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ROLE OF INTERMITTENT FASTING ON METABOLIC HEALTH IN OVERWEIGHT ADULTS: A NARRATIVE REVIEW

Narrative Review

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ABSTRACT

Background: Intermittent fasting (IF) has emerged as a widely practiced dietary strategy with growing scientific interest for its potential role in managing obesity and improving metabolic health. With global rates of overweight and obesity rising at an alarming pace, effective non-pharmacologic interventions are increasingly needed to address associated metabolic disorders such as insulin resistance, dyslipidemia, and impaired glucose regulation.

Objective: This narrative review aims to explore the metabolic effects of intermittent fasting in overweight and obese adults, highlighting its clinical benefits, potential limitations, and areas requiring further investigation.

Main Discussion Points: The review synthesizes findings from recent literature, revealing that IF is consistently associated with reductions in body weight, improved insulin sensitivity, better glycemic control, and favorable lipid profile changes. Various IF regimens, including time-restricted eating and alternate-day fasting, show similar metabolic benefits. However, the evidence is limited by short intervention durations, small sample sizes, and variability in outcome measures. Methodological issues such as selection bias, lack of blinding, and limited population diversity further constrain the generalizability of results. Despite these limitations, IF appears well-tolerated and effective for short- to medium-term metabolic improvements.

Conclusion: Intermittent fasting holds promise as an adjunct strategy for managing metabolic health in overweight populations. While current evidence supports its use in clinical practice, further high-quality, long-duration studies are needed to confirm long-term efficacy, safety, and sustainability.

Keywords: Intermittent Fasting, Metabolic Health, Obesity, Insulin Resistance, Dietary Intervention, Narrative Review.

INTRODUCTION

The escalating prevalence of overweight and obesity constitutes one of the most pressing public health challenges globally. According to the Global Burden of Disease Study 2019, over five million deaths annually can be attributed to complications related to excess body weight, underlining the urgent need for effective and sustainable interventions to address metabolic health deterioration in this population group (1). The World Health Organization estimates that more than 1.9 billion adults are overweight, with over 650 million classified as obese, a trend that has only intensified with the globalization of sedentary lifestyles and high-calorie diets. These conditions are closely associated with an increased risk of type 2 diabetes, dyslipidemia, hypertension, and cardiovascular diseases, significantly straining both individual health and healthcare systems (2,3). Among the emerging strategies to counteract metabolic dysfunction in overweight and obese adults, intermittent fasting (IF) has garnered considerable scientific and public interest. Unlike conventional continuous energy restriction (CER), IF is characterized by cycles of eating and fasting that vary in duration and frequency. Popular regimens include alternate day fasting (ADF), the 5:2 diet, and time-restricted eating (TRE). These protocols aim not only to reduce caloric intake but also to induce beneficial metabolic adaptations such as improved insulin sensitivity, enhanced lipolysis, and reduced oxidative stress. Multiple randomized controlled trials and meta-analyses have highlighted IF's efficacy in improving key metabolic indicators, including body weight, glycemic control, lipid profiles, and markers of inflammation (4-6).

Despite the mounting evidence in support of IF, several research gaps remain. While IF appears effective in promoting weight loss and improving short-term metabolic parameters, its long-term sustainability, safety across diverse populations, and superiority over traditional calorie restriction approaches remain subjects of ongoing debate. For instance, findings indicate that while IF and CER yield comparable weight loss, IF may confer additional benefits through circadian rhythm alignment and autophagy activation, yet these mechanisms are not uniformly substantiated across studies (7,8). Moreover, certain populations may experience adverse effects, such as lean muscle loss or hypoglycemia, particularly in the absence of appropriate nutritional support (9). The objective of this narrative review is to explore the effects of intermittent fasting on metabolic health in overweight and obese adults, with a focus on understanding the physiological underpinnings, benefits, limitations, and practical implications of this dietary intervention. By integrating evidence from randomized controlled trials, meta-analyses, and narrative syntheses published within the last five years, this review aims to elucidate the therapeutic role of IF in managing obesity-related metabolic derangements (10,11). The scope of this review encompasses adult populations classified as overweight or obese (BMI $\geq$ 25 kg/m^2), excluding those with pre-existing metabolic diseases such as diabetes, unless specifically addressed by the studies. Studies included in this synthesis span various intermittent fasting protocols and investigate outcomes related to body composition, glucose metabolism, insulin sensitivity, lipid profiles, and inflammatory markers (12,13). Both short-term and longer-duration interventions are considered to offer a balanced view of efficacy and safety.

