Effect of Intermittent Fasting Interventions for Treatment of Overweight and Obesity in Adults – A Systematic Review

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Abstract

Recent data from the 2019 Global Health Metrics report indicates a troubling trend: more than five million deaths annually can be traced back to health issues related to being overweight or obese. This comprehensive review, scrutinizes the role of intermittent fasting (IF) in improving metabolic functions and aiding in weight loss among the adult demographic. This review, built on the solid foundations of the Cochrane and PRISMA protocols, thoroughly examines a plethora of research concerning IF as a viable approach to combat adult obesity and overweight conditions. Our extensive research canvassed several academic and scientific databases such as PubMed, Embase, PsycINFO, Web of sciences, Scopus and the Cochrane Library, up until the latter part of February 2023, with no barriers on language. We identified 3241 studies, which after deduplication procedures, narrowed down to 3065. Through meticulous evaluation, we shortlisted 386 studies. Ultimately, our synthesis includes 10 research papers with contributions from India (6 studies), as well as individual studies from Pakistan, Saudi Arabia, the USA, and China, collectively observing 845 adults. Our synthesis of the selected research posits that IF provides enduring and beneficial outcomes for adults suffering from obesity and excess weight. The intervention showcases a marked improvement in managing blood glucose, lipid concentrations, insulin sensitivity, and overall cardiovascular functioning. It is also observed that integrating IF with consistent physical activity serves as an effective dual strategy for not only weight control but also for fostering an enhanced state of general health.

Keywords: Alternate day fasting, fasting, health outcomes, intermittent fasting, obese, overweight, weight loss

Introduction

The incidence of overweight and obesity, indicative of global nutritional challenges, is escalating due to substandard dietary choices and sedentary behavior. The current statistics reveal that obesity afflicts 650 million individuals globally, with an additional 1.9 billion identified as overweight.[1] the global burden of disease has highlighted a grim outcome, citing that obesity contributed to 5.02 million premature deaths in 2019.[2] Research conducted by the Indian Council of Medical Research-India Diabetes indicates a considerable occurrence of obesity in the Indian adult population, with 41.7% of women and 22.3% of men affected.[3]

The aging process, intertwined with obesity, can lead to persistent health detriments, such as cardiovascular conditions, diabetes, and disorders of the musculoskeletal system, thus magnifying the societal and personal toll of obesity.[4,5] The drift toward unhealthy dietary patterns across populations is predicted to exacerbate the obesity crisis.[6,7] Within medical circles, body mass index (BMI) is recognized as a crucial health indicator.[8]

For the Asian demographic, a BMI ranging from 23 to 24.9 kg/m^2 is considered overweight, while a BMI of 25 kg/m^2 or greater denotes obesity.[4] An elevation in BMI during one's adult years is linked to an increased likelihood of chronic health issues and various cancers, including but not limited to endometrial, breast, and colon cancers.[9,10]

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Obesity is defined by the Obesity Medicine Association as a chronic, relapsing condition with multifaceted neurobehavioral roots, where an increase in adipose tissue disrupts its normal function, leading to a spectrum of negative metabolic, biomechanical, and psychosocial outcomes.[11] It stands as a principal precursor for several noncommunicable diseases, encompassing diabetes, hypertension, cardiovascular diseases, and specific cancers.

Intermittent fasting (IF) delineates a dietary pattern of intentional, cyclical caloric restriction, with zero to minimal calorie consumption during designated periods, punctuated by intervals of regular food intake.[12] This regimen typically involves a 16-h fast daily, a full-day fast every other day, or fasting for two nonsequential days per week. Caloric intake during fasts is significantly curtailed while eating patterns on nonfasting days permit normal or moderated calorie consumption.[13] Historically, since the 1960s, fasting has been lauded as an effective obesity treatment, with contemporary research unveiling additional health advantages beyond weight management.[14]

Moreover, fasting transcends its role as a health practice, being intricately interlaced with the spiritual and cultural fabric of communities, especially in India. It has recently gained traction once again, especially among younger adults and those in their middle years, as a popular method for controlling weight. This revival has popularized the concept of IF.[15-17]

This systematic review and meta-analysis aspires to meticulously examine the impact and health advantages of IF protocols. Specifically, it seeks to determine their effectiveness in managing and potentially reversing the trends of obesity and overweight in adults across international borders.

