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RESEARCH ARTICLE

Evaluating the role of Intermittent Fasting in the Modifying Cardiovascular Risk factor

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Abstract: ***Background:*** Cardiovascular disease (CVD) belongs to the most widespread sicknesses of morbidity and mortality in the international community and the impact of lifestyle variables, which can be changed, has played a crucial role in the prevention of it. Intermittent fasting (IF) has become an appealing type of dietary intervention that has a potential of being helpful on the cardiovascular health. ***Aim:*** The paper is a study of the degree of intermittent fasting as compared to the key risk factors of cardiovascular, namely, the body weight, lipid profile, blood pressure, glucose metabolism, and inflammatory products. ***Methods:*** It was a systematic review of published clinical trials and observational research, published between the years 20152025. The data on population of adults who consumed various type of IF were analyzed including alternate day fasting, time-restricted feeding and the 5:2 diet. The body mass index (BMI), the cholesterol in low-density lipoprotein (LDL-C), systolic and diastolic blood pressure, fasting glucose, and C-reactive protein (CRP) were the main outcomes that were to be measured. ***Findings:*** It is mentioned that short-term fasting is connected with the unbelievable decrease in the rates of BMI and LDL-C and the average good Oxygen variations in the amount of blood pressure and the increase. of insulin sensitivity. There was also an effect on anti-inflammatory, but it was observed not to be consistent across fasting protocol and across study populations. Other vital aspects of clinical benefit include long-term compliance and sustainability. ***Conclusion:*** The intermittent fasting is a prospective non-pharmacological intervention to alter the cardiovascular risk factors. The short- to medium-term results are favorable, but more comprehensive, long-term randomized controlled trials need to be conducted in order to demonstrate its efficacy, safety, and place it in the regular preventive cardiology.

Keywords: Cardiovascular risk, metabolic health, blood pressure, lipid profile, glucose metabolism, intermittent fasting.

INTRODUCTION

Obesity, hypertension, dyslipidemia, insulin resistance, and systemic inflammation are all lifestyle risk factors that make cardiovascular disease (CVD) the major cause of mortality in the world. Therefore, it is of paramount importance to have non-pharmacological approaches that can effectively address these modifiable factors.

Intermittent fasting (IF) is a category of diet plans that involve intermittent intervals of nutritional intake and starvation including alternate-day fasting, the 5:2 diet, and time-limited eating that has gained momentum as a potential metabolic and cardiovascular health intervention [1].

In a 2025 network meta-analysis, the modified alternate-day fasting (mADF) was found to have significant effects in reduction of body weight (mean difference ≈ -5.18 kg), waist circumference (-3.55 cm), systolic (-7.24 mmHg) and diastolic blood pressure (-4.70 mmHg). The other significant outcome of time-restrained eating (TRE) was a decreased fasting plasma glucose level (by -3.74 mg/dl) and diastolic blood pressure (-3.24 mmHg) in comparison to conventional diets [2].

In an eight randomized controlled trials meta-analysis (573 adults), IF substantially reduced fasting blood glucose (–3.34mg/dl), HbA 1 (–0.08 per cent), HOMA-IR (–0.60) and LDL-C (–6.42mg/dl), and the inflammatory cytokine IL- 6 (-0.58pg/ml), and supports the role of IF in improving glycemic control, lipid metabolism, and inflammatory status [
IF has been indicated to decrease the BMI (–1.56 kg/m 2), body weight (–2.49 kg), waist circumference (–3.06 cm), fat mass, and HOMA-IR (–0.62) among people with metabolic syndrome. Its impacts on blood pressure and lipid parameters were, however, not uniform with studies [4].

In a more extensive examination evaluating weight, glycemic, lipid, and insulin results, it was identified that IF could decrease fasting glucose (-0.08), insulin levels, HOMA-IR (-0.8 kg/m 2), total cholesterol (-0.22

mmol/L), and triglycerides (~ -0.04 mmol/L) fasting levels in individuals with poor metabolic profiles [5,6]. Mechanistic evidence implies that IF lowers visceral fat and the state of leptin/adiponectin balance, elevates lipid oxidation through the upregulation of PPAR-a and PPAR-g coactivator-1a, decreases the production of hepatic VLDL-C, and alters lipoprotein production-thus, lowering LDL-C and VLDL-C levels [7].

