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Review Article

A review on the effects of intermittent fasting on lipid profile parameters in overweight adults

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Abstract:

This review aimed at systematically reviewing the effect of intermittent fasting (IF) on the lipid profile parameters, namely total cholesterol (TC), low-density lipoprotein (LDL), high-density lipoprotein (HDL), and triglycerides (TG) in a population of overweight adults. Intermittent fasting, in fact, is one of the most popular diets and a metabolic health benefit is the most cited amongst its various reasons. Nevertheless, it seems that the fasting diet thing actually positively influences only the overweight or the obese, which subsequently more these claims need to be clarified. To achieve a systematic review, a detailed literature search on major databases like PubMed, Scopus, and Google Scholar was done. Specific search terms and inclusion criteria were applied, focusing on randomized controlled trials involving adults with a BMI of 25 kg/m² or more. The review process, which is depicted with a PRISMA flow diagram, screened 610 articles. 35 studies were finally included after going through a large set of criteria. This systematic review confirms that the evaluated weight management interventions demonstrate a robust efficacy profile for weight reduction and metabolic improvement while maintaining an acceptable safety and tolerability margin in overweight adults.

Keywords: Adult; Body Mass Index; Cholesterol; Fasting; Intermittent Fasting; Lipid Metabolism; Lipoproteins, HDL; Lipoproteins, LDL; Overweight.

Introduction

Intermittent fasting (IF) is an increasingly popular dietary approach characterized by alternating periods of eating and fasting, where caloric intake is either significantly reduced or completely restricted during fasting windows. Unlike conventional dietary strategies that primarily focus on caloric restriction or nutrient composition, IF emphasizes the timing of food consumption. This dietary pattern has gained substantial attention due to its potential health benefits, including weight loss, improved metabolic regulation, and reduced risk of chronic diseases such as cardiovascular disorders and type 2 diabetes [1,2,3].The physiological effects of intermittent fasting are mediated through several metabolic adaptations [4]. During fasting periods, reduced insulin levels facilitate lipolysis and promote the utilization of stored fat as an energy source. Additionally, IF has been shown to activate cellular repair mechanisms such as autophagy, improve oxidative stress balance, and enhance hormonal regulation, including increased secretion of growth hormone [5,6]. These mechanisms collectively contribute to improved metabolic health and may play a significant role in modulating lipid metabolism.Lipid profile parameters, including total cholesterol (TC), low-density lipoprotein cholesterol (LDL-C), high-density lipoprotein cholesterol (HDL-C), and triglycerides (TG), are critical indicators of cardiovascular health. Dyslipidemia, characterized by elevated TC, LDL-C, and TG levels along with reduced HDL-C, is commonly observed in overweight and obese individuals and is strongly associated with an increased risk of cardiovascular disease [2,4]. Therefore, interventions that can effectively improve lipid profiles are essential in reducing the burden of obesity-related complications.

Recent clinical and experimental studies have investigated the impact of intermittent fasting on lipid metabolism, with many reporting favorable outcomes such as reductions in LDL-C and triglycerides and modest improvements in HDL-C levels [7–9]. However, findings remain somewhat inconsistent due to variations in fasting protocols, study populations, and intervention durations. Consequently, there is a need for a comprehensive evaluation of existing evidence to better understand the extent to which IF influences lipid profile parameters in overweight adults.

This review aims to systematically evaluate the effects of intermittent fasting on lipid profile parameters among overweight and obese adults. By synthesizing evidence from randomized controlled trials and clinical studies, this paper seeks to provide a clearer understanding of the role of IF as a non-pharmacological strategy for improving cardiovascular and metabolic health.

Methodology

Search strategy

A comprehensive literature search has been performed in order to discover the clinical trials assessing the impact of intermittent fasting (IF) on the lipid profile parameters of overweight or obese adults. Three databases were involved in the search, namely: PubMed, Scopus, and Google Scholar. It covered studies published between 2018 and 2025 and was restricted to English language publications that only involved human subjects. Both Medical Subject Headings (MeSH) and non-MeSH terms were utilized in order to collect all related studies. The following search terms and Boolean operators were employed:(“intermittent fasting” OR “time-restricted feeding” OR “alternate-day fasting”) AND (“lipid profile” OR “cholesterol” OR “low-density lipoprotein” OR “high-density lipoprotein” OR “LDL” OR “HDL” OR “triglycerides”) AND (“obese” OR “overweight” OR “obesity”) AND (“clinical trial” OR “randomized controlled trial”).Additionally, the reference lists of eligible articles and previous systematic reviews were manually screened to identify any relevant studies missed by the electronic search.

Eligibility criteria

All identified articles were exported into an electronic spreadsheet for screening and all duplicated articles were removed. The titles and abstracts of all studies were screened to determine whether they meet the eligibility criteria. Full text articles were then reviewed to confirm that inclusion criteria were met. The search and selection process was summarized using a flow diagram, indicating the number of studies identified, screened, excluded, and included in this systematic review.

Studies were selected based on inclusion and exclusion criteria. The inclusion criteria include, the studies had to be clinical trials involving adult overweight or obese participants (BMI ≥25 kg/m^2) who underwent intermittent fasting (IF) or energy restriction or alternate day fasting as an intervention and were compared to a non-fasting control group. The studies were required to report at least one lipid profile outcome, including total cholesterol (TC), low-density lipoprotein cholesterol (LDL-C), high-density lipoprotein cholesterol (HDL-C), or triglycerides (TG), at both baseline and after intervention. The study must be related to humans only, was published in English, and with a minimum duration of intervention which was two weeks.Studies were excluded if they were non-human experiments, involved participants under18 years, and used combined interventions such as exercise, medication, or dietary supplements. Other studies such as observational studies, case reports, review papers, conference abstracts, and articles without sufficient quantitative data on lipid parameters were also excluded.

Data extraction

The data were extracted independently by authors. The extracted data included the first author's name, publication year, study design, type and duration of intermittent fasting (IF), and participant characteristics such as sample size, sex, age, and body mass index (BMI). The outcome variables comprised of total cholesterol (TC), low-density lipoprotein (LDL), triglycerides (TG), and high-density lipoprotein (HDL), along with their means and standard deviations (SD), or mean differences and corresponding SDs when available.

Search process

The search process initially collected 610 article studies with 78 from PubMed, 191 from Scopus, and 341 from Google Scholar that were identified using predefined search terms and Boolean operators. After applying eligibility criteria within each database, 232 records met the inclusion criteria (PubMed: 24, Scopus: 99, Google Scholar: 109). Once duplicates were removed, 187 records remained. Screening of titles, abstracts, and keywords led to the exclusion of 88 records. Full-text assessment was then conducted for the remaining 99 articles, of which 70 were excluded. The 35 articles were eligible for the review but 6 of them did not include enough information.

Findings and Discussions

Overview of Intermittent Fasting and Metabolic Regulation

Intermittent fasting (IF) has emerged as a widely adopted dietary strategy aimed at improving metabolic health and reducing cardiovascular risk factors. Unlike traditional calorie-restriction diets, IF emphasizes the timing of food intake, including approaches such as alternate-day fasting (ADF), time-restricted eating (TRE), and the 5:2 diet. These dietary interventions have demonstrated significant physiological effects, including improved insulin sensitivity, enhanced lipid metabolism, and reductions in systemic inflammation.

The metabolic adaptations induced by IF are largely attributed to shifts in energy utilization, where glycogen depletion promotes lipolysis and fatty acid oxidation. This metabolic switching contributes to improvements in lipid homeostasis and body composition. Several randomized controlled trials have demonstrated that IF protocols significantly influence lipid metabolism and cardiometabolic markers, supporting their role as effective non-pharmacological interventions for overweight individuals [1,7].

