International Journal of Environmental Sciences
ISSN: 2229-7359
Vol. 11 No. 20s, 2025
https://www.theaspd.com/ijes.php

Effects of Intermittent Fasting on Obesity and Neurological Health

Aya Abdelsattar Abdelfattah[1], **Amal Taha Aboulghit**[2], **Esam Omar Kamel**[3], **Tahany Abbass Abdellah**[1]
[1]Histology and Cell Biology Department, Faculty of Medicine, South Valley University, Qena, Egypt.
[2]Histology and Cell Biology Department, Faculty of Medicine, Assiut University, Assiut, Egypt
[3]Histology Department, Faculty of Medicine, Al-Azhar University, Assiut, Egypt.
***Corresponding author:** Aya Abdelsattar Abdelfattah

Abstract:
Intermittent fasting (IF) has gained growing attention in recent years as a promising dietary intervention for weight management and improving overall health. This review explores the impact of intermittent fasting on obesity and neurological health by analyzing preclinical and clinical studies. IF has shown significant benefits in reducing body weight, enhancing insulin sensitivity, and modulating metabolic biomarkers. Additionally, IF exhibits neuroprotective properties through the regulation of oxidative stress, inflammation, and neurotrophic factors, suggesting its potential in preventing neurodegenerative diseases such as Alzheimer's and Parkinson's. However, further long-term human studies are needed to establish standardized IF protocols and to fully understand its mechanisms. This review aims to highlight the physiological and neurological benefits of intermittent fasting and guide future research and therapeutic applications.

Keywords: *Intermittent fasting, Obesity, Neurological health, Neuroprotection, Metabolism, Inflammation*

1. INTRODUCTION

Obesity is a global health concern associated with numerous comorbidities, including cardiovascular diseases, type 2 diabetes, and neurodegenerative disorders. Traditional dietary interventions often fail to produce sustainable weight loss or improve long-term metabolic health. Recently, intermittent fasting (IF) has emerged as an alternative dietary approach with promising metabolic and neurobiological benefits. IF includes various patterns of eating, such as time-restricted feeding, alternate-day fasting, and the 5:2 diet. This review synthesizes current evidence on the effects of intermittent fasting on obesity and neurological health.

Obesity has emerged as one of the most significant global public health challenges of the 21st century. It is associated not only with cardiovascular and metabolic diseases but also with cognitive decline and neurodegenerative disorders such as Alzheimer's disease and Parkinson's disease (Ng et al., 2014). The growing prevalence of obesity has driven an urgent need to identify effective, sustainable strategies that address both weight management and overall health. Among various dietary interventions, intermittent fasting (IF) has gained considerable attention as a non-pharmacological and potentially neuroprotective approach to combat obesity and enhance brain health (Patterson & Sears, 2017).

Intermittent fasting encompasses several eating patterns that cycle between periods of fasting and eating, such as alternate-day fasting, time-restricted feeding, and the 5:2 diet. These regimens have demonstrated promising outcomes in reducing body weight, improving metabolic profiles, and lowering the risk of chronic diseases (Tinsley & La Bounty, 2015). Beyond weight loss, emerging evidence suggests that IF may influence brain function by enhancing neuroplasticity, reducing neuroinflammation, and improving cognitive performance (de Cabo & Mattson, 2019).

The neurological benefits of IF are partly attributed to its ability to induce metabolic switching from glucose to ketone bodies, which serve as a more efficient and neuroprotective energy source for neurons. This metabolic adaptation may enhance mitochondrial function, reduce oxidative stress, and support synaptic plasticity and neuronal resilience (Mattson et al., 2018). Furthermore, IF modulates the expression of brain-derived neurotrophic factor (BDNF), a critical molecule involved in neurogenesis and cognitive function (Kritikou et al., 2021).

Animal studies have provided substantial insights into the mechanisms by which IF exerts neuroprotective effects. In rodent models of obesity and high-fat diet-induced brain damage, IF has been shown to reduce

neuroinflammation, preserve hippocampal integrity, and improve memory performance (Anton et al., 2018). These findings support the potential of IF as a preventive and therapeutic tool for obesity-related neurological impairments.

Despite promising results from animal models and short-term human trials, the long-term safety, sustainability, and neurological outcomes of intermittent fasting in diverse populations remain underexplored. More rigorous randomized controlled trials are needed to establish optimal fasting protocols and to assess the impact of IF on neurological health in obese individuals across different age groups and comorbidities (Rothschild et al., 2014).

