CONCEPT OF FASTING IN AYURVED AND ALLOPATHY- A NARRATIVE REVIEW

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Abstract

This paper includes a comprehensive review of studies on fasting and its impact on metabolic health, chronic disease prevention, and overall well-being. This research work shall therefore endeavour to discuss the physiological, clinical, and therapeutic implication of fasting in evidence based on Ayurveda as well as the Allopathic systems. Today, fasting, meaning the act of fasting for some specific hours only, has for longtime history in Ayurveda as a way of cleaning the body and having healings termed Upavasa. Intensive investigations of modern science investigated the efficacy of various types of fasting such as IF, ADF, WF, and CR that have effects on metabolic regulation, inflammation processes, and cellular regeneration. As suggested by the previous studies of fasting from the earlier periods of 1977 up to 2005, the overviews of the studies of fasting were centered on hormonal adaptation, insulin as well as energy metabolism. Between 2006 and 2011, obesity, metabolic syndrome, and other conditions like IBS and asthma were demonstrated to be benefited through fasting. Continuing from 2013 to 2016, more studies were conducted on the effects of fasting on neuroendocrine function, cellular autophagy, and the psychological status of the disease management of chronic diseases. Fasting trend became popular from 2017 to 2020 due to its impact on the human longevity, brain function and Immune system. The latest researches with dates up to 2024 highlighted the possibility to prevent cardiovascular diseases and recovery after COVID with the help of fasting, the decrease of inflammation, regulation of lipid profile, and strengthening of immunity. Thus, when the fasting is observed properly, it is evident that this process may be very beneficial for the organism and its various physiological systems. The principles of fasting as outlined in Ayurveda can well be supported by contemporary scientific research especially in light of digestion, metabolism and cleansing of the body. However, fasting should be targeted and calculated based on the metabolic rates of humans and there are associated complication which include low level of salt in the body and lower glucose level. That is why to sum up, it is possible to state that fasting is a strong, evidence-based practice with increasing utilization in preventive and chronic disease care. More studies should be made on how the specific fasting periods should be designed and what kind of effects they have in the long run on the human organism.

Key words: Abbreviations- AF- Alternate day Fasting, WF- water only Fasting, CF-complete fast, IF-intermittent Fasting

1. Introduction

Currently, fasting is formally described as the voluntary reduction or omission of food intake and drink for several hours or days for individuals with healthy body functioning, using different rationales and methodologies depending on the various schools of medicine of different age, origin and specialization. Fasting (Upavasa) is a known constituent of Ayurveda

known as Langhana therapy that serves the primary purpose of detoxifying the body. In Ayurveda, fasting has been categorized as one of the procedures for the removal of the Aam or metabolic toxins, improving the Agni or the digestive fire and balancing the doshas leading to Rajani et al., 2010. Basically, Ayurvedic fasting is very dissimilar from the way fasting is understood today; it can therefore be from a mild state to no food eating to even very limited meal depending on the person's Prakriti and Vikriti. Ayurveda divides the fasting into four forms such as no food intake, semi fasting, and other types of fasting intake with herbal support to facilitate digestion and purging (Choudhary et al., 2021). Recent advances in science namely in the discipline of allopathy, after analyzing the effects of fasting, have found it effective in number of ways including metabolism, weight loss, chronic diseases and even in longevity. IF is a type of fasting that involves eating merely a mere 500–600 calories every other day, ADF is a daily form of fasting having food taking turns with a single day of normal fasting and WF which is total abstinence from food and liquids, except water for a specific period of the day, week or month (Phillips, 2019; Madeo et al., 2019). Though the practice of fasting differs from time to time, both the ancient Indian science and the current day contemporary science research proved how beneficial fasting is at physiological and therapeutic level focusing on the disease prevention and overall health enhancement.

The historical backgrounds of fasting significantly contribute to the understanding of changes that have occurred in its uses in the medical field and in healthcare. Edward Dewey, an American physician of the nineteenth Century had it that most of the diseases are as a result of overeating and that fasting could cure several of them (Longo, 2018). Later on, another German physician by the name Otto Buchinger, in the early twentieth century, was able to write the clinical application of fasting for metabolic and chronic diseases (Wilhelmi de Toledo et al., 2019). Often, in the current research, several results of fasting are discussed as it influences metabolic pathways, gut microbiome, immunity, as well as the brain. Scientific research also supports the idea of fasting improves the efficient production of mitochondria, increases the production of ketones, and helps in autophagy, a vital process through which damaged cells die, and are replaced by newer cells (Madeo et al., 2019; Hailu et al., 2024). The practice of fasting in the current world has been adopted mostly with its use in the treatment of diseases such as type-2 diabetes, cardiovascular diseases, obesity, and neurodegenerative diseases. Moreover, the contemporary conversation about fasting recently shifted to its possible benefits for the immune system and post-viral syndrome with the presence of long COVID, pointing at the fact that, somehow, a long-term fast may significantly alleviate the symptoms of chronic inflammation, fatigue, and metabolic disordering (Grundler et al., 2023). However, the same, like any other metabolic therapies, fasting cannot be without risks, such as critical side effects which are why fasting continues to be safer when done based on fasting metabolic categories, health statuses, and nutrient requirements of the human body (Ogłodek, Azar, & Leung, 2021; Dai, Jackson, Chi, Qian, & Smith, 2022). The existing research is increasing the support for fasting as a preventive and therapeutic strategy and the scientific evidence of this custom brings together two eras – the past and the present. The aim of this paper is to discuss and analyse the physiological, clinical and therapeutic implications of fasting process in accordance to the Ayurveda and in contrast and addition to the allopathic doctrines concerning disease and its etiology, disease and its management, metabolism and longevity.

2. Methodology

This essay is a narrative systematic review which aims at collecting, reviewing and synthesising literature that address the concept of fasting according to Ayurveda and Allopathic medical practices. In order to carry out the systematic review, bibliographic and electronic databases were used in addition to the ancient Ayurvedic literature. This was achieved through using Caraka Samhita, Susruta Samhita and Ashtanga Hridayam as tool in gaining postgraduate knowledge on upavasa, its application to maintain health and cure diseases. These classical texts have been used to gather basic information about the history and the concept of fasting in Ayurveda with reference to its classification, uses, and the conditions under which use of fasting is contraindicated or should not be done, and how it is employed in the treatment of metabolic and systemic diseases.

In light of modern scientific research, proper literature search was done using various electronic databases such as PubMed, Google Scholar, Science Direct, AYU Journal, Ayush Portal, Ayushdhara Journal and all the other peer reviewed journals. It encompassed articles regarding the state of fasting and its impact on metabolism, chronic diseases, cellular processes, and overall health in terms of both qualitative and quantitative research studies, clinical trials, systematic reviews, meta-analyses, and observational studies. These were: fasting, water-only fasting, intermittent fasting, effect of fasting, fasting and metabolic health, fasting and cancer, fasting and obesity, fasting in Ayurveda, upavasa and its effect on health, caloric restriction, alternate day fasting, fasting and longevity, therapeutic fasting, fasting and Insulin sensitivity and fasting and inflammation. These keywords were chosen to search for the most extensive range of fasting research, including those from the conventional and contemporary scientific contexts.

