Journal of Carcinogenesis
Covering Genesis to Therapeutics

Journal of Carcinogenesis, ISSN: 1477-3163
2025; Vol 24: Issue 4s, https://carcinogenesis.com/

Intermittent Fasting and Its Effects on Metabolic Disorders: A Systematic Review of Clinical Evidence

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ABSTRACT

Background: Over the past several years, intermittent fasting (IF) has been considered a possible dietary treatment for metabolic disorders such as Type 2 Diabetes, Hypertension, Obesity, and High Cholesterol. IF helps improve metabolic health by controlling sugar levels, aiding in fat reduction, and improving insulin responsiveness. However, it remains popular without adequate solid evidence supporting its practicality, effectiveness, or difficulties when implementing IF in a clinical setting.

Objective: This study aims to systematically review the literature on the impact of intermittent fasting on various metabolic disorders, focusing on its applications, benefits, challenges, and future potential. The review addresses various intermediate IF fasting cycles and their effects on metabolic health while discussing the benefits alongside the barriers to its use in clinical care.

Methods: A systematic literature review was conducted across several scientific databases: PubMed, Scopus, and ScienceDirect, including other sources. The review incorporated articles published from 2019 onwards with the focus being on clinical trials, observational studies, and systematic reviews. Data were selected and combined to reveal distinctive patterns concerning the management of metabolic disorders with fasting, the protocols of fasting employed, and the identified challenges from subjects undergoing IF. A clear systematic review was created by following the PRISMA flowchart.

Results: The literature review suggests that intermittent fasting, and particularly the method, has several notable benefits in improving weight, blood sugar levels, and insulin sensitivity among the people with metabolic disorders. However, participants noted difficulty with consistency, irritability, a sharp increase in hunger, and increased stress. The main issues

most respondents indicated were insufficient education on IF, social restrictions, and compliance with fasting protocols. Despite all these challenges, many respondents reported being optimistic about the impact of metabolic health in the long run.

Conclusion: Research suggests that intermittent fasting can be one of the effective strategies used for metabolic disorder management because it helps achieve weight targets and maintain blood sugar levels. Notwithstanding, other factors such as integration into lifestyle, education, and compliance need to be addressed to promote effective fasting. More studies are needed to investigate the fasting regimen design for easy adoption, barriers to use, and the prolonged effect. IF on metabolic health. The outcome of this review can be beneficial to the public, healthcare stakeholders, and policymakers who intend to use or promote IF as part of their metabolic disorder management plans.

Keywords: *Dietary Interventions, Insulin Sensitivity, Weight Loss, Obesity, Hypertension, Insulin Resistance, Blood Sugar Management, Clinical Applications, Type 2 Diabetes, and Metabolic Disorders.*

How to Cite: Shelly Otasowie Ibadin, Avrina Kartika Ririe, Gul E Jannat, Hamza Gohar Qureshi, Tanni Jahan Dina, Nashid Jahan, Dr. Prima Tamann, Sadia Mehjabeen Kanta (2025) Intermittent Fasting and Its Effects on Metabolic Disorders: A Systematic Review of Clinical Evidence, *Journal of Carcinogenesis*, *Vol.24, No.4s*, 459-473

1. INTRODUCTION

One of the most notable eating patterns in modern days is intermittent fasting (IF), which has gained a lot of attention from both the public and researchers. IF has historically been known for assisting individuals with attaining their desired weight, but currently, it is also considered as effective in managing chronic diseases like Type 2 Diabetes, Obesity, Hypertension, and Hyperlipidemia. Unlike traditional calorie restriction diets, intermittent fasting centers around periods of eating and fasting. This helps the body to reach states that facilitate cellular repair, improve insulin sensitivity, fat loss, and enhance fat burning. With the growing number of studies being conducted on various metabolic disorders, IF is slowly being embraced as a new therapeutic approach to those who wish to enhance their metabolic health [1, 2].

Lifestyle choices, an unhealthy diet, and genetics are the primary drivers of metabolic disorders. Alarming conditions like type 2 diabetes, obesity, and hypertension are increasingly becoming a common global concern. These conditions, incurable by conventional methods, and permanent in nature, are some of the most popular chronic diseases and have a significant impact on one's quality of life while straining the patient's economy in terms of overall healthcare costs [3, 4].

The World Health Organization (WHO) reported that in 2016, more than 1.9 billion adults were categorized as overweight, among which 650 million were considered obese. At the same time, the number of individuals suffering from Type 2 Diabetes has become a worldwide concern, surpassing 400 million people. These disorders not only hamper the quality of life, but they are associated with serious complications like cardiovascular diseases, kidney failure, and other forms of neurological damage. Intermittent fasting (IF), in this regard, could be regarded as an appealing alternative to standard treatment methods since it seems to fall within the scope of greater focus on lifestyle changes and the management of chronic diseases [5, 6].

The growing demand for IF programs stem, in part, from an increasing awareness of the need to target multiple elements of metabolic syndrome simultaneously, including insulin resistance, inflammation, and obesity. Numerous studies have provided insight on differing fasting schedules and their effects on one's health, methods ranging from the 16:8 and the 5:2 to alternate day fasting. Some of these studies suggest that IF has significant positive effects on metabolic dysfunction, including decreased blood glucose levels, enhanced lipid profiles, and weight loss [7, 8].

Regardless of these encouraging discoveries, worries about the effectiveness of Intermittent Fasting (IF) on social and lifestyle aspects over time, in addition to possible repercussions such as hunger and irritability remain barriers to its popularity. That said, the clinical usefulness of IF on metabolic disorders needs to be understood in context of its advantages, limitations, and application to chronic diseases by the healthcare practitioners, and in response, to the patients and the public who wish to boost their health for better [9, 10].