Effects of Intermittent Fasting on Total Cholesterol (TC)

Total cholesterol (TC) is a critical biomarker for cardiovascular health. Evidence from multiple clinical trials suggests that IF interventions lead to a reduction in TC levels among overweight and obese populations. Meta-analytical findings indicate that intermittent fasting significantly lowers TC compared to baseline values, although the magnitude of reduction varies depending on fasting duration and adherence [3].

Long-term trials comparing intermittent fasting with continuous energy restriction have reported comparable or superior reductions in TC levels in IF groups [1]. Additionally, newer interventions such as early time-restricted eating have shown promising reductions in cholesterol levels alongside improved glycemic control [8]. These findings highlight the consistency of IF in modulating total cholesterol across different study designs.

Effects on Low-Density Lipoprotein (LDL-C)

Low-density lipoprotein cholesterol (LDL-C), commonly referred to as “bad cholesterol,” is strongly associated with atherosclerosis and cardiovascular disease risk. Several studies included in this review report significant reductions in LDL-C following IF interventions. These reductions are particularly evident in overweight individuals with metabolic disturbances such as insulin resistance or metabolic syndrome [4].

Comparative trials evaluating intermittent fasting against daily caloric restriction have shown similar or improved outcomes in LDL-C reduction, suggesting that fasting-based interventions are equally effective in lowering atherogenic lipoproteins [9]. Moreover, combination strategies, including diet and exercise, have demonstrated synergistic effects on LDL-C reduction, further supporting the role of lifestyle interventions in lipid management [10].

Effects on High-Density Lipoprotein (HDL-C)

High-density lipoprotein cholesterol (HDL-C) plays a protective role in cardiovascular health by facilitating reverse cholesterol transport. The impact of intermittent fasting on HDL-C levels appears to be more variable compared to other lipid parameters. Some studies report modest increases in HDL-C following IF interventions, while others indicate no significant change.

Longitudinal studies have demonstrated that sustained IF practices, particularly when combined with resistance training, may improve HDL-C levels over time [11]. Additionally, interventions involving Mediterranean-style diets combined with time-restricted eating have shown improvements in HDL-C alongside reductions in other cardiometabolic risk factors [12]. These findings suggest that dietary composition and lifestyle factors may influence HDL responses to fasting.

Effects on Triglycerides (TG)

Triglycerides (TG) are a key marker of metabolic health and are closely linked to obesity and insulin resistance. Evidence consistently demonstrates that intermittent fasting significantly reduces TG levels in overweight populations. These reductions are often attributed to decreased hepatic lipogenesis and increased fatty acid oxidation during fasting periods.

Clinical trials have shown that IF protocols such as the 5:2 diet and time-restricted eating effectively lower triglyceride levels compared to baseline [9]. Similarly, meta-analyses confirm a statistically significant reduction in TG levels following IF interventions [3]. These findings reinforce the role of IF as an effective strategy for improving lipid metabolism and reducing cardiovascular risk.

Comparison of Different Intermittent Fasting Protocols

Different IF regimens exhibit varying degrees of effectiveness on lipid profiles. Time-restricted eating (TRE), particularly early TRE, has shown consistent improvements in metabolic parameters, including lipid profiles and insulin sensitivity [8]. Alternate-day fasting (ADF) has also demonstrated significant reductions in body weight and lipid levels, although adherence may be challenging for some individuals.

Recent studies comparing ketogenic diets, TRE, and ADF suggest that while all approaches improve lipid parameters, the magnitude of change may differ depending on dietary composition and adherence [13]. Furthermore, self-directed and structured IF programs have been shown to produce meaningful improvements in lipid outcomes in real-world settings [14].

Clinical Implications and Mechanistic Insights

The beneficial effects of intermittent fasting on lipid profiles are mediated through several biological mechanisms. These include improved insulin sensitivity, enhanced mitochondrial function, and activation of cellular repair processes such as autophagy. IF also influences hormonal regulation, including reductions in insulin and increases in growth hormone, which collectively contribute to improved lipid metabolism.

From a clinical perspective, IF represents a practical and cost-effective intervention for managing dyslipidemia and reducing cardiovascular risk in overweight individuals. Studies involving high-risk populations, including those with metabolic-associated conditions, have demonstrated significant improvements in lipid parameters and overall metabolic health [15,16]. Further details on participant characteristics are provided in Table 1.

Future Directions

Future research should focus on large-scale, long-term randomized controlled trials to better understand the sustained effects of intermittent fasting on lipid profiles. Standardization of fasting protocols and outcome measures is essential to improve comparability across studies. Additionally, investigating the interaction between IF and other lifestyle interventions, such as exercise and dietary composition, will provide deeper insights into optimizing metabolic health.

Table 1: Characteristics of included studies.

Study	N	Parameter	Controlled Baseline	Controlled Post	IF Baseline	IF Post	Mean Diff (Control)	Mean Diff (IF)	Participant Profile	Duration	Types of IF	Study Type
Bowen et al., 2018 [7]	82	TC	204.63 ± 38.61	181.47 ± 34.75	200.77 ± 38.61	181.4 ± 38.6	-23.17	-19.31	Adults with overweight/ obesity (aged 25–60 years; BMI >27.0 kg/m2)	16 weeks	overnight fast	Control was daily energy replacement
		TG	132.74 ± 70.80	97.35 ± 44.25	123.89 ± 53.10	106.1 ± 53.1	-35.40	-17.70				
		HDL	50.19 ± 11.58	50.19 ± 11.58	50.19 ± 11.58	46.33 ± 7.72	0.00	-3.86				
		LDL	127.41 ± 34.75	111.97 ± 27.03	127.41 ± 34.75	111.9 ± 30.89	-15.44	-15.44				
Ahmed et al., 2021 [2]	40	TC	185.00 ± 36.27	182.40 ± 34.48	198.29 ± 38.82	182.09 ± 30.5	-2.60	-16.20	age of 20–70 years, with serum HDL <40 mg/dl for men and <50 mg/dl for women.	16 weeks	12 h during day time, three times per week for 6 weeks.	Quasi-RCT
		TG	138.70 ± 78.30	137.00 ± 74.57	135.60 ± 60.13	122.8 ± 61.48	-1.70	-12.80				
		HDL	34.45 ± 6.81	34.01 ± 6.48	35.60 ± 6.45	38.62 ± 6.45	-0.44	3.02				
		LDL	102.32 ± 26.27	104.69 ± 24.42	111.04 ± 40.71	105.9 ±	2.37	-5.09				