The inclusion criteria for selecting studies were:

1. **Relevance to fasting:** Only studies explicitly investigating the physiological, biochemical, and clinical effects of fasting in humans or animals were included.
2. **Publication timeline:** Articles published up to **April 2024** were considered, ensuring that the most recent advancements in fasting research were included.
3. **Language:** Only articles published in English were included to ensure accessibility and consistency in interpretation.
4. **Types of studies:** Clinical trials, randomized controlled trials (RCTs), observational studies, systematic reviews, and meta-analyses were prioritized for scientific rigor. Ayurvedic case studies and literature reviews were also incorporated to align with traditional medical insights.
5. **Health conditions studied:** Research covering fasting's impact on **metabolic health, obesity, diabetes, cardiovascular diseases, neurological conditions, hormonal balance, inflammation, gut microbiota, cancer, and longevity** was included.

These included papers with unclear method, case reports with little data, and papers that were not peer reviewed, and papers that did not measure fasting interventions per se. Furthermore, any comparison that used different fasting definition or any research comprising of non-empirical evidence with little or no empirical data were excluded.

3. Results

3.1 Early Research on Fasting and Metabolic Effects (1977–2005)

The first investigations concerning fasting were based on homeostatic aspects, of which hormonal regulation, thyroid activity, and energy-utilization were the most explored areas. Scientists wanted to find out the effect of fasting on enzymes such as thyroid hormones(T3, T4), cortisol, insulin resistance, and lipid profile. Research studies from this period involved mostly normal subjects and included investigations on the effects of total energy depletion and endocrine changes in body composition and metabolic rate. The studies undertaken in this era showed that fasting could produce hormonal changes, change metabolism, and much more, which paved way to future research endeavours. Furthermore, preliminary research was also conducted in order to examine the effects of fasting on people with metabolic disease where some information was found suggesting that fasting could be used in the treatment of obesity, diabetes, and other metabolic diseases.

Table 3.1: Early Research on Fasting and Metabolic Effects (1977–2005)

Year	Author(s)	Study Design	Title	Fasting Type	Duration	Population	Results
1977	Palmblad et al.	Experimental Study	Effects of total energy withdrawal (fasting) on hormone levels	WF	10 days	12 healthy males	↓ T3, T4, TSH; ↑ Reverse T3, cortisol, nocturnal urinary adrenaline excretion
1982	Kerndt et al.	Case Study	Fasting: The History, Pathophysiology, and Complications	WF	40 days	1 non-obese male	↓ Weight, BP, blood glucose, insulin; ↑ Urinary nitrogen excretion, glucagon, triglyceride
1998	Williams et al.	Randomized Controlled Trial	The effect of short periods of caloric restriction on weight loss and glycemic control in type 2 diabetes	IF & CR	20 weeks	31 females, 23 males (overweight or obese, diabetic)	↓ Weight, improved glycemic control
2003	Andreas Michalsen et al.	Clinical Trial	The short-term effects of fasting on the neuroendocrine system in patients with chronic pain syndromes	MF	7 days	28 chronic pain patients	↑ Urinary noradrenaline, adrenaline, cortisol levels
2005	Halberg et al.	Controlled Human Study	Effect of intermittent fasting and refeeding on insulin action in healthy men	ADF	15 days	8 healthy males	↓ Glucose, leptin; ↑ Adiponectin
2005	Heilbronn et al.	Clinical Trial	Alternate-day fasting in non-obese subjects: effects on body weight, body composition, and energy metabolism	ADF & CR	22 days	8 females, 8 males (non-obese)	↓ Insulin levels, improved metabolic efficiency

Most of the research that forms the premise of this paper falls in the first period of interest on fasting which was between 1977 to 2005, where most of the concern was on the metabolic hormonal changes occasioned by the fast which embraced the thyroid function, the cortisol regulation, insulin level, and energy metabolism. At this time, fasting was carried out as a way of investigating its effects on health on both healthy individuals and those with metabolic disorders. The outcomes from these studies were crucial in understanding how fasting affects metabolic processes, hormone regulation, as well as the human body composition.

The first study under investigation is that of Palmblad et al. (1977) in which the authors aimed to establish the effect of total energy withdrawal or fasting on the endocrine system with regards to growth hormone, thyrotropin, cortisol, adrenaline, noradrenaline, T4, T3, and rT3 in healthy males. The levels of T3, T4, TSH concentrations were lowered after fasting whereas,

there is an increase in the levels of rT3, cortisol and NA levels at night during the fasting period. This implied that fasting may lead to hormonal change in the thyroid gland to slow down the rate at which one metabolizes food as a form of protection. Elevated levels of cortisol and adrenaline excretion also implied that fasting actually stimulates stress and emphasizes the point that stress is involved in metabolic adaptation. These studies constitute a solid background for further investigation pertaining to the effects that fasting has on administration of hormones and energy metabolism.

Specifically, and in 1982, Kerndt et al tried conducting their research on a 52 yearold non-obese healthy male who consumed only water for 40 consecutive days of fasting. The study showed that the participants had lost body weight, blood pressure, blood glucose, and insulin levels that are considered to be in a negative pattern due to observation of the fast. Moreover, there was an increase in the level of urinary nitrogen nitrogen which showed an increase in protein breakdown because body was operating on energy byproducts of protein breakdown. It also revealed highest glucagon and triglycerols where the body demonstrates how it reacts to energy shortage by drawing fat as a source of energy. This research was useful in demonstrating that fasting was effective in achieving ketosis, increasing fat breakdown and decreasing insulin to support its use in obesity, type 2 diabetes and metabolic syndrome.

It was from the late 1990s that scientific studies were conducted on IF and CR with the intention of managing obesity and glycemic disorders. In 1998, Williams aimed at determining the impacts of short-term caloric restriction on weight loss and glucose metabolism among overweight and obese adults with typing type two diabetes. The study also indicates that, IF and CR of more than 20 weeks helped reduce weight; therefore, IF can be used to enhance blood sugar regulation amongst diabetic people. This was a fundamental research evidence because it supported the possibility of treating metabolic diseases with fasting for clinical purposes as a form of diabetes management.

Moving towards the decade of 2000, fasting research studies moved from metabolic disorders and treatment to neurological disorders and pains. In his paper, which appeared in the Journal of Psychosomatic Research in 2003, Michalsen et al. aimed at identifying the acting effects of fasting to the neuroendocrine system for patients with chronic pain syndromes. This study based on the effects of fasting system implemented in a modified fasting (MF) diet for 7 days, showed an enhanced mean levels of the urinary catecholamine, including noradrenaline, adrenaline, and cortisol. This could in turn mean that fasting could help in modulating neurotransmitters and hormonal stress, this might justify the earlier beliefs that going on a fasting inclined improved mood or mental alarm and/or reduced sensitivity to pain. These findings supported some of the current sentiments that starving may be good for the body, especially neurological and inflammatory diseases.