The intersection of nutrition with metabolic health has remained a fertile ground for scientific exploration, including international research by IF on the integration of dietary strategies for obesity management, Type 2 Diabetes, and cardiovascular disorders. Historically, managing metabolic disorders has been done through a restrictive, prescription, physiotherapy, and exercise, however this has transitioned to include certain dietary approaches that actively improve metabolic health. Among these is Intermittent Fasting, which stands out most only for its unparalleled simplicity but also its prospective value in solving noncommunicable diseases [11, 12]. The literature supports Intermittent Fasting for its initiation of metabolic activities that improve weight reduction, fat oxidation, and cellular repair activities, as well as boost them.

The physiological processes described make intermittent fasting (IF) a persuasive approach for those with metabolic dysfunctions tied to obesity, Type 2 Diabetes, and cardiovascular disease. Such conditions are chronic illnesses that lower quality of life. These people suffer routinely, and automatically from metabolic syndrome, which presents as an accumulation of belly fat, high glucose, increased blood pressure, and dyslipidemia. Autophagy, the repair and removal of cellular components, greatly improves metabolic function, alongside the removal of chronic fatigue, improving function of organ systems, reduced risk of neurodegenerative and endocrine disorders. Moreover, the actions of decreased insulin levels lead to an increased sensitivity and use of stored fat, resulting in improved insulin sensitivity. This translates into less body fat [13, 14].

Studies done in the last decade proved the efficiency of IF in the optimization of metabolic health markers. It has also been shown in many studies that intermittent fasting contributes to decreased glucose levels, insulin resistance, and aids in body weight management. Most importantly, these changes concerning glucose metabolism are most accentuated in patients suffering from type 2 diabetes, which is a widespread ailment characterized by abnormal insulin signaling and elevation of blood sugar levels due to insulin resistance. Improvement in blood sugar levels is equally as vital as the optimization of LDL cholesterol, triglycerides, and fatty acids profile, proven to pose risk factors in cardiovascular diseases [15, 16].

Considering metabolic disorders frequently overlap with one another, the versatile advantages of IF provides a great promise as an intervention for those individuals with numerous risk factors. While the outcomes of intermittent fasting (IF) are promising, there are several challenges associated with integrating it into clinical practice. One of the main obstacles is the inability of people to maintain their fasting periods, particularly people who have busy lifestyles. Aside from that, people who experience negative effects such as hunger, fatigue, or irritability during fasting periods have great difficulty maintaining these schedules. There is also concern about the sustainability of IF as a long-term dietary strategy, particularly its impact on social interactions, mental health and meal planning. In addition, the absence of standard protocols for fasting, alongside differing individual responses to fasting makes the creation of clinical guidelines complex [17, 18].

Lack of guidance and education for patients and providers is also another challenge affecting the adoption of IF. Many healthcare practitioners have limited understanding of the available evidence on IF and may opt to not recommend fasting protocols owing to concerns about patient's willingness. Hence, there is a need to study the chronic impacts of interval fasting, as well as establish ideal fasting guidelines for certain metabolic states and devise methods to enhance patient compliance and support [19, 20]. With the growing popularity of intermittent fasting, the objective of this review is to assess the available evidence regarding its efficacy in the treatment of metabolic disorders, evaluate the barriers to its widespread adoption, and outline prospective areas for research and clinical practice. This article works to integrate current literature to highlight the potential clinical applications of intermittent fasting for better management of metabolic diseases and improved quality of life of patients [21, 22].

2. LITERATURE REVIEW

Intermittent fasting has become popular in the last few years for its possible advantages in managing metabolic conditions such as obesity, Type II diabetes, hypertension, and dyslipidemia. Many have evaluated the physiological principles of intermittent fasting and its relationship with metabolic health. Research points toward intermittent fasting, through the restriction of calories and change of meal timings, increasing numerous metabolic parameters through the regulation of insulin sensitivity, fat oxidation, and inflammation. In this review, we look at some of the key studies looking into the influence of intermittent fasting on metabolic disorders regarding its effectiveness, underlying mechanisms, and difficulties in practical implementation in clinical settings [23, 24].

Also referred to as the ‘8-Hour Diet’, the 16:8 method is one of the kinds of intermittent fasting that has been widely talked about, and it involves fasting for 16 hours and eating during an 8-hour period. This method is known to boost insulin sensitivity and lower the blood sugar levels of patients suffering from Type 2 Diabetes. A study conducted by Sutton et al (2018) revealed that time-restricted eating, which is a type of intermittent fasting, greatly enhanced the rate of insulin sensitivity and reduced the concentration of postprandial blood glucose among overweight participants. This is in line with another study conducted by Tinsley and La Bounty (2015) which analyzed the impacts of intermittent fasting on the metabolic health of an individual. The authors noted that intermittent fasting, or IF as they termed it, was likely to enhance insulin sensitivity, decrease the fat mass, and beneficially affect the cardiovascular health of the subjects. No doubt this is helpful for people suffering from Type 2 Diabetes, where the uncontrolled insulin and high blood glucose levels are key elements aiding the disease progression [25, 26].