Materials and Methods

For this systematic review, we meticulously adhered to the protocol and standards set by the Cochrane review framework and the PRISMA guidelines. The compilation included a diverse array of randomized controlled trials (RCTs) & observational studies that examined the role of IF in managing adult obesity and overweight. The literature was exhaustively searched from a variety of scholarly databases such as Google Scholar, Medline, PubMed, PsycINFO, Embase, and the Cochrane Library. The time frame spanned over three decades of research, starting from January 1990 to the end of the 3rd week of February 2023, without restrictions on language. Our search methodology utilized a comprehensive set of keywords relating to overweight and obesity treatment modalities, including IF, weight reduction, and health impacts, among others. A thorough hand-searching of references from selected academic journals was also conducted to capture any pertinent literature that might have been missed initially. One investigator preliminarily reviewed titles and abstracts, which were then subject to collective authorial approval for progression to full-text assessment. The inclusion for in-depth analysis was limited to those RCTs that specifically addressed adult obesity and overweight interventions.

We established inclusion parameters that permitted a broad spectrum of studies within the designated period, focusing on the principal variable of IF. The review was confined to full-text articles published in English to ensure a comprehensive evaluation.

Conversely, studies not published in English, those released before 1990, and research involving pediatric subjects were excluded, thereby refining the review to be solely adult-centric and within the specified temporal and linguistic scope.

Data extraction and statistical analysis

In the process of evaluating each study deemed relevant, authors meticulously reviewed the entirety of the articles. The authors compiled data encompassing participant numbers, age at diagnosis, duration of follow-up, the structure of the study, details of the IF regimen employed, and comprehensive outcome data. Standardized data collection templates were utilized to ensure uniformity and each dataset underwent independent scrutiny. Subsequently, these compiled data were methodically entered into the Cochrane Review Manager software.[18] For the aggregation and analysis within this systematic review and meta-analysis, we employed a random-effects model to accommodate the inherent variability across the included studies.

Results

The review of the randomized control trial followed the guidelines laid out in the Preferred reporting items for systemic review (PRISMA) statement [Figure 1]. PubMed, Embase, PsycINFO, Web of sciences, Scopus and the Cochrane Library were searched from their inception without language restrictions to identify all randomized controlled trials (RCTs) & Observational studies related to intermittent fasting interventions for treatment of overweight and obesity in Indian adults. Terms such as overweight, obese, intermittent fasting, fasting, weight loss and treatment were used to find articles describing these concepts. We also conducted a manual search of the cited works of a select number of journals in order to identify additional studies with potential relevance. Total 3241 were searched among from various databases. Maximum records were from Pubmed followed by Embase and google scholar. 176 articles were removed due to duplication. 3065 articles were screened, among them 386 were eligible but only 10 articles were included and 376 were removed due to various reasons from this study [Figure 1]. This data is summarized in Table 1. Each study compared different groups based on past records, but none of them randomly assigned participants. Using the numerous sample approaches as a guide, we carefully reviewed the weight loss fasting and obesity management in this study.

Posttreatment analysis revealed a notable decrease in the average body weight from 88.5 ± 19 to 83.8 ± 17.6 kg, and a significant reduction in BMI from 31.4 ± 5.3 to 29.6 ± 5.1 kg/m^2,