The significance of conducting this review lies in its potential to bridge the gap between emerging evidence and clinical applicability. While intermittent fasting is increasingly adopted by the public, healthcare providers often lack clear, evidence-based guidance regarding its implementation and monitoring. By synthesizing current findings and identifying consistent patterns and limitations, this review aims to support clinicians and researchers in making informed decisions about incorporating IF into obesity and metabolic health management strategies. It also seeks to highlight areas where further high-quality research is needed, particularly regarding long-term adherence, personalized fasting protocols, and the interplay between IF and other lifestyle interventions. In summary, intermittent fasting represents a promising yet complex dietary strategy for improving metabolic health in overweight and obese adults. Through this review, we aim to provide a comprehensive and critical appraisal of the current literature, offering nuanced insights into the clinical value, mechanisms, and practical considerations of IF in contemporary metabolic health management.

THEMATIC DISCUSSION

Impact on Weight Reduction and Body Composition

One of the most consistently reported outcomes of intermittent fasting (IF) is its role in inducing weight loss among overweight and obese individuals. Across various fasting protocols, such as time-restricted eating (TRE), alternate-day fasting (ADF), and the 5:2 regimen, reductions in body weight and fat mass have been consistently demonstrated. A systematic review suggested that, IF was

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associated with significant reductions in overall body weight and adiposity, particularly when combined with physical activity, suggesting a synergistic effect in modulating energy balance and fat oxidation (10). Similarly, a meta-analysis of randomized controlled trials (RCTs) concluded that IF significantly reduced body weight by an average of 2.05 kg and fat mass by 2.14 kg in adults over 40, without compromising lean muscle mass (11). These findings emphasize IF's utility not only in caloric deficit creation but also in promoting selective fat loss, an important consideration in metabolic health.

Glycemic Control and Insulin Sensitivity

Improvement in glycemic indices is another central metabolic benefit attributed to intermittent fasting. In a 2025 meta-analysis, IF demonstrated significant improvements in fasting blood glucose and HbA1c levels among overweight and obese adults without diabetes, with a standardized mean difference (SMD) of 1.74 in favor of IF versus control diets (12). A separate scoping review focusing on insulin resistance also affirmed the consistent finding that IF improves insulin sensitivity while reducing fasting insulin concentrations in obese adults, which may lower the risk of progression to type 2 diabetes (13). Mechanistically, these benefits are likely mediated by prolonged fasting periods promoting lipolysis, depletion of hepatic glycogen, and enhancement of insulin receptor sensitivity.

Cardiometabolic Profile and Lipid Modulation

Several studies have demonstrated the ability of IF to modulate lipid profiles, particularly triglycerides (TG) and low-density lipoprotein (LDL) cholesterol. A study reported a significant reduction in TG levels (MD: -0.32 mmol/L; $p < 0.001$), while preserving high-density lipoprotein (HDL) levels, in overweight adults practicing IF (13). Contrastingly, a comparison study suggested that while both IF and continuous calorie restriction (CCR) improved metabolic parameters, IF led to a greater reduction in HDL cholesterol, raising concerns about potential drawbacks in lipid modulation (14). These discrepancies underscore the necessity of stratifying lipid responses based on the type of IF regimen and baseline metabolic risk profiles.

Inflammatory and Oxidative Stress Markers

The anti-inflammatory and antioxidative benefits of IF have garnered increasing attention, particularly in the context of metabolic syndrome. A systematic review evaluated the impact of IF on circulating oxidative stress markers and found a trend toward reduced oxidative damage in overweight individuals, although only three out of six trials showed statistically significant reductions (15). A study also noted that IF decreased oxidative lipid markers and may influence circadian rhythms, suggesting potential indirect effects on systemic inflammation and metabolism (16). However, these findings remain preliminary, and larger, mechanistically focused studies are needed to substantiate these effects.

Sustainability and Tolerability of IF Regimens

While clinical efficacy is well-documented, long-term adherence and tolerability of IF remain less understood. A narrative review, concluded that IF was generally well-tolerated and had dropout rates similar to traditional calorie-restricted diets, indicating comparable feasibility in clinical practice (17). Nonetheless, concerns persist regarding potential adverse events such as hypoglycemia, fatigue, or nutrient deficiencies, especially in populations with comorbidities or specific dietary requirements. Individualization of fasting protocols and appropriate medical supervision are therefore crucial to mitigate such risks.