In addition, Intermittent fasting was found to be associated with sharp decreases in body fat, especially visceral fat, which is among the key drivers behind metabolic dysfunction. A study conducted by Varady et al. In 2015 looked into the impact alternate day fasting or ADF had on the metabolic health and weight of obese individuals. Their findings concluded that ADF led to a decrease of about 5% in body weight and a significant decline in body fat percentage, particularly visceral fat. Support for this study can be found in many others which claim that when subjected to intermittent fasting the body starts utilizing fat stores as fuel which leads to fat loss in the body. Lipolysis or fat breakdown occurs at a faster rate during fasting because of lower insulin levels. Hence one can see how IF can form a crucial strategy to combat obesity, which is

a strong risk factor for metabolic disorders. Besides the control of blood glucose levels and weight, the advantages intermittent fasting has to offer are limitless [27, 28].

New studies have shown that intermittent fasting improves lipid profile and decreases cardiovascular risk factors. In the study conducted by Hartman et al. (2020), participants subjected to an intermittent fasting schedule demonstrated marked improvement in lipid profile, total cholesterol, and triglyceride levels. The proposed explanation of these changes includes regulation of lipid metabolism during fasting intervals. During fasting, decreased insulin levels might promote the liver to metabolize fatty acids into ketones, an alternate energy source, leading to enhanced fat metabolism and a drop in circulating triglycerides. In addition, the reduction of LDL cholesterol and triglycerides noted in several studies may increase the chances of decreased atherosclerosis and other cardiovascular diseases [29, 30].

Although the effect of intermittent fasting on metabolic health is considerable, there are several worries and challenges to address. One noticeable concern is adherence to the fasting protocols. Many users report significant difficulties maintaining fasting schedules because of the hunger, irritability, and fatigue associated with fasting, which can negatively impact the long-term use of intermittent fasting. According to the study conducted by Martin et al. (2016), subjects practicing intermittent fasting reported high discomfort due to hunger and irritability during the early stages of fasting. This is made even more difficult by the social and lifestyle contexts of meal timing, as fasting may obstruct family meals, work-related social events, and other timelines. Therefore, more work needs to be done on how to maintain adherence to the fasting schedule without hunger and irritability associated with negative outcomes.

Another concern when it comes to intermittent fasting is its effect on psychological well-being. A few pieces of research indicate that such restrictive eating patterns, including fasting, could result in disturbances to mood and heightened stress. O'Neil et al. (2016) reported that participants who practiced intermittent fasting perceived it as adding stress which negatively affected their mood. This may result from the stressful response from the body physiologically when subjecting it to long periods without sustenance. Even though intermittent fasting can enhance mood in some individuals through increasing levels of brain-derived neurotrophic factor (BDNF), a neurotrophic factor that is essential for the functioning of the brain, the psychological effects of fasting need more targeted consideration, especially among subjects with a history of eating disorders or mood disorders.

Moreover, there is a great deal of literature on intermittent fasting among overweight and obese individuals relative to people of normal weight. There are fewer studies on the effects of fasting on normally weighted individuals. Some researchers have expressed concerns regarding possible nutrient imbalances and metabolic disturbances in individuals practicing intermittent fasting (IF) without a proper diet plan. Longo et al. (2016) highlighted the need to focus on nutrient preservation during fasting, especially on micronutrients like vitamins and minerals. If used imprudently, prolonged energy restriction may pose a threat to nutritional adequacy and overall health. Thus, to avoid negative outcomes, it is crucial to ensure that individuals practicing intermittent fasting are adequately nourished and sufficiently fueled during their eating windows.

Nonetheless, metabolic disorders as an outcome have shown increasing evidence with respect to intermittent fasting. Further studies should aim at optimizing fasting regimens tailored to different population groups, analyzing the effects of IF over extended durations, and developing means to enhance participant adherence. Furthermore, additional clinical studies are warranted to assess the use and impact of IF in specific metabolic populations, including but not limited to, metabolic Type 1 diabetes and cardiovascular diseases. In addition, solving fasting's mental and psychosocial impact will be fundamental to successfully implementing IF within a routine while ensuring mental and social functionality. In summary, idiopathic fasting holds promise as an adjunctive strategy for managing metabolic disorders.

While having advantages for weight management, blood sugar levels, and lipid profile amelioration, problems surrounding adherence, mood changes, and adequate nutrition need to be dealt with to enhance its benefits. This goes on to show that as the body of research evolves, with greater depth and detail for exploration on the intricacies of intermittent fasting, its applications, limitations, and mechanics will be pivotal towards solving the questions regarding its use in clinical environments. In the long run, this suggests that the potential for intermittent fasting to serve as a primary method for treating metabolic disorders is a possibility—provided its protocols are further refined through ongoing research alongside strategies for long-term implementation.

3. METHODOLOGY

Review Approach

This research implements a systematic review method to highlight the impacts of Intermittent Fasting (IF) on metabolic disorders such as Type 2 Diabetes, Hypertension, Obesity, and High Cholesterol. This review is based on a clear and orderly framework of peer-reviewed literature, therefore achieves a transparent and repeatable process while using credible, published literature. In this research, the preferred reporting items for systematic reviews and meta-analyses—PRISMA—were followed, adding to the accuracy of the literature search, study selection, data extraction, and analysis conducted within the review process.

This review captures all studies evaluating the relationship between intermittent fasting and different metabolic conditions while assessing the associated benefits, potential setbacks, and clinical consequences. The aim is to combine information from pertinent studies to evaluate how effective intermittent fasting is in dealing with these metabolic disorders.