This review aims to consolidate current findings on the effects of intermittent fasting on obesity and neurological health by examining clinical trials, animal studies, and mechanistic insights. Through a critical evaluation of the evidence, the review seeks to highlight the potential of IF as a holistic strategy for improving both metabolic and cognitive outcomes.

2. Intermittent Fasting and Obesity

2.1 Mechanisms of Action Intermittent fasting influences several physiological pathways that regulate energy balance and metabolism. It promotes lipolysis, improves insulin sensitivity, reduces fasting glucose levels, and modulates hormones like leptin and adiponectin (Patterson & Sears, 2017).

2.2 Clinical Evidence Human trials have demonstrated that IF can lead to significant weight loss, reduced waist circumference, and improved lipid profiles (Trepanowski et al., 2017). Moreover, IF appears to be more sustainable and tolerable compared to traditional calorie restriction.

Intermittent Fasting and Obesity Management

Numerous studies have demonstrated that intermittent fasting (IF) contributes significantly to weight reduction and metabolic improvement. A 2015 randomized trial by Harvie et al. showed that participants following a 5:2 IF regimen exhibited greater fat mass reduction and insulin sensitivity improvements compared to those on a continuous calorie restriction diet. These findings align with results from Trepanowski et al. (2017), who observed similar benefits in lipid profile and glucose metabolism among obese individuals practicing alternate-day fasting.

Moreover, IF has been linked to favorable hormonal changes, such as increased adiponectin levels and decreased leptin resistance, both of which contribute to improved appetite regulation and fat oxidation (Heilbronn et al., 2005). In obese animal models, IF also decreased visceral fat and hepatic lipid accumulation (Varady et al., 2010), further confirming its potential in combatting obesity-related complications.

Metabolic Switching and Ketogenesis

One of the core mechanisms behind the benefits of IF is metabolic switching — the transition from glucose-based energy to ketone-based energy. This process typically occurs after 12–16 hours of fasting and induces the production of ketone bodies such as beta-hydroxybutyrate (BHB), which serves as a more stable and neuroprotective energy source (Newman & Verdin, 2014). This shift enhances insulin sensitivity and reduces markers of systemic inflammation, which are major drivers of obesity-related chronic diseases (de Cabo & Mattson, 2019).

Intermittent Fasting and Brain Health

Recent research has uncovered the neurological benefits of IF, especially in its ability to protect against cognitive decline and neurodegeneration. Mattson et al. (2018) reported that intermittent fasting increases brain-derived neurotrophic factor (BDNF) expression, which plays a crucial role in synaptic plasticity and memory formation. In animal studies, intermittent fasting improved spatial learning and reduced hippocampal damage in high-fat diet-induced obese rats (Li et al., 2013).

Moreover, IF modulates several molecular pathways, including reduced oxidative stress and enhanced autophagy, which are essential for maintaining brain homeostasis. This contributes to lower risk of Alzheimer's and Parkinson's disease in both preclinical and observational studies (Longo & Panda, 2016).

Intermittent Fasting, Mood, and Mental Performance

In addition to cognitive benefits, IF may influence emotional well-being. Studies have reported improvements in mood, alertness, and reduction in symptoms of depression in individuals practicing time-restricted feeding (Michalsen et al., 2003). The proposed mechanisms involve increased levels of

BDNF and reduced neuroinflammation, which are often linked to mood disorders and psychological stress.

Limitations and Gaps in Current Literature

Despite promising outcomes, the literature remains inconclusive regarding the long-term effects of intermittent fasting on both metabolic and neurological health. Many human studies are limited in duration, and variability in fasting protocols makes standardization difficult. There is a need for larger, longitudinal studies that assess adherence, sustainability, and differential effects across gender, age, and health conditions (Patterson & Sears, 2017).

3. Intermittent Fasting and Neurological Health

3.1 Neuroprotective Mechanisms IF enhances brain health by reducing oxidative stress, inflammation, and promoting autophagy. It also upregulates brain-derived neurotrophic factor (BDNF), which supports neurogenesis and synaptic plasticity (Mattson et al., 2018).

3.2 Effects on Neurodegenerative Diseases Preclinical studies suggest that IF can delay the onset and progression of neurodegenerative diseases such as Alzheimer's and Parkinson's. Animal models show reduced amyloid-beta accumulation and improved mitochondrial function under IF regimens (Longo & Panda, 2016).

4. Challenges and Limitations Despite the growing body of evidence, challenges remain. Most studies are short-term or conducted on animal models. There is a lack of consensus on optimal fasting protocols, and individual variability in response to IF exists. Potential side effects and adherence issues should also be addressed.