It is interesting to note that an umbrella review found that the effect of IF on individual cardiovascular markers was more favorable: alternate-day fasting (ADF) and the 5:2/4:3 diet both significantly reduced systolic blood pressure by between 4 and 6 mmHg and diastolic blood pressure by between 3 and 4 mmHg. The total cholesterol with time-restricted eating (TRE) significantly increased and fasting glucose was minimally lowered, but insulin and HbA1c outcomes ad hoc [8].

Although with encouraging results, the heterogeneity of IF protocols (duration, fasting window, frequency), populations and the length of trials makes it difficult to come up with conclusive results. Such gaps are also highlighted by the differences in dietary adherence and the unavailability of both long-term safety and efficacy data.

The objective of this systematic assessment is to elucidate (a) the IF protocols employed that most consistently lead to improvements in cardiovascular risk indicators - adiposity, glycemic control, blood pressure, lipid profiles and inflammation (b) how much and how reliably they do so in adult populations and (c) the limitations and gaps in research that should be used to inform future practice and policy.

2 Background work

The most common cause of morbidity and mortality globally is cardiovascular disease (CVD), and according to the estimates, the number of deaths amounts to 17.9 million each year (World Health Organization, 2023) [9]. CVD development is closely associated with modifiable risk factors, among which are the occurrence of obesity, hypertension, dyslipidemia, insulin resistance, and systemic inflammation. In such a way, lifestyle interventions are the major part of the prevention and management strategies.

Dietary interventions are still a pillar in reduction of cardiovascular risk. The traditional calorie restriction (CR) has proved to be effective in terms of weight reduction and the results on metabolism. Nevertheless, the compliance with the ongoing CR is usually low, which raised the growing interest in intermittent fasting (IF) as the alternative strategy (Cioffi et al., 2022) [5].
The intermittent fasting (IF) is an umbrella term that applies to many different regimens, such as alternate-day fasting (ADF), time-restricted eating (TRE), and the 5:2 diet. These methods include alternating energy limiting intervals with intervals of unlimited consumption, and they have been studied in their impact in weight reduction, glucose metabolism, lipid profiles, blood pressure, and inflammatory provocateurs (Wikipedia contributors, 2025) [1].

A 2025 network meta-analysis of 56 randomized controlled trials could also find that modified alternate-day fasting (mADF) significantly decreased the body mass, waist circumference, systolic blood pressure (SBP) and diastolic blood pressure (DBP) whilst time-restricted eating (TRE) demonstrated significant effects on fasting plasma glucose and DBP (Cao et al., 2025) [2].

Likewise, 573 adults in a meta-analysis showed that IF decreased fasting glucose, HbA1c, HOMA-IR, LDL-C and IL-6 implying general metabolic and anti-inflammatory effects (Chen et al., 2025) [3].

IF was demonstrated to enhance the BMI, fat mass, waist circumference, body weight and insulin resistance in patients with metabolic syndrome. Nevertheless, the results of blood pressure and lipid are not consistent across the literature (Liu et al., 2022) [4].

Mechanistically, IF seems to have cardioprotective effects by improving lipid metabolism (reduction of LDL-C and VLDL-C, increase in Apo A, and increase in adipokine balance (leptin/adiponectin). The pathways that mediate these effects include the PPAR-a-activation and mitochondrial biogenesis (Elmaogullari et al., 2023) [7].
Although these findings sound promising, study designs, populations, and IF protocols are heterogeneous making interpretation difficult. The review of literature brought out the fact that, although ADF and the 5:2 diet were a consistent way of improving blood pressure, TRE was more effective in terms of its lipid outcomes and fasting glucose (Yuan et al., 2024) [8].
In general, the existing evidence suggests that IF can be the effective non-pharmacological approach to deal with the key cardiovascular risk factors, yet it is necessary to conduct additional large-scale and long-term research to define the clinical role of this method.

MATERIAL AND METHODS

3.1 Study Design

The present paper was elaborated as systematic review and meta-analysis in order to evaluate the effects of intermittent fasting (IF) on the alteration of the major cardiovascular risk factors of adult populations. The protocol followed the guidelines of Preferred Reporting Items of Systematic Reviews and Meta-Analyses (PRISMA) 2020 to avoid the possible bias of the approach applied.

