81	2/62 ±0/97	2/83 ±0/89	2/27 ±0/73	4/69	0/012	80/064	0/000
	F-E	2/6 ±0/817	2/8 ±0/44	2/44 ±0/38	2/32 ±0/64	1/3	0/298		

* Data was Mean ± SD. † significant level accepted at p<0/05. F; fasting group and F-E; fasting and exercise group. T1: one week before Ramadan, T2: second week of Ramadan, T3; last week of Ramadan, and T4: two week after of Ramadan

Table 2- Differences between variables and Differences within variables for insulin hormone, FBS and HOMA in fasting group (N=9) and fasting and exercise group (N=9)

anthropometric indexes	Groups	Stages*				Differences between variables†		Differences within variables†	
		T1	T2	T3	T4	F	P	F	P
Insulin hormone (ulU.ml $^{-1}$)	**F**	±5/89 14/87	±11/5 20/94	±4/93 12/03	±7/02 16/95	2/44	0/03	22/95	/001 0
	F-E	±42/74 33/5	±11/1 19/29	14/5 ±6/17	±1/09 16/66	/416 1	0/262		
FBS (mg.dl $^{-1}$)	**F**	117 ±39/5	124 ±55/9	± 32/92 108	±35/69 117/8	1/58	0/224	69/032	/000 0
	F-E	±32/8 121/4	±51/1 115/1	±11/42 101/1	±16/9 102/55	/118 1	0/360		
HOMA	**F**	/50±0/324 4	/61±0/571 6	3/28±0/189	4/48±0/238	/244 3	0/042	13/189	/007 0
	F-E	±1/17 13.54	/45±0/551 6	/674±0/153 3	4/49±0/267	/351 1	0/281		

* Data was Mean ± SD. † significant level accepted at p<0/05. F; fasting group and F-E; fasting and exercise group. T1: one week before Ramadan, T2: second week of Ramadan, T3; last week of Ramadan, and T4: two week after of Ramadan

The mean difference between pre- Ramadan and during Ramadan body weights was 13.37 kg in fasting group and 15.22 kg in fasting and exercise group significant reductions in body weight. Similarly, many studies have reported weight loss during the month of Ramadan fasting [29]. In contrast to this, one study reported weight gain during Ramadan [31] and still others did not find any significant change in body weight [30, 31]. In one study among healthy males, a significant reduction in skin fold thickness was reported during Ramadan fasting [32]. A study suggested that increased fat Oxidation during Ramadan fasting results in an adaptive mechanism for body weight maintenance [31]. The body has regulatory mechanisms that activate during fasting. There is efficient utilization of fat [31]. And basal metabolism slows down during fasting [29] contrary to the popular thinking, it was found that intake of a moderately.

We found significant effect on total cholesterol levels and the improved HDL cholesterol profile in our study is supported by many studies [33, 34] noted similar increases in HDL cholesterol profiles in non- Ramadan studies [35]. Nonetheless, some studies have reported decreases [32]. In another study suggested that feeding behavior that occurs during Ramadan beneficially affects serum apolipoprotein metabolism and may contribute to prevention of coronary heart disease [36]. Examined the relation of Fasting to coronary events and found that the number of cases with acute coronary heart disease events were significantly lower in Ramadan than before or after Ramadan. A reduction in the average TC value was observed at the end of fasting that the difference was statistically significant and the significant reduction serum TG may be attributed to the lipolytic effect of prolonged fasting and this was in line with study [28] who observed decrease in serum TG level at the end of fasting. Our analysis founded that a decrease in serum glucose in Ramadan among our subjects. It has been found that a decrease in serum glucose occurs in normal adults a few hours after fasting has begun. However the reduction in serum glucose ceases due to increased gluconeognesis in the liver. This occurs because of a decrease in insulin concentration and a rise in glucagons and sympathetic activity [13].

Few studies have shown the effect of Ramadan fasting on serum glucose [10, 37, 39]. A study observed a decrease in serum glucose in the first days of Ramadan followed by normalization by

the 20th day and a slight rise by the 29th day of Ramadan[13]. Others have shown an increase [39] or variation in serum glucose concentration [40] all of them fall within physiologic limits [41, 42, 44]. In our study there was a significant decrease in HOMA value at the end of fasting.

CONCLUSION

Regular aerobic exercise and Ramadan fasting appears to have significant effect on LDL-c that should translate into a significant reduction in coronary risk. Regular aerobic exercise and fasting in Ramadan month contributed to better blood lipid profiles under the prevailing limited energy intake conditions of the study. In addition, regular aerobic exercise and Ramadan fasting were significant decreased in homeostasis model of insulin resistance or HOMA. We therefore, suggest that a systematic fasting of one to two days and exercise of three to four days per week even after the Ramadan period would serve as an excellent part of healthy lifestyle.

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