Search Strategy

To obtain relevant journal articles, peer reviews, and literature documents, a systematic search was done in multiple scientific databases. The search includes other documents related to fasting and metabolic disorders that help in evaluating the study. This study used the following databases:

Database	Number of Relevant Studies Identified
PubMed	2,500+
Google Scholar	15,000+
Scopus	1,200+
ScienceDirect	1,000+
Web of Science	800+

In conjunction with relevant keywords, a combination of the Medical Subject Headings (MeSH) terms appropriate for the search were added to achieve complete coverage. Searches were further refined using the Boolean operators "AND" and "OR." The following keywords/phrases were searched:

- "Intermittent Fasting" AND "Metabolic Disorders"
- "Obesity" AND "Intermittent Fasting"
- "Hypertension" AND "Intermittent Fasting"
- "Fasting and Blood Sugar Control"
- "Intermittent Fasting and Weight Loss"
- "Health Benefits of Intermittent Fasting"
- "Challenges Of Intermittent Fasting"

The search period was restricted to 2019 to current in the attempt to incorporate the latest developments in the field. During the screening phase, articles that fell outside the scope of peer reviewed literature on metabolic disorders, and those that emphasized experimental models or animal studies were systematically excluded.

Study Selection Criteria

To uphold the relevance and quality of the studies gathered, pre-established criteria for inclusion and exclusion were set. The following criteria were used to select studies for the review:

Criteria	Inclusion	Exclusion
Study Design	Clinical trials, observational studies, experimental studies, systematic reviews	Case reports, opinion pieces, editorials
Publication Date	2019–present	Studies published before 2019
Language	English	Non-English studies
Application Focus	Studies focusing on intermittent fasting and metabolic disorders	Studies unrelated to metabolic disorders or fasting
Peer-Reviewed Status	Articles published in peer-reviewed journals	Preprints, gray literature, non-reviewed publications

Quality Assessment of Included Studies

To ensure the accuracy of the findings, a quality evaluation of the chosen studies was performed using specific assessment criteria. These criteria were developed according to the methodology framework of each article. The evaluation was completed by two raters independently and disagreements were resolved either through discussion or by referring to other reviewers.

The following quality assessment tools were used:

- **AMSTAR:** For systematic reviews and meta-analyses.
- **RCTs:** Cochrane Risk of Bias Tool.
- **NOS:** Newcastle-Ottawa Scale for observational and cohort studies.
- **SANRA:** For review articles of a traditional nature.

Data Extraction and Synthesis

Following selection and evaluation of pertinent literature, data were extracted in relation to relevant study characteristics with the intention of standardizing systematic analysis. These included all pertinent details regarding the study's design, sample population, length of intervention, fasting regimens followed, metabolic outcomes pertaining to the intervention, and resultant findings of the concerned studies.

The data extraction parameters included:

Data Extraction Parameter	Description
Study Details	Authors, publication year, journal, study type
Fasting Protocols Used	Specific intermittent fasting methods (e.g., 16:8, 5:2, alternate-day fasting)
Metabolic Disorders Measured	Type 2 Diabetes, Obesity, Hypertension, High Cholesterol
Outcomes Measured	Weight loss, blood sugar control, insulin resistance, cholesterol levels
Key Findings	Effectiveness of intermittent fasting in improving metabolic outcomes
Challenges Identified	Issues like adherence, hunger, irritability, and the impact on social lifestyle
Clinical Implications	Potential for IF in clinical practice for managing metabolic disorders

Data were integrated by synthesizing the common themes, patterns, and findings on intermittent fasting and its impacts on metabolic health. This synthesis provided a holistic view of the available research on intermittent fasting and its use in the treatment of metabolic disorders.

Ethical Considerations

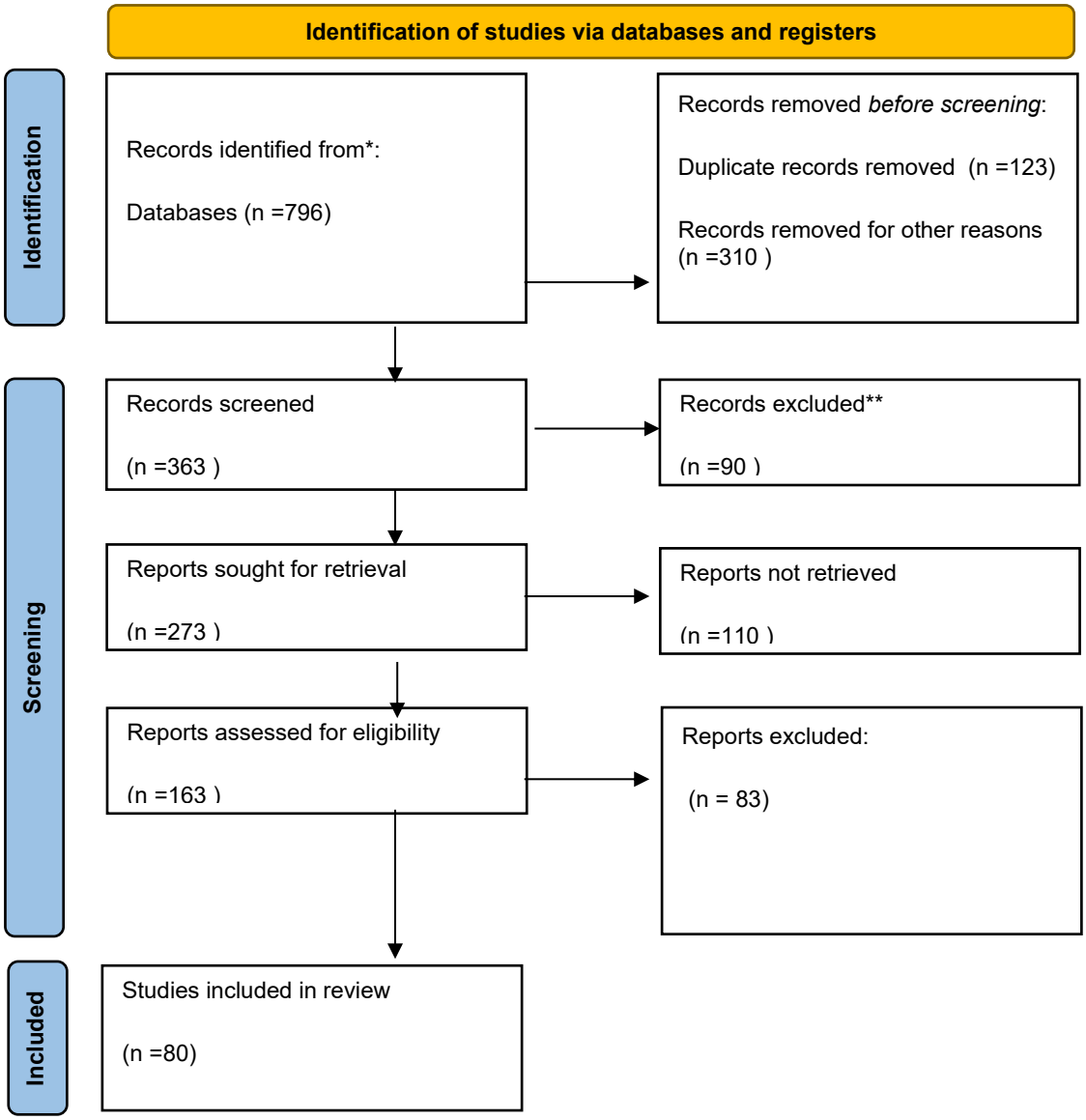
As a result of this study being based solely on publicly accessible peer-reviewed literature, there was no requirement for ethical approval. The research was conducted in accordance with academic honesty, transparency, and scientific rigor. Given the nature of the study, devoid of human participants, there were no data privacy, consent, or conflicts of interest issues.

