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Evidence-based Review on Intermittent Fasting Diet

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Objectives

- Introduction of Intermittent Fasting Dietary Approach
- Evidence review on Intermittent Fasting Dietary Approach
- Application challenges and Limitations

Intermittent Fasting (IF)

- Involves normal/near normal daily caloric intake with the use of short-period, strict calorie restriction
- Timing focus
- Gained popularity in recent years
- Less specific on food choices, i.e. no particular “assigned foods” that one must consume, typically no food group exclusion
- Different variations that suit different lifestyles
- Strong community support due to flexibility and popularity

Intermittent Fasting – How is it Done?

2 Basic Varieties: Time Restricted Feeding & 24-hour Fasting Period Protocols

Time Restricted Feeding Protocol

Time spent fasting/ hours duration with daily calories consumed

16:8 (popular among individuals new to IF)

18:6

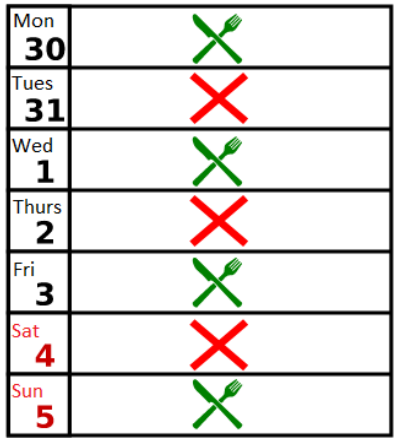
20:4 (most restrictive in timing)

Usually no particular caloric requirement or goal

Fast window typically set at night time

Image credit: Google photo search

Intermittent Fasting – How is it Done?



24-hour Fasting Period Protocol

As known as Alternate Day Fasting
24-hour "fast" followed by 24-hour eating period

Done several times a week

"Fast Day" caloric requirement usually set, e.g. 400-600kcal intake, or a minimum of 75% reduction from a typical day at baseline

Popular Variation: 5:2 Protocol
(Fast for 2 days of the week)

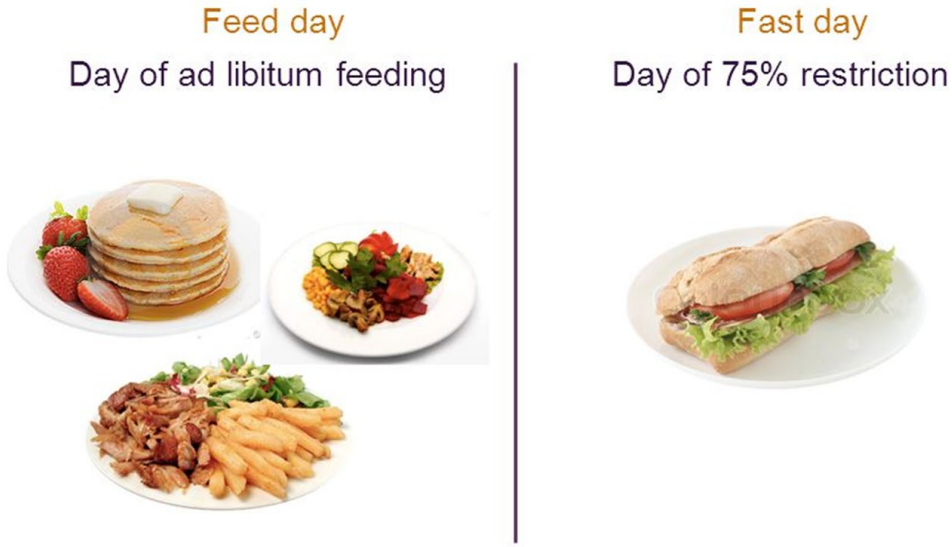


Image credit: Google photo search

Intermittent Fasting – Proposed Mechanisms

Ketogenic State

body undergoes metabolic switching from Glucose to Ketones & Fatty Acids as main source of fuel, i.e. Glucose-Ketone Switchover

thus affecting bio-transformation of lipids ->reduction of fat mass, decrease in levels and sizes of Triglycerides and LDL

leading to body weight reduction and risk reduction in developing coronary heart disease

Dong TA, Sandesara PB, Dhinsa DS et al. Intermittent fasting: A heart healthy dietary pattern. *The American Journal of Medicine*. 2020 Aug;133(8):901-907. doi: 10.1016/j.amjmed.2020.03.030.