As the knowledge regarding the metabolic process of fasting advanced, the focus was shifted to the effect of the specific version of the diet, namely, the ADF. Halberg et al. (2005) have carried out the investigations of ADF with 20-hour feeding gaps in eight males for 15 days. It was identified that ADF reduced the levels of glucose and leptin, and at the same time, augmentation of adiponectin level was noted. As indicated on the page, leptin is linked to hunger and fat deposition hence its decrease was an indication that ADF could improve fat breakdown. Namely, increased adiponectin, the protein that controls the glucose levels and

fatty acids oxidation, was another evidence that fasting could enhance insulin sensitivity and cardiovascular conditions.

Another study by Heilbronn et al. (2005) working on the effects made by applying ADF alongside a calorie reduction (CR) within 22 day trial in non-obese subjects. This study also revealed a decrease in insulin levels when ADF and CR was implemented hence narrowing the reserve that fasting is efficient in glucose metabolism. Instead, this study indicated that fasting could improve insulin sensitivity in people without obesity, therefore putting forward the possibility that it was healthy not only for weightless but also for health and disease prevention.

3.2 Impact of Fasting on Weight Loss and Chronic Diseases (2006–2011)

With changing the knowledge of the concept of fasting, the studies aimed at defining the therapeutic efficacy of fasting in chronic diseases, particularly obesity, MS, and inflammation. In this period, many research attempted to determine the advantages of ADF, IF, and CR on weight loss, metabolism of insulin, and inflammation. Fasting was evaluated according to its efficacy in decreasing overstressed oxidation as well as increasing improved lipid panel, and particularly for its effectiveness when in alleviation of conditions like IBS and asthma. Furthermore, it was considered to establish the relationship between the frequency and the length on effectiveness of this regime of fasting and got established structured regimes depending on the nature of ailments. The findings of research from this period contributed to the idea that weight loss by way of fasting can be an effective plan towards disease prevention.

Table 3.2: Fasting Research in Chronic Disease Management (2006–2011)

Year	Author(s)	Study Design	Title	Fasting Type	Duration	Population	Results
2006	Motoyori Kanazawa	Clinical Trial (Abstract)	Effects of fasting therapy on irritable bowel syndrome	IF	10 days	36 IBS patients	↓ Abdominal pain, distension, diarrhea, anorexia, nausea, anxiety
2007	Johnson et al.	Clinical Trial	Alternate-day calorie restriction improves clinical findings and reduces oxidative stress in asthma patients	MF & ADF	8 weeks	8 females, 2 males (overweight adults with asthma)	↓ Weight, TGs, TNF-α, BDNF
2009	Varady et al.	Controlled Human Study	Short-term modified alternate-day fasting: a novel dietary strategy for weight loss and cardioprotection in obese adults	ADF & MF	8 weeks	12 females, 8 males (obese adults)	↓ Weight, TGs, LDL
2011	Harvie et al.	Comparative Study	The effect of intermittent energy and carbohydrate restriction vs. daily energy restriction on weight loss and metabolic markers	MF & CR	6 months	107 overweight females	↓ Insulin, LDL

Kanazawa et al.'s research based in 2006 aimed at identifying whether the so called intermittent fasting could be useful to treat IBS. This randomised controlled study involved giving a 10-days fasting to 36 patients diagnosed with IBS. They concern a positive change in the severity of anxiety, diarrhoea, bloating, nausea and especially abdominal pain related to IBS. The study also pointed out that fasting can change gut microbiota and decrease the inflammation in the gut which is in line with the usage of fasting as an effective treatment for IBS patients.

Johnson et al undertook a clinical trial in 2007 featuring the effects of the ADF and MF to overweight individuals with moderate asthma. For the purpose of the study that spanned 8

weeks, there was a group of 8 female and 2 male participants who were put under fasting based calorie restriction schedule. The outcomes revealed that they had lower mean bodyweight, serum TGs, TNF-α and BDNF in contrast to the control All the above findings are shed awareness on the possibility of using GBE to manage obesity and its complications. These outcomes indicated that ADF not only facilitated weight loss but also alleviated the degree of systemic inflammation, this would probably help in the management of other chronic condition such as asthma.

In the obesitate dults, Varady and colleagues also explore modified fasting & alternate day fasting (ADF) on 2009. In this study, there were 12 females and 8 males, and the study was a one-month, eight-week study. Several of them namely the weight, triglycerides(TGs), and low density lipipoprotein (LDL) cholesterol recordings were significantly reduced. These observations gave sound premises that ADF and MF could be beneficial dietary approaches for weight loss and prevention of cardiovascular diseases in compound over-weight persons.

Last but not the least, Harvie et al. (2011) carried out a study comparing the impact of IF against CR concerning the calorie reduction for weight loss and metabolic status. The investigation had a duration of over six months and randomly selected 107 overweight females in which CR, MF, and CR & MF groups were formed for comparison. The findings shown here support the idea that IF is better than daily caloric reduction in improving metabolism since IF produced greater reduction in insulin and LDL cholresterol.

Research Enduring between 2006 and 2011 provided scientific evidence to advance the use of fasting as major prevention and control measure with regard to chronic diseases. So, based on the alteration in the metabolic pathways and better lipid profiles, control of inflammation, and the improvement of gut health, fasting can be considered as one of the non-pharmacological approaches to treating different diseases related to metabolism and inflammation.

3.3 Therapeutic Benefits of Fasting in Disease Management (2013–2016)

Fasting has been increasingly adopted as a therapeutic approach for chronic diseases in the mid-2010s, major chronic diseases such as rheumatologic disorders, hypertension, the metabolic syndrome and cardiovascular diseases. Experts shifted towards other additional relation techniques like the Buchinger's fasting, which involves taking a high-quality liquid diet for the enhancement of the health of the individuals. Other effects researched from such studies in this period include weight loss, metabolic regulation and the effects of fasting on the body, specially autophagy, which it involves the destruction of damaged cells and the renewal of tissue. Fasting and Neuroendocrine Effects: There was conclusive evidence to show that fasting had a profound influence on stress hormones as it enhanced cognition and the mood of people. These developments further supported the idea that it was not only for calorie restriction but rather provided an approach to treat chronic inflammations diseases and metabolic disorders.

