



Intermittent Fasting and its Health Implications: A Review

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Received: January 30, 2019; **Published:** April 17, 2019

Abstract

Intermittent fasting, is the periodic voluntary abstinence from food and drink. Intermittent fasting is a broad term that encompasses a variety of programs that manipulates the timing of eating occasions by utilizing short-term fasts in order to improve the blood parameters and overall health. Books on ethnology and religion describe a remarkable variety of fasting forms and practices. Renewed interest in fasting regimens is evidenced by a plethora of popular press publications and diet recommendations. This review examines some studies conducted on intermittent fasting programs to determine if they are effective in improving body composition and clinical health markers associated with diseases.

Keywords: Cardiac Health; Intermittent Fasting; Metabolic Markers; Obesity; Resting Energy Expenditure

Abbreviations

IMF: Intermittent Fasting; eTRF: Early Time-Restricted Feeding; MS: Multiple Sclerosis.

Introduction

Intermittent fasting (IMF) is a dietary strategy in which periods of normal food and drink consumption are punctuated by periods of energy restriction or fasting. The objective of IMF is to create a net reduction in energy intake that causes it to fall below energy expenditure, thereby creating a state of negative energy balance and inducing weight loss [1]. Work by various groups has consistently shown that such an approach is associated with significant reduction in body mass in obese participants, whilst also improving blood lipid profile and lowering concentrations of inflammatory markers [2-4]. Although these findings are broadly comparable to those seen following a period of daily calorie restriction, current understanding of how IMF affects human health and metabolism is far from complete.

There are different fasting schedules in IMF:

- 1. 16:8 diet or time-restricted feeding:** This involves fasting for 16 hours in a day (24 hours cycle) and eating wilfully for the next eight hours. Nutritionists and researchers believe that metabolic activity increases from 10:00am to 6:00pm and decreases after evening hours. Hence, it is best to restart fasting after 6:00pm.
- 2. Alternate day fasting:** In alternate day fasting, every alternate day one consumes not more than 500Kcal, rest of the days eating consciously. This process would be repeated every alternate day.
- 3. Modified Fasting Regimens or the 5:2 plan:** In the modified fasting regime, the dieter has to fast for two days in the week and eat consciously and normally for the remaining five. Modified fasting regimens generally allow for the consumption of 20–25% of energy needs on regularly scheduled “fasting” days.

Studies demonstrating the advantages of Intermittent fasting

- Studies on the effectiveness of IF on obesity and weight loss

According to Mattson., *et al.* intermittent fasting can produce similar effects as intensive exercises, increasing heart rate variability while reducing resting heart rate and blood pressure [5]. In a study conducted by Johnson., *et al.* [6], ten subjects were selected with a BMI>30, and were maintained for 8 weeks on a dietary regimen in which they ate ad libitum every other day, while consuming less than 20% of their normal calorie intake on the intervening days. Over the eight-week period, nine of the subjects adhered to the diet and lost 8% of their initial body weight. The results observed were; decrease in markers of oxidative stress and inflammation, improvement of asthma-related symptoms and several quality-of-life indicators.

In another study, Harvie., *et al.* [7] observed the effects of intermittent and continuous energy restriction on weight loss and various biomarkers (for conditions including breast cancer, diabetes and cardiovascular diseases) among young overweight women. They found that intermittent restriction was as effective as continuous restriction for improving weight loss, insulin sensitivity and other health biomarkers.

Based on a systematic review and meta-analysis by Harris., *et al.* [8], on “Intermittent fasting interventions for treatment of overweight and obesity in adults” it was inferred, Intermittent energy restriction may be an effective strategy for the treatment of overweight and obesity. This review included a total of six studies. The intermittent energy restriction regimens varied across studies and included alternate day fasting, fasting for two and four days per week. Study duration was 3-12 months. Four studies included continuous energy restriction and two studies included a no treatment control intervention. Meta-analyses showed that intermittent energy restriction was an effective treatment for weight loss (-4.14kg; 95% CI -6.30kg to -1.99kg; $p \leq 0.001$).

Studies of IF on diabetes

A trial was conducted by Sutton [9] on early time-restricted feeding (eTRF), a form of IF that involves eating early in the day to be in sync with circadian rhythms in metabolism. Men with pre-diabetes were randomized to eTRF (6-hr feeding period, with dinner before 3 p.m.) or a control schedule (12-hr feeding period)

for 5 weeks. The study demonstrated for the first time in humans that eTRF improved cardio-metabolic health such as insulin sensitivity, blood pressure, oxidative stress and appetite.