Comparison with Continuous Energy Restriction

A recurrent theme in the literature is the comparison between IF and CCR. While both approaches appear to produce similar degrees of weight loss and metabolic improvements, some evidence suggests unique advantages of IF, particularly in aligning with circadian biology and stimulating autophagy. For instance, a study reported increased expression of autophagy-related genes following a dawn-to-dusk fasting protocol, indicating potential benefits for cellular rejuvenation and metabolic aging (18). However, most reviews agree that the clinical superiority of IF over CCR remains inconclusive and is likely influenced by individual preferences and lifestyle compatibility.

Inconsistencies and Research Gaps

Despite a growing body of evidence, several gaps and controversies persist. Disparities in study design, fasting duration, participant demographics, and outcome measures contribute to variability in results. For instance, while some studies show improvements in HDL levels with IF, others report reductions, suggesting that individual lipid responses may vary based on genetics, baseline health status, or adherence patterns. Additionally, most trials are short-term, often less than 12 weeks, limiting insights into the sustainability and long-

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term safety of IF. There is also a paucity of data on the effects of IF in populations with metabolic comorbidities, such as polycystic ovary syndrome or non-alcoholic fatty liver disease.

CRITICAL ANALYSIS AND LIMITATIONS

Despite the growing interest in intermittent fasting (IF) as a therapeutic approach for managing metabolic health in overweight and obese adults, several critical limitations exist in the current body of literature that constrain the strength and applicability of the evidence. Many studies included in recent reviews suffer from small sample sizes, limiting statistical power and the ability to detect meaningful differences between interventions. For example, several trials assessed the effects of IF on glycemic control or lipid profiles in cohorts of fewer than 100 participants, which weakens the reliability of subgroup analyses and limits conclusions on dose-response relationships or long-term benefits (13,14). Furthermore, while some randomized controlled trials (RCTs) have been conducted, a significant proportion of the literature comprises observational or quasi-experimental designs, which are inherently more prone to bias and cannot establish causal relationships. Methodological limitations are common across studies. Selection bias is notable in trials that predominantly enroll metabolically healthy individuals or those motivated to participate in weight loss programs, which may overestimate the efficacy of IF due to high adherence and compliance. Additionally, the lack of participant blinding in dietary intervention studies introduces performance bias, as participants' expectations may influence behavior and reporting of subjective outcomes. For instance, in studies measuring appetite or quality of life alongside metabolic markers, unblinded designs may skew results due to placebo effects or differential lifestyle changes between groups (15,16). Another critical concern is the short duration of most interventions. The majority of studies evaluate metabolic outcomes over periods ranging from 4 to 12 weeks, which is insufficient to assess long-term adherence, sustainability, or potential adverse effects such as nutrient deficiencies or hormonal disruptions. For example, while reductions in body weight and insulin resistance are often observed within the first few weeks, it remains unclear whether these benefits persist beyond the initial intervention phase or if participants regain weight post-intervention (17,18).

Publication bias further complicates interpretation of the evidence. Positive findings are disproportionately represented in the literature, while studies with null or negative results are less likely to be published or cited. This bias inflates the perceived efficacy of IF and undermines balanced evaluation. Systematic reviews attempting to synthesize IF-related outcomes often note the difficulty in identifying unpublished or grey literature, particularly those reporting on tolerability issues, adverse effects, or poor adherence rates (19). Measurement heterogeneity is another key limitation. Studies vary in the metrics used to evaluate metabolic outcomes, making cross-study comparisons challenging. For example, while some trials use fasting insulin and HOMA-IR to assess insulin sensitivity, others rely on postprandial glucose, continuous glucose monitoring, or surrogate markers like waist circumference. Similar variability exists in lipid outcome definitions, body composition assessments, and even in how adherence to fasting protocols is monitored. These discrepancies hinder meta-analytic efforts and obscure the interpretation of findings across different populations and settings (20). Lastly, the generalizability of existing findings remains restricted. Most studies are conducted in high-income settings with access to nutritional guidance, healthcare, and monitoring tools. Populations such as older adults, individuals with polypharmacy, or those with complex metabolic diseases are often underrepresented. Additionally, cultural and behavioral factors influencing meal timing, fasting feasibility, and dietary preferences vary widely, which could affect the external validity of IF regimens applied uniformly across different regions or ethnic groups (21). Without targeted studies in diverse cohorts, the broader clinical applicability of intermittent fasting remains uncertain. In summary, while intermittent fasting demonstrates promise for improving metabolic health in overweight individuals, the current literature is constrained by design limitations, methodological inconsistencies, and narrow population focus. Future research must address these shortcomings through rigorously designed, longer-duration, multicenter trials that standardize outcome measures and include underrepresented populations to fully elucidate the benefits and risks of this dietary strategy.