Intermittent Fasting – Proposed Mechanisms

Circardian Rhythm Theory

Human physiologic processes occur at most advantageous time as dictated by evolution

Fasting probably allows optimization of our organs' functioning

Prediction: fasting at proper time of the day may sync with circadian rhythm and thus promote health

Oxydative Stress Hypothesis

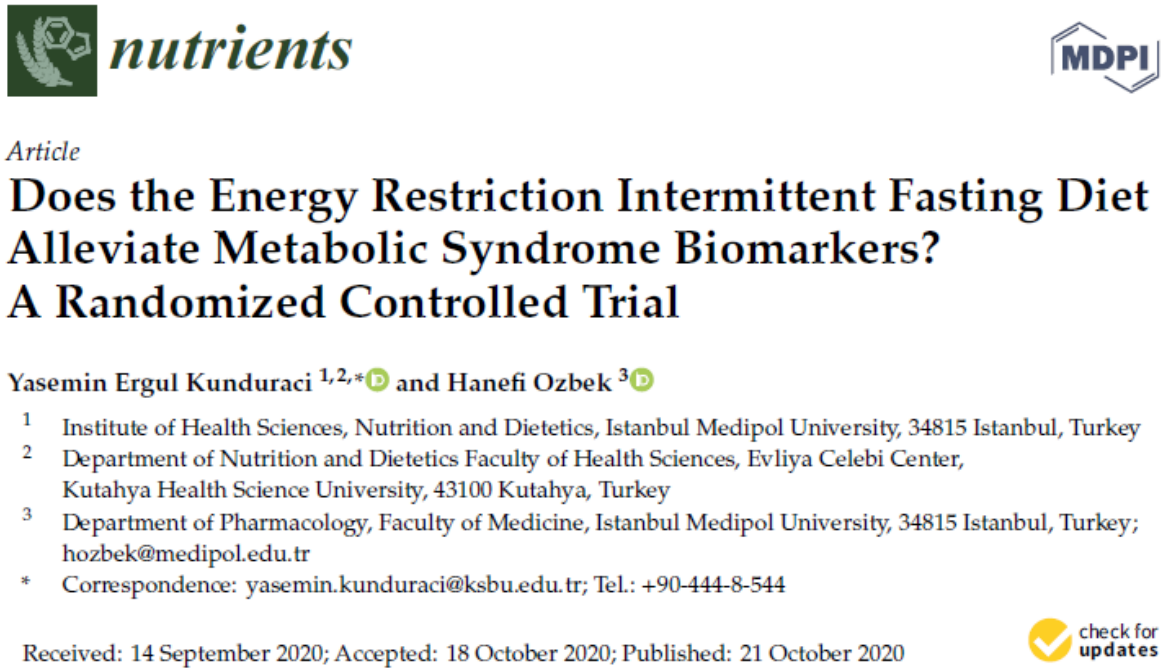
Decreased energy intake causes mitochondria to produce fewer radicals and thus improve inflammation markers

Dong TA, Sandesara PB, Dhinsa DS et al. Intermittent fasting: A heart healthy dietary pattern. *The American Journal of Medicine*. 2020 Aug;133(8):901-907. doi: 10.1016/j.amjmed.2020.03.030.

Intermittent Fasting Evidence Search

- Literature search: Pubmed, Hospital Authority Hong Kong eKG (e-Knowledge Gateway) Database; 2015-2020
- Keyword search: Intermittent Fasting, Metabolic Syndrome, Cardiovascular
- Outcomes: Weight change; Lipid profile, Blood Pressure, Inflammatory Biomarkers, other important factors in the development of CVD
- RCTS, observation studies as well as review articles
- Limit to human trials
- Includes studies (2011 – 2020) quoted from review articles

Intermittent Fasting vs Continuous Calorie Restriction (short-term RCT)



nutrients

MDPI

Article

Does the Energy Restriction Intermittent Fasting Diet Alleviate Metabolic Syndrome Biomarkers? A Randomized Controlled Trial

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check for updates

Kunduraci, YE, & Ozebek, H. Does the energy restriction intermittent fasting diet alleviate metabolic syndrome biomarkers? A randomized controlled trial. *Nutrients*. 2020 Oct 21;12(10):3213. doi: 10.3390/nu12103213.