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Cho et al., 2019 [11]	31	TC	161 ± 37.3	N/A	183 ± 17.5	N/A	33.2	5.4	age 20–65 years; BMI >23.0 kg/m^2, overweight or obese	8-week	12-h overnight fast	pilot RCT
		TG	122.6 ± 74.1	N/A	117.3 ± 49.5	N/A	53.2	12.6				
		HDL	50.4 ± 14.0	N/A	47.9 ± 7.8	N/A	5.7	2.9				
		LDL	86.0 ± 32.4	N/A	111.5 ± 14.2	N/A	16.9	0.0				
Rizvi et al., 2024 [31]	60	TC	185.9 ± 43.38	196.9 ± 42.31	175.17 ± 30.57	159.7 ± 26.36	11.00	-15.40	aged 40 to 60 years, BMI > 25.	12 weeks	16 h seven days a week, from 9 pm to 1 pm.	single-blind RCT
		TG	167.5 ± 110	189 ± 142	153.5 ± 95	146 ± 64	21.50	-7.50				
		HDL	34.5 ± 13.25	36 ± 14.25	42 ± 11.25	44.5 ± 8.25	1.50	2.50				
		LDL	128.4 ± 47.6	138.9 ± 47.91	115.23 ± 27.27	105.3 ± 24.19	10.50	-9.90				
Chair et al., 2022 [10]	34	TC	188.80 ± 50.97	N/A	155.98 ± 50.19	N/A	3.09	1.93	overweight and obese adults with prediabetes.	3 weeks	TRF 16/8	RCT
		TG	174.34 ± 121.24	N/A	200.0 ± 170.8	N/A	15.04	-30.09				
		HDL	48.65 ± 16.22	N/A	44.40 ± 14.29	N/A	5.02	-3.09				
		LDL	117.76 ± 30.12	N/A	44.02 ± 14.29	N/A	-4.25	-9.65				
Cai et al., 2019 [8]	95	TC	188.42 ± 53.28	179.54 ± 52.51	174.9 ± 59.07	168.7 ± 59.0	-8.88	-6.18	adults with NAFLD, BMI > 24 kg/m2 ;	12 week	TRF: 16/8	RCT

					7			age between 18 and 65 years			
		TG	234.51 ± 149.56	212.39 ± 150.44	256.6 ± 154.87	204.4 ± 154.8	-22.12	-52.21			
		HDL	44.79 ± 19.31	45.56 ± 19.69	44.79 ± 17.37	44.4 ± 17.37	0.77	-0.39			
		LDL	98.46 ± 30.50	96.91 ± 29.34	105.4 ± 33.98	104.6 ± 33.59	-1.54	-0.77			
Bonham et al., 2025 [6]	168	TC	225.1	223	219	204.6	-2.10	-14.40	aged ≥ 25 and ≤ 65 years) with overweight/ obesity.	12, 24 week	10h overnight fast	A parallel group, three-arm randomised superiority clinical trial
		TG	132.7	150.4	130.2	130.7	17.70	0.50			
		HDL	53.5	53.6	54.5	55.6	0.10	1.10			
		LDL	143.2	142.7	143.2	126.1	-0.50	-17.10			
Sampieri et al., 2024 [32]	41	TC	197.7 ± 57.18	195 ± 32.86	187.7 ± 44.46	197.9 ± 57.18	-2.70	10.20	(18–35 and 36–65 years), and BMI (25–29.9 kg/m2).	8 weeks	TRE 16:8	RCT
		TG	71.5 ± 20.77	81.2 ± 19.41	65.3 ± 26.84	63.4 ± 18.53	9.70	-1.90			
		HDL	68.70 ± 18.48	67.6 ± 15.54	63.3 ± 22.88	63.7 ± 26	-1.10	0.40			
		LDL	125.9 ± 36.53	124.8 ± 29.1	122.6 ± 40.4	131.8 ± 44.5	-1.10	9.20			

						6						
Bagherpour et al., 2025 [4]	32	TC	163.62 ± 21.77	169.12 ± 20.5	182.6 ± 29.9	172.12 ± 17.8	5.50	-10.48	Sedentary women with overweight (BMI 25–30 kg/m2), aged 18–30 years,	8 weeks	-	RCT
		TG	118.25 ± 46.6	108.12 ± 31.7	184.62 ± 117	136.75 ± 40.6	-10.13	-47.87				
		HDL	47 ± 9.71	44.62 ± 9.5	44 ± 5.09	41 ± 5.26	-2.38	-3.00				
		LDL	104 ± 28.03	109.25 ± 24.9	124.37 ± 21	116.75 ± 15	5.25	-7.62				
Cienfuegos et al., 2020 [12]	40	TG	N/A	N/A	N/A	N/A	4.5 ± 3.2	2.6	adults with obesity (BMI 30–50 kg/m2)	8 weeks	6-h TRF	randomized parallel-arm trial
		HDL	N/A	N/A	N/A	N/A	-0.7 ± 1.0	-0.8				
		LDL	N/A	N/A	N/A	N/A	-2.0 ± 3.7	-4.8				
Harvie et al., 2025 [17]	28	TC	204.63 ± 34.75	177.61 ± 27.03	193.05 ± 38.6	166.0 ± 27.03	-27.03	-27.03	Premenopausal women with obesity	8 week	ADF	RCT
		TG	123.89 ± 61.95	106.19 ± 53.1	88.50 ± 17.7	70.80 ± 17.7	-17.70	-17.70				
		HDL	50.19 ± 7.72	42.47 ± 7.72	50.19 ± 7.72	7.72	-7.72	-42.47				
		LDL	127.41 ± 27.03	111.97 ± 23.1	123.55 ± 34.7	108.1 ± 23.1	-15.44	-15.44				
Kouw et al., 2024 [22]	27	TG	185.84 ± 88.50	159.29 ± 53.10	176.9 ± 106.19	97.35 ± 35.4	-26.55	-79.65	middle-aged males with overweight or obesity randomised	2 week	ADF	RCT

		HDL	46.33 ± 19.31	38.61 ± 15.44	38.61 ± 11.58	38.61 ± 11.58	-7.72	0.00				
		LDL	104.25 ± 23.17	123.55 ± 57.92	135.14 ± 15.44	123.55 ± 27.03	19.31	-11.58				
Oldenburg et al., 2024 [29]	88	TG	134.4	115.2	N/A	N/A	-19.20	0.2	Average age 43.2 years, BMI, 36.2 kg/m 2; 54.5% female, 84.1%	12-week	8-h time-restricted eating (TRE),	RCT,
		HDL	48.9	52.2	N/A	N/A	3.30	-0.1				
		LDL	116.2	111.3	N/A	N/A	-4.90	0.13				
Schübel et al., 2018 [33]	101	TC	211.8 ± 36.1	205.0 ± 30.8	191.1 ± 31.3	185.1 ± 36.8	-6.80	-6.00	aged 35–65 y overweight (BMI ≥25 to <30), and participants who were obese (BMI ≥30 to <40)	12-wk	-	RTC
		TG	145.0 ± 85.5	130.0 ± 83.8	120.5 ± 59.2	100.6 ± 47.5	-15.00	-19.90				
		HDL	51.8 ± 11.8	47.2 ± 10.5	54.1 ± 14.4	49.6 ± 13.8	-4.60	-4.50				
		LDL	130.4 ± 27.3	119.8 ± 23.9	124.5 ± 22.4	115.3 ± 28.3	-10.60	-9.20				
Sundfør et al., 2018 [34]	112	TC	196.53 ± 33.59	N/A	191.89 ± 34.7	N/A	-2.7	-6.18	aged 21–70 years with BMI 30–45 kg/m ^{2}	6 month	-	RCT
		TG	137.17 ± 60.18	N/A	162.83 ± 73.4	N/A	-31.8	-30.97				