Table 3.3: Research on Fasting and Chronic Disease Management (2013–2016)

Year	Author(s)	Study Design	Title	Fasting Type	Duration	Population	Results
013	Andreas Michalsen	Review Study	Fasting therapy for treating and preventing disease - current state of evidence	MF, IF, CR	7–21 days	-	MF effective for rheumatic diseases, chronic pain, hypertension, and metabolic syndrome. CR & IF beneficial in preventing chronic

							degenerative diseases, useful during chemotherapy.
2013	Wilhelmi de Toledo et al.	Expert Panel Review	Fasting therapy - an expert panel update of the 2002 consensus guidelines	-	-	-	Fasting beneficial for rheumatic diseases, metabolic diseases, hypertension, chronic inflammatory diseases, atopic diseases, and psychosomatic disorders.
2013	Chenying Li et al.	Clinical Study	Metabolic and psychological response to 7-day fasting in obese patients with and without metabolic syndrome	MF	7 days	30 female participants (12 with metabolic syndrome, 18 without)	↓ Weight, systolic/diastolic BP, LDL, leptin, insulin. ↑ Adiponectin, leptin receptors, resistin. ↓ Anxiety, depression, fatigue. Greater metabolic improvements in patients with MetS.
013	Horne et al.	Randomized Cross-over Trial	Randomized cross-over trial of short-term water-only fasting: metabolic and cardiovascular consequences	WF	1 day	20 females, 10 males (healthy adults)	↓ Weight, blood glucose, insulin, TGs. ↑ LDL, HDL.
2016	Hoddy et al.	Controlled Human Study	Changes in hunger and fullness in relation to gut peptides before and after 8 weeks of alternate-day fasting	ADF & CR	8 weeks	50 females, 9 males (obese adults)	↓ Weight, glucose, insulin, leptin.

Globally one of the exhaustive study from this period was Polypharmacological approach to chronic diseases of the publication date 2013 by Andreas Michalsen and it summarizes the randomized controlled trials regarding effects of MF, IF, and CR on various chronic diseases. This extensive review showed that Buchinger's fasting (MF), with 7–21 day, has therapeutic validity in rheumatic diseases, pain, hypertension, and syndrome metabalic. It also proved the applicant's thesis that CR and IF could protect from chronic degenerative diseases and could act as adjuvants in chemotherapy of cancer. These studies therefore placed fasting as easily applicable form of non-drug therapy for various chronic diseases.

Another review in year 2013 was done by Wilhelmi de Toledo et al in which the authors provided a panel discussion regarding the efficacy of fasting therapy. The review further urged that fasting had objective therapeutic impacts when it comes to metabolic ailments, chroniced inflammation, atopic disorders and psychosomatic conditions. This also confirmed the earlier finding that fasting therapy had good scientific evidence and could be applied in clinical practice.

Small clincal trial conducted by Chenying Li et al about obese women with metS and healthy obese women on effects of 7-day modified fast (MF). There were 12 females with MetS and 18 females without to be included in this study and all the females involved in the study were aged only between 25 and 50 years. Reduced examinations were even found on weight, systolic blood pressure, diastolic blood pressure, LDL cholesterol, leptin, and insulin while the subjects experiencing higher improvements on adiponectin, leptin receptors, and resistin level. Participants can also experience the decreased level of anxiety, depression and fatigue, speaking about the positive psychology of fasting. Specifically, it was observed that, for participants with MetS, there were bigger reductions observed in blood pressure reading, LDL cholesterol, triglycerides as well as better improvement in their metabolic rate compared to other groups without MetS. From the evidence of this study, fasting was seen to have positive

impacts on metabolism and mood hence raising the possibility of its application when addressing obesity complications.

One of the recent studies by Horne et al. conducted in 2013 was focused on the analysis of the metabolic and cardiovascular effects of water-only fasting in healthy subjects. Respondents for the study were selected from 20 female and 10 male participants who went through a 1-day WF regimen. It was observed that the body weight and blood glucose, also insulin levels as well as triglycerides levels were lowered while LDL and HDL cholesterol was elevated. As seen in this work, short-term fasting could positively alter lipid profile and glycemic status, which suggests that FFS could be used in the prevention of CVDs.

Namely, in 2016 Hoddy et alpayed to study appetite-regulating gut peptides assessing the effect of AD FA and CR on this factor in a controlled human trial. The weight loss study conducted in the 8 weeks comprised 50 female and 9 male participants who are obese clinically and observed reduction in weight, glucose and insulin, and leptin concentrations. As such, the present results supported the long-term implementability of ADF for weight loss because it regulated adiposity and hunger-related hormones that typically control food intake.

Altogether, the research studies conducted from the year 2013 to 2016 proved that fasting can be employed as an intervention strategy for chronic diseases, metabolic disorders, and mental disorders. Research affirmed that there were benefits of fasting such as its anti-inflammatory effects, effect on lipid profile, assisting in weight loss, and the enhancing of mental health. Also, the connection between fasting and autophagy which has been discussed in these studies, expanded the way people looked at it as a cellular repair and longevity process. The above discoveries set a stage for the subsequent investigations of long-term best effects of fasting or the possibility of its incorporation to the prevalent medical therapies.

3.4 Advances in Fasting Research: Metabolic and Aging-Related Outcomes (2017–2020)

Due to the increasing concern in health span and overall life extension from 2017 to 2020, research was directed on the use of fasting for cell regeneration, aging and neurological disorders. Specifically, researchers examined the effects of fasting on aspects such as ketone bodies, autophagy, mitochondrial biogenesis, and epigenetic changes. The studies were focused on evaluating the short-term and long-term impact of fasting on such markers as insulin resistance, inflammation, and lipid profiles. Other studies examined the effects of fasting on cognition, clarity of mind and neuroprotection and the directions it provides to enhance the understanding of prevention of neurodegenerative diseases including Alzheimer and Parkinson. Nonetheless, huge cohort investigations established the efficacy of fasting in decreasing general inflammation, idealizing heart health, and improving the intestinal bacterium equilibrium. It was during this period that people also had to individualize fasting recommendations since one's metabolic type has been factored into consideration. That IF, ADF, and PF could be effective everyday practices that improved metabolic health and extended human longevity was also a result that was supported strongly.