Intermittent Fasting vs Continuous Calorie Restriction (short-term RCT)

- 12 weeks trial, 70 subjects (65 completed)
- 18 – 65 years old
- BMI ≥ 27
- Dx of metabolic syndrome (IDF 2005/NCEP-ATP III)
- Several exclusion criteria
- Primary outcomes: BMI, waist/hip ratio, BP, cholesterol profile (HDL/LDL/TG), fasting glucose, fasting insulin, insulin resistance
- Randomized into 2 groups: Continuous Energy Restriction (CER) and Intermittent Energy Restriction (IER) groups

Intermittent Fasting vs Continuous Calorie Restriction (short-term RCT)

- 12-week Intervention Period
- Meetings with dietitian at baseline, weeks 4, 8, 12
- No physical activity recommendation given

IER Group	CER Group
• Daily 16 hours fasting period (only water/calorie-free drinks allowed) • 25% energy reduction diet during the 8-hour feed period	• 25% reduction from habitual energy intake

IER
Intermittent Energy Restriction

CER
Continuous Energy Restriction

Baseline Characteristics

Overweight individuals with mean age 40s with Metabolic Syndrome

Table 1. Baseline characteristics of metabolic syndrome patients who completed the trial.

Characteristics	IER Group (n = 32)	CER Group (n = 33)	p-Value
Age (years)	47.44 ± 2.17	48.76 ± 2.13	0.718
Gender ratio (men/women)	16:16	15:18	0.714
BMI (kg/m^2)	36.58 ± 0.93	32.82 ± 0.72	0.002
Fat mass (%)	39.53 ± 1.23	37.06 ± 1.34	0.180
Waist to hip ratio	1.05 ± 0.02	1.04 ± 0.02	0.747
Physical activity ratio (sedentary/active)	23:9	27:6	0.381
Daily meal skipping/or not	25/7	26/7	0.948
Skipped meal (breakfast/lunch/dinner)	9:14:2	8:16:2	0.768
Fasting glucose	119.19 ± 7.63	115.06 ± 5.96	0.494
Triglycerides	212.31 ± 23.52	197.61 ± 29.95	0.168
HDL cholesterol	42.50 ± 1.77	46.65 ± 2.24	0.152
TSH (mU/L)	2.16 ± 0.27	1.98 ± 0.22	0.788

Data presented as mean ± SEM. IER: İntermittent Energy Restriction; CER: Continuous Energy Restriction; BMI: body mass index; HDL: high-density lipoprotein; TSH: thyroid stimulating hormone. p-values for comparison between groups at baseline.

Kunduraci, YE, & Ozebek, H. Does the energy restriction intermittent fasting diet alleviate metabolic syndrome biomarkers? A randomized controlled trial. *Nutrients*. 2020 Oct 21;12(10):3213. doi: 10.3390/nu12103213.

Outcomes

Table 2. Body composition measurements in both groups.

	IER Group (n = 32)			CER Group (n = 33)			p-Value **
	Baseline	12th Week	p-Value *	Baseline	12th Week	p-Value *	
Weight	97.53 ± 2.82	89.26 ± 2.41	<0.001	88.43 ± 2.00	82.62 ± 1.76	<0.001	0.029
FM (kg)	38.79 ± 1.80	33.27 ± 1.59	<0.001	32.89 ± 1.56	28.80 ± 1.51	<0.001	0.045
FM (%)	39.53 ± 1.23	37.10 ± 1.35	<0.001	37.06 ± 1.34	34.61 ± 1.40	<0.001	0.207
FFM (kg)	58.73 ± 1.85	55.98 ± 1.80	<0.001	55.54 ± 1.59	53.83 ± 1.44	<0.001	0.352
TBW (kg)	43.43 ± 1.34	40.80 ± 1.33	<0.001	40.77 ± 1.06	38.98 ± 1.02	<0.001	0.281
BMI (kg/m^2)	36.58 ± 0.93	33.52 ± 0.87	<0.001	32.82 ± 0.72	30.69 ± 0.65	<0.001	0.011
W/H	1.05 ± 0.02	1.01 ± 0.02	<0.001	1.04 ± 0.02	1.00 ± 0.01	<0.001	0.904
TWL		8.27 ± 0.81			5.80 ± 0.65		0.020
TWL (%)		8.32 ± 0.64			6.42 ± 0.64		0.041
TTW (cm)		6.84 ± 0.57			5.15 ± 0.55		0.015

