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Research Paper

Effect of Ramadan Fasting on Lipid Profile Parameters and Body Mass Index Among a Group of Healthy Adult People in Mosul City / Iraq

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ABSTRACT:

BACKGROUND :

There is increasing interest regarding the health implications of Ramadan fasting in the recent years. Many reports indicate that fasting during the holy month of Ramadan results in reduced body weight and improved metabolic parameters like lipid profile in healthy individuals.

OBJECTIVE:

To study the effect of fasting during the holy month of Ramadan on serum lipid profile and body mass index in healthy adult volunteers.

PATIENTS AND METHODS:

prospective cohort study was done including a total of 50 healthy volunteers. Venous blood samples were taken from volunteer, 1week before Ramadan, and, on the 28th day of Ramadan. Lipid profile (total cholesterol, triglyceride and HDL-C) were measured using automated clinical chemistry analyzer and (LDL-C, VLDL-C and atherogenic index) were calculated mathematically. Body mass index was also measured for each participant.

RESULTS:

Participants showed no significant difference in mean of BMI , P= 0.11. A significant reduction in the mean of total cholesterol (P=0.01), triglyceride (P=0.001), VLDL-C (P=0.001) and atherogenic index (P=0.001) were observed. A significant increase in HDL-C level at the end of Ramadan (P=0.001) was noted. No significant difference in mean of LDL-C (P=0.13).

CONCLUSION:

Fasting Ramadan may have beneficial health effects in the levels of lipid profile.

KEYWORDS: lipid profile, Ramadan, Fasting.

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INTRODUCTION:

Ramadan fasting in Islam is one of the five pillars of faith [(1)]. It involves abstaining from food, drink, smoking, and sexual activities from dawn until dusk [(2)]. There is growing interest in the health effects of Ramadan fasting, which is the most common form of intermittent fasting based on religious and spiritual traditions [(3-4)]. Significant changes in meal timings during fasting days, along with alterations in diet quality and quantity, can impact body composition and metabolic profiles [(5)]. While some studies suggest that Ramadan fasting can lead to reduced body weight and fat mass, as well as improved metabolic parameters in healthy individuals [(6-7)], its effects on various health outcomes remain complex and not fully understood [(8-9)]. Lipids are indispensable to virtually all biological processes, functioning as integral structural elements within cellular membranes and participating in intricate metabolic and endocrine pathways. Mastery of dyslipidemia is paramount, given their ubiquity in clinical settings and their association with atherosclerotic conditions, notably coronary artery disease, a predominant cause of mortality in urbanized populations [(10)]. Given that dyslipidemia is recognized as a biomarker for metabolic syndrome and increases the risk of cardiovascular disease (CVD), the impact of intermittent fasting on plasma lipid parameters

including serum triglycerides (TGs), total cholesterol (TC), high-density lipoprotein cholesterol (HDL-C), low-density lipoprotein cholesterol (LDL-C) , very low-density lipoprotein cholesterol (VLDL-C), Intermediate-density lipoprotein (IDL) and apo-lipoproteins has been documented in numerous studies [11-12].

Several studies indicate that the lifestyle alterations during Ramadan—a form of intermittent fasting characterized by reducing meal frequency from three to two times daily, increased physical activity during worship, and reduced smoking due to daytime restrictions—can influence weight loss and metabolic processes. Specifically, these changes are believed to improve lipid profiles and decrease inflammatory mediators, thereby reducing cardiovascular risk factors [19].

METHOD:

Prospective cohort study was conducted on 50 volunteers at Mosul city, and samples had been taken two times from each volunteer firstly, 1week before Ramadan on the 15th of March / 2023, and then, on the 28th day of Ramadan , the 19th of April / 2023 . Verbal and signed written consents from all volunteers were gained prior to their engagement in the study. The compliance was ensured at the beginning of the study by written consent and then by follow up. The inclusion criteria included subjects ages 20 to 40 years and apparently healthy, with no previous clinical history of dyslipidemia, diabetes mellitus, or hypertension. At the beginning of study, samples from 57 volunteers were collected but only 50 of them (23 males and 27 females) were included in the study, as some of volunteers did not match the criteria of inclusion for example four cases were apparently healthy adults but found after testing to have hyperlipidemia, and others apologized from attending the second sampling. Anthropometric measurements of height and body weight were obtained, and the Body Mass Index (BMI) was subsequently computed by using the global equation [BMI (Kg/m2) =Weight (Kg)/height (m2)]. A venous blood specimen, approximately 3 ml in volume, was extracted from each participant utilizing a 5 ml disposable syringe, the syringe samples were transferred into gel tubes (serum separator tube), left at room temperature in up standing position until the blood was clotted, and then centrifuged (ROTOFIX 32) at 4000 rpm (revolution per minute) for 10 minutes to obtain serum, then total cholesterol (TC), triglycerides , and HDL-C were measured immediately using automated method (Cobas Integra 400 plus). LDL-C was calculated using the Friedewald formula. Atherogenic index (TC/HDL-C) and VLDL-C were also calculated. The data were analyzed using Statistical Package for Social Sciences (SPSS) version 26. A Kolmogorov Smirnov test confirmed that the data were normally distributed. the data were expressed as means ± SD. Student paired t-test was used to compare the means of two groups. P-value of less than 0.05 was considered to indicate statistical significance.

RESULTS:

In this study 50 participants were included, (23, 46%) were males, and (27, 54%) were females, as presented in figure (1).

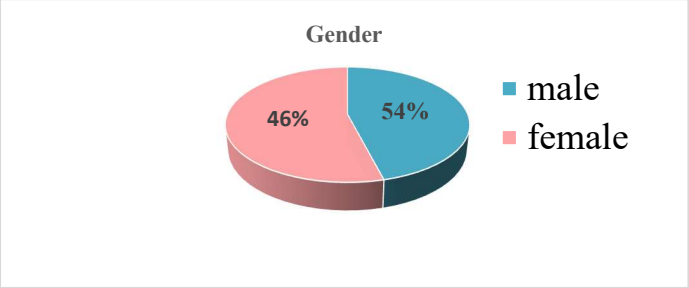

Figure 1: Gender distribution .

The mean ± SD of age of the included participants was (29.32 ± 5.05) years. 24% of them were aged ≤ 25 yrs., 40% were 26-30 yrs., 16% were 31-35 yrs. and 20% were > 35 yrs., as presented in figure (2).

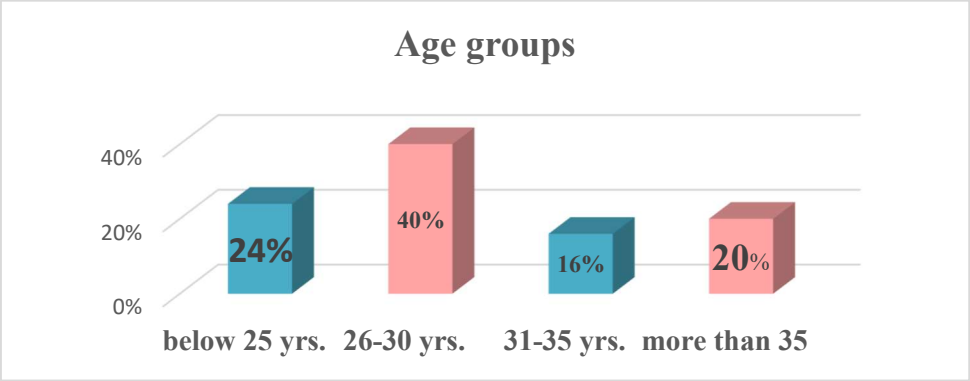

Figure 2: Age group distribution.

The BMI was normal in 42% of participants, and overweight in 58% of participants, as presented in figure (3).

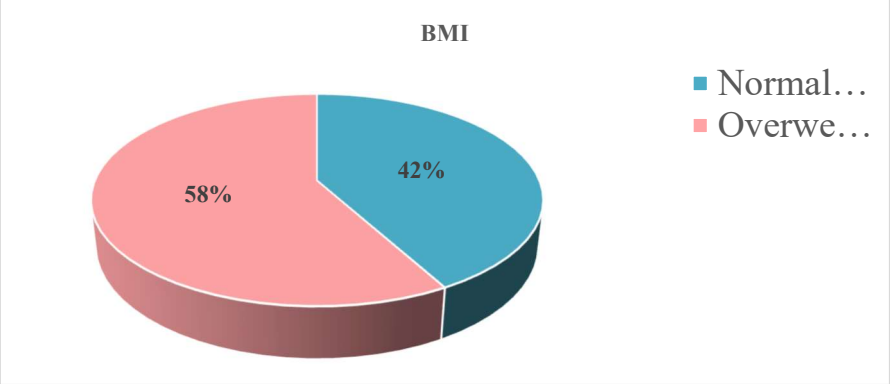

Figure 3: Groups of BMI .