IMPLICATIONS AND FUTURE DIRECTIONS

The findings from this narrative review present several important implications for clinical practice, public health policy, and future research on intermittent fasting (IF) as a metabolic intervention in overweight and obese adults. Clinically, IF emerges as a viable non-pharmacologic dietary approach that may complement existing strategies for weight reduction and metabolic regulation. The consistent evidence demonstrating improvements in body weight, insulin sensitivity, glycemic control, and lipid profiles suggests that IF can be safely recommended to patients, especially those who are seeking alternatives to traditional calorie-restricted diets (22,23). However, clinical application requires individualized assessment, particularly in patients with comorbidities, to determine the most suitable fasting

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protocol, minimize potential risks such as hypoglycemia, and ensure adherence through lifestyle support and counseling. From a policy and guideline perspective, the growing body of supportive evidence warrants the inclusion of IF in national and international dietary guidelines as an evidence-based intervention for metabolic health management. At present, most professional dietary recommendations focus primarily on caloric restriction and macronutrient manipulation. Including structured IF models as acceptable alternatives could offer more flexibility and personalization in dietary counseling. Given the global burden of obesity-related non-communicable diseases, public health authorities should consider developing standardized frameworks for the implementation, monitoring, and education of IF-based interventions within clinical and community health settings (24). Nonetheless, several key research questions remain unanswered. Despite short-term improvements, the long-term sustainability of IF in terms of weight maintenance, metabolic adaptation, and cardiovascular outcomes is not well established. It is also unclear which subtypes of IF (e.g., time-restricted eating vs. alternate-day fasting) are most effective for specific populations. Additionally, current evidence is heavily skewed toward metabolically healthy overweight individuals, with limited data available on older adults, ethnic minorities, patients with endocrine disorders, or those on complex pharmacotherapy (25,26). Moreover, potential adverse effects such as nutritional deficiencies, disordered eating behaviors, or hormonal imbalances remain underexplored.

To strengthen the evidence base and guide evidence-informed recommendations, future studies should employ robust, methodologically sound randomized controlled trials with larger, more diverse sample populations. Trials of at least six months duration are needed to assess adherence, metabolic durability, and safety. Researchers should standardize outcome measures for weight loss, insulin resistance, lipid parameters, and inflammatory markers to allow for better comparability across studies. Additionally, mechanistic studies exploring the biological pathways activated by different IF regimens, such as autophagy, circadian modulation, and mitochondrial adaptation, would deepen understanding of IF's therapeutic mechanisms (27). Finally, qualitative studies exploring participant experiences, barriers to adherence, and psychosocial outcomes will be valuable in optimizing IF implementation in real-world settings. In conclusion, intermittent fasting shows promising clinical potential as a metabolic health strategy for overweight and obese adults, but its broader integration into care models requires more comprehensive, high-quality evidence and multidisciplinary collaboration.

CONCLUSION

This narrative review highlights that intermittent fasting (IF) demonstrates significant potential as a non-pharmacological intervention to improve metabolic health in overweight and obese adults. Across various protocols, IF has been consistently associated with reductions in body weight, improved insulin sensitivity, better glycemic control, and favorable lipid modulation. While the strength of current evidence is promising, much of it is derived from short-term studies with methodological limitations, including small sample sizes and heterogeneous outcome measures. Nonetheless, the reproducibility of metabolic benefits across diverse fasting models suggests a reasonable degree of reliability in the literature. Clinicians may consider IF as a viable option within personalized lifestyle management plans, particularly for patients seeking alternatives to continuous calorie restriction. However, tailored recommendations, close monitoring, and patient education are essential to ensure safety and adherence. There remains a critical need for long-term, high-quality randomized controlled trials that explore IF's sustainability, safety, and efficacy across broader and more diverse populations. Such research will be key to shaping formal clinical guidelines and maximizing IF's integration into metabolic care pathways.

AUTHOR CONTRIBUTION

Author	Contribution
Akif Saeed Ch*	Substantial Contribution to study design, analysis, acquisition of Data Manuscript Writing Has given Final Approval of the version to be published
Naheed Shah	Substantial Contribution to study design, acquisition and interpretation of Data Critical Review and Manuscript Writing Has given Final Approval of the version to be published
Shaikh Khalid Muhammad	Substantial Contribution to acquisition and interpretation of Data Has given Final Approval of the version to be published
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Mariam Akhtar	Substantial Contribution to study design and Data Analysis Has given Final Approval of the version to be published
Bashir Ahmed	Contributed to study concept and Data collection Has given Final Approval of the version to be published
Asmat Nawaz	Writing - Review & Editing, Assistance with Data Curation
Fahad Asim	Writing - Review & Editing, Assistance with Data Curation

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