Data presented as mean ± SEM. IER: İntermittent Energy Restriction; CER: Continuous Energy Restriction; FM: fat mass; FFM: fat-free mass; TBW: total body water; BMI: body mass index; W/H: waist/hip ratio; TWL: total weight loss; TTW: total thinning around waist circumference; * p-values are for changes between time points within groups. ** p-values are only for comparisons between the two groups' measurements at the end of the 12th week.

Table 3. Changes in blood pressure, lipid profile, and glycemic measures in the IER and CER groups.

	IER Group			CER Group			p-Value **
	Baseline	12th Week	p-Value *	Baseline	12th Week	p-Value *	
SBP (mm Hg)	131.88 ± 2.49	124.53 ± 2.11	<0.001	140.73 ± 2.69	127.73 ± 1.85	<0.001	0.146
DBP (mm Hg)	83.97 ± 1.36	79.22 ± 1.15	<0.001	89.06 ± 1.66	80.85 ± 0.95	<0.001	0.277
HDL (mg/dL)	42.50 ± 1.77	43.03 ± 1.78	0.173	46.65 ± 2.24	46.27 ± 2.10	0.175	0.244
LDL (mg/dL)	147.19 ± 5.96	130.19 ± 4.80	<0.001	148.12 ± 5.80	132.15 ± 4.28	<0.001	0.761
TC (mg/dL)	226.88 ± 8.14	197.56 ± 6.58	<0.001	230.09 ± 8.66	200.73 ± 6.15	<0.001	0.726
TG (mg/dL)	212.31 ± 23.52	170.47 ± 12.60	<0.001	197.61 ± 29.95	157.61 ± 13.53	<0.001	0.362
Glucose (mg/dL)	119.19 ± 7.63	103.72 ± 2.70	<0.001	115.06 ± 5.97	101.94 ± 2.40	<0.001	0.777
Insulin (IU/L)	14.40 ± 2.69	12.17 ± 1.81	0.118	15.81 ± 0.34	13.42 ± 1.57	0.046	0.462
HOMA-IR	4.88 ± 0.74	3.59 ± 0.50	<0.001	4.09 ± 0.80	3.15 ± 0.51	0.004	0.369
HbA1c (%)	6.56 ± 0.31	6.24 ± 0.26	<0.001	6.41 ± 0.25	6.10 ± 0.16	<0.001	0.777

Data presented as mean ± SEM. IER: İntermittent Energy Restriction; CER: Continuous Energy Restriction; SBP; systolic blood pressure; DBP: diastolic blood pressure; HDL: high-density lipoprotein; LDL: low-density lipoprotein; TC: total cholesterol; TG: triglycerides; Glucose: fasting glucose; HOMA-IR: homeostatic model assessment of insulin resistance; HbA1c: glycosylated hemoglobin Type A1c. * p-values are for changes between time points within groups. ** p-values are only for comparisons between the two groups' measurements at the end of the 12th week.

Intermittent Fasting vs Continuous Calorie Restriction (short-term RCT)

- Mean body weight loss: IER group (8.32%+/-0.64%) and CER group (6.42%+/-0.64%)
- Mean body fat reduction: IER group (5.5kg) and CER group (4kg)
- Systolic & diastolic blood pressure, LDL, TC, TG, fasting glucose, HOMA-IR, HbA1C had statistically significant decrease in both groups; HDL almost similar between the two groups; no inter-group differences in these changes
- Insulin decreased only in the continuous calorie restriction group significantly
- No significant differences were observed in metabolic syndrome biomarkers between the two groups
- No macronutrients and fiber intake deficiencies in IER group

Intermittent Fasting vs Continuous Calorie Restriction (12-month RCT)

- 100 subjects (69 completed)
- 3 Groups: Alternate-Day Fasting (ADF),Daily Calorie Restriction (DCR), Control Groups
- 18-65 years old
- BMI 25-39.9 (mean 34)
- Several exclusion criteria

Randomized Controlled Trial > JAMA Intern Med. 2017 Jul 1;177(7):930-938.

doi: 10.1001/jamainternmed.2017.0936.