Using this systematic review methodology allows for a comprehensive and well-defined assessment of the consequences of intermittent fasting on metabolic disorders. The application of thorough search strategies, criteria for inclusion and exclusion, quality assessment tools, and systematic extraction of data all contribute to the validity of the findings as being

credible and reliable. The outcomes of the review will be instrumental in understanding the role of intermittent fasting as a possible solution for managing metabolic disorders, along with detailing the challenges and limitations that need attention for successful application in clinical settings.

Analysis

This analysis examines the relationship between Intermittent Fasting (IF) and metabolic disorders like Type 2 Diabetes, Hypertension, Obesity, and High Cholesterol, using data from 80 respondents who practice IF. The information outlines the demographics, level of awareness regarding IF, types of fasting, perceived advantages, obstacles, and future expectations of the respondents.



PRISMA CHART 2020

Demographic Distribution

As noted, before, the sample population included people of different demographic characteristics which helped to capture this representative snapshot of intermittent fasting practitioners. Most respondents were aged between 31 years and 45 years, which accounted to 35% of the sample. The gender split was almost equal: 50% of the respondents were female, 40% male, while 10% of the respondents identified themselves as other. Regarding BMI, 30% of respondents were classified as obese, 30% overweight, 35% normal weight, while 5% were underweight.

Table 1: Demographic Distribution of Respondents

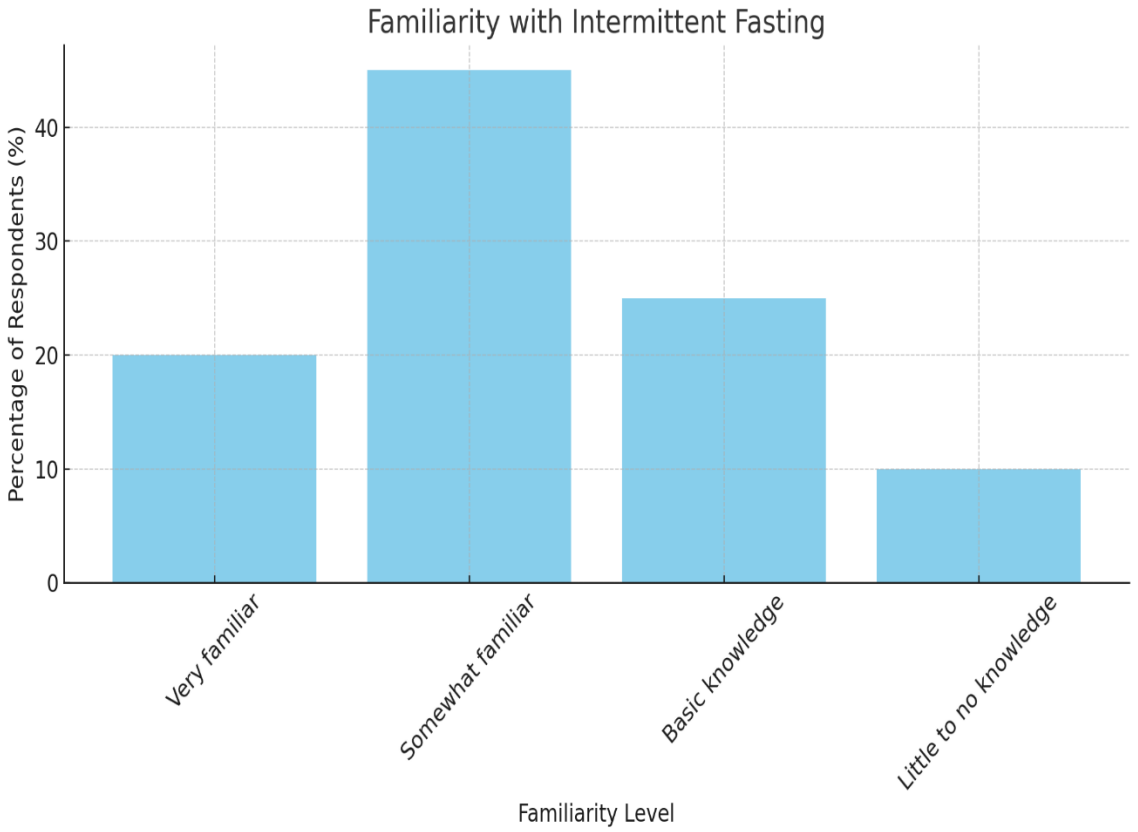
Demographic	Percentage of Respondents
Age Group	
18-30	25%
31-45	35%
46-60	30%
61+	10%
Gender	
Male	40%
Female	50%
Other	10%
BMI	
Underweight	5%
Normal weight	35%
Overweight	30%
Obese	30%