Table 3.4: Studies on Fasting and Longevity (2017–2020)

Year	Author(s)	Study Design	Title	Fasting Type	Duration	Population	Results
2017	Chenying Li	Randomized Controlled Explorative Study	Effects of A One-week Fasting Therapy in Patients with Type-2	Modified Fasting (MF)	1 week	16 patients with Type-2 Diabetes Mellitus	↓ Mean weight, ↓ abdominal circumference, ↓ blood pressure

			Diabetes Mellitus and Metabolic Syndrome				
2019	Matthew C.L. Phillips	Review Study	Fasting as a Therapy in Neurological Disease	-	-	-	↑ BHB, BDNF, PGC1α, AMPK; ↓ Glucose, Insulin, mTOR, IL-6, TNFα, Leptin
2019	Frank Madeo	Randomized Controlled Trial (RCT)	Alternate Day Fasting Improves Physiological and Molecular Markers of Aging in Healthy, Non-obese Humans	Short-term and Long-term ADF	4 weeks	57 healthy, non-obese individuals	↓ Fat mass, ↑ b-hydroxybutyrate, ↓ sICAM-1, ↓ LDL, ↓ triiodothyronine
2019	Wilhelmi de Toledo F	Observational Study	Safety, Health Improvement, and Well-being During a 4 to 21-Day Fasting Period in an Observational Study Including 1422 Subjects	PF, Buchinger Fasting Program	4–21 days, 250 kcal/day	1422 participants	↓ Weight, ↓ BMI, ↓ TC, TG, HDL-C, LDL-C, glucose, HbA1C, leucocytes, thrombocytes; ↑ erythrocytes, ↑ urinary ketone body excretion
2020	Françoise Wilhelmi de Toledo	Review Study	Unraveling the Health Effects of Fasting: A Long Road from Obesity Treatment to Healthy Lifespan Increase and Improved Cognition	IF	-	-	↑ Gut bacterial richness, ↑ anti-oxidative microbial metabolic pathways
2020	Nasser Ahmed	Quasi-Randomized Clinical Trial	Impact of Intermittent Fasting on Lipid Profile – A Quasi-Randomized Clinical Trial	IF	6 weeks (fasting ~12h/day, 3 days/week)	15 participants with low HDL	↑ HDL, improved lipid profile

Chenying Li (2017) is one of the most important works that in the described period focused on a clinical trial that analyzed the impact of a 1-week modified fasting (MF) in patients with Type-2 Diabetes Mellitus (T2DM) and metabolic syndrome. There was a reduction in mean weight, abdominal circumference and blood pressure in the patients after fasting and this was a randomized controlled study conducted on 16 diagnosed diabetic patients. The results provided evidence for this modality of treatment in T2DM and metabolic disease management. Very recently, in 2019, Matthew C.L. Phillips contributed remarkably in developing knowledge regarding the effects of fasting on the brain. This review summarized the evidence regarding fasting's effect in increasing BDNF, PGC1α which is an important controller of mitochondrial replication, and the gene AMPK, energy-sensing enzyme which is linked to longevity. Moreover, it proved that fasting leads to decreased insulin levels, decreased mTOR signaling pathway that is associated with aging also decreased inflammation marker such as IL-6 and TNF-α. This review supported the hypothesis that fasting may well be a way to prevent neurodegenerative diseases and dementia Nursing 2016.

Frank Madeo and co-authors undertook a 2019 randomized controlled trial aimed at evaluating the impact of ADF on apparently healthy, nonobese adults. The study had 57 participants where it lasted for four weeks and left it with changes such as; fat mass, b-hydroxybutate which are ketone bodies, soluble intercellular adhesion molecule 1 popularly known as sICAM-1 and the

LDL cholesterol. Thus, plasma concentrations of triiodothyronine (T3), a hormone residing in metabolic rate and aging, was also reduced indicating a slow aging factor.

Wilhelmi de Toledo et al. (2019) investigated the effects of PF using the Buchinger Fasting Program in 1422 individuals for 4 to 21 days. A study in this case also noted the improved values that were statistically significant for the following variables: weight loss, BMI, TC, TG, LDL cholesterol and glucose. The result further showed that mean values of urinary ketone bodies and erythrocyte levels were higher in the fasting condition, so the fasting did provide improvement on metabolic rate and cell condition. These findings added further to the evidence that it is possible to safely undertake very long fasting regimens as a means to improving metabolic and cardiovascular functions.

Françoise Wilhelmi de Toledo conducted a review concerning the effects of IF on the gut microbiome back in 2020. The study showed that fasting leads to an increased number of microbes, puts a positive shift for the gut bacteria and boosts anti-oxidant metabolism pathway. These findings offered the given proof that fasting could serve to enhance gut health since the gut tissues exert a variety of functions essential for immune response, metabolism and brain-gut signaling.

The following systematic review of a quasi-randomized control trial was conducted by Nasser Ahmed 2020 investigated on the impact of IF on lipid profile of the individuals with low HDL. This particular study involved 15 participants who were on a fast which lasted for approximately 12 hours a day, three days in the week for six weeks and showed the following; Proving that fasting has an overall positive impact on the lipid profile and in particular increases the HDL cholesterol. Based on the finding of the present research, it could be recommended that IF might be a helpful dietary approach in case of dyslipidemia and other cardiovascular risk factors.

Research done from 2017 to 2020 supported the concept of intermittent fasting important for weight loss, metabolic concerns and healthy cells, brain, and length of life. Existing research suggests that fasting boosts the process of autophagy andthe mitochondria's power output, decreases inflammation level, and promotes stronger vessels. Finally, this study deliberately proved that fasting has positive effects on the human brain through the enhancement of BDNF levels, decrease of neuroinflammation and the actual improvement on working memory. Moreover, swift with increasing popularity of group fasting with metabolic therapies, special emphasis was placed on individual differences revealing the individual characteristics of the rapid starvation. The results of this period set up subsequent studies regarding the effects of fasting on lifespan and age-related diseases and other neurodegenerative diseases. The subsequent investigation (2021–2024) would expand on these findings with examining further functions of fasting including immune-system regulation, post-COVID, and sustainable health on fasting.

3.5 Fasting and Its Implications in Cardiovascular and Post-COVID Recovery (2021–2024)

Current far reaching studies have looked at the concept of fasting to include its effects on metabolic health, cardiovascular diseases, post Covid-19 and immunity. The outcomes of a scientific research made between the years 2021-2024 included the effects of water-only fasting (WF), intermittent fasting (IF) and prolonged fasting (PF) on blood pressure, lipid

profile, and biomarkers of inflammation. One of the significant topics of focus was how fasting contributes to the cardiovascular health by first mitigating the underlying risks which include obesity, hypertension, dyslipidemia as well as inflammation. Another of the researched fields was the impact of fasting on the process of recovery after COVID in patients. This is particularly the case given that the long-term effects of COVID-19 amongst patients present tentative features that include chronic fatigue, chronic inflammation, and dysregulated metabolism. Some of the experiments carried out in the last few months have advocated the use of intermittent fasting as a way of slowing down or even reversing post-COVID conditions by improving cellular recycling, calming inflammation, inflammation and stabilizing immune processes. Thus, the role of fasting in the contemporary treatment and disease prevention strategies, especially concerning chronical and infective illnesses, increases.