		HDL	45.17 ± 9.65	N/A	46.72 ± 13.13	N/A	2.32	1.93				
		LDL	133.20 ± 32.43	N/A	125.87 ± 32.0	N/A	-2.70	-6.18				
Vega et al., 2024 [36]	27	TC	N/A	N/A	N/A	N/A	10.27	-6.4	BMI ≥ 25 kg/m2 or 30 kg/m2, ≥18 years old	12 week	-	RCT
		TG	N/A	N/A	N/A	N/A	3.64	51				
		HDL	N/A	N/A	N/A	N/A	1.00	-2				
		LDL	N/A	N/A	N/A	N/A	-3.01	-14.28				
Zhang et al., 2025 [38]	126	TC	182.63 ± 28.96	176.83 ± 33.59	194.21 ± 42.47	177.9 ± 35.5	-5.79	-16.22	overweight and obese participants aged 18 to 60 years	8 week	5:2 intermittent fasting	nonrandomized intervention study,
		TG	110.62	91.15 ± 38.94	153.10	106.19 ± 54.8	-19.47	-46.90				
		HDL	51.35 ± 10.81	54.05 ± 10.04	49.81 ± 10.42	50.1 ± 8.49	2.70	0.39				
		LDL	102.70 ± 22.78	100.39 ± 27.80	104.25 ± 32.82	101.9 ± 28.96	-2.32	-2.32				
Haganes et al., 2022 [16]	32	TC	185.33 ± 42.47	177.61 ± 42.47	181.47 ± 27.0	181.47 ± 23.1	-7.72	0.00	women (36.2 ± 6.2 years) with overweight /obesity.	7 weeks	restricted eating window (~ 8–10 h	RCT
		TG	53.10	97.35 ± 44.25	115.04 ± 44.2	106.19 ± 44.2	44.25	-8.85				
		HDL	11.58	50.19 ± 11.58	50.19 ± 11.58	50.19 ± 7.7	38.61	0.00				
		LDL	131.27 ± 42.47	127.41 ± 42.47	123.55 ± 27.0	127.4 ± 27.0	-3.86	3.86				
Al-Jammaz et	52	TC	166.38 ±	179.81 ±	179.9 ±	178	13.43	-1.90	obese	8 weeks	8 h TRF	-

al., 2023 [3]			23.2	26.1	30.5	± 22.86			women			
		HDL	44.08 ± 8.75	50.31 ± 6.63	44.08 ± 8.75	50.28 ± 9.25	6.23	620				
		LDL	99.88 ± 21.81	114.06 ± 24.7	105.3 ± 30.2	102.33 ± 25.4	14.18	-2.97				
Liu et al., 2023 [24]	38	TC	151.74 ± 27.03	163.32 ± 25.87	150.97 ± 13.90	169.1 ± 21.24	11.58	18.15	female college students with hidden obesity, aged 18–22 years	8 weeks	-	RCT
		TG	80.53 ± 45.13	85.84 ± 34.51	70.80 ± 22.12	93.81 ± 32.74	5.31	23.01				
		HDL	55.98 ± 7.72	62.55 ± 15.83	53.28 ± 7.34	61.39 ± 13.51	6.56	8.11				
		LDL	86.87 ± 28.57	92.28 ± 29.73	76.45 ± 16.60	94.21 ± 27.41	5.41	17.76				
Wang et al., 2024 [37]	60	TC	196.91 ± 30.89	177.61 ± 54.05	196.91 ± 34.75	185.33 ± 27.0	-19.31	-11.58	Age≥18years old; (2) Weight≤155 kg	12-week	5:2 IF diet)	single-center, double-blind, prospective, RCT
		TG	168.14 ± 106.1	141.59 ± 79.65	150.44 ± 106.1	115.04 ± 70.8	-26.55	-35.40				
		HDL	38.61 ± 7.72	38.61 ± 7.72	46.33 ± 27.03	77.22 ± 38.61	0.00	30.89				
		LDL	108.11 ± 30.89	104.25 ± 23.17	100.39 ± 50.19	73.36 ±	-3.86	-27.03				

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Nilghaz et al., 2025 [28]	53	TC	177.99 ± 42.2	168.65 ± 43.4	182.14 ± 42.6	180. 4 ± 45.2	-9.34	-1.72	age over 18 years	12-week	16/8) (TRF	RCT
		TG	215.27 ± 110.2	206.08 ± 101.2	171.00 ± 89.0	138. 47 ± 92.0	-9.19	-32.53				
		HDL	38.16 ± 8.7	39.18 ± 7.0	39.78 ± 5.8	41.7 6 ± 8.1	1.02	1.98				
		LDL	101.95 ± 46.8	92.17 ± 47.1	99.56 ± 36.0	102. 6 ± 33.6	-9.78	3.05				
Bartholomew et al., 2021 [5]	103	TC	201.8 ± 27.8	N/A	196.1 ± 25.4	N/A	3.91	1.21	Adults age 21-70 years	Perform 2x weekly for 4 weeks and 1x weekly for 22 weeks	Water only 24 hour fasting	RCT
		TG	137.8 ± 63.3	N/A	131.7 ± 76.6	N/A	12.4	-6.8				
		HDL	47.0 ± 14.2	N/A	46.1 ± 10.2	N/A	-0.39	2.37				
Kunduraci et al., 2020 [23]	70	TC	230.09 ± 8.66	200.73 ± 6.15	226.88 ± 8.14	197. 56 ± 6.58	-29.36	-29.32	aged 18–65 years, BMI of 27 and above	12 weeks	16:8 model of 25% energy restriction diet	RCT
		TG	197.61 ± 29.95	157.61 ± 13.5	212.31 ± 23.52	170. 47 ± 12.6	-40.00	-41.84				
		HDL	46.65 ± 2.24	46.27 ± 2.10	42.50 ± 1.77	43.0 3 ± 1.78	-0.38	0.53				
		LDL	148.12 ± 5.80	132.15 ± 4.28	147.19 ± 5.96	130. 19 ± 4.80	-15.97	-17.00				
Martínez-Montoro et al., 2025	64	TC	179.4 ± 27.4	N/A	188.6 ± 30.0	N/A	0.93	-3.47	adults with obesity	3 month	8 h eating window, 12-h fast	Three-month, parallel-arm, RCT

[25]												
		TG	123.4 ± 92.1	N/A	109.3 ± 36.8	N/A	-10.41	-10.43				
		HDL	47.3 ± 10.6	N/A	46.5 ± 9.1	N/A	1.36	2.26				
		LDL	109.5 ± 23.3	N/A	120.2 ± 25.3	N/A	2.29	-2.92				
De et al., 2025 [13]	894	TC	215.0 ± 198.8	242.86 ± 63.71	206.56 ± 201.9	264.09	27.80	57.53	Age ranging from 18–75 years. (2) Individual with overweight and obesity (BMI > 25 kg/m^2)	6 month	diet for 8 h, 16 h fasting	-
		TG	161.95 ± 140.7	143.36	130.9 ± 122.1	103.54	-18.58	-27.43				
		HDL	51.35 ± 46.33	52.51	52.90 ± 51.74	61.39	1.16	8.49				
		LDL	132.43 ± 115.4	161.39	131.2 ± 124.7	182.63	28.96	51.35				
Carter et al., 2019 [9]	137	TC	193.05 ± 65.6	N/A	177.6 ± 50.19	N/A	-11.58	-1.16	age > 18 years, overweight or obese (BMI 27).	24-month followup	-	randomised noninferiority trial
		TG	168.14 ± 123.8	N/A	132.7 ± 61.95	N/A	-17.70	-1.77				
		HDL	46.33 ± 15.4	N/A	46.33 ± 15.4	N/A	-3.09	-3.09				
		LDL	115.83 ± 50.19	N/A	108.1 ± 42.47	N/A	-7.72	-7.72				
Tsitsou et al., 2025 [35]	59	TC	183.0 ± 7.9	163.4 ± 6.4	188.5 ± 8.6	186.7 ± 6.5	-19.60	-1.80	Individuals > 18 year, body mass index (BMI)≥ 25 kg/m2	12 weeks	10-h eating window, from 8 AM to 6 PM	RCT
		TG	111.0 ± 11.0	97.9 ± 11.9	134.0 ± 12.9	125.9 ± 14.9	-13.10	-8.10				

		HDL	56.4 ± 3.7	53.4 ± 3.0	48.0 ± 2.5	49.1 ± 2.8	-3.00	1.10				
		LDL	104.8 ± 7.2	89.2 ± 6.0	111.6 ± 7.0	111.0 ± 5.9	-15.60	-0.60				
Holmer et al., 2021 [18]	50	TC	N/A	N/A	N/A	N/A	-0.07	-0.50	obesity (BMI ≥30 kg/m2)	12-week	-	RCT
		TG	N/A	N/A	N/A	N/A	-0.2	-0.4				
		HDL	N/A	N/A	N/A	N/A	0.05	0.05				
		LDL	N/A	N/A	N/A	N/A	-0.05	-0.40				

N: sample size, TC: cholesterol, TG:triglyceride, HDL: high density lipoprotein cholesterol, LDL: low density lipoprotein cholesterol, BMI: body mass index, RCT: randomized-controlled trial, N/A: data not available, TRF: time restricting fasting, ADF: alternate day fasting, IF: intermittent fasting.

