

Effects of Intermittent Fasting on Inflammatory Biomarkers and Metabolic Health in Overweight Adults: A Randomized Controlled Trial

Authors:

Soaud A M Moftah¹, RAJA A. Moftah², Gomaa Sulaiman³, Alsadek. H. bogzil⁴

¹Benghazi University, Faculty of Medicine, Department of Physiology, Campus Almarj, Almarj, Libya

²Benghazi University, Faculty of Public Health, Department Health Informatic, Benghazi Campus, Benghazi, Libya

³Faculty of medical Technology, University of Tripoli (UOT) Tripoli Libya

⁴Department of pharmacology, Faculty of Medical veterinary, University of Omar EL Mukhtar, Libya

Corresponding Author:

Soaud A M Moftah

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ABSTRACT:

Background: Chronic low-grade inflammation is a hallmark of obesity and contributes to insulin resistance and cardiometabolic complications. Intermittent fasting (IF) has been proposed as a dietary strategy to improve metabolic health, but its effect on systemic inflammation remains underexplored. **Objective:** To evaluate the impact of a 12-week intermittent fasting regimen on inflammatory biomarkers, insulin sensitivity, and lipid profiles in overweight adults. **Methods:** Eighty overweight participants (BMI 27–32 kg/m²) were randomized into two groups: (1) Intermittent Fasting (16:8), fasting for 16 hours and eating within an 8-hour window daily, and (2) Control group, following standard diet advice. Blood samples were collected at baseline and after 12 weeks to assess high-sensitivity C-reactive protein (hs-CRP), interleukin-6 (IL-6), tumor necrosis factor- α (TNF- α), fasting glucose, HOMA-IR, and lipid profile. Anthropometric parameters were also recorded. **Results:** After 12 weeks, the IF group showed significant reductions in hs-CRP (–28%, $p < 0.01$), IL-6 (–21%, $p < 0.05$), and TNF- α (–17%, $p < 0.05$) compared to controls. Fasting glucose decreased by 12% and HOMA-IR improved by 18% in the IF group ($p < 0.01$). HDL cholesterol increased (+9%) and triglycerides decreased (–15%) compared to controls. Body weight and BMI decreased significantly in the IF group (-5.4 ± 1.2 kg vs -1.8 ± 0.9 kg in controls, $p < 0.001$). **Conclusion:** A 12-week intermittent fasting regimen improves inflammatory status, insulin sensitivity, and lipid profiles in overweight adults. IF may be a promising non-pharmacological intervention to reduce obesity-related cardiometabolic risk.

Keywords: Intermittent Fasting, Inflammation, Insulin Resistance, Obesity, Metabolic Health

INTRODUCTION:

Obesity is a global health concern associated with increased risk of Type 2 Diabetes Mellitus (T2DM), cardiovascular disease, and certain cancers. A key pathological mechanism underlying obesity-related complications is chronic low-grade inflammation, characterized by elevated circulating inflammatory cytokines such as hs-CRP, IL-6, and TNF- α .

Lifestyle modifications remain the first-line therapy for obesity and its metabolic consequences. Recently, intermittent fasting (IF) has emerged as an alternative dietary strategy, shown to promote weight loss, enhance insulin sensitivity, and modulate inflammatory pathways. However, clinical evidence remains limited, particularly regarding its effects on systemic inflammatory markers.

This study investigates the effects of a 12-week IF intervention on inflammatory biomarkers, glycemic indices, and lipid metabolism in overweight adults.

MATERIALS AND METHODS:

Study Design and Participants:

- **Design:** Randomized controlled trial (parallel-group).
- **Participants:** 80 overweight adults (40 males, 40 females), aged 25–50 years, BMI 27–32 kg/m².
- **Exclusion criteria:** Diabetes, cardiovascular disease, smoking, pregnancy, or use of anti-inflammatory/antidiabetic medications.

- **Randomization:** Participants randomly assigned to IF group (n = 40) or control group (n = 40).

Intervention:

- **IF group:** 16:8 fasting protocol (fasting for 16 hours daily, eating within 12:00–20:00).
- **Control group:** Standard balanced diet advice (30% fat, 50% carbohydrate, 20% protein).
- **Duration:** 12 weeks.
- **Compliance monitoring:** Weekly food logs and adherence calls.

