The Review of DIABETIC STUDIES

OPEN ACCESS

Effect of Intermittent Fasting on Various Biochemical Variables Related to Obesity

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Abstract

Background and Objectives: Intermittent fasting (IF) is one of the most promising strategies among the fasting methods known to humans. It has the ability to combat various diseases, including obesity, type 2 diabetes, hyperlipidemia, and heart diseases. The study aims to explore the effects of IF on body mass index, several indicators of diabetes, and the risk of atherosclerosis, in addition to a number of hormones.

Methods: The study included 20 patients aged 25 to 45 years with a body mass index (BMI) greater than 34 kg/m2. Patients were systematically all male for a purpose of following the 16:8 IF strategy in four Consecutive weeks. It was emphasized to neglect cases that suffer from chronic diseases, take medications, or take weight loss pills.

Results: The results showed that IF showed great benefit for losing weight and reducing body mass index by approximately 7 degrees. As for fat levels, the effect of IF appeared clear in reducing the percentage of harmful fats and lowering the risk factor in the fourth group that applied IF for 30 days, while IF showed a rapid and clear effect in reducing the levels of indicators related to diabetes. Level of cortisol also decreased after applying the IF protocol in obese for 30 days, while IF had a rapid and clear effect on increasing irisin levels in obese.

Conclusion: IF plays an important role in losing weight and reducing risk factors for diabetes and atherosclerosis, as following this protocol improves the quality of life, with the need for more studies to know its long-term effect.

Keywords: Obesity, Intermittent fasting, Insulin, Serum glucose, Lipid.

1. Introduction

Human health is significantly harmed by obesity, a chronic, complex medical problem. Over the past 30 years, the prevalence of obesity has skyrocketed in every nation, with rates for adults and children aged 6 to 11 doubling and for teenagers aged 12 to 19 tripling [1]. With its considerable and deep effects on morbidity, death, and health care costs, obesity has emerged as a major public health burden[2]. Contineous food intake events results in an surplus of energy intake over utilization—that is, an surplus of calories intake relative to burned—the human body progress to obesity, a multifactorial chronic disease [3,4], and obesity is known as a person who having a BMI of 30 and above. Recently, a group of methods have emerged to get rid of obesity, perhaps the most prominent of which is the intermittent fasting (IF) protocol. Reducing the amount of calories consumed each day is known as IF and it can take on various forms, Time Restricted Eating (TRE) is a food in which the person must starve for 12 to 18 hours every day; Alternate Day Fasting (ADF) alternates a day of eating food with a food-free day; and Periodic Fasting (PF) involves fasting one or more days per week [5]. In order to assess the impact of intermittent starvation(16:8) on weight loss and some hormones and other variables to examine its effectiveness in maintaining an ideal body weight, a small pilot investigation including obese patients was developed.

2. Materials and Methods

Study samples: The Institutional Ethics Committee accepted the trial, incorporating the most recent updates and best clinical practice guidelines. Prior to the trial, each participant provided written informed consent study design. We included 20 patients aged 25 to 45 years with a BMI > 34 kg/m2Patients were systematically all male. Referring them to a medical team specialized in treating obesity case for a purpose of following the 16:8 IF strategy in four consecutive weeks under medical supervision. Emphasis was placed on neglecting cases that suffer from chronic diseases, take medication, or take weight-loss pills.

The fasting state was taken into account for all cases for 14 hours for the first group baselines G1. The second group (G2) was subjected to intermittent starvation (16:8, 16 hours of fasting, and 8 hours of specific food) for ten days. The third group (G3) completed IF for 20 days, and the fourth group (G4) completed IF for 30 days, and blood was drawn from a vein for all groups, respectively.

Biochemical parameters: The kit utilized for biochemical analysis were commercially purchased to evaluate Glycated hemoglobin (HbA1c) (Biohermes), Roche kits was used to measure Insulin, T3 (triiodothyronine), T4 (tetraiodothyronine , thyroid stimulating hormonef. cortisol hormone, using a device Cobas e 411. Moreover, the

concentration of glucose and lipid parameters were estimated using the analysis kit made by BioLabo company using a spectrophotometer and irisin level was examined via ELISA method. Most of tests were conducted in scientific laboratories at College of Science in the University of Mosul and College of Pharmacy in Ninevah University.

3. Result

BMI: The results showed that effect of IF was clear with a significant difference in second group G2, after following IF protocol for ten days, as BMI values decreased significantly compared to first group G1, which is a baseline. While continuing IF protocol for another ten days, a high significant decrease in BMI values was observed in third group G3, which had continued for 20 days compared to first group. A very high significant decrease in BMI values was observed in fourth group G4, after IF that continued for 30 days, which indicates effectiveness of IF protocol in reducing level of body mass index and losing excess weight (Table 1).