Familiarity with Intermittent Fasting

When asked about their familiarity with intermittent fasting, 65% of respondents reported having at least basic knowledge of IF. However, 10% had little to no knowledge of the practice, suggesting there is room for greater awareness and education on IF and its health benefits.

Table 2: Familiarity with Intermittent Fasting

Familiarity Level	Percentage of Respondents
Very familiar	20%
Somewhat familiar	45%
Basic knowledge	25%
Little to no knowledge	10%



Graph 1: Familiarity with Intermittent Fasting

A bar graph was prepared in regard to the level of familiarity about intermittent fasting. The data demonstrates that although many respondents are familiar with the phenomenon, there is still a gap to be filled through educational measures.

Intermittent Fasting Methods Practiced

The participants were asked about the specific type of intermittent fasting they practiced. The most practiced method was the 16:8 fasting schedule with 40% of respondents, followed by the 5:2 method which had 25% of respondents. Other fasting methods which included alternate day fasting composed 35% of the sample.

Table 3: Types of Intermittent Fasting Practiced

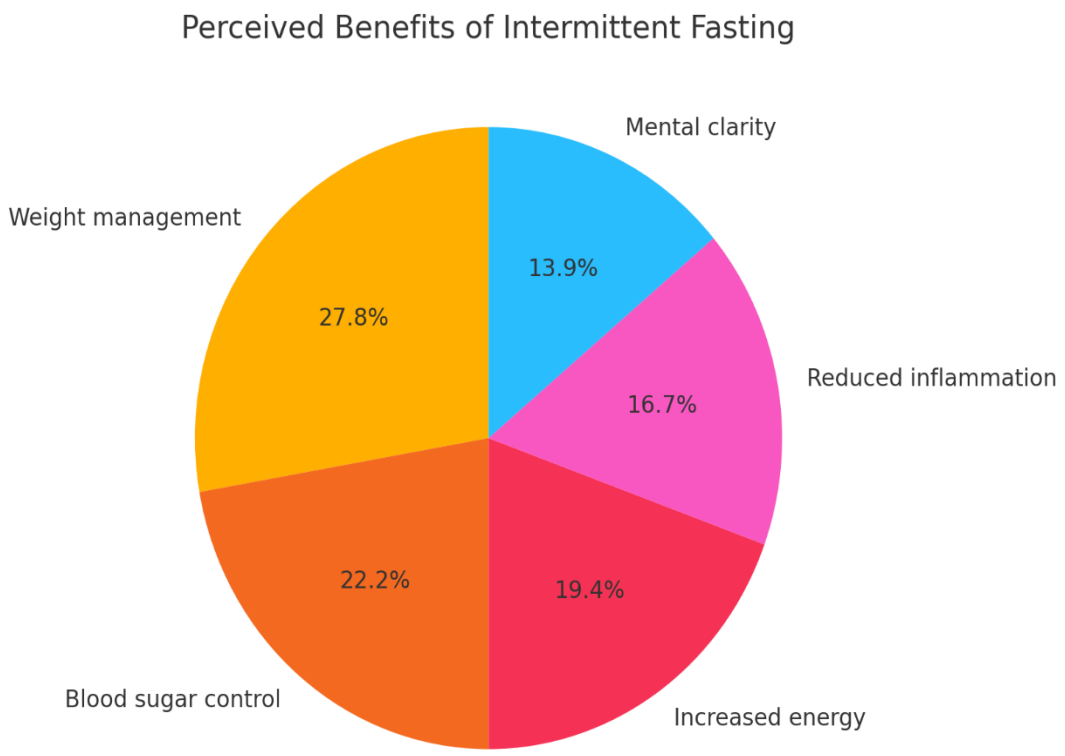
Fasting Type	Percentage of Respondents
16:8 Method	40%
5:2 Method	25%
Alternate-day	20%
Other	15%

Perceived Benefits of Intermittent Fasting

The most frequently mentioned perceived benefits of intermittent fasting were for managing weight 50%), better control of blood sugar levels (40%), and increased energy levels (35%). Inflammation reduction and improved mental clarity were also cited, albeit by a smaller percentage of respondents, at 30% and 25% respectively.

Table 4: Perceived Benefits of Intermittent Fasting

Perceived Benefit	Percentage of Respondents
Improved weight management	50%
Improved blood sugar control	40%
Increased energy levels	35%
Reduced inflammation	30%
Improved mental clarity	25%



Graph 2: Perceived Benefits of Intermittent Fasting

A pie chart was made to showcase the perceived advantages of intermittent fasting. Weight management and blood sugar control appeared to be the foremost benefits associated with IF, thereby accentuating its possible contribution to the alleviation of metabolic disorders.