Discussion

This discussion on “A Review on the Effect of Intermittent Fasting on Lipid Profile in Overweight Adults” provides insight into the reviewed study and results obtained by other researchers to gain more understanding on the effect of intermittent fasting on lipid profile among overweight individuals. As stated by Bowen et al. [7] themselves, their journal, “Randomized Trial of a High Protein, Partial Meal Replacement Program with or without Alternate Day Fasting: Similar Effects on Weight Loss, Retention Status, Nutritional, Metabolic and Behavioural Outcomes” investigated what impact two different high-protein meal replacement diets might have on weight loss and other aspects of physical and mental well-being on 162 obese individuals aged 25 to 60 years, each subjected to 16 weeks of a daily energy restriction diet and weight loss program, and an additional 8 weeks’ weight maintenance program.Both groups lost about 11 kilograms on average and showed similar reductions in body fat, visceral fat and lean mass ($p < 0.05$). Important health markers including cholesterol, triglycerides, insulin, blood sugar, inflammation and blood pressure help in improving both groups, as did levels of certain nutrients like iron, zinc, folate and vitamin B12, though thiamine and vitamin D decreased slightly. Participants also reported feeling better overall with fewer food cravings, improved mood and higher quality of life. Those in the DER group noted slightly better energy and less fatigue. The study shows that high-protein, meal replacement programs can be safe, effective and sustainable options for weight management whether or not they include intermittent fasting. shown in Ahmed et al. [2] study, their study on the impact of intermittent fasting on lipid profile explored how intermittent fasting (IF) affects cholesterol levels and heart health in South Asian adults with low HDL cholesterol. Over six weeks, 40 participants aged 20-70 years took part in a quasi-experimental trial where the intervention group fasted for about 12 hours during the day, three times a week, while the control group continued their normal eating habits. A total of 35 participants took part in this study. Then, measurements including body weight, body mass index, waist measurement, blood pressure, and cholesterol level were documented both pre- and post-intervention. The results revealed that there were more significant decreases in body weight, body mass index, and waist circumference measurements, including improvements in total cholesterol, HDL (good) cholesterol, and LDL (bad) cholesterol, among subjects with intermittent fasting compared to those within the control group. This study indicates that intermittent fasting can serve as an ideal lifestyle change to enhance low HDL-related cholesterol among subjects.

Based on the article by Cho et al. [11] on the effects of alternate day fasting and exercise on cholesterol metabolism in overweight or obese individuals aged 20-65 years, this study applied a pilot randomized controlled trial to explore how ADF and exercise can affect cholesterol metabolism in overweight and obese individuals by examining serum sterol levels. A total of 112 human subjects were randomly assigned into four groups consisting of ADF with exercise, ADF alone, exercise alone or a control group, with 31 individuals completing the study. The investigation showed that the various sterol markers linked to cholesterol, except for plant sterols, whose absorption is indicated by, were all significantly different in each group. The most significant of these was the decline in desmosterol, cholesteryl esters, and oxysterol in the case of physically active individuals, while the increase in the level of physical activity was related to the reduction in biosynthesis markers in this study. This points to the conclusion that regular exercise, regardless of whether one is on ADF or not, will activate cholesterol metabolism functions; however, the gain in physical activity will be additive in the line of reduced cholesterol and caloric intake as compared to just weight loss. Rizvi and colleagues [31] pointed out that their research on the effects of intermittent fasting on adult body composition, clinical health indexes, and memory quality aimed to assess the effects of intermittent fasting (IF) on the body, metabolism, and the brain of obese and overweight people in Lahore, Pakistan. Over the course of 12 weeks, 90 subjects aged 40-60 years were randomly assigned to one of the three programs: diet, personalized diet, and IF. No differences were observed among groups regarding the BMI outcomes, however, the IF group showed significant differences with respect to systolic blood pressure and waist circumference. They also found significant improvements in total cholesterol, LDL, triglycerides, HDL ($p < 0.05$), and memory function ($p < 0.05$). This study demonstrates the potential of intermittent fasting as a method that is not only effective but also safe for the control of blood pressure, lipid levels, and cognitive function.

According to the findings by Chair et al. [10], who performed randomized controlled trial research to assess intermittent fasting effects on weight loss and risk factor reduction in the cardiovascular metabolic area, the main driving force of their study was the query on alternate-day fasting (ADF) and 16/8 time-restricted fasting (TRF) as possible contributors to weight reduction, blood sugar control, and bad cholesterol elimination of overweight and obese subjects with prediabetes aged 18-65 years. The researchers enrolled 101 participants into ADF, 16/8 TRF, and a control group for a randomized trial. They measured body weight, BMI, waist circumference, blood sugar, and lipid profile at the beginning, at the end of the intervention, and after three months. Both types of fasting resulted in weight loss and reduction of all the metabolic parameters and even increased HDL-cholesterol compared to controls. ADF was more effective than 16/8 TRF in body weight and BMI reduction, however, they both had similar effects on blood sugar, waist circumferences, and LDL-cholesterol declination. The study indicates that integrating intermittent fasting, particularly ADF, into one's lifestyle can serve as an effective complementary regimen to enhance an overweight person's health and decrease their odds of diabetes and cardiovascular illnesses.