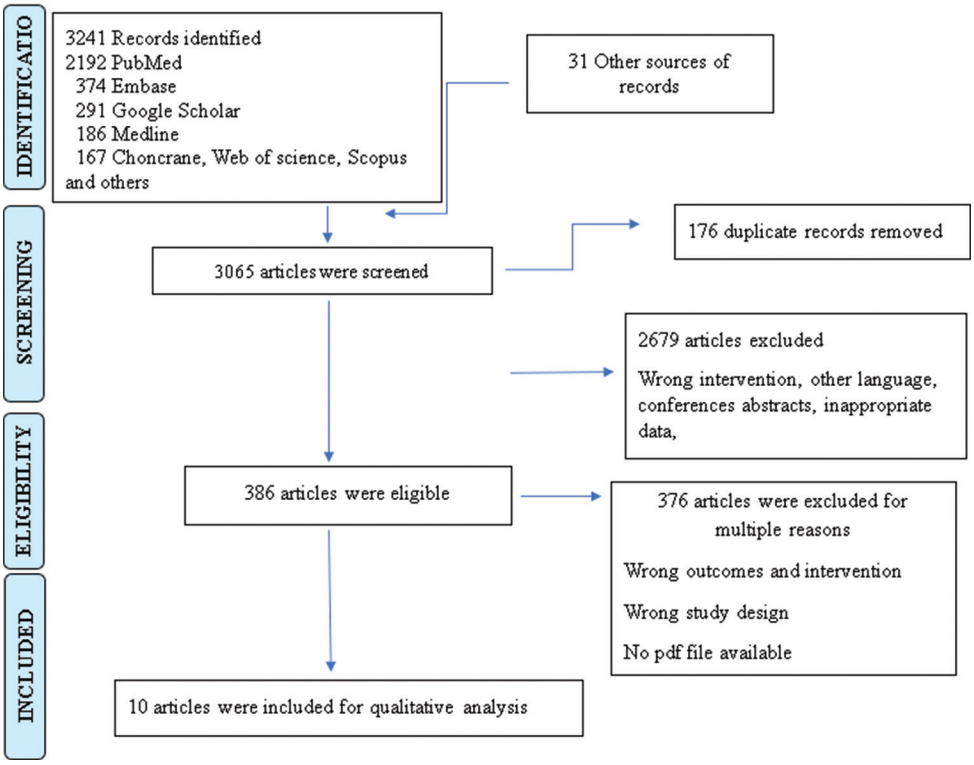

Figure 1: Articles selection mechanism schedule by PRISMA in this study

with statistical significance noted ($P < 0.05$).[11] Participants reported improvements in dietary habits and enhanced physical fitness as additional advantages of the IF regime.

Comparative assessments of BMI and percentage of weight loss were conducted against initial measurements. The study's initial average weight was recorded at 79.63 ± 16.80 kg, which decreased to 75.83 ± 15.92 kg by the study's conclusion. Similarly, the starting average BMI was 29.327 ± 4.92 kg/m^2, which was reduced to 27.952 ± 4.66 kg/m^2.[1]

In groups engaging in a mix of alternate-day fasting (ADF) and regular physical activity, weight reduction outcomes varied: participants in the ADF cohort lost an average of 6 ± 4 kg, those in the exercise cohort shed 3 ± 1 kg, and the control group noted a loss of 1 ± 0 kg, with these changes proving statistically significant ($P = 0.05$).[21] A significant decrease in both body weight and waist size was noted ($P < 0.0001$).[23] Various IF approaches, including modified ADF (MADF), specific diet limitations, time-restricted eating, and calorie-restricted (CR) diets, were supported by evidence of differing strengths, from high or moderate to very low, as summarized in Table 1.

Discussion

This detailed review was undertaken to gauge the health benefits of IF and its effectiveness in reducing overweight and obesity in adults from various regions. This regimen has been proven to assist participants in achieving weight reduction, trimming down abdominal fat, and fostering healthier lifestyle habits.[27] The data revealed that IF led to substantial decreases in both total weight and body composition, including reductions in both fat mass and fat-free mass.[27,28]

Our study found that participants with higher baseline BMI values saw more significant weight loss with IF, suggesting this method's particular efficacy for individuals with greater body mass indices.

Health statistics confirm a direct association between increased BMI and the risk of serious health issues, including certain types of cancer.[28] BMI is widely used to determine body fat levels and to categorize individuals as overweight or obese.[28] IF's increased recognition is partly due to its reported metabolic benefits of continuous caloric restriction, especially in terms of energy expenditure.[29]

Investigations by Cuccolo & associates have identified a fasting duration of 16 h as conducive to positive weight changes.[30] Our findings suggest that IF is an effective strategy for significant weight loss and metabolic improvement in those who are obese. Notable weight loss was seen with the MADF and the 5:2 diet.[28,29,31]

Recent research has concentrated on IF's impact on overweight, obesity, or dyslipidemia. A variety of fasting approaches, such as ADF, CR, and exercise programs, have been consistently associated with weight loss, as highlighted by Klempel *et al*.[32]

Both resistance and aerobic exercise are acknowledged for aiding weight control, with aerobic exercise being particularly effective in altering body composition.[33] However, the combined long-term effect of exercise and IF has not been

Table 1: Comprehensive review and meta-analysis of randomized trials on intermittent fasting for adult weight and obesity management

Author's name	Country	Year published	Number of participants	Study design	Age (years)	Duration of fasting	Type of intermittent fasting	Initial BMI	After intervention BMI	Initial body weight	After intervention body weight	Outcomes	Purpose of the study	Grade rating
Salis *et al.*[11]	India	2022	32	Experimental study	35.6±8.9	3 months	MADF, 5:2 diets	31.4±5.3	29.6±5.1	88.5±18.7	83.8±17.6	BMI	This pilot study tested a weight loss approach in a contemporary setting through an empirical trial of intermittent fasting at a Mumbai nutrition clinic	Moderate
Kaushik *et al.*[1]	India	2021	55	Retrospective study	18–65	1–3 months	MADF	29.327±4.92	27.952±4.66	79.63±16.80	75.83±15.92	BMI/ weight loss	This research aimed to verify the success of a healthy feasting and fasting program in promoting weight loss and decreasing abdominal fat	Moderate
Majid *et al.*[19]	Pakistan	2023	115	Prospective analytic study	21.25±1.89	1 month	TRE	21.94±3.81	21.86±3.85	61.17±13.11	60.79±13.17	BMI	The study's aim was to assess how fasting influenced the weight and BMI of medical students at a government medical college	Very low
Kang *et al.*[20]	China	2022	131	Retrospective study	35.3±10.1	3 months	CR/TRE	30.9±4.9	28.1±4.6	86.2±18.6	78.2±16.9	BMI/ weight loss	This study aimed to determine the impact of a 12-week clinical weight loss program on patient health outcomes	High

Contd...