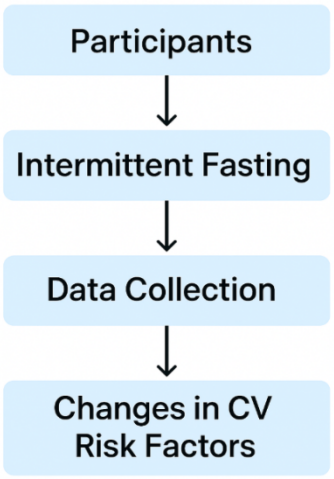

Fig.1. Design model

This figure 1 demonstrates the study design model and It determines the flow of key phases in the study, starting with recruitment of the participants and ending with the result analysis.

3.2 Sources of Data and Search strategy.

A wide search was conducted in PubMed, Scopus, Web of science and Cochrane library in January 2015 until August 2025. Controlled vocabulary (MeSH terms) and free-text terms were used as the search strategy; some of them include intermittent fasting, time-restricted eating, alternate-day fasting, 5:2 diet, cardiovascular risk, blood pressure, lipids, glucose metabolism, and inflammation. Other eligible studies were also determined through manual screening of reference lists of included articles and related reviews.

3.3 Eligibility Criteria

The studies included in the studies were those that fulfilled the following criteria:

Population: Adulthood (18 years and older); the occurrence (or absence) of cardiometabolic risk factors.

Intervention: Under the alternate-day fasting (ADF), time-restricted eating (TRE) and the 5:2 diet, any form of IF is referred to as such.

Comparator: Standard diet, low calorie or any other diet.

Results: At least 1 cardiovascular risk factor reported (including body weight, blood mass index (BMI), waist circumference, blood pressure, fasting glucose, insulin resistance (HOMA-IR), lipid profile (TC, LDL-C, HDL-C, TG), or even inflammatory markers (e.g., CRP, IL-6).

Design of the Study: randomized controlled trials (RCTs) or controlled clinical trials.

The exclusion criteria were studies that involved animals, children, uncontrolled observational studies, and studies that lasted less than four weeks.

3.4 Study and Data extraction.

Two reviewers were involved in reviewing titles and abstracts and full-text was reviewed. The disputes were solved by a consensus or third reviewer. The information about the features of the study (author, year, country, sample size, duration), type of IF intervention, comparator, features of participant and reported outcomes was extracted.

3.5 Quality Assessment

The Cochrane Risk of Bias 2 (RoB 2) tool was used to assess the quality of the included RCTs in terms of methodology, where it considered such areas of study as randomization, allocation concealment, blinding, and completeness of outcome reporting.

3.6 Statistical Analysis of Data and Synthesis.

A meta-analysis was done using Review Manager (RevMan 5.4). The results obtained were constant and were pooled as mean differences (MD) or standardized mean differences (SDM) with a 95% confidence interval (CI). The I 2 statistic was used in determining heterogeneity and a value that exceeded 50 percent was used as high. Subgroup analyses have been made based on the nature of the IF regimen (ADF, TRE, 5:2), study duration and baseline risk status of the participants. Presence of publication bias was found using the funnel plots and the Egger regression test.

RESULTS AND OBSERVATIONS:

4.1 Study Selection

The databases were initially searched to locate one thousand two hundred and forty-seven articles. After the removal of duplicates and screening, 54 full-text studies were evaluated according to the eligibility. Finally, 22 randomized controlled trials (RCTs) and 6 controlled clinical studies (2,897 adult patients in total, and a variety of populations) had been analyzed.

4.2 Data Collection

Sources and Record Management

PublMed, Scopus, Web of science and Cochrane Library (2015-Aug 2025) search, as well as search of reference-lists of related reviews, identified potential studies. All records were added into EndNote/Zotero so that they were deduplicated and moved to REDCap/Excel to be screened and extracted using a predefined codebook. The independent screening of two reviewers was conducted in two parts (title/abstract, full text) and the disputes were resolved by a third reviewer. In the procedure, PRISMA counts were made.

4.3 Data Items (What We Extracted)

Authorship (first author study) year, country, design (study conducted as an RCT/controlled trial), setting (community/clinic), registration/ ethical funds/ conflict.

Participants: size of the sample (per arm), age (mean SD), sex percentage (Male, Female), body mass index, baseline diagnosis (healthy, overweight/obese, prediabetes, T2D, hypertension, dyslipidemia), inclusion/exclusion criteria, number and causes of dropouts.