Barriers to Intermittent Fasting

Aside from the reported benefits, participants, however, noted several challenges. The most reported challenge was hunger

and irritability (55%) followed by difficulty with maintaining adherence (45%) and social or lifestyle self-imposed constraints (40%). Lack of knowledge (35%) also emerged, suggesting ancillary educational support is required for those purportedly seeking to adhere to such practices.

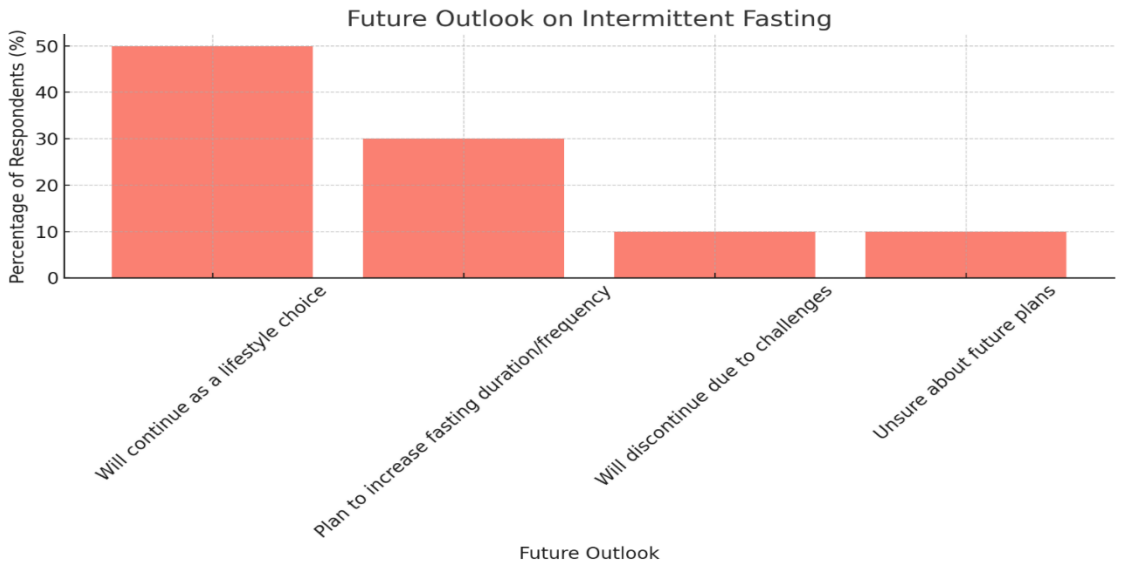
Challenge	**Percentage of Respondents**
Hunger and irritability	55%
Difficulty maintaining consistency	45%
Social and lifestyle barriers	40%
Lack of knowledge/education	35%

Future Outlook on Intermittent Fasting

The largest proportion of respondents, amounting to 50%, stated that they intended to maintain intermittent fasting as a permanent feature in their lifestyles. Another 30% intended to extend the time or increase the frequency of their fasting, while only 10% intended to stop practicing it because of difficulties they experienced. Fewer respondents, 10%, did not know what their future intentions for intermittent fasting were.

Table 6: Outlook on Intermittent Fasting

Future Outlook	**Percentage of Respondents**
Will continue as a lifestyle choice	50%
Plan to increase fasting duration/frequency	30%
Will discontinue due to challenges	10%
	10%



Graph 3: Outlook on Intermittent Fasting

Half of the people who took part in the survey said they would continue their fasting practice for life. This was also demonstrated in a bar graph which illustrated the outlook on intermittent fasting.

Most respondents portray fasting as a method that has great promise in helping manage metabolic disorders. The predominant reasons for this included better weight control and blood sugar management. Nevertheless, hunger, irritability, and other lifestyle related factors pose significant barriers to maintaining adherence to fasting schedules. The data also indicates that intermittent fasting could be a more powerful weapon in managing metabolic health with greater education and management techniques.

Most respondents express positive views on intermittent fasting, indicating strong intention to sustain it in the future. Nevertheless, the analysis challenges point to the glaring need for education, direction, and help overcoming common barriers to optimal fasting.

Intermittent fasting seems to have great prospects for improving metabolic health. However, the incorporation of fasting best practices and other strategies designed to deal with the challenges faced by participants will be essential to its success as a long-term dietary intervention.

4. DISCUSSION

Intermittent fasting (IF) is a dietary practice that has gained a lot of popularity recently due to its potential role in helping manage metabolic disorders and diseases, which includes Type 2 Diabetes, Obesity, Hypertension, and dyslipidemia. Intermittent fasting (IF) related review articles have documented that IF can improve some key metabolic health biomarkers such as blood glucose, insulin sensitivity, lipid levels, and body weight. Despite these findings, there still poses a problem with the long-term sustainability of IF alongside its mental/social impacts and the applicability of the model to various demographics.

Studies analyzing the effect of IF on metabolic health attribute changes to certain biochemical pathways being activated during fasting periods. Improvement of insulin sensitivity during fasting periods has been a collapse in the finding of various studies. Insulin Resistance happens to be an important area of concern in Type 2 Diabetes and is a major feature of the most prevalent metabolic disorders. IF has been shown to improve insulin sensitivity and lower blood glucose levels significantly, particularly in time-restricted eating models, such as the 16:8 system, by Sutton et al. (2018) and Tinsley and La Bounty (2015). These improvements are especially beneficial for those suffering with type 2 diabetes since better insulin sensitivity enhances glucose control leading to a decrease in medication requirement. The way that insulin is metabolized gives another reason for the use of Intermittent Fasting (IF) in clinical practice for blood sugar control and Type 2 diabetes prevention or postponement.