Table 1: Contd...

Author's name	Country	Year published	Number of participants	Study design	Age (years)	Duration of fasting	Type of intermittent fasting	Initial BMI	After intervention BMI	Initial body weight	After intervention body weight	Outcomes	Purpose of the study	Grade rating
Bhutani *et al.*[21]	USA	2013	83	Experimental study	45±6	3 months	MADF	35±1	33±1	91±6	85±6	Weight loss	The objective was to observe the effects of alternate-day fasting combined with exercise on body weight and chronic heart disease risk factors	Moderate
Almoraie and Alosaimi[22]	Saudi Arabia	2019	340	Prospective clinical trial study	18–40	1–3 months	MADF	32.6±1.2	28.2±5.2	85.14±6.2	74.02±3.6	Weight loss	This clinical trial aimed to evaluate the influence of intermittent fasting on weight management in overweight and obese Saudi participants	High
Sayedda *et al.*[23]	India	2013	20	Prospective study	24.65±4.38	1 month	TRE	-	-	71.10±8.20	68.92±8.01	Weight loss	The study sought to evaluate the impact of Ramadan fasting on cardiovascular health markers in a healthy male population	Low
Pathan and Patil[24]	India	2015	30	Prospective study	25–35	1 month	TRE	-	-	61.90±11.39	60.56±10.74	Weight loss	The research compared adult male body weights before and after Ramdan fasting in the Marathwada region	Very low

Contd...

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Author's name	Country	Year published	Number of participants	Study design	Age (years)	Duration of fasting	Type of intermittent fasting	Initial BMI	After intervention BMI	Initial body weight	After intervention body weight	Outcomes	Purpose of the study	Grade rating
Salahuddin and Masood-ul-Hassan[25]	India	2014	30	Case control	37±8.6	1 month	TRE	-	-	60.47±1.72	58.52±1.68	Weight loss	This study focused on the impact of Ramadan fasting on various cardiovascular and metabolic health indicators in both normotensive and hypertensive individuals	Low
Roy and Bandyopadhyay[26]	India	2017	36	Prospective study	22.73±1.56	1 month	TRE	-	-	57.5±7.26	55.53±7.28	Weight loss	The current study examined the effects of Ramadan fasting on hematological and renal function markers in young males in Kolkata	Moderate

MADF: Modified alternate-day fasting, RD: Restricted diet, TRE: Time-restricted eating, CR: Calorie RD, BMI: Body mass index

emphasized as much. Research indicates that resistance training paired with a 16-h daily fast can lead to a decrease in body fat percentage while maintaining muscle mass.[34] Postmeal exercise has been shown to be more beneficial for managing blood sugar levels and improving insulin sensitivity than exercising before eating.[35]

Merging IF with consistent exercise can potentially enhance the reduction of body weight and yield broader health benefits more than when either is done in isolation.[20,36]

It has been demonstrated that IF positively influences body composition and is not limited to managing obesity through calorie reduction.[37] It also impacts metabolic pathways and biological rhythms, including the body's circadian rhythm.[38,39]

New findings suggest that the gut microbiome can be positively modified by IF, thereby aiding weight loss efforts.[40,41] Caloric restriction, a key aspect of IF, activates sirtuin, a significant metabolic regulator.[42] This restriction is linked to increased lifespan and the promotion of a healthy lifestyle, as shown in research models.[43,44] In principle, IF can result in a net caloric deficit, assuming no compensatory overeating occurs, leading to sustained weight loss and metabolic health benefits.[45] This extensive research effort is poised to further explore IF's clinical role in detail.

Conclusion

The collated research findings strongly suggest that IF is a robust intervention for tackling obesity and overweight issues, providing lasting health advantages not only on a global scale but also notably within the Indian population. Both preclinical and clinical evidence support that this dietary regimen can significantly improve metabolic health by optimizing blood glucose, enhancing lipid profiles, increasing insulin sensitivity, and bolstering cardiovascular health. Such improvements position IF as a formidable nondrug-related strategy for individuals seeking weight management solutions. Given the substantial role that diet plays in the onset and maintenance of obesity, IF emerges as a key dietary strategy. Its implementation, coupled with a transition to healthier nutritional choices and augmented physical activity, has the potential to mitigate or even reverse the obesity epidemic, a benefit that extends to Indian population grappling with these health challenges.

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Conflicts of interest

There are no conflicts of interest.

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