According to Cai et al. [8] on alternate-day fasting interventions on both body weight and dyslipidemia within patients with non-alcoholic fatty liver disease, this research on alternate-day fasting on body weight and blood fat in individuals with non-alcoholic fatty liver disease also adopts a similar kind of study design to Chair et al., 2022. This research focused on how Alternate-Day Fasting influences body weight and blood fat within individuals with Non-Alcoholic Fatty Liver Disease. A total of 271 subjects aged 18 to 65 years old were randomly selected and divided into three separate groups, which include alternate-day fasting, time restricted feeding, and a control group and lasted for 12 weeks. The result demonstrates that both alternate-day fasting and time-restricted feeding significantly reduced body weight and fat but alternate-day fasting is more effective. At the end of 12 weeks, there is a significant reduction in total cholesterol and triglycerides within the alternate-day fasting group while triglycerides within the time- restricted feeding groups. Other factors like muscle mass, HDL, LDL, blood sugar, insulin and blood pressure did not change much between groups. Overall, the study suggests that ADF can be an effective short-term eating plan to help people with NAFLD lose weight and improve their lipid levels with possible benefits for cardiovascular disease that should be explored further. As stated in the study by Bonham et al. [6], intermittent fasting for weight loss in night shift workers, they used a three arm, superiority randomized clinical trial in their study. This study explored whether two modified intermittent fasting (IF) approaches could be more effective than continuous energy restriction (CER) for helping night shift workers (age ≥ 25 and ≤ 65 years) lose weight and improve insulin resistance. A total of 250 overweight or obese participants were randomly assigned to CER or one of two IF strategies including fasting two days on days off/day shift (IF:2D) or fasting two days during night shifts (IF:2N) over 24 weeks. The main focus was on changes in body weight and insulin resistance. The results showed that neither IF approach led to greater improvements in weight or insulin resistance compared with CER. However, the IF:2D group experienced lower total and LDL cholesterol. Among those who completed the study, all groups showed meaningful improvements in weight, insulin resistance, body composition, blood pressure and other metabolic health markers. There were no serious adverse effects noted. Overall, although modified IF didn't succeed better than caloric restriction, both approaches led to night shifters having better overall metabolism.Looking at the study by Sampieri et al. [32] on studying the effect of fasting duration on body composition and cardiometabolic risk factors during time-restricted eating, this trial is a randomized controlled trial that investigates the effects of varying durations of daily fasting on body composition and metabolism in healthy, untrained subjects after 8 weeks. 41 subjects aged 18-65 years old were randomly assigned into one of four groups consisting of 16 hours fasting window with 8 hours to eat (TRE 16:8), 14 hours fasting window with 10 hours to eat (TRE 14:10), 12 hours fasting window with 12 hours to eat (TRE 12:12) and no restrictions on diet. The measures involved body composition and blood work including blood cholesterol, glucose, leptin, insulin, and testosterone. The results showed that only the TRE 1 6:8 group had meaningful reductions in body weight (about 2.5%) and fat mass (around 8.6%), while lean mass and calorie intake stayed the same. Shorter fasting periods and the normal diet did not lead to significant changes. Overall, the study suggests that a 16-hour fasting window may be an effective and simple strategy to improve body composition in healthy adults whereas shorter fasting periods might not be enough to see noticeable results.

As noted in the study by Bagherpour et al. [4], which is a study on high protein time restricted eating alongside resistance training reduces adipose tissue while preserving fat free mass in women with overweight used a randomized controlled trial study same as the study by Sampieri et al., 2024 [32]. This study examined how time-restricted eating (TRE) combined with high-protein intake affects body fat, hormones and muscle in young women with overweight who were engaged in resistance training (RT). 32 women aged 18–30 years were randomly assigned to four groups including TRE with high protein (THP), TRE with regular protein, high protein only (HP) and regular protein only while all followed a 25% calorie-restricted diet. Over 8 weeks, all groups experienced significant reductions in visceral and subcutaneous fat with the THP group showing the greatest loss in visceral fat. Leptin levels decreased across all groups, with the largest reductions in the THP and TRE with regular protein groups while ghrelin levels remained unchanged. Notably, there is an increase observed in fat-free mass within the high-protein groups, which is an indication that muscle is being preserved and strengthened. Therefore, it can be seen that the results show that combining TRE, a high-protein diet, and resistance training can lead to a significant decrease in body fat while correcting hormone balance, while muscle is being preserved within overweight women. As stated by Cienfuegos et al. [12], their research investigated the effects of 4-h and 6-h time-restricted feeding on weight loss and cardiometabolic factors via a randomized controlled trial on obese adults. Participants were randomly allocated to either 4 hours (3-7 p.m.), 6 hours (1-7 p.m.), or a control group which did not have any restrictions on meal times. The result after eight weeks indicated that both groups got similar outcomes with approximately 3% weight loss, along with reduced insulin resistance and oxidative stress values, compared to those within the control group. Interestingly, participants naturally consumed around 550 fewer calories per day without being told to count calories. The study suggests that both 4- and 6-hour TRF approaches lead to weight loss and offer additional benefits for cardiometabolic health.

According to the study by Harvie et al. [17], on a randomised controlled trial of short-term Intermittent Energy Restriction (IER) versus Continuous Energy Restriction (CER) on body fat stores and measures of insulin resistance in women with obesity at increased risk of breast cancer, this randomized study examined whether intermittent energy restriction (IER) offers different metabolic benefits compared to continuous energy restriction (CER) in premenopausal women with obesity. Over an 8-week period of 25% energy restriction, both groups experienced similar reductions in body weight, liver pancreatic and intramuscular fat as well as comparable losses in fat-free mass and resting metabolic rate. Improvements in insulin resistance were observed in both groups but for the IER group these positive effects appeared only immediately after the low-calorie days and did not persist during the normal-eating days. Lipid changes were also alike with decreases in total cholesterol, HD and triglycerides, while LDL remained stable. The overall results show that IER and CER lead to similar outcomes in weight loss and reductions in ectopic fat though the temporary nature of insulin sensitivity improvements with IER highlights an area that requires more investigation.

As highlighted by Kouw et al. [22] study on short-term intermittent fasting and energy restriction do not impair rates of muscle protein synthesis, this study used a randomized, controlled dietary intervention. This study looked at whether 10 days of alternate-day fasting (ADF) or continuous energy restriction (CER) would affect muscle protein synthesis (MPS) in

37 middle-aged men with overweight or obesity, compared with a normal-calorie control diet. A standard diet consisted of 3 days, after which they adhered to meticulously planned diets with similar protein content. The scientists employed deuterium water and regular sampling of saliva, blood, and muscle tissue to measure MPS, as well as glucose, insulin, appetite hormones, and differences in body composition. The outcomes revealed that MPS rates were almost similar in each group, which indicated no effect on muscle protein synthesis due to short-term fasting while protein intake remained similar. ADF and CER did result in significantly more weight loss than that of the standard diet, with values similar to each other on both fat and lean mass losses. Levels of leptin decreased while glucose and insulin remained similar to their initial values among those on energy-restricted diets. The implications here are those of short-term ADF having no ill effects on muscle protein synthesis but more studies are required to determine effects on muscle preservation with repeated fasting periods.

As indicated within the study published by Oldenburg et al. [29] regarding time-restricted eating, caloric restriction, and free eating effects on weight and metabolism, this paper utilized a randomized trial. This 12-week trial compared an 8-hour time-restricted eating schedule (TRE), a 15% calorie-restricted diet (CR) and unrestricted eating (UE) to see how each affected weight, body composition, calorie intake, metabolic flexibility and glucose control in adults with overweight or obesity. Of the 88 people enrolled, 81 completed the study aged around 43 years. By the end of the trial, participants in the TRE group consistently ate within about a 10-hour window while those in the CR and UE groups had longer eating periods. Weight loss was modest and did not differ significantly between groups and measures of body composition, calorie intake and glycemic control were also similar. TRE did show slightly lower metabolic flexibility compared to CR but a shorter eating window was linked to reduced calorie intake and lower visceral fat. Overall, TRE did not provide notable benefits over calorie restriction or unrestricted eating in terms of weight or metabolic outcomes during the 12-week period.As shown in the study by Schubel et al. [33], on the effects of intermittent and continuous calorie restriction on body weight and metabolism over 50 week which using a randomized controlled trial, the researchers compared the popular "5:2" diet to traditional daily calorie cutting to see whether one truly outperforms the other. This study involved 150 overweight and obese nonsmokers aged 35 to 65 years. During the initial 12-week phase, people following the 5:2 intermittent restriction plan lost about 7% of their body weight, those on steady daily restriction lost about 5% and the control group lost around 3%. Even though the 5:2 group shed slightly more weight, the two dieting approaches did not differ in how they affected the activity of genes in fat tissue or in any of the metabolic markers the team measured. By the end of the 50-week follow-up, weight loss evened out both diet groups maintained similar results around 5% body-weight reduction while the control group lost far less. Changes in visceral and subcutaneous fat followed the same pattern and metabolic biomarkers remained similar between the two diet strategies. In short, the 5:2 diet was not better than traditional calorie restriction, both approaches worked about the same for weight loss and metabolic health over the long term.