No significant difference in the mean ± SD of BMI (25.58 ± 3.12 Kg/m2 vs. 25.51 ± 3.12 Kg/m2) Kg/m2 prior to vs. at the end of Ramadan, (p-value 0.11).

A significant reduction in the mean ± SD of TC (156.20 ± 25.43) mg/ dL, TG (73.22 ± 25.93) mg/dL, VLDL-C (14.64 ± 5.18) mg/dL and AI (3.42 ± 0.61) at the end of Ramadan in comparison to the mean before Ramadan (160.80 ± 23.88) mg/dL, (87.74 ± 32.99) mg/dL, (17.54 ± 6.59) mg/dL and (3.59 ± 0.66), (P=0.01, P= 0.001, P=0.00, and P=0.001, respectively).

A significant increase in the mean ± SD of HDL-C level at the end of Ramadan (45.36 ± 1.17) mg/dL than before Ramadan (44.74 ± 1.68) mg/dL (P= 0.001) . No significant difference in LDL-C level, (p-value 0.13), as presented in Table (1).

Table 1: Mean ± SD difference in BMI and lipid profile prior to and at the terminus of Ramadan .

	Pre-Ramadan Mean ± SD	End of Ramadan Mean ± SD	p-value
BMI (Kg/m²)	25.58 ± 3.12	25.51 ± 3.12	0.11
TC (mg/dL)	160.80 ± 23.88	156.20 ± 25.43	0.01*
TG (mg/dL)	87.74 ± 32.99	73.22 ± 25.93	< 0.001*
HDL-C (mg/dL)	44.74 ± 1.68	45.36 ± 1.17	0.001*
LDL-C (mg/dL)	99.23 ± 23.88	96.19 ± 24.09	0.13
VLDL-C (mg/dL)	17.54 ± 6.59	14.64 ± 5.18	< 0.001*
AI	3.59 ± 0.66	3.42 ± 0.61	0.001*

*p-value is significant.

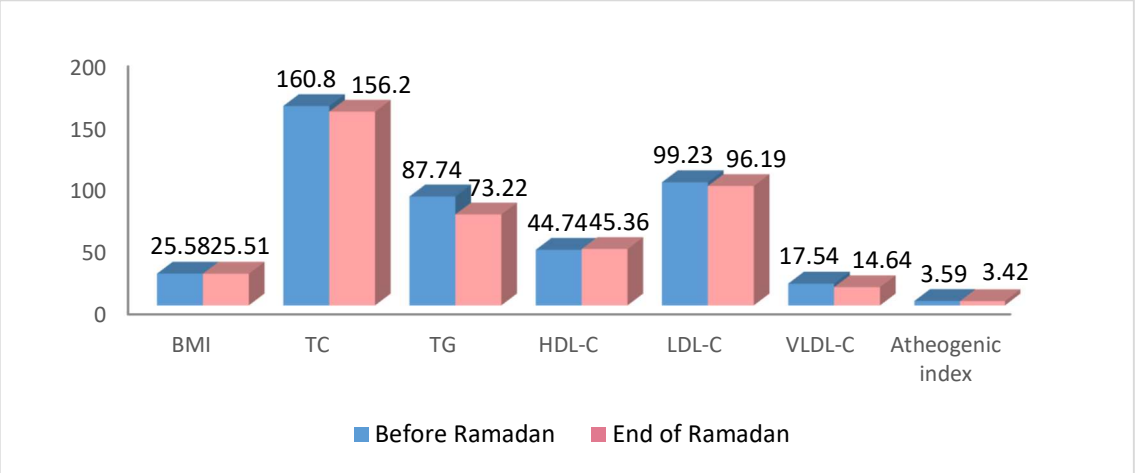

Figure 4: BMI and lipid profile prior to and at the end of Ramadan.