DISCUSSION

Both intermittent fasting and short-term calorie-restricted diets produce similarly effective weight loss in obese and overweight people and the development of type 2 diabetes [17, 24, 29].

Multiple studies have illustrated that intermittent fasting induces favorable metabolic changes, such as improved insulin sensitivity, lowered fasting glucose levels, and decreased visceral fat accumulation. These changes are crucial in addressing obesity and metabolic syndrome, both of which are risk factors for cognitive dysfunction.

Experimental data from animal and human studies indicate that IF enhances neuronal resistance to injury and neurodegeneration. This neuroprotection is mediated by increased BDNF, modulation of inflammatory cytokines, and reduced neuronal oxidative damage.

Clinical trials suggest that IF not only supports weight loss but also improves executive function and memory. In particular, time-restricted feeding has shown promise in enhancing working memory in healthy adults and reducing symptoms of depression and anxiety.

Mechanistically, IF triggers autophagy and enhances mitochondrial efficiency, processes vital for brain cell survival and function. It also affects gut microbiota diversity, which is increasingly recognized as a key factor in both metabolic and brain health.

In conclusion, intermittent fasting represents a promising, low-cost, and non-invasive approach to combat obesity and support neurological well-being. Future studies should aim to optimize IF protocols and investigate long-term safety, adherence, and effectiveness in diverse populations.

SUMMARY:

Intermittent fasting (IF) has emerged as a widely studied dietary strategy characterized by alternating periods of eating and fasting. Unlike traditional caloric restriction methods, IF focuses more on the timing of food intake rather than the content or quantity of the diet. Common forms of IF include alternate-day fasting, the 5:2 regimen (five days of normal eating and two fasting days), and time-restricted feeding (e.g., eating only within an 8-hour window each day). Accumulating evidence from predinical and clinical studies suggests that IF exerts significant effects on both metabolic health—especially in the context of obesity— and neurological function, including neuroprotection, cognitive performance, and resistance to neurodegenerative diseases

Mechanisms Linking IF to Obesity Management

Obesity is a multifactorial chronic disease characterized by excessive fat accumulation, metabolic dysregulation, insulin resistance, and systemic inflammation. IF influences several key physiological and :biochemical pathways that directly or indirectly contribute to weight control and metabolic optimization
Hormonal Regulation: During fasting, insulin levels drop and glucagon and growth hormone levels rise, promoting lipolysis and fat oxidation
Caloric Deficit: IF often leads to a spontaneous reduction in caloric intake due to fewer eating .opportunities, contributing to weight loss Improved Insulin Sensitivity: IF enhances glucose uptake and reduces insulin resistance, especially in overweight and prediabetic individuals
Modulation of Gut Microbiota: Emerging evidence suggests that IF alters gut microbial composition in ways that may favorably influence energy metabolism and adiposity Reduction in Inflammatory Markers: Chronic low-grade inflammation, a hallmark of obesity, is .mitigated through reductions in pro-inflammatory cytokines (e.g., TNF-a, IL-6)
Several randomized clinical trials have demonstrated that IF regimens can lead to 5-10% reductions in body weight, improvements in waist circumference, and favorable shifts in lipid profiles (e.g., decreased LDL cholesterol, increased HDL cholesterol). IF has also shown promise in improving blood pressure and lowering circulating glucose levels, making it a viable non-pharmacologic intervention for metabolic syndrome and type 2 diabetes .
Beyond its metabolic benefits, IF appears to exert neuroprotective effects through various cellular and molecular mechanisms. The brain, which is highly metabolically active, responds to fasting-induced .metabolic shifts in ways that may enhance its resilience and function Brain-Derived Neurotrophic Factor (BDNF) O IF has been shown to increase levels of BDNF—a protein crucial for neurogenesis, synaptic plasticity, and cognitive performance. Elevated BDNF levels have been associated with improved learning, memory, and .mood regulation
Autophagy and Cellular Cleansing O Fasting triggers autophagy, a cellular process that clears damaged organelles and misfolded proteins. This process is essential in preventing neurodegenerative disorders such as Alzheimers and Parkinson s diseases, .where abnormal protein aggregates play a central role
Mitochondrial Biogenesis and Oxidative Stress O Intermittent fasting enhances mitochondrial efficiency and reduces oxidative damage in neural tissue. By boosting the activity of antioxidant enzymes and limiting reactive oxygen species (ROS) generation, IF contributes to neuronal survival under stress conditions
Chronic neuroinflammation has been implicated in mood disorders and neurodegeneration. IF helps downregulate microglial activation and reduces levels of inflammatory cytokines in the brain, contributing to .a healthier neural environment
Cognitive and Behavioral Effects .3 ^ Studies in both humans and animal models suggest that IF can enhance cognitive performance. Rodent studies have demonstrated improved spatial learning and memory in fasted groups, while some human studies report better executive function, attention, and verbal memory in individuals following IF protocols. Moreover, IF may help regulate mood by stabilizing neurochemical pathways involved in serotonin and .dopamine synthesis
The chronic inflammation, insulin resistance, and vascular dysfunction associated with obesity impair cerebral perfusion, hippocampal function, and neurogenesis. Through its dual action—reducing obesity and enhancing neuroplasticity—intermittent fasting addresses both the cause and consequence of this pathological relationship