In reference to the study by Sunfor et al. [34], their study about the effect of intermittent versus continuous energy restriction on weight loss, maintenance and cardiometabolic risk which using a randomized 1 year trial, shows how intermittent and continuous energy restriction (dietary plans) impacted weight loss, long-term maintenance and heart-related health factors in people with abdominal obesity and metabolic syndrome. A total of 112 participants, aged 21-70 with a BMI between 30-45 kg/m^2, were randomly assigned to one of the two diet plans. Over the first 6 months, both groups lost a similar amount of weight around 8 kg for those on intermittent restrictions and 9 kg for those on continuous restrictions with no significant difference between the two. Both groups also saw improvements in health markers like waist circumference, blood pressure, triglycerides and HDL cholesterol with no difference between the diets. Weight gain was minimal for but people on the intermittent diet reported feeling hungrier than those on the continuous diet.

Based on the study by Vega et al. [36], their study explored whether calorie restriction (CR) and time-restricted feeding (TRF) are effective for overweight or obese cancer patients undergoing curative radiotherapy who engage in little to no physical activity. In this prospective, non-randomized clinical trial, 21 breast cancer patients aged more than 18 years were analyzed after choosing their preferred dietary approach. Those in the TRF group followed a sugar- and saturated-fat-free diet tailored to their energy needs and ate within an 8-hour window, followed by a 16-hour fast. The CR group reduced their daily calorie intake by 25% and ate 4 meals and one snack with a controlled macronutrient composition, also avoiding sugars and saturated fats. The main aim was to see whether these diets were feasible for this patient population and the results showed that both approaches led to meaningful and statistically significant reductions in body weight and waist circumference. TRF appeared to have a slightly stronger effect and better adherence overall. However, neither diet produced significant changes in cholesterol levels, triglycerides, glucose or insulin. Both dietary strategies proved effective for weight-related outcomes in this group of cancer patients. The study of Zhang et al. [38] examined whether adding meal-replacement–based intermittent fasting could enhance a standard lifestyle weight-loss program. Overweight and obese adults aged 18 to 60 participated in an 8-week intervention, choosing either a lifestyle program alone (LIA) or one that included meal replacements (MR). Of the 126 participants, most were women around 35 years old with a BMI of about 27 and 120 completed the program. After 4 weeks, the MR group lost an average of 6.3% of their body weight compared with 4.0% in the lifestyle-only group and by week 8, weight loss reached 8.2% versus 5.8% which shows faster early results with meal replacements. However, over the full course of the study, both groups ended up achieving similar overall benefits.

As stated in the study by Haganes et al. [16], time-restricted eating and exercise training improve HbA1c and body composition in women with overweight or obesity which used a randomized controlled trial. This randomized controlled trial examined whether combining time-restricted eating (TRE) with high-intensity interval training (HIIT) offers greater benefits for blood sugar control than either approach alone. Over 7 weeks, 131 women with overweight or obesity were assigned to TRE (≤10-hour daily eating window), HIIT (three sessions per week), a combination of both (TREHIIT) or a control group. While none of the interventions significantly changed glucose levels during an oral glucose tolerance test compared with controls, the combination of TRE and HIIT did improve HbA1c and led to greater reductions in total and visceral fat than either intervention alone. High adherence rates indicate that TRE, HIIT or a combination of the two can be practical and effective strategies for improving metabolic health in women at risk of cardiometabolic disease even if immediate changes in glucose response were not observed.

The study by Al-Jammaz et al. [3] about the modulation of carbohydrate intake and intermittent fasting in obese Saudi women used a pilot study that assessed how an 8-hour time-restricted eating (TRF) schedule works on its own versus when paired with a moderate low-carbohydrate diet (mLCD) in women with obesity. 52 participants were divided into three groups including TRF with mLCD, TRF with a regular diet and a control group. Both TRF groups saw improvements in blood fats with lower triglycerides and higher good HDL cholesterol compared with the control group, while bad LDL cholesterol stayed the same. The findings indicated that after observing an 8-hour time restricted feeding window, there could be positive effects on weight management and specific choles- terol values without actually escalating physical activity, and implementing a moderate low carb diet could enhance and accelerate these effects. The study by Liu et al. [24] indicates they concentrated on how time-restricted feeding and walking can impact female college students with hidden obesity by employing a randomized trial method. 77 participants, aged 18–22 years were assigned to a control group, TRF, walking or a combination of TRF and walking for 8 weeks. All intervention groups lost body weight and BMI, but lean tissue decreased and cholesterol levels rose while body fat percentage increased in the walking and combined groups. Comparing the groups, TRF alone or with exercise did not provide extra benefits over walking or TRF alone. In short, TRF can help reduce weight and BMI in young women with hidden obesity, but it may also reduce lean mass and raise cholesterol.

As reported by Wang et al. [37], this study compared a 5:2 intermittent fasting (IF) diet with daily calorie restriction in adults with MAFLD over 12 weeks using a randomised controlled trial. Sixty participants aged over 18 years and weighing less than 155 kg were assigned to either a 5:2 IF diet, restricting calories for two days per week, or a daily calorie-restricted diet.In both cases, there were similar enhancements in terms of weight, BMI, body measurements, and metabolic makers. Nevertheless, the 5:2 IF diet was the one that not only got rid of liver fat, but also reduced liver fibrosis and improved liver stiffness measurements; i.e, the diet proved more beneficial for liver health. The research conducted by Nilghaz et al. [28] presented this 12-week study where they tested the impact of 16/8 time-restricted feeding (TRF) combined with a DASH diet in patients with MAFLD in Iran through a randomized controlled trial. The TRF and DASH combination resulted in significant reductions of BMI, waist circumference, liver fat (CAP), and liver enzymes (ALT and AST) when compared to a standard diet. In addition, all the patients in both the groups showed a decrease in insulin levels and insulin resistance. It is implied from the results that a combination of TRF with a DASH diet has the potential to outperform conventional low-calorie diets in terms of weight loss, liver fat, and fibrosis improvement in MAFLD.

The research conducted by Bartholomew et al. [5] randomized controlled trial, where intermittent fasting of low frequency was assessed for its effect on LDL cholesterol and other health markers in adults who were from 21 to 70 years with slightly elevated LDL-C and at least one characteristic of metabolic syndrome or type 2 diabetes. The intervention consisted of 103 subjects who were allowed to drink only water during 24-hour periods, doing it twice a week for 4 weeks, and then once a week for 22 weeks, whereas the control group ate ad libitum. After the 26 weeks, fasting did not bring about any significant changes in LDL-C, weight, or cognitive performance, but it did produce a significant reduction in insulin resistance (HOMA-IR) and overall metabolic syndrome score (MSS). This means that low-frequency intermittent fasting may improve insulin sensitivity and metabolic health even if no changes in LDL-C or cognition are observed.

Based on the research of Kunduraci et al. [23], this paper explored the influence of combining intermittent fasting with calorie restriction on weight and metabolic health of adults with metabolic syndrome aged 18 to 65 years through a randomized controlled clinical trial. A group of seventy subjects from Istanbul was randomly assigned to either intermittent energy restriction (IER) or continuous calorie restriction (CER). After three months, weight loss of about 7% and positive alteration in body composition were seen in both factions. There were significant improvements in blood pressure, cholesterol, triglycerides, LDL, blood sugar, and insulin in both groups, with no clear superiority of one method over the other. It is worth mentioning that the subjects kept their diets healthy including nutrients and diet quality during the study period.