Lipid profiles: The impact of intermittent starvation on lipid profile levels was examined, and statistical analysis revealed that the second group, which followed IF for 10 days, had no change in lipid levels at all, as evidenced by the appearance of measured lipid parameters. There were no notable differences between the first and second groups. HDL and LDL levels did not significantly differ in the third group, which followed an IF strategy for twenty days in a row, compared with first group, while cholesterol, triglycerides, very low-density lipoprotein and atherogenic index levels showed significant decrease in third group compared to first group. In fourth group, IF protocol played an effective role in reducing levels of harmful fats for body in a highly significant manner, while it increased level of high-density lipoprotein in fourth group compared to first group (Table 1).

Table 1: Metabolic parameters of the studied groups.

Lipid profiles	Group 1	Group 2	Group 3	Group 4
BMI	34.17±2.64[a]	32.02 ±2.68[b]	29.60±2.61[c]	27.66±2.46[d]
Cholesterol	208.80±41.5a	195.50±36.6ab	179.30±31.6bc	163.00±32.8c
Triglycerides	276.20±58.8a	244.00±71.0a	202.50±54.9b	159.3±36.1c
HDL	45.2±2.2b	45.7±2.2b	46.8±2.5b	50.8±3.2a
LDL	108.36±38.5a	101.00±32.1ab	92.00±27.1ab	80.34±29.3b
VLDL	55.24±11.7a	48.8±14.2a	40.50±10.9b	31.86±7.2c
Atherogenic index	4.62±0.92a	4.29±0.83ab	3.84±0.7b	3.22±0.6b

Insulin resistance and prediabetes: Results showed that IF is very beneficial for avoiding development of type 2 diabetes. Table 4, shows that first group has fairly high levels of blood glucose and insulin levels and occurrence of insulin resistance, also following IF protocol contributed effectively and significantly to reducing blood glucose and insulin levels, as well as insulin resistance in groups 2, 3 and 4 compared to first group. The results also show that IF works to reduce level of sugar and insulin faster than reducing levels of lipids (Table 2).

Table 2: Glycemic and insulin resistance parameters of the studied groups.

Variables	Group 1	Group 2	Group 3	Group 4
Serum sugar	130.30±16.6a	109.30±13.7b	98.40±11.5c	88.50 ± 9.1d
Insulin	42.0 ±1.0a	34.07±9.9b	28.23±7.6c	22.61±6.5d
Insulin resistance	13.6±4.4a	9.42 ±3.7b	6.95±2.4c	5.00 ±1.7c

The levels of thyroid hormones were monitored in this study to determine effects of IF on them. T3-tri-iodothyronine and T4 (tetraiodothyronine) hormones showed a non-significant increase in third and fourth groups, and no significant change appeared in second group compared to first group. thyroid stimulating hormone) TSH (level was not affected at all by the IF protocol, and it was found that there was no significant difference between four groups.

IF did not show a change in level of cortisol in second group compared to first group, and the results showed a non-significant decrease in third group, while significant decrease was clear in fourth group after applying IF for a month. While level of irisin increased significantly in second group and a highly increased in third and fourth groups compared to first group (Table 3).

Table 3: Endocrine hormones values of the studied groups.

Hormones	Group 1	Group 2	Group 3	Group 4
T3	105.1±18.9a	105±18.7a	101.4±14.4ab	91.5±11.52b
T4	2.66 ±0.63a	2.68±0.60a	2.49±0.48ab	2.23±0.54b
TSH	1.33±0.80a	1.48± 0.92a	1.64±1.01a	1.72±1.09a
Cortisol	268±67.9a	253±94.1a	229±93ab	193±72.1b
Irisin	6.03 ±1.22d	7.56 ±0.76c	9.01±1.20b	10.56±0.79 a

4. Discussion

Significant differences were found between Initial body mass index compared to BMI at end of intervention, BMI value decreased by approximately 6 degrees. The reduction in food consumption was the cause of the drop in body weight. There are currently few studies that demonstrate how IF affects weight loss. Nearly all of these

investigations involved obese individuals with a BMI between 30 and 39.9 kg/m² [6]. Additionally, found that individuals who fasted occasionally experienced similar weight loss outcomes [7].

Klempel et al. (2015) found that the BMI decline in obese people was significant at 1.3 points out of 35 kg/m2, indicating how well IF lowers this parameter in their investigation on the relationship between IF and weight loss [8]. However, if people suffer from hunger or lack of support after a year, continuing to live in this manner could have negative effects [9].