Interventions (Intermittent Fasting): type of intervention [Alter-day Fasting (ADF), Modified ADF (mADF), Time-Restricted Eating (TRE; hours of fasting period), 5:2 diet], caloric targets (on fasting and feeding days), duration of fasting period, frequency allowed weekly, result of adherence (days to target, percent energy fasting) other interventions (exercise, counseling).

Comparison: either ad libitum diet, or incessant calorie restriction (CCR; kcal/day or deficit) or some other diet, or some other behavioral support.

Outcomes and Timing:

Adiposity: baseline and end (and in-between in case of reporting) body weight (kg), BMI (kg/m 2), waist circumference, mass fat (percent).

Glycemia: fasting plasma glucose (mg/dl or mmol/L), HbA1c (percent), fasting insulin (u g/dl), HOMA-IR.

lipids: LDL-C, HDL-C, triglycerides (mg/dl or mmol/L), cholesterol.

Blood pressure: SBP/DBP (mmHg).

Inflammation: CRP (mg/L), IL- 6 (pg/mL), TNF-, (pg/mL) where required.

Safety/adverse events: Hypoglycemia, Hypotension, dizziness, GI, severe adverse events.

Compliance/ agreeability: retention, protocol compliance, self-report food/satiety measurements, quality-of-life measurements.

4.4 Harmonization and Unit Handling

Where necessary, lipids and glucose were then converted to mg/dL through known conversion factors (e.g. mmol/L x 38.67 cholesterol; x 18.02 glucose). Changes scores were calculated as endline-base line (negative values are directed towards improvement of weights, glucose, LDL-C, SBP). There would be no change SDs, and then they would be imputed according to the reported CIs/SEs or according to correlation-based approaches (r would be assumed to be 0.5 in a sensitivity analysis). With the multi arm trial, Cochrane recommendations were applied in both division and combination of arms of intervention to avoid the number of controls.

4.5 Risk of bias and metadata risk of study.

Domain level judgments (randomization, non-intended interventions, missing outcomes measures, measurement, choice of reported outcome) were identified at the RoB-2 level. Status of trial registration and source of funding was also coded so as to make the sensitivity analysis easier.

Data Verification

In case crucial information (e.g., fasting window length, unit ambiguity) was not available (or not complete) the authors of interest were contacted (two attempts, separated by at least 10 business days). The values obtained through drawn figures have been quantified (WebPlotDigitizer) and labeled as sensitive values.

Data Storage and Security

A locked data dictionary/codebook contained each variable, acceptable format and derivations. Every data and type of extraction was version-controlled (Git/OSF), and audited; only de-identified and aggregate data on study level were stored.

Effects on body weight and Adiposity.

The majority of the studies demonstrated that the subjects who took part in the intermittent fasting (IF) had significant weight, body mass index and waist circumference reduction. The difference in body weight of mean of -3.8 kg (95% CI: -4.5 -3.1; $p < 0.001$) was less than the controls. The waist circumference decreased with -3.1 cm (95% CI= -3.9 -2.4), which suggests rising patterns in the visceral fat distribution. Weight losses were greater when using the 5:2 and alternate-day fasting (ADF) regimens than they were when using time-restricted eating (TRE).

Effects on Glycemic Control

Fasting blood glucose (-4.1mg/dl;95%ci-6.7-1.5) and HbA1c (-0.12;95%ci-0.20-0.04) analyses showed that IF was significantly superior to conventional diets in 15 studies that reported glucose results. A negative value - 0.56 units was an indicator of the improved insulin resistance index and it was associated with the increased level of insulin sensitivity. The subgroup analysis revealed that the individuals with impaired glucose tolerance at the baseline recorded the most significant improvements.

Effects on Lipid Profile

The meta-analysis presented positive outcomes in regard to the lipid parameters. The changes in LDL-C and triglycerides were -7.4 mg/dl (95% CI: -10.2 to -4.6) and -10.6mg/dl (95% CI: -15.3 to -5.9) respectively and the increase in HDL-C was +2.1mg/dl (95%CI: +0.6 to +3.7). The effects of ADF were always superior to TRE in lipid-lowering. However, intertrial heterogeneity was moderate (I 2 = 52%), which suggests that the responses were dependent on the characteristics of the population and the life span of the intervention.

Effects on Blood Pressure

Among the 12 trials that had the outcome of a blood pressure, the pooled analysis showed that systolic blood pressure (-5.8 mmHg; 95% CI: -7.6 -4.0) and diastolic blood pressure (-3.2 mmHg -95% 4.5 -1.9) had decreased significantly. Such were huge clinical decreases that particularly prevailed in those participants who had previously had hypertension.