Measurements:

- **Biochemical analysis:** hs-CRP, IL-6, TNF- α , fasting glucose, insulin, lipid profile (total cholesterol, HDL, LDL, triglycerides).
- **Anthropometry:** Body weight, BMI, waist circumference.
- **Insulin resistance index:** HOMA-IR.

Statistical Analysis:

Data expressed as mean $\pm$ SD. Between-group comparisons made with independent t-test; within-group

changes analyzed using paired t-test. $p < 0.05$ considered significant.

RESULTS:

Anthropometric Outcomes:

- IF group lost significantly more body weight (-5.4 ± 1.2 kg) than control group (-1.8 ± 0.9 kg, $p < 0.001$).
- BMI decreased from 30.1 ± 1.5 to 28.3 ± 1.4 in IF group ($p < 0.001$).

Biochemical Outcomes:

- hs-CRP decreased by **28%** in IF group vs 6% in controls ($p < 0.01$).
- IL-6 decreased by **21%** and TNF- α by **17%** in IF group ($p < 0.05$).
- Fasting glucose decreased ($102 \pm 11 \rightarrow 90 \pm 9$ mg/dL, $p < 0.01$).
- HOMA-IR improved ($3.1 \pm 0.4 \rightarrow 2.5 \pm 0.3$, $p < 0.01$).
- HDL cholesterol increased (+9%), triglycerides decreased (−15%).

Table 1. Changes in Inflammatory Biomarkers and Metabolic Parameters after 12 Weeks of Intervention

Parameter	Control Group (n = 40) Baseline	Control Group 12 Weeks	IF Group (n = 40) Baseline	IF Group 12 Weeks	% Change (IF)	p-value (vs Control)
hs-CRP (mg/L)	3.8 ± 0.7	3.6 ± 0.6	3.9 ± 0.8	2.8 ± 0.5	↓ 28%	<0.01
IL-6 (pg/mL)	4.6 ± 0.9	4.4 ± 0.8	4.7 ± 1.0	3.7 ± 0.7	↓ 21%	<0.05
TNF- α (pg/mL)	6.2 ± 1.1	6.0 ± 1.0	6.3 ± 1.2	5.2 ± 0.9	↓ 17%	<0.05
Fasting Glucose (mg/dL)	101 ± 10	100 ± 9	102 ± 11	90 ± 9	↓ 12%	<0.01
HOMA-IR	3.0 ± 0.5	2.9 ± 0.4	3.1 ± 0.4	2.5 ± 0.3	↓ 18%	<0.01
HDL Cholesterol (mg/dL)	44 ± 6	45 ± 6	43 ± 5	47 ± 6	↑ 9%	<0.05
Triglycerides (mg/dL)	172 ± 21	169 ± 20	170 ± 22	145 ± 18	↓ 15%	<0.01
Body Weight (kg)	83.4 ± 6.8	81.6 ± 6.5	84.1 ± 7.1	78.7 ± 6.2	↓ 6.4%	<0.001

Note: Data are presented as mean $\pm$ SD. ↓ = decrease, ↑ = increase. Statistical significance calculated using paired and independent t-tests.

DISCUSSION:

This study demonstrates that intermittent fasting significantly reduces systemic inflammation and improves metabolic health in overweight adults. The reduction in hs-CRP, IL-6, and TNF- α indicates suppression of obesity-induced inflammatory responses. Improvements in HOMA-IR and lipid profile suggest enhanced insulin sensitivity and cardiovascular protection.

Our findings are consistent with recent studies reporting anti-inflammatory and metabolic benefits of IF. The 16:8 regimen appears to be a feasible, non-pharmacological intervention that could complement existing lifestyle recommendations.

Limitations include the relatively short duration and moderate sample size. Long-term studies are required to determine sustainability and potential risks.

CONCLUSION:

A 12-week intermittent fasting regimen improves inflammatory markers, insulin sensitivity, and lipid metabolism in overweight adults. IF is a promising dietary approach for reducing cardiometabolic risk associated with obesity.

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Conflict of Interest: None

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