Effect of Alternate-Day Fasting on Weight Loss, Weight Maintenance, and Cardioprotection Among Metabolically Healthy Obese Adults: A Randomized Clinical Trial

John F Trepanowski [1], Cynthia M Kroeger [2], Adrienne Barnosky [1], Monica C Klempel [1], Surabhi Bhutani [1], Kristin K Hoddy [1], Kelsey Gabel [1], Sally Freels [3], Joseph Rigdon [4], Jennifer Rood [5], Eric Ravussin [5], Krista A Varady [1]

Affiliations + expand

PMID: 28459931 PMCID: PMC5680777 DOI: 10.1001/jamainternmed.2017.0936

Free PMC article

Trepanowski JF, Kroeger CM, Barnosky A et al. Effect of alternate-day fasting on weight loss, weight maintenance, and cardioprotection among metabolically healthy obese adults: A randomized clinical trial. *JAMA Internal Medicine*. 2017 Jul 1;177(7):930-938.

Intermittent Fasting (12-month RCT)

Intervention:

6-month "weight loss phase" (all meals provided at months 1- 3, dietary counseling at months 4 - 6)

Alternate Day Fasting Group	Calorie Restriction Group	Control
• 25% energy needs on fast days (taken as lunch) • 125% energy needs on alternating feast days	• 75% energy intake everyday, split between 3 meals	• Usual energy intake (no intervention)

Followed by 6-month "weight maintenance phase" (no meals provided, had dietary counseling, received personalized energy targets)

Alternate Day Fasting Group	Calorie Restriction Group	Control
• 50% energy needs on fast days (taken as lunch) • 150% energy needs on alternating feast days	• 100% energy intake everyday, split between 3 meals	• Usual energy intake (no intervention)

Intermittent Fasting (12-month RCT) Outcomes

- Total Weight Loss: ADF group (-6%; 95%CI, -8.5% to -3.6%), DCR group (-5.3%; 95%CI, -7.6% to -3%), relative to control; no significant difference between the intervention groups
- No significant differences between the intervention groups: BP, heart rate, Triglycerides, fasting glucose, fasting mean HDL, C-reactive protein, Homocysteine concentrations (at 6 & 12 month)
- Weight regain from months 6 to 12 (−0.8%; 95% CI, −3.2% to 1.7%) was not significantly different between the ADF group and the DCR group
- weight regain from months 6 to 12 was not significantly different between the ADF group and controls (0.8%; 95% CI, −1.8% to 3.3%), or the DCR group and controls (1.5%; 95% CI, −0.8% to 3.9%)

Intermittent Fasting (12-month RCT) Outcomes

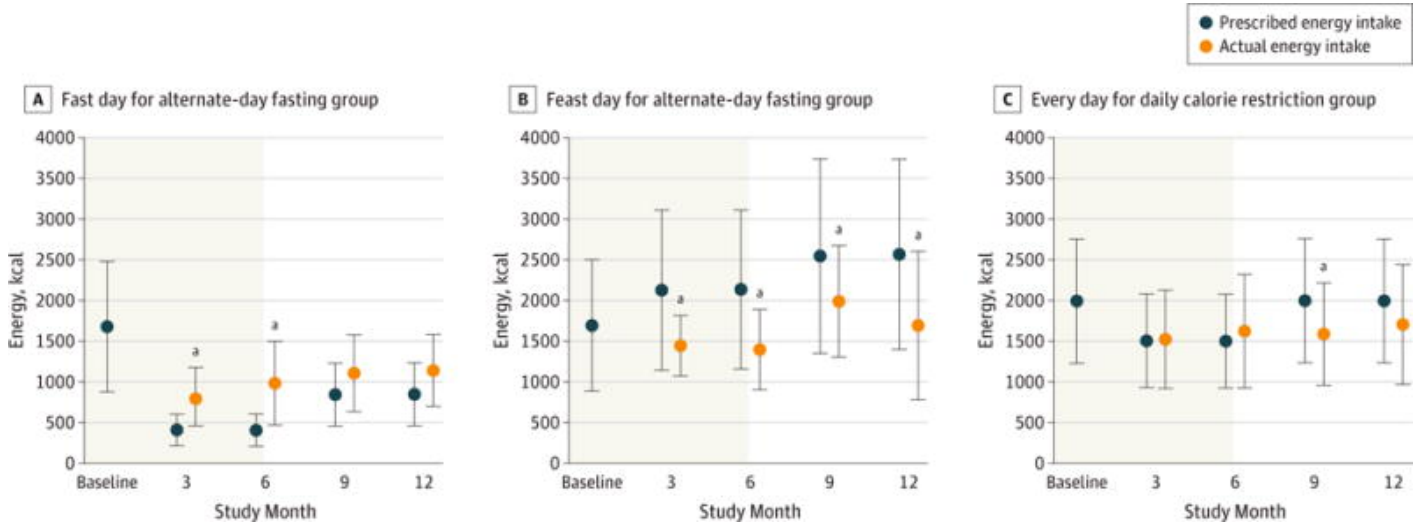
- Total cholesterol levels were not significantly different between the groups at month 6 & 12