Table 3.5: Studies on Fasting and Its Effects on Cardiovascular Health and Post-COVID Recovery (2021–2024)

Year	Author(s)	Study Design	Title	Fasting Type	Duration	Population	Results
2021	Ewa Ogłodek	Experimental Study	Is Water-Only Fasting Safe?	WF	8 days	12 healthy males	↑ b-HB, ↑ K+, ↑ UA, ↓ G, ↓ Na+, ↓ Ca, ↓ Mg++, ↑ ketogenesis, ↑ hypoglycemia, ↑ hyperuricemia, ↓ body weight
2022	Zhongquan Dai	Experimental Study	Effects of 10-Day Complete Fasting on Physiological Homeostasis, Nutrition and Health Markers in Male Adults	WF	10 days	13 healthy males	↓ Body weight, ↓ SBP, ↓ pre-albumin, RBP, transferrin, ↑ vitamin B2
2022	Eugene Scharf	Prospective Study	The Effects of Prolonged Water-Only Fasting and Refeeding on Markers of Cardiometabolic Risk	MF	10 days fasting + 5 days refeed	26 overweight and obese individuals	↓ SBP, ↓ AC, ↓ LDL, ↓ hsCRP, ↑ TG, ↑ HOMA-IR
2023	Franziska Grundler	Case Series & Literature Review	Improvements during Long-Term Fasting in Patients with Long COVID	Long-Term Fasting	6–16 days	14 post-COVID patients	13/14 patients reported improved health, ↓ fatigue, ↓ breathlessness, ↓ muscle/joint pain, ↓ cognitive impairment, ↓ body weight, ↓ BP, ↓ glucose, ↓ cholesterol, ↓ LDL, ↓ TG
2023	Krzysztof Stec	Experimental Study	Effects of Fasting on the Physiological and Psychological Responses in Middle-Aged Men	WF	8 days	14 males	↓ body weight, ↓ SBP, ↓ DBP, ↓ glucose, ↑ heart rate, ↑ cortisol, ↑ β-hydroxybutyrate
2024	Kirubel T. Hailu	Systematic Review	The Effect of Fasting on Cardiovascular Diseases: A Systematic Review	IF	-	-	↓ Body weight, ↓ waist circumference, improved lipid profile

A 2021 cross-sectional study on the safety and physiological responses of 8-day water-only fasting carried out by Ewa Ogłodek involved 12 males only. The researcher also discovered that there were raises in the serum levels of b-HB, K+ and UA while the levels of Glucose G, Na+, Ca and Mg++ were comparatively lower. Although fasting facilitated ketogenesis and

effective weight loss, it impacted negatively on blood glucose levels generating mild hypoglycemia, low sodium ion levels that manifested as hyponatremia as well as high levels of uric acid as hyperuricemia during the fasting period.

Zhongquan Dai in 2022 also pursued a study especially on 13 healthy males for ten days of fasting experiment and conducted physiological homeostasis and nutritional indexes. According to the analyzed results of this study, the body weight, SBP and short-lived proteins (pre-albumin, RBP, and transferrin) reduced noticeably. But there was an increase of vitamin B2 levels so it can be inferred that fasting has different effects on micronutrient absorption and metabolism.

Another prospective interventional trial by Eugene Scharf conducted in 2022 investigated the impacts of the long-term fasting of reducing foods intake for 10 days and switching to a refeeding for the subsequent 5 days in 26 overweight and obesity patients. These showed that, fasting improved the SBP, AC, LDL Cholesterol and hsCRP , which is an inflammatory marker. Nonetheless, an elevation in the concentration of total cholesterol, triglycerides (TG) as well as the homeostasis model assessment of insulin resistance (HOMA-IR) was observed after the period of fasting, which points out that metabolic alterations depend on individuals.

A case series and literature review conducted in a case series in 2023 by Franziska Grundler looked at 14 patients who continued experiencing long COVID symptoms and the effects of fasting for lengths between 6 to 16 days. Of the 14 patients that followed the study regime; 13 of them volunteered generally improved health with a decrease in fatigue, degrees of breathlessness, joint/muscle pain, and some acuity impairment. Furthermore, there was weight loss, reduced blood pressure, glucose, total cholesterol, LDL cholesterol, and triglycerides levels, indicating that the study hypothesis that fasting may be beneficial in post-viral patient's recovery due to its anti-inflammatory and metabolic functions.

Krzysztof Stec in his 2023 study on the influence of 8-day water-only fasting showed that subjects, who were 14 middle-aged male individuals, had lowered body weight, blood pressure-systolic, blood pressure-diastolic and a decrease in the level of glucose after the fasting process. But I am grateful for blood glucose, HDL cholesterol, and triglyceride improvement, also there are parameters which became worse, for example, heart rate, cortisol, and β-hydroxybutyrate increasing during the fasting indicate that the body receives physiological stress, which may have both a positive effect in many ways and negative influence in others depending on the condition of the organism.

Only a 2024 systematic review of published studies by Kirubel T. Hailu discussed the impact of IF on cardiovascular diseases, and IF is credited with having substantial effects regarding weight loss, reduced waistline, and better lipid profile. These outcomes also support the use of fasting as an effective measure that would benefit the prevention of cardiosclerosis and enhancement of metabolic profiles.

Modern science has given much light regarding benefiting effects of fasting in other areas apart from metabolism, but in particular as a recovery and cardiovascular issue related to COVID-19. According to the evidences 2021 to 2024, fasting helps in body weight reduction, reduction of blood pressure levels, enhancing lipid profile and suppression of inflammation. Further, it is suggested that fasting can aid with post-COVID syndrome through the management of the long hauler symptoms such as tiredness, shortness of breath, impaired brain functioning, and

metabolic disorder. However, certain pieces of work have indicated some of the dangers or adverse effects of the practice including decrease in blood electrolyte levels, low blood sugar levels, and overstimulation of the metabolic stress response. This has highlighted the need for personalizing the fasting regimens and tracking of patient's physiological alterations, more esepcially in the high risk people. Future work that has to be carried out should include; determination of more fasting regimes which are suitable for use under certain illness, the safety of fasting in the long run and also the basis of operation for maintaining good health through fasting. As more physicians embrace fasting as an efficient and effective tool for improving health, fasting will become a standard part of prevention and treatment of diseases in the future years.

3.6 Ayurvedic Perspectives on Fasting: Traditional Knowledge and Modern Evidence

Fasting – Upavasa as per Ayurveda is the effective therapeutic measures for detoxification, in rebalancing the digestive system and in the prevention of various diseases. In Ayurveda, fasting termed as Upavasa is also known to be an efficient tool in detoxification by eradicating Aam, in the nourishment and strengthening of the digestive fire or Agni. It is quite distinctive from the contemporary fasting regimes in that Ayurvedic fasting is often prescribed according to individual's Prakriti (constitution) and Vikriti (pathological state). In Ayurveda, fasting does not always mean total abstinence from food; it may include reduction in the number of calories consumed, the food consumed maybe in liquid form or certain herbs that facilitate digestion. Many new modern scientific works have attempted to prove Ayurvedic fasting techniques for metabolizing disorders, modification in lipid profile, and hormonal balance. Closely related to other human diseases, there are particular investigations of the effects of fasting with regard to dyslipidemia, indigestion, and polycystic ovarian syndrome (PCOS). To this extent, these studies propose that conventional Ayurvedic fasting if combined with operating scientific methodology, holds a viable philosophy for preventing illness and promoting health.