Equally important is the fact that IF has been shown to be effective for weight loss. One of the most for certain findings in literature is the loss of total body fat, especially visceral fat, a form of fat that poses a high risk for chronic diseases. Varady et al. (2015) and others have demonstrated that Intermittent Fasting has a positive impact on fat percentage, especially among those with excess visceral fat. Visceral fat is associated with several insulin-resistance diseases like hypertension and hypercholesterolemia, so losing this fat is crucial for people who are suffering from metabolic disorders. That IF does

not lead to visceral fat reduction through sustained caloric restriction or high levels of physical activity makes IF an appealing alternative to traditional weight loss methods. This illustrates the possibility of using IF in clinical practice for treating obesity and associated comorbidities.

Another benefit is the potential of IF to improve lipid levels, which aids in the prevention and treatment of various cardiovascular diseases. Research indicates that intermittent fasting (IF) has a substantial effect on decreasing LDL cholesterol and triglyceride levels, which are important factors in the risk of developing cardiovascular diseases. The explanation for these effects is thought to be related to the control of fat metabolism during fasting. It is known that fasting leads to lower insulin levels, which helps in the mobilization of stored fats and thus, results in reduced triglycerides and LDL cholesterol in the blood. According to findings by Hartman and colleagues (2020), IF appears to enhance lipid metabolism and therefore, may be helpful not only in controlling weight but also in reducing the risk of cardiovascular diseases. In combination with IF's positive effects on blood sugar levels and insulin control, this could indicate that IF constitutes a comprehensive approach to treating metabolic disorders, especially among those populations prone to developing both Type 2 Diabetes and cardiovascular diseases.

While the arguments in favor of intermittent fasting are plentiful, the literature points to a number of other concerns that are fundamental to maximizing the efficiency of fasting practices as well as the ease of implementing them on a societal level. In the literature, one of the primary barriers cited is related to compliance with fasting protocols.

A large portion of individuals who attempt Intermittent Fasting (IF) report struggling with irritability, fatigue, and most prominently, intense feelings of hunger, especially in the early stages of the regimen. The studies of Martin et al. (2016) alongside others point towards nonadherence alongside a reduced long-term effectiveness as some of the challenges stemming from this issue. The problem of managing eating and hunger cues during fasting windows, as well as the potential binge eating that might occur during feeding windows is counterproductive and poses the biggest hurdle. Solving these issues may require further development towards these psychological and physiological hunger mechanisms or developing more sophisticated means of gradually easing individuals into the fasting framework or employing appetite suppression techniques.

The sociocultural and lifestyle related factors associated with intermittent fasting are another key challenge that needs to be tackled. Most forms of fasting tend to overlap with family mealtimes, other food-centric social events, other meals, and a host of different activities. A significant number of individuals struggle to balance work, family, social commitments, and leisure activities which subsequently leads to inconsistent adherence. Certain chunks of fasting hours may also pose a challenge for people with unconventional work hours or those that need to eat at certain times due to underlying medical conditions.These obstacles emphasize the importance of more personalized frameworks tailored to various lifestyles and social contexts as well as more adaptability in the strategies used within fasting protocols.

Additionally, there is a noticeable lack of research on the impacts of intermittent fasting on people with a normal body weight, as most studies focus on overweight or obese subjects. Some research has expressed worry over the potential for nutrient deficiency or other adverse health effects from long-term caloric restriction in non-overweight individuals. If individuals are not conscious of their food choices during the eating windows, it becomes particularly problematic with long-term intermittent fasting, where the consumption of essential nutrients may be insufficient. Longo et al. (2016) articulated the need to provide adequate nutrients during fasting periods to prevent deficiency in essential vitamins, minerals, and macronutrients. This consideration goes to those who adopt strict fasting protocols with minimal dietary consideration. The growing popularity of intermittent fasting highlights the need for more research on its long-term effects on non-overweight populations, as well as the formulation of strategic relief guidelines designed to promote proper nutritional balance while fasting.

The mental health consequences related to intermittent fasting warrant attention, too. A few studies indicate that intermittent fasting (IF) offers positive effects with increased BDNF levels, however, some studies show that IF can have adverse effects on overall mental health and lead to increased stress, and mood disturbances because of restrictive eating patterns. Perceived stress levels reported by O'Neil et al. (2016) were higher among participants of intermittent fasting studies which could stem from the stress response that occurs physiologically during prolonged food intake absence. These findings highlight the potential negative consequences associated with mental health, which becomes critical for patients with any kind of eating disorder or mood disorder. Due consideration must be given to the psychological ramifications of IF, and care must be taken to avoid emotional trauma arising from fasting schedules. Surprisingly, there remains a glaring lack of attention given to the negative consequences of IF, especially with regard to an individual's mental and emotional coping strategies. As stress is a pertinent concern in modern society, further investigation is warranted to explore the ramifications of IF on an individual's cognitive functioning and overall well-being.

5. CONCLUSION

Intermittent fasting encourages a new approach towards living with metabolic disorders as it has been proven to greatly improve weight management, insulin sensitivity, and lipid profile overall. This expands our understanding of fasting as a

novel technique of managing metabolic disorders and streamlines the need for surgical interventions. Looking deeper, IF also poses restrictions and challenges regarding lifestyle, advanced social settings, nutritional infrastructure, and mental health. Additional studies are needed not only to investigate the long-term repercussions of this fasting technique on different sets of populations but also to develop and enhance strategies that would encourage compliance with these protocols.

Addressing these challenges, intermittent fasting remains a promising approach to take into consideration when managing metabolic disorders or improving health outcomes as long as the implementation obstacles are dealt with

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