DISCUSSION:

This study revealed non-significant decrease in BMI and this agrees with the Pakistani study of Khan *et al.,*2017 [13] in which (P = 0.284), but disagrees with the Iranian study of Nachvak *et al.*,2018 [14] in which the decrease of BMI was statistically significant (P = 0.001). These disagreements may be due to the sample size in this study (50 participants) in comparison to Nachvak *et al.,*2018 [14] (152 participants) and farag *et al.,*2020 [15] (120 participants), that was not sufficient enough to show the real statistical change even if decreased. Also may be due to different life styles, type and amount of food consumed among individuals in different regions. Regarding total cholesterol (TC), the study showed that it decreased at the end of Ramadan and this decrease was significant statistically (P = 0.01). This appears to agree with the study of Sharma *et al.,*2020 [16] with high significance (p = 0.0001), and also with the Singaporean study of Zare *et al.,*2011 [17] with (P = 0.001, but the study result disagrees with Khan *et al.,*2017 [13] study in which TC although decreased but was not statistically significant (P = 0.424). During fasting, there is a significant reduction in insulin levels, which in turn decreases Hydroxy methyl glutaryl –CoA reductase enzyme activity (HMG-CoA reductase), leading to reduced cholesterol synthesis and consequently lower cholesterol levels. However, prolonged fasting exceeding 14 hours activates gluconeogenesis and lipolysis to meet the body's energy and glucose needs. If lipolysis is exacerbated due to limited carbohydrate availability, there is a substantial increase in acetyl coenzyme A. In this scenario, acetyl coenzyme A cannot enter the Krebs cycle and is instead converted into other metabolites such as ketones and cholesterol [18]. This study showed a highly significant decrease in triglyceride levels (from 87.74 ± 32.99 to 73.22 ± 25.93 mg/dL with P =

0.001), this is similar to Sharma *et al.,*2020 [16] (P = 0.0001) and Nachvak *et al.,*2018 [14] (P = 0.0001), but differs with Shehab *et al*., 2012[19] in which the decrease was not significant (P-value 0.254), again may be due to the type and amount of fat consumption during Ramadan, whether monounsaturated and polyunsaturated fatty acids, or saturated fatty acids, as we already know that triglyceride is heavily affected by the external source and type of food consumed [39] . Regarding HDL-C it showed a significant increase in this study, (P = 0.001), this is also seen with Sharma *et al.,*2020 [16] (P = 0.0001). While in Khan *et al.,*2017 [13] study, there was significant decrease in HDL-C (P = 0.028). The variation highlights the differing levels of physical activity among Muslims during Ramadan. While some may reduce their activity, others increase their prayer, which constitutes a moderate form of physical exercise [19]. The study also showed a decrease in LDL-C although not statistically significant (P = 0.13). However, serum LDL-C was increased in these studies Nachvak *et al.,*2018 [14], and farag *et al*.,2020 [15]. While other studies showed significant decrease in LDL-C like Zare *et al.,*2011 [17], and Shehab *et al.,*2012 [19], these differences in LDL-C among different studies may result from heterogeneities in food habits with different compositions and amount of meals consumed by the subjects in various Muslim populations. Regarding VLDL-C in our study, there is a statistically significant decrease in results (P = 0.001). This goes in line with the study of Temizhan *et al.,*2000 [12] which also showed a significant decrease in VLDL-C levels (P = 0.001). Although other studies do not show such agreement like the Kuwaiti study of Abdelfatah *et al.,*2005 [20] and Iraqi study of Khudhur *et al.,*2017 [21] in which VLDL-C showed no significant change with (P = 0.7) and (P = 0.5) respectively. Because as we know VLDL-C depends on TG in its calculation and the latter two studies showed non-significant change also in triglyceride which is largely dependent on type and amount of external food consumed by the volunteers [22]. Considering atherogenic index (TC/HDL ratio), it showed a statistically significant decrease in mean value (P = 0.001) , and this agrees with Khudhur *et al*.,2017 study [21] .

CONCLUSION:

The study's findings collectively suggest that fasting the holy month of Ramadan may have beneficial healthy effects on the levels of lipid profile in our society. This could probably have protective effect against coronary artery disease.

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