As can be observed in Figure 1, extended periods of fasting led to the increase and decline of some blood markers such Insulin sensitivity, blood pressure, Beta cell function and liver enzymes:

1. Decreasing post prandial glucose, appetite, blood pressure
2. Increase in insulin sensitivity and Beta cell function for better uptake of glucose by the cell and its storage.

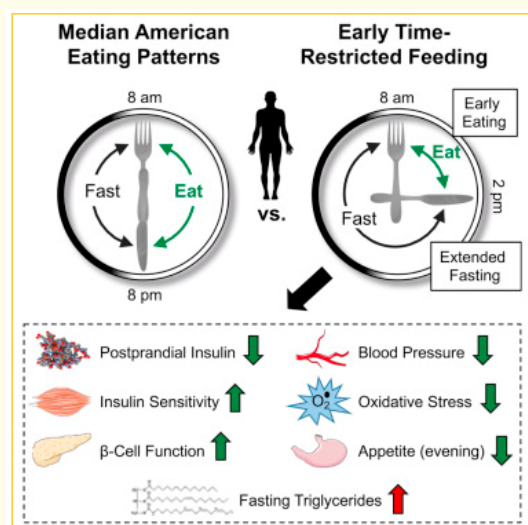


Figure 1: Impact of Early Time Restricted Feeding on cardio-metabolic health parameters.

Source: Elizabeth F. Sutton et al. “Early Time-Restricted Feeding Improves Insulin Sensitivity, Blood Pressure, and Oxidative Stress Even without Weight Loss in Men with Prediabetes”. *Cell Metabolism*; June (05, 2018); Volume 27, ISSUE 6, P1212-1221.e3.

Effect of IF on breast cancer

Breast cancer is the most common cause of cancer mortalities among women in developing countries and the second most common cause of cancer deaths in developed countries [10].

In a cohort of 2413 patients with early-stage breast cancer, night fasting less than 13 hours were associated with a statistically significant 36% increased risk of breast cancer recurrence

compared with nightly fasting more than 13 hours but was not associated with a statistically significant increased risk of breast cancer-specific and all-cause mortality [11].

Effect of IF on allergies and autoimmunity

Both allergies and autoimmune disorders come from a deregulated metabolism and faulty immune cells [12]. Intermittent fasting can reduce inflammation leading to allergies and auto immune conditions like rheumatoid arthritis and MS [18]. Periodic fasting (PF) may kill cancer and immune cells, particularly the more active autoimmune cells, by partially overlapping mechanisms that are poorly understood. Although we are only beginning to understand the relationship between nutrients, fasting and autoimmune disorders, the dietary treatment of MS and other autoimmune diseases has high potential, since it may stimulate and take advantage of the ability of the organism to repair and replace its damaged cells without interfering with the function of normal cells and systems

Reduces inflammation and pro-inflammatory cytokines

IF is known to lower levels of systemic inflammation and pro-inflammatory cytokines [13]. Patients with rheumatoid arthritis experienced less symptoms like inflammation and joint pain when put on a fasting diet [14]. IF also significantly reduces leptin, that is elevated in patients with rheumatoid arthritis, lupus, type 1 diabetes, autoimmune hepatitis, multiple sclerosis, psoriasis and ulcerative colitis, leading to inflammatory responses and symptoms [15,19].

Kickstarts Ketogenesis

Intermittent fasting initiates ketogenesis, where the body utilizes stored fat for fuel rather than glucose. Ketosis helps to increase the levels of glutathione and it is low in patients with autoimmune disorders [16].

Disadvantages of intermittent fasting

Although intermittent fasting has benefits, our body's response to fasting is different and specific. IF can lead to hormonal imbalances, disrupting sleeping patterns, fatigue, insomnia, etc. Females with hormonal imbalances should be cautious before undertaking IF [17].

Conclusion

Based on reviews of research studies on intermittent fasting, it has shown to be an effective therapeutic strategy to aid in weight loss, cell repair, tissue damage, improving memory functions, reducing triglycerides levels etc. Further studies are needed to assess the ability to maintain the weight loss without regaining it and the long-term effects of IMF on health. Together, evidence from animal and human studies strongly support the need for continuous and rigorous clinical investigation of using intermittent fasting regimens to improve health.

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Volume 3 Issue 5 May 2019

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