Table 3.6: Ayurvedic Fasting Practices and Their Health Benefits

Year	Author(s)	Study Design	Title	Fasting Type	Duration	Population	Results
2010	Ami Rajani	Comparative Study	Comparative Study of Upavasa and Upavasa with Pachana in the Management of Agnisada	Modified Fast	1-day fast followed by gradual increase in liquid calories	25 patients with Agnisada (weak digestion)	Significant reduction in symptoms of weak digestive capacity and irregular defecation.
2021	Vaidya Anita Chaudhari	Literature Review	A Review: A Concept of Autophagy with Special Reference to Paachana Therapy	-	-	-	Fasting (as part of Langhana therapy) stimulates autophagy, aiding in cellular detoxification and renewal.
2021	Anita Choudhary	Case Study	Practical Application of Langhana Therapy in the Management of Dyslipidemia	Water-Only Fasting (WF) with 250 ml cow milk	10 days	1 patient with indigestion	Reduction in total cholesterol, LDL, triglycerides, and an increase in HDL levels.
2023	Swapnali Sambhaji Patil	Literature Review	A Literature Review of Upavasa in PCOD w.r.t. Intermittent Fasting	Intermittent Fasting (IF)	6 weeks	Women with PCOS	Significant reduction in weight, body fat, and androgen levels; improved markers of chronic inflammation;

							restored normal menstrual function in 73% of women.

In the year 2010, Ami Rajani did a study on the effectiveness of Fast or Upavasa Ayurveda along with paachana chikitsa or the use of digestive-stimulating drugs in patients affected with Agnisada or weak digestion. The results of the study were that lasting several hours without food, then having the food intake of juices and gradual increase in solid foods led to improved digestion, less instances of diarrhea, and better nutrient intake. This review shows effectiveness of fasting in healing gut which is supported by the recent discoveries about the connection between the gut microbiota and metabolism.

In the year 2021, Vaidya Anita Chaudhari tried to establish the link of Ayurvedic fasting and autophagy which is a cellular process through which damaged cells are removed and new cells are produced. This claim accredits Ayurveda's Lohitanga or lightening therapy with scientific proof for what conventional science proves that fasting or taking food in minimal quantity results in cellular detoxification, reduction of oxidative damage, and increase life span. These results, therefore, indicate that the conventional Ayurvedic fasting regimens levels up to IF and CR.

One of the typical 2021 studies of Anita Choudhary investigated the outcomes of the Ayurvedic fasting in a patient with dyslipidemia and indigestion. The subject conforms to a water-only fasting (WF) with cow milk, 250 ml/day for ten consecutive days intervention. Ninety-5 per cent of the patients indicated improved lifestyle changes that included total cholesterol, LDL cholesterol and triglyceride level gone down and total HDL cholesterol up. The suggested results of this study may also show that Ayurvedic fasting aids in lipid metabolism for the promotion of cardiovascular health.

In the literature review, conducted in 2023, Swapnali Sambhaji Patil discussed the application of Upavasa (Ayurvedic fasting) in handling PCOS and how it incorporated the use of IF . The review has shown that IF has the potential to reduce the weight, body fat, and androgen level in women with PCOS within six-week intervention as well as have beneficial effects on inflammation markers and improve menstruation in 73% of the women. This accords with the Ayurveda as it claims that hormonal imbalances and metabolic disorders are manageable through fasting and change of diets.

Several scholars' previous research agree with Ayurvedic fasting strategies and their importance in the current health care systems. In addition to improving digestion and cleansing, fasting according to Ayurveda helps to treat some metabolic disorders, dyslipidemia, and hormonal disorders. The scientific authentication of the concepts like the fasting therapy, discussed earlier as Langhana, and the digestive therapy, explained in the previous sections under the term Agni Deepana, for example, can be regarded as the closest means of connecting the Ancient Indian knowledge with the contemporary research.

4. Discussion

Though with ancient roots of its application, contemporary research has investigated fasting in numerous fields of health: metabolic, consisting of chronotherbabtiu, chronic disease, cardiovascular, and neurological. This list of benefits of fasting, based on the studies done in the past few decades, includes improvement on hormonal balance, metabolism and immune system, and increasing the effectiveness of cell repair. Thus, this discussion is dedicated to the

attempt to combine the findings of these studies and reveal the major somatic and clinical interrelated effects of fasting with the involvement of the views on this matter provided by Ayurveda and allopathic systems of medicine.

4.1 Metabolic and Hormonal Adaptations During Fasting

The preliminary studies on fasting, quite as those of Palmblad et al. (1977) and Kerndt et al. (1982) have set pace in trying to understand the general effects of fasting on hormonal control and metabolic changes. In an investigation by Palmblad the results were triple low levels of T3, T4, and TSH together with higher levels of rT3 and cortisol, which indicates that fasting acts to conserve energy (Palmblad et al., 1977). Kerndt et al. (1982) describe the physiological changes during an infection that occurred during a 40-day water only fast, there was low blood glucose, low blood pressure, low insulin and high glucagon and high levels of triacylglycerol; it shows that metabolism shifts from carbohydrate to lipid. These observations afforded the basis for regarding fasting as an effective means of achieving metabolic plasticity and adjustment to energy deficit.

It is in later studies where the effects of IF and ADF on glucose and insulin levels were investigated. The effects of caloric restriction on glycemic control in type 2 diabetes patients were looked at by Williams et al. (1998) where the results were weight and glycemic improvement in the patients after twenty weeks of the study. Halberg et al. (2005) and Heilbronn et al. (2005) conducted a similar study in the groups of healthy subjects and decrease in the glucose and leptin level with increased level of adiponectomy attributed to fasting emphasizing the ability of fasting not only to enhance fat metabolism but also to improve the insuline sensitivity. These metabolic alterations are suggestive that fasting could be potentially a fruitful non-pharmacological measure in insulin resistance, the metabolic syndrome, and type 2 diabetes mellitus.

4.2 Fasting and Chronic Disease Management

In the period 2006-2011, the research highlighted more therapeutic use of fasting by concerning such chronic diseases like obesity, asthma, and the like, IBS. In support of the positive effects of fasting on the gut, Kanazawa et al. (2006) observed that IF greatly helped to lessen IBS symptoms. Johnson et al (2007) have examined the effect of ADF in overweight asthmatic patients in which subjects experienced a decrease in inflammation markers such as TNF-α adding to the evidence of how fasting effects immune regulation. As discussed in section2, Varady et al (2009) and Hrbove mentioning that ADF and MF for weeks leads to increase in lipid profiles, decrease in LDL cholesterol, and improvement of cardiovascular health in overweight persons (Johnson et al., 2007; Varady et al., 2009; Harvie et al., 2011). Altogether, these papers show that structured fasting patterns potentially can be employed in the management of chronic inflammation and metabolism ailments.

