
A review of 5:2 intermittent fasting, alternate day fasting or time restricted fasting for the management of obesity

PRASHANT PATEL, NAJEED KHAN, AHMED RASHID AHMED

DEPARTMENT OF SURGERY AND CANCER



Imperial College
London

BACKGROUND

- Nearly one quarter of UK adults are obese (BMI greater than 30g/m²)
- Prediction by 2050: 60% men, 50% women
- Leading cause of preventable death worldwide associated with a range of health problems including T2DM, CVD, Malignancy, OSA, OA
- Resulting NHS costs attributable to being obese are projected to reach **£9.7 billion** by 2050 with wide costs to society estimated to reach **£49.9 billion** per year
- Obesity it self is a pandemic!



TIER-3 WEIGHT MANAGEMENT SERVICES

- Very costly to deliver, £6 billion per year spent on obesity treatments & £10m for treating T2DM
- Tier-3 service provides minimally significant weight loss of 3-5%
- Poor adherence to diets with >50% weight regained in the first year following weight loss
- Introduction (but lacking of) Pharmacological agents e.g. Orlistat (lipase inhibitor), Saxenda, Wegovy
- Sustainable weight loss?
- What is the best diet strategy?

INTERMITTENT FASTING – A POSSIBLE SOLUTION?

- **An umbrella term for a number of different strategies of fasting that do not involve a continuous restriction of calories daily**
 1. 5:2 intermittent fasting
 2. Time-restricted feeding
 3. Alternate day fasting

- **Objectives:**
 - Compare intermittent fasting strategies vs traditional continuous energy restriction (CER)
 - 1. Weight loss
 - 2. Improving cardiometabolic factors

TIME RESTRICTED FEEDING

- Fasting and feeding at specific intervals within a 24-hour cycle. The most widely used and researched format of TRF is a 16-hour fast, with an 8-hour feeding window (16:8) .
- Hypothesised to be effective for its affects on the human circadian rhythm