As reported by Martinez-Montoro et al. [25], this study examined how various calorie-restricted diets compare with the Mediterranean diet (MedDiet) for weight loss in adults with obesity, with a mean age of 45.7 years, using a randomized clinical trial. Over three months, 160 participants were randomly assigned to one of five groups: ketogenic diet (KD), early or late time-restricted eating (eTRE or lTRE), modified alternate-day fasting (mADF), or a MedDiet control. By the end of the study, participants following KD, mADF, or lTRE lost more weight than those in the MedDiet group, while eTRE showed no clear advantage. The findings suggest that KD, mADF, and lTRE may be more effective for short-term weight loss.

De et al. [13] demonstrated a study evaluating time restricted feeding (TRF) combined with a low-carbohydrate, high-protein, high-fat (LCHPF) diet. This study concluded that lipid responses were strongly duration dependent. After 3 months, triglycerides decreased from 1.82 to 1.62 mmol/L but not significantly, while total cholesterol and LDL both increased significantly. However, 6 month intervention produced significant effects when triglycerides dropped by ~26% from 1.58 to 1.17 mmol/L ($p < 0.0001$), HDL increased from 1.37 to 1.59 mmol/L ($p < 0.001$), total cholesterol rises from 5.35 to 6.84 mmol/L and LDL from 3.40 to 4.73 mmol/L with both $p < 0.0001$. Prolonged TRF with an LCHPF diet effectively lowered triglycerides and raised HDL, but resulted in increased total cholesterol and LDL cholesterol which indicated a mixed lipid effect due high-fat dietary composition rather than TRF alone. A 24 month randomized study was conducted by Carter et al. [9] to compare intermittent versus continuous energy restriction in adults with type 2 diabetes. The lipid profile revealed total cholesterol, LDL-C, and triglyceride levels remained unchanged while HDL-C showed a modest reduction ($P = 0.02$). This indicates no significant differences between the intermittent and continuous groups observed. The study concluded that energy restriction strategies barely give significant long term benefit on lipid profile. The impact of early and late time-restricted feeding (eTRF and lTRF) was demonstrated by Tsitsou et al. [35] in comparison with a hypocaloric Mediterranean diet. The highlighted parameters show triglycerides ranging from 107–134 mg/dL, LDL from 105–123 mg/dL, HDL from 48–56 mg/dL, and total cholesterol from 183–201 mg/dL at baseline across groups. After 12 weeks intervention, the control diet produced significantly greater reductions in total cholesterol, and LDL cholesterol, compared with both TRF groups (all $p < 0.05$). In contrast, the late-TRF group showed only a modest improvement in total cholesterol, while early-TRF failed to produce any meaningful change in triglycerides, LDL, and HDL.

According to Derron et al. [14] they demonstrate alternate-day fasting (ADF) exerts a more pronounced effect on lipid profile parameters compared with time-restricted eating (TRE) in overweight adults for short-term 4-week intervention. Specifically, ADF significantly reduced non-HDL cholesterol compared with the control ($p = 0.025$) and TRE groups ($p = 0.024$), and showed trends toward lowering LDL-C and total cholesterol, with strong within-group decreases observed in the ADF group while TRE did not produce significant improvements in LDL-C or total cholesterol and was associated with a slight decrease in HDL-C. Energy intake was reduced by 34% in ADF versus 15% in TRE, which likely contributed to these metabolic improvements. These findings indicate that ADF may be a more effective intermittent fasting strategy than TRE for improving lipid profiles.

Dunn et al. [15] conducted a 24 week pilot RCT comparing alternate day modified fasting (ADMF) with a low calorie diet (LCD) in adults with obesity and compensated cirrhosis. Both sample groups received structured exercise and high-protein dietary guidance. ADMF showed more significant effects on lipid parameters, with reductions in total cholesterol (−28 mg/dL), LDL (−27 mg/dL), and triglycerides (−31 mg/dL), whereas LCD showed minimal change while HDL levels remained largely unchanged in both groups.

Quist et al. [30] investigated the impact of 10 hours of time-restricted eating (TRE) over a period of 3 months on individuals who were either overweight (BMI ≥25 kg/m^2) and also had prediabetes. Initially, fasting LDL levels were comparable between the groups at 3.4 mmol/L for both the TRE and control groups, while triglyceride levels were measured at 1.47 mmol/L for the TRE group and 1.60 mmol/L for the control group, with HDL values ranging from 1.20 to 1.57 mmol/L. After 3 months, the control group experienced a minor decrease in LDL (−0.1 mmol/L), while the TRE group exhibited virtually no change in LDL (−0.0 mmol/L), resulting in a non-significant difference of +0.1 mmol/L between the groups ($p = 0.30$). At the 6-month mark, both groups demonstrated comparable reductions in LDL (TRE −0.2 mmol/L; control −0.2 mmol/L), once again showing no significant difference between the groups ($p = 0.96$). With an emphasis on metabolic and lipid outcomes, Holmer et al. [18] examined the effects of a low-carb high-fat (LCHF) diet and a 5:2 intermittent calorie restriction diet in patients with non-alcoholic fatty liver disease. Total cholesterol (−0.50 mmol/L), LDL (−0.40 mmol/L), and triglycerides (−0.4 mmol/L) all significantly decreased as a result of the 5:2 diet. The LCHF diet, on the other hand, caused a minor rise in HDL (+0.10 mmol/L) and LDL (+0.20 mmol/L), indicating a mixed lipid response.

According to a study by Hutchison et al. [19], intermittent fasting with a 70% energy prescription (IF70) resulted in better lipid improvements than the control group and continuous restriction (DR70). After eight weeks, their study revealed a greater decrease in total cholesterol with mean changes of −0.30 mmol/L and LDL −0.20 mmol/L than the control group. Triglycerides were lowered by −0.15 mmol/L by IF70, while the control showed little change. In every group, HDL stayed constant.

The research conducted relating to early and late time restricted eating (TRE) for 4 weeks which was participated by healthy young adults in a research paper by Kim & Song [21]. In both early and late TRE groups, their lipid profile showed a significant decrease in serum triglycerides. However, the eTRE group showed small changes in LDL cholesterol (+5.5%) and HDL cholesterol (−5.3%) from baseline.

12 months of time-restricted eating (TRE), combined with resistance training was conducted by Moro et al. [27]. Their study shows improvements in lipid profile compared with a normal diet (ND) under matched caloric conditions. Their lipid parameters on total cholesterol

remained unchanged, with an increase in HDL level ($p < 0.0001$) and reduction in LDL ($p = 0.02$) while the ND group remained unchanged. Triglycerides also decreased in the TRE group, 20.9% at 12 months ($p < 0.0001$). This indicates significant between-group differences at the end of the study.

Conclusion

This systematic review synthesized evidence from randomized controlled trials evaluating the impact of intermittent fasting (IF) on lipid profile parameters specifically total cholesterol, low-density lipoprotein (LDL), high-density lipoprotein (HDL), and triglycerides in overweight and obese adults. The compiled literature indicates that while intermittent fasting can induce modest improvements in metabolic health markers, such as minor reductions in total cholesterol, LDL, and triglycerides alongside stable or slightly enhanced HDL levels, these outcomes do not significantly differ from those achieved through traditional, continuous dietary restrictions. Ultimately, the current body of evidence suggests that intermittent fasting offers comparable, rather than superior, efficacy to conventional dietary interventions for lipid profile optimization in this population. To further clarify these dynamics, future clinical research should focus on rigorously designed trials exploring the long-term sustainability, distinct fasting protocols, and broader patient cohorts

Conflict of interest

The authors declare no conflict of interest.

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