- LDL cholesterol levels significantly increased in the ADF group (11.5mg/dL) relative to DCR group

- No significant differences in glucoregulatory and inflammatory factors (fasting plasma glucose, fasting insulin, high-sensitivity C-reactive protein, homocysteine) between the intervention groups, or relative to control

- BP was not significantly different between the intervention groups, or relative to controls, at month 6 or 12

Intermittent Fasting (12-month RCT) Outcomes



Alternate-Day Fasting Group had greater caloric intake deviation from the prescribed calorie goal: ate more than prescribed calories on fast days, less than prescribed calories on feast days

Daily Calorie Restriction group generally met the prescribed energy goal

Literature Review

Review

Intermittent Fasting in Cardiovascular Disorders—An Overview

Bartosz Malinowski [1,*], Klaudia Zalewska [1], Anna Węsierska [1], Maya M. Sokołowska [1], Maciej Socha [2], Grzegorz Liczner [1], Katarzyna Pawlak-Osińska [3] and Michał Wiciński [1]

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Received: 12 February 2019; Accepted: 18 March 2019; Published: 20 March 2019

Comparing outcomes of 4-week to 12-week IF trials on overweight or obese/ HT/ Ramadan subjects

Malinowski B., Zalewska K., W˛esierska A et al. Intermittent fasting in cardiovascular disorders – An overview. *Nutrients*. 2019 Mar 20;11(3):673. doi: 10.3390/nu11030673.

Literature Review

Table 2. Impact of intermittent fasting on lipid profile.

First Author and Reference Number	Number of Enrolled	Participants Description	Time	Lipids	NCT Number
Harvie et al., 2011 [27]	107	Overweight or obese premenopausal women	6 months	NS (LDL, TGs, HDL)	NCT02679989
Varady et al., 2013 [28]	15	Overweight individuals BMI 20–29.9 kg/m^2	12 weeks	↓TC ($p < 0.01$) ↓LDL ($p < 0.01$) NS HDL ↓TGs ($p < 0.01$)	NCT00960505
Bhutani et al., 2013 [25]	83	Obese individuals BMI 30–39.9 kg/m^2	12 weeks	NS TC ↓LDL ($p < 0.05$) NS TGs ↑HDL ($p < 0.05$)	NCT00960505
Eshghinia et al., 2013 [29]	15	Overweight or obese women BMI ≥ 25 kg/m^2	8 weeks	NS (LDL, TGs, HDL)	-
Teng et al., 2013 [30]	28	Malay Men BMI 23–29.9 kg/m^2	12 weeks	↓TC ($p < 0.001$) ↓LDL ($p < 0.05$) NS HDL NS TGs	NCT01665482
Harvie et al., 2013 [31]	77	Overweight or obese women	3 months	NS (LDL, TGs, HDL)	NCT00869466
Chowdhury et al., 2016 [32]	23	Obese individuals BMI 30–39.9 kg/m^2	6 weeks	NS (LDL, TGs, HDL) ↑TC	-

Abbreviations: NS, not statistically significant ($p > 0.05$); LDL, low-density lipoprotein; TGs, triglycerides; HDL, high-density lipoprotein; TC, total cholesterol. Only studies from the past 10 years with full data published were considered.

4 out of 7 trials showed improvement in lipid profile
(lowered TC, LDL, TG; increased HDL levels)

Literature Review

Table 3. Impact of intermittent fasting on inflammatory markers' concentration.