Limitations and Considerations

Despite its promising outcomes, IF is not universally effective or safe. Key limitations include .Individual variability: Genetic, behavioral, and environmental factors influence responsiveness to IF Risk of disordered eating: Some individuals may experience bingeing or psychological stress related to food restriction
Not suitable for certain populations: IF may be contraindicated in pregnant women, children, • .individuals with eating disorders, or those with certain chronic illnesses without medical supervision
.Long-term adherence: Sustainability of IF as a lifestyle requires motivation and structured support.

CONCLUSION

Intermittent fasting is a promising, multifaceted approach that addresses two major modern health challenges: obesity and neurological dysfunction, Through a complex interplay of hormonal, molecular, and neurochemical changes, IF promotes weight loss, enhances insulin sensitivity, and strengthens cognitive and emotional health. While not a universal solution, IF represents a powerful tool in the preventive and therapeutic arsenal of modern medicine, particularly when tailored to individual needs and accompanied by professional guidance. Future research should continue to explore its long-term safety, effectiveness in .diverse populations, and mechanisms of action at the systems biology level.

Intermittent fasting is a promising dietary intervention for combating obesity and enhancing neurological health. Its multifaceted benefits warrant further investigation through large-scale, long-term clinical trials. Future research should aim to clarify mechanisms, determine optimal fasting protocols, and assess IF's long-term safety and effectiveness.

The reviewed studies reached a consensus on the role of intermittent fasting, with its effect on common food electronics calories outperforming those of other foods with respect to average and density, and it also has useful data in people with diabetes or prediabetes. Intermittent fasting is known to play an important role in regulating the metabolism of different birds.

REFERENCES:

- Abdelatty, K. A., Fawzy, M. A., Elsheikh, W. M. H., Elfikky, S. M., Nassra, R. M. A., & Saad, H. M. H. (2025). Assessment of serum B-Cell Activating Factor level as a marker of disease activity in a cohort of Egyptian patients with Inflammatory Bowel Disease. SVU-InternationalJournalofMedicalSciences,8(1),1276:1287. https://doi.org/10.21608/SVUIJM.2025.345484.2053.
- Abdellateef, A. A., Ahmed, M. A., Mahmoud, A. M., & Khodry, M. M. (2025). Outcomes of Implementation of Enhanced Recovery after Surgery in Gynecological Oncology. SVU-International Journal of Medical Sciences, 8(1), 336:350. https://doi.org/10.21608/SVUIJM.2024.319459.1978.
- Abdelsattar, A. A.. Abo-Elghit, A. T., Kamel, E. 0., & Abdellah, T. A. (2025). Intermittent fasting serves as a .1 potential intervention to counteract the high fat diet induced neuronal changes in dentate gyrus of rats. SVU-International Journal of MedicalSciences,8(2),300-314. https://doi.org /10.21608/SVUIJM.2025.388013.2180.
- Anton, S. D. et al. (2018). Flipping the metabolic switch: Understanding and applying health benefits of intermittent fasting. Obesity.
- Asghar, A., Akhtar, T., Batool, T., Khawar, M. B., Nadeem, S., Mehmood, R.,&Sheikh, N. (2021). High-fat diet-induced splenic, hepatic, and skeletal muscle architecture damage: cellular and molecular players. Molecular and Cellular Biochemistry, 476(10), 3671-3679.
- Ayuob, N., & ElBeshbeishy, R. (2016). Impact of an energy drink on the structure of stomach and pancreas of albino rat: can omega-3 provide a protection?. PloS one, 11(2), e0149191.
- de Cabo, R.,&Mattson, M. P. (2019). Effects of intermittent fasting on health, aging, and disease. NEJM.
- de Cabo, R.,&Mattson, M. P. (2019). Effects of intermittent fasting on health, aging, and disease. NEJM.
- Ge, Y., Bruno, M., Nash, M. S., Coates, N. H., Chorley, B. N., Cave, M. C., & Beier, J. I. (2023). Vinyl chloride enhances high-fat diet-induced proteome alterations in the mouse pancreas related to metabolic dysfunction. Toxicological Sciences, 193(1), 103-114.
- Ghweil, A. A., Abd Elaziz, D. H., 8i AN, A. A. (2023). Correlation between liver function tests, lipid profile and .5 fibroscan in non-alcoholic fatty liver disease. SVU-International Journal of Medical Sciences, 6(1), 160-165. https://doi.org /10.21608/svuijm.2020.48106.1024
- Harvie, M. N. et al. (2015). The effects of intermittent energy restriction on weight loss and metabolic disease risk markers. Obesity Reviews.
- Heilbronn, L. K. et al. (2005). Alternate-day fasting in nonobese subjects: effects on body weight, body composition, and energy metabolism. The American Journal of Clinical Nutrition.
- Ismaeil, S. G., Hany, A. M. M., Gad, G. S., & Wahman, M. M. A. (2024). Impact of the Nutritional Support on the Response of the Anatomical Site of Gastrointestinal Malignancy to the treatment in Cancer Patient in Qena. SVU-International Journal of MedicalSciences, 7(2),982:994..https://doi.org/10.21608/SVUIJM.2024.319184.1977.
- Kritikou, M. et al. (2021). Intermittent fasting and neurotrophic factors: A promising link. Frontiers in Neuroscience.
- Li, L. et al. (2013). Intermittent fasting induces hippocampal neurogenesis and improves memory performance in HFD rats. Brain Research.
- Longo, V. D.,&Panda, S. (2016). Fasting, circadian rhythms, and time-restricted feeding in healthy lifespan. Cell Metabolism, 23(6), 1048-1059
- Longo, V. D.,&Panda, S. (2016). Fasting, circadian rhythms, and time-restricted feeding in healthy lifespan. Cell Metabolism.

- Mattson, M. P. et al. (2018). Intermittent fasting: a neuroprotective dietary intervention? Nature Reviews Neuroscience.
- Mattson, M. P. et al. (2018). Intermittent metabolic switching, neuroplasticity and brain health. Nature Reviews Neuroscience.
- Mattson, M. P., et al. (2018). Intermittent metabolic switching, neuroplasticity and brain health. Nature Reviews Neuroscience, 19(2), 63-80.
- Michalsen, A. et al. (2003). Prolonged fasting therapy in patients with chronic pain syndromes and depression. Forschende Komplementärmedizin.
- Newman, J. C., & Verdin, E. (2014). Ketone bodies as signaling metabolites. Nature Reviews Molecular Cell Biology.
- Ng, M. et al. (2014). Global, regional, and national prevalence of overweight and obesity. The Lancet.
- Patterson, R. E.,&Sears, D. D. (2017). Metabolic effects of intermittent fasting. Annual Review of Nutrition, 37, 371-393.
- Patterson, R. E.,&Sears, D. D. (2017). Metabolic effects of intermittent fasting. Annual Review of Nutrition.
- Rothschild, J. A. et al. (2014). Time-restricted feeding and metabolic disease. Cell Metabolism.
- Sayed, E. A. G., Abou-Raya, A., El-Bordiny, M., & Yehia, K. (2025). Clinical, Laboratory Characteristics, Comorbidity and Function in Elderly patients with Rheumatoid Arthritis. SVU-International Journal of MedicalSciences, 8(1),27:38. https://doi.org/10.21608/SVUIJM.2024.341846.2042.
- Tinsley, G. M.,&La Bounty, P. M. (2015). Effects of intermittent fasting on body composition and clinical health markers in humans. Nutrition Reviews.
- Trepanowski, J. F. et al. (2017). Effects of alternate-day fasting on weight loss, weight maintenance, and cardioprotection. JAMA Internal Medicine.
- Trepanowski, J. F., et al. (2017). Effect of alternate-day fasting on weight loss, weight maintenance, and cardioprotection among metabolically healthy obese adults: a randomized clinical trial. JAMA Internal Medicine, 177(7), 930-938.
- Varady, K. A. et al. (2010). Intermittent fasting and visceral fat reduction. Nutrition Journal.