According to our study, IF may be able to enhance lipid profile. Reducing the amount of eaten food reduces numbers of calories entering body. It also helps improve the efficiency of metabolism process and analyze stored fats (because they will be a source of energy during fasting), which leads to weight and fat loss. These outcomes were congruent with recent study demonstrating that different forms of IF, such as Ramadan and alternative day fasting, lower body weight and Lipids levels (10). Studies that compare various forms of IF [11], also indicate that IF may be a useful lifestyle change for lowering risk of cardiovascular disease. Long term clinical trials are lacking, with majority of IF trials were conducted over limited periods of time. To confirm their efficacy and safety, long-term research should be done [12].

Based on our findings, IF has the chance to manage blood glucose problems, especially for those prone of developing type 2 diabetes. Nonetheless, it is crucial to consider that study results can vary based on parameters such as duration of fasting, type of meal, and person demographic characteristics such as age, gender, and comorbidities. Other research has also indicated that exercise combined with IF improves blood sugar control by lowering fasting glucose and improving insulin hyposensitivity, which in turn reduces the development of diabetes complications and deaths [13,14].

IF may reduce body fat, insulin resistance, and HbA1c levels not only by reducing total calories, but also through metabolic reprogramming. This reprogramming involves switching from using glucose as fuel to burning fatty acids and ketones from fat stocks. By reducing body fat, IF may also improve sensitization to hormones, which in turn boosts appetite instinct [15].

Through the study, it was noted that cortisol levels decreased significantly in the fourth group, which applied the IF protocol for a month, IF helps maintain low levels of cortisol, which regulates immune system and helps maintain fat burning levels in the body. In clinical research involving 163 individuals with metabolic syndrome, Vegetable protein, saturated fat, and irisin levels were found to positively correlate [16].

Another study known as “The Dietary Approaches for the Prevention of Hypertension” score and irisin level were found to positively correlate when the impact of food quality and diet style on irisin level was examined. While eating meat has been linked to a negative influence on irisin levels, eating fruit has been related with a beneficial effect [17].

An analysis of the effect of IF on irisin levels revealed that Religious Ramadan Starvation dampens serum irisin levels [18]. In a study by Karras et al. (2021), the effects of Religious Orthodox Starvation and a time-regulated diet (16:8) on irisin levels were investigated [19]. During the starvation period, daily intake of animal source-based meals, such as, meat, dairy products, and eggs is escaped, alongside relocation of seafood and olive oil which are not consumed on particular days of the week. It was shown that conventional fasting increased irisin levels more than time-restricted feeding did. [20]. Serum irisin levels in the IF groups were higher than in the first group in the current investigation. It was not implied that the intervention alone was the source of this difference. A number of variables, such as variations in food composition, diet adherence, and study duration, affect the association between diet and irisin. However, the amount of food consumed was not noted. by the individuals involved. The research has certain limitations, one of which being this specific situation[21,22].

The results of this study indicate a significant decrease in cortisol levels, with an increase in irisin concentration after implementing an IF protocol. Despite the importance of these hormonal changes, the physiological mechanisms behind them and their clinical implications still require further research and analysis. Cortisol is a glucocorticoid hormone secreted from the adrenal cortex in response to physical and psychological stress via the hypothalamic-pituitary-adrenal axis (HPA axis), and plays a central role in regulating glucose metabolism, immune functions, and proteolysis. It is known that chronically high cortisol is associated with increased visceral fat, insulin resistance, and a higher risk of heart disease. Therefore, the decrease observed in this study may reflect an improvement in HPA axis regulation, perhaps indicating a reduction in chronic stress levels and an improvement in inflammatory responses (23,24).

As for irisin, it is a myoquine secreted from muscle fibers during physical activity, and it is considered an important mediator in converting white adipose tissue into a brown or “brown-like” pattern, which increases energy consumption and fat burning. The elevation of irisin in this study is consistent with previous studies suggesting that IF or caloric restriction may enhance irisin secretion and improve energy metabolism (25,26). However, this study did not address the molecular mechanisms that might explain these changes, such as gene expression of FNDC5 (Fibronectin type III domain-containing protein-5), and the lack of long-term follow-up makes it difficult to predict the clinical impact of these hormonal changes.

5. Conclusion

Intermittent fasting have a crucial role in weight loss and mitigated risk factors for diabetes and atherosclerosis, as following this protocol improved the quality of life, with the need for more studies to know its long-term effect.

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