First Author and Reference Number	Number of Enrolled	Participants Description	Time	Inflammatory Biomarkers	NCT Number
Harvie et al., 2013 [31]	77	Overweight or obese women	3 months	NS (IL6, TNFα, leptin, adiponectin)	NCT00869466
Varady et al., 2013 [28]	15	Overweight individuals BMI 20–29.9 kg/m^2	12 weeks	↓CRP ($p = 0.01$) ↓Leptin ($p = 0.03$) ↑Adiponectin ($p < 0.01$)	NCT00960505
Bhutani et al., 2013 [25]	83	Obese individuals BMI 30–39.9 kg/m^2	12 weeks	NS CRP	NCT00960505
Hoddy et al., 2016 [55]	59	Obese individuals BMI 30–39.9 kg/m^2	10 weeks	↓Leptin ($p < 0.05$)	-
Chowdhury et al., 2016 [32]	23	Obese individuals BMI 30–39.9 kg/m^2	6 weeks	NS (IL6, CRP, leptin, adiponectin)	-
Safavi et al., 2017 [56]	34	Male individuals 16–64 years old (Ramadan)	4 weeks	NS (adiponectin, TNFα)	-

Abbreviations: NS, not statistically significant ($p > 0.05$); IL6, interleukin 6; CRP, C-reactive protein; TNFα, tumor necrosis factor α; Only studies from the past 10 years with full data published were considered.

3 out of 6 trials observed improvements in various inflammatory markers, namely, CRP, Leptin,IL6, TNFα, Adiponectin

Literature Review

Table 4. Impact of intermittent fasting on blood pressure.

First Author and Reference Number	Number of Enrolled	Participants Description	Time	Blood Pressure	BDNF	NCT Number
Harvie et al., 2011 [27]	107	Overweight or obese premenopausal women	6 months	↓Systolic ($p = 0.99$) ↓Diastolic ($p = 0.84$)	NS	NCT02679989
Varady et al., 2013 [28]	15 (5 M/10 F)	Overweight individuals BMI 20–29.9 kg/m^2	12 weeks	↓($p = 0.51$)	-	NCT00960505
Bhutani et al., 2013 [25]	83 (3 M/80 F)	Obese individuals BMI 30–39.9 kg/m^2	12 weeks	↓Systolic ($p = 0.254$) ↓Diastolic ($p = 0.570$)	-	NCT00960505
Eshghinia et al., 2013 [29]	15 F	Overweight or obese women BMI ≥25 kg/m^2	8 weeks	↓Systolic ($p < 0.001$) ↓Diastolic ($p < 0.05$)	-	-
Teng et al., 2013 [30]	28 M	Malay Men BMI 23–29.9 kg/m^2	12 weeks	↓Systolic ($p < 0.05$) ↓Diastolic ($p < 0.05$)	-	NCT01665482
Erdem et al., 2018 [63]	60	Individuals from the Cappadocia cohort with prehypertension and hypertension SBP 12—139 and ≥140; DBP 80–89 and ≥90 mmHg		↓Systolic ($p < 0.001$) ↓Diastolic ($p < 0.039$)	-	

Abbreviations: SBP, systolic blood pressure; DBP, diastolic blood pressure; BDNF, brain-derived neurotrophic factor; M, male; F, female. Only studies from the past 10 years with full data published were considered.

3 out of 6 trials showed statistically significant blood pressure improvements

Literature Review

Author manuscript
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Am J Med. 2020 August ; 133(8): 901–907. doi:10.1016/j.amjmed.2020.03.030.

Intermittent Fasting: A Heart Healthy Dietary Pattern?

Tiffany A. DONG, MD[1], Pratik B. SANDESARA, MD[2], Devinder S. DHINDSA, MD[2], Anurag MEHTA, MD[2], Laura C. ARNESON, MD[3], Allen L. DOLLAR, MD[4], Pam R. TAUB, MD[5], Laurence S. SPERLING, MD[6]

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Dong, TA., Sandesara PB, Dhinsa DS et al. Intermittent fasting: A heart healthy dietary pattern. *The American Journal of Medicine*. 2020 Aug;133(8):901-907. doi: 10.1016/j.amjmed.2020.03.030.