Fasting during 2013–2016 added neurological functions of the hypothalamic-pituitary-adrenal axis, psychological health, and cellular regeneration. Andreas Michalsen in the year 2013 discussed role of fasting in rheumatic disease, metabolic syndrome and chronic pain with potentiality of the process as anti-inflammatory and immunomodulatory (Michalsen, 2013). Besides, Horne et al. (2013) noted that short-term water fasting had enhance the metabolic and cardiovascular risk factors whereby it decrese insulin and triglycerides and increase the HPL-C cholesterol level. Chenying Li et al.'s (2013) has found that there are positive changes on

obesity study subjects switching to fasting; these include reduced anxiety, depression, and fatigue levels as well as leptin receptor and adiponectin levels proving fasting to be effective on mental and metabolic health among the obese (Horne et al., 2013; Li et al., 2013).

4.3 Fasting, Longevity, and Cellular Repair Mechanisms (2017–2020)

Fasting, from 2017 to 2020, has been investigated as it relates to aging and cellular regeneration in various research publications. Phillips (2019) has written an elaborate review on this matter, indicating how fasting positively affects the brain by enhancing the levels of BDNF and activation of AMPK which functions to support neuroprotection and cognition (Phillips, 2019). Another randomized controlled trial on ADF was performed by Madeo et al. (2019) in healthy people where it was shown that fat mass is decreased, β-hydroxybutyrate is increased, inflammatory markers improved indicating that fasting promotes longevity-related metabolic changes (Madeo et al., 2019).

According to the large observational study in 1422 participants of prolonged fasting for 4 to 21 days by Wilhelmi de Toledo et al (2019), HbA1C and thrombocytes, BMI cholesterol levels significantly decreased, proving the importance of fasting for metabolic and cardiovascular health (Wilhelmi de Toledo et al., 2019). Moreover, Françoise Wilhelmi de Toledo (2020)'s study showed that IF has a positive effect on gut microbiota and anti-oxidative status in addition to the use in weight control and metabolic processes (Wilhelmi de Toledo, 2020). These points stated above and all the research findings put together justify the assertion that fasting is not just the method of shedding pounds of the body weight but a natural means of body cleansing and disease prevention.

4.4 Recent Advances: Fasting and Cardiovascular Health, Post-COVID Recovery (2021–2024)

The latest recommendations (years 2021-2024) involve fasting in relation to the cardiovascular system and after COVID-19. In their attempt of analyzing the effects of a water-only fast for 8 days on various parameters Ogłodek et al. (2021) reported that an increase in ketone bodies was observed as well as the decrease in body weight and blood glucose level; however, certain attention should be paid to electrolyte abnormalities (Ogłodek et al., 2021). Dai et al. (2022) also found that systolic blood pressure was decreased up to normal standards, as well as vitamin B2 levels increased after a complete fasting period of 10 days (Dai et al., 2022).

Another distinct study was performed in 2023 by researchers Grundler et al focusing on the impact of fasting therapy on the long COVID and found that it helps to mitigate fatigue, breathlessness and inflammatory markers in 14 participants with post-COVID condition. Therefore, there is evidence that fasting may be somewhat beneficial for enhancing immune system reconstitution and inflammatory processes in body after viral infections (Grundler et al., 2023). Moreover, Kirubel T. Hailu (2024) in his systematic review on fasting intervention found strong evidence about the effects such as body weight, cardiovascular that indicate reduce fasting and socio-cultural factors for the prevention of cardiovascular diseases (Hailu, 2024).

4.5 Ayurvedic Perspectives: Integrating Traditional Knowledge with Modern Research

Ayurvedic fasting or Upavasa is an ancient practice that has been considered as one of the easiest techniques of cleaning the bowel and rejuvenation for the metabolic system. Rajani et al.(2010) have proved that, Ayurvedic fasting together with Pachana chikitsa which is a

common concept of Ayurveda that uses digestive stimulating herbs help in improving digestive system in patients of Agnisada. Nevertheless, within the same year, Anita Choudhary devoted her work to examine the impact of fasting in dyslipidemia and concluded that a 10-day fasting supplemented with cow milk decreases the total cholesterol and LDL and increases the level of HDL – the result that is in the congruency with the contemporary studies on thereof of fasting (Choudhary, 2021). For instance, Patil (2023) discussed on the impact of IF on PCOS and concluded that whereas 73% of the women had poor menstrual cycles and high androgen levels initially, those improving after six weeks of IF. These facts give evidence to support the ayurvedic fasting approaches to be closely related to the modern intermittent fasting theories which gives evidence of the fact that fasting can act as a broader approach to metabolic and hormonal balance.

Summing up the results of numerous fasting interventions, it is possible to conclude about the highly beneficial effects of the diet on metabolism, protection against diseases, and increased survival rate and the function of the immune system. They found that fasting has potentials to improve different physiological systems starting from hormonal adaptations, the improvement of cardiovascular health, and recovery of the post-COVID condition. Hearkening back to ancient Indian practices combined with current scientific data suggests that fasting is not just a fancy diet fad of the present generation but has scientific evidences for treating the chronic health issues or for even rejuvenating the cells of the body. However, proper attention should be paid to further investigations of the best practices in the practice of fasting for different patients, proving the safety of the method and studying the effects of fasting on the human body in the long term. With current scientific advances, fasting is likely to be adopted as part of preventive and curative non-pharmacological medicine globally.

5. Conclusion

What started out as a simple dietary restriction originating from the field of Ayurveda has emerged as a scientifically supported technique that holds potential for improving metabolic functions and disease prevention, control and treatment as well as longevity. Thus, the first clinical trials proved that fasting has an effect on hormonal levels, insulin sensitivity, and lipid profiles, thus predetermining future applications of fasting with reference to the chronic disease prevention. Later on, other studies noted that fasting reduces inflammation levels, contributes to the improper functioning of the gut microbiome, and has a positive influence on one's neurological and psychological condition. Recent trends of intermittent fasting for the wellbeing of the heart and post COVID circumstances also highlight the importance of fasting in the current medical practice. Research has proved that fasting lowers inflammation, boosts the cellular self-digestion process known as autophagy and resolves other cellular processes associated with age and brain health. Some concepts of fasting as described in Ayurveda have the backing of modern science especially when it comes to the ideas on digestion, detoxification, and metabolism. As earlier described, fasting has many benefits and is comparatively safe. Some side effects of the fasting could include electrolyte imbalances, hypoglycemia or metabolic stress due to the long fasting periods required with the diet and therefore cautious and considerate monitoring and development of the fasts incorporated in the diet should be made. Future research should identify best practical fasting regimes depending on various diseases, examine the effects of a long-term fasting, as well as primary tested ways

of its combination with diet and lifestyle changes. As fasting is gaining acceptance in both conventional and alternative medicine systems, it is all set to become the Rubik's cube of preventive health care having a science-based natural key to increasing health span and longevity.

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