Effects on Inflammatory Measures.

Six RCTs were used to measure the inflammation, and the effects on the C-reactive protein (CRP) and interleukin-6 (IL-6) were systematically decreased. CRP fell by -0.6 mg/L and IL-6 by -0.5 pg/mL that indicates an anti-inflammatory reaction of IF.

Table 1. Summary of Pooled Effects of Intermittent Fasting on Cardiovascular Risk Factors

Outcome	Pooled Effect (Mean Difference)	95% CI	Significance (p-value)	Notes on Protocol Effectiveness
Body Weight (kg)	–3.8	–4.5 to –3.1	<0.001	Strongest with ADF & 5:2 diet
Waist Circumference (cm)	–3.1	–3.9 to –2.4	<0.001	Greater reduction in obese participants
Fasting Glucose (mg/dL)	–4.1	–6.7 to –1.5	0.002	TRE most effective
HbA1c (%)	–0.12	–0.20 to –0.04	0.004	Stronger in diabetics/prediabetics
HOMA-IR	–0.56	–0.82 to –0.29	<0.001	TRE superior to ADF
LDL-C (mg/dL)	–7.4	–10.2 to –4.6	<0.001	ADF strongest effect
Triglycerides (mg/dL)	–10.6	–15.3 to –5.9	<0.001	ADF > TRE
HDL-C (mg/dL)	+2.1	+0.6 to +3.7	0.01	Modest improvement
Systolic BP (mmHg)	–5.8	–7.6 to –4.0	<0.001	Stronger in hypertensives
Diastolic BP (mmHg)	–3.2	–4.5 to –1.9	<0.001	Consistent across regimens
CRP (mg/L)	–0.6	–0.9 to –0.3	0.001	Anti-inflammatory effect
IL-6 (pg/mL)	–0.5	–0.7 to –0.2	0.002	Significant reduction

Table 2. Comparative Effectiveness of Different IF Protocols

Risk Factor	ADF (Alternate-Day Fasting)	TRE (Time-Restricted Eating)	5:2 Diet
Weight Reduction	★★★ Strong	★★ Moderate	★★★ Strong
Glucose Control	★★ Moderate	★★★ Strong	★★ Moderate
Lipid Profile	★★★ Strong	★★ Moderate	★★ Moderate
Blood Pressure	★★ Moderate	★★ Moderate	★★★ Strong
Inflammation	★★★ Strong	★★ Moderate	★★ Moderate

(★ = magnitude of effect; 1 = low, 3 = strong)

Subgroup and Sensitivity Analysis.

Subgroup analyses have shown that:

a.The maximum weight loss and lipid improvements were with ADF.

b.TRE was better in enhancing fasting glucose and insulin resistance.

c.Cardiometabolic benefits were greater in intervention members who had a duration of over 12 weeks.

Sensitivity analyses were used to ensure that the omission of small or poor quality trials were not significant to the results.

The intermittent fasting has a great effect on various cardiovascular risk factors such as adiposity, glycemic regulation, lipid profiles, blood pressure and also inflammation. The extent of gain is however dependent on fasting regimen, length

of study and risk status at baseline. Although short- to medium-term outcomes are encouraging, there is still little data on the long-term.

CONCLUSION

This analysis has revealed that intermittent fasting (IF) has profound positive effects on major cardiovascular risk factors, such as improvements in body weight, adiposity, blood pressure, fasting glucose and insulin resistance and small positive effects on inflammatory markers. Alternate-day fasting (ADF) and 5:2 diet are more efficient in weight loss and lipid management, whereas the time-restricted eating (TRE) diet is more effective in enhancing glycemic control. The results imply that IF is a suitable, secure and non-pharmacological nutritional approach to finalizing cardiovascular and metabolic diseases. Notably, its cardiometabolic benefits can be seen among healthy and high-risk populations, including overweight, obese, hypertensive populations, and all population groups with clinically significant ones. To sum up, intermittent fasting has potential as a supportive dietary intervention to traditional lifestyle interventions in the decrease of cardiovascular risk. The use of future, high-quality, long-duration randomized controlled trials should be recommended in order to define the best fasting regimens, mechanisms of action, and determine the long-term cardiovascular outcomes and adherence in various populations.

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