Literature Review

The Effect of Intermittent Fasting after a Cardiovascular Event

Human data is sparse regarding intermittent fasting after a cardiovascular event

In observational studies, Muslims with history of ischemic cardiomyopathy have decreased incidence of acute decompensated heart failure during Ramadan (Salim et al, 2013)

Meta-analysis comparing 2 studies, 648 patients, with coronary artery disease; underwent 1 monthly 1-day religious fast and observed lower risk for coronary heart disease (Horne et al, 2012)

AHA Scientific Statement on Meal Timing & Frequency (2017)

"…There is evidence that both alternate-day fasting and periodic fasting may be effective for weight loss, although there are no data that indicate whether the weight loss can be sustained long term. In addition, both eating patterns may be useful for lowering triglyceride concentrations but have little or no effect on total, LDL, or HDL cholesterol concentrations. These protocols may also be beneficial for lowering blood pressure, but a minimum weight loss of 6% may be required to see an effect. Intermittent fasting may also be effective for decreasing fasting insulin and IR, but fasting glucose remains largely unchanged. Future work in this area should aim to examine whether these effects still persist in longer-term (>52 weeks) randomized, controlled trials."

Considerations in Implementing IF: Possible Adverse Effects

- Severe hypoglycemia for individuals at risk of hypoglycemia/ reactive hypoglycemia
- Risks of fall and fracture associated with fluctuating glucose concentration especially in elderly
- Excessive restriction may lead to dysregulation of hormone management
- Cardiovascular event in the presence of hypoglycemia
- Suboptimal nutrient intake (micronutrients)
- Initial dizziness
- In prolonged fasting period, potential accumulation of keto acids leading to ketoacidosis/ metabolic arthritis

Considerations in Implementing IF: Practical Limitations

Serious considerations in safely implementing in patients with multiple risk factors/ post-cardiovascular events

Dieters with clinical conditions require close clinical monitoring

Abundance of misconceptions/ false information

Considerations in Implementing IF: To What Extent Are People Taking?

600 calories “Fast Day” Menu A

Meal	Food choices	Energy (kcal)
Morning time	black coffee/ tea 3-4 cups	0-20
Afternoon snack	fresh fruit 1 small piece sugar-free mints	50-80 10-20
Dinner	instant noodles 1 large pack	450

~550kcal
Low micronutrient Profile

Considerations in Implementing IF: To What Extent Are People Taking?

600 calories "Fast Day" Menu B

Meal	Food Choices	Energy (kcal)
Breakfast	Skim milk/ unsweetened calcium fortified soy milk ½ cup Oatmeal ½ bowl (25g dry oat)	 140
Snack	Fresh fruit 1 small piece	50-80
Lunch	Konjac noodles with 1oz protein (lean meat/fish) Cooked mixed vegetables 1 cups	60-80 40
Snack	tomato, cucumber, kale, okra salad 1 cup with lemon juice/vinegar as dressing	15-20
Dinner	Steamed soft tofu 3oz with light sesame dressing Mixed vegetables soup 1 cup Grilled corn 1 ear/ steamed yam 1 small piece (1/2cup)	80 80 100
Beverages	Water 8-10 cups, coffee/ tea in moderation	0-20

~600kcal, Better micronutrient profile

Limitations and Outstanding Questions

- Majority of Intermittent Fasting trials were up to 12-month trial period
- Effectiveness and sustainability in long term
- Whether positive effects seen affect all populations similarly
- Whether positive effects reverse as diet return to normal
- Whether time-restricted fasting protocol involuntarily lead to significant decrease in caloric intake

Conclusion

Intermittent Fasting can potentially lead to 3-7% loss of body weight, and lowered risks of cardiovascular events by reducing the risk-related biomarkers, according to clinical trials on overweight individuals for up to 12-month trial period.

While outcomes of Intermittent Fasting diet are mostly comparable to Continuous Calorie Restriction diet (in terms of change of body weight, lipid profile, blood pressure, inflammatory biomarkers), according to some short-term RCTs and literature reviews; many of these studies were conducted on otherwise metabolically healthy overweight/obese individuals.

However, Intermittent Fasting could lead to serious adverse events when implemented exceedingly.

Individuals with certain health conditions may pose themselves at high risk of adverse events by following Intermittent Fasting diet.

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