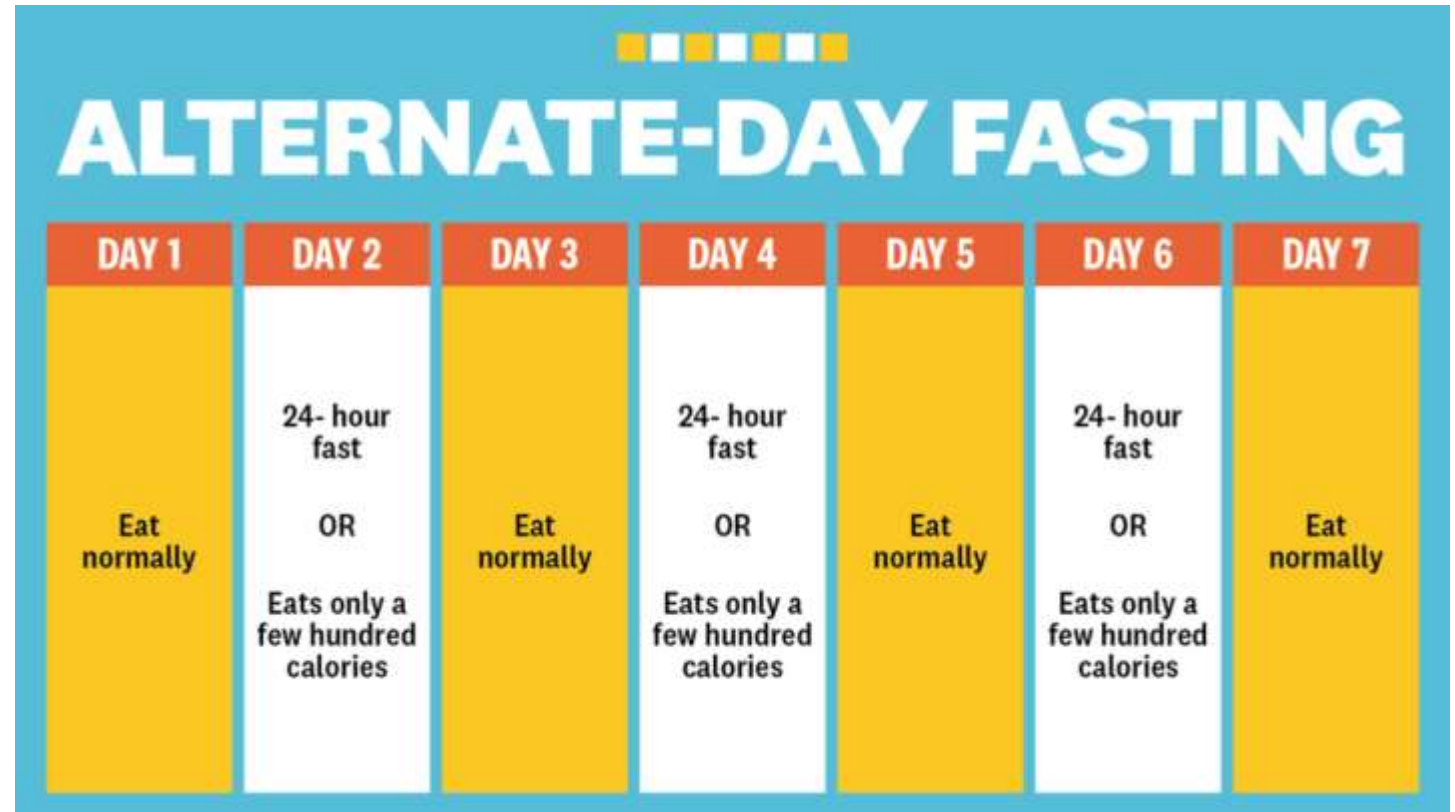


The infographic features a blue header with a yellow and white pie chart icon and the title "THE 16:8 DIET". Below the header is a table with 7 columns representing "DAY 1" through "DAY 7" and 8 rows representing time intervals: "MIDNIGHT", "4 AM", "8 AM", "12 PM", "4 PM", "8 PM", and "MIDNIGHT". The table uses color-coding: orange for the first meal, yellow for the last meal, and white for fasting periods. The feeding window is from 12 PM to 8 PM.

	DAY 1	DAY 2	DAY 3	DAY 4	DAY 5	DAY 6	DAY 7
MIDNIGHT							
4 AM	FAST	FAST	FAST	FAST	FAST	FAST	FAST
8 AM							
12 PM	First meal	First meal	First meal	First meal	First meal	First meal	First meal
4 PM	Last meal by 8PM	Last meal by 8PM	Last meal by 8PM	Last meal by 8PM	Last meal by 8PM	Last meal by 8PM	Last meal by 8PM
8 PM							
MIDNIGHT							

ALTERNATE DAY FASTING

- ADF restricts energy intake to every other day.
- This generally involves a feeding day, where food is consumed normally over a 24-hour period, and a fasting day, where there is either partial or complete cessation of energy intake.



5:2 INTERMITTENT FASTING

- The 5:2 fasting method consists of 5 days of normal feeding days with 2 non-consecutive or consecutive fasting days of minimal calorie intake
- Calories intake is commonly 0-25% of the estimated total energy requirements or average calorie consumption



METHODS



The databases PUBMED, EMBase, and Cochrane libraries were searched using the terms “intermittent fasting”, “5:2 diet”, “alternate day fasting”, “alternate day feeding”, “time restricted feeding”, “time restricted fasting”, “overweight”, “obese”.



Studies of adults (>18 y old) including RCT, single arm, and cohort studies, with overweight (BMI > 25) without additional co-morbidities participants were included for analysis.



27 studies met the inclusion criteria

RESULTS

- All three IF strategies; including ADF, TRF and 5:2, produced weight loss according to the standards set out in NICE guidelines, ranging from 2 – 10%, from baseline.
- Range of weight loss was achieved ($P < 0.05$)
 - TRF: (2.6% - 3.6%)
 - 5:2 IF (5.4% - 6%)
 - ADF (3.2% - 6.4%)
- Within the literature IF consistently outperformed a control group who were not given any intervention

Time restricted feeding 16:8

Patients	Diet length	Design and intervention group	Body weight	Energy intake	Blood pressure	Plasma Lipids			Gluoregulatory markers		Inflammation	Oxidative stress
						LDL	HDL	TG	Fasting glucose	Fasting insulin		
N = 116	12 week	RCT, 2 groups 1) Control 2) TRF	O	NT	NT	O	O	O	O	O	NT	NT
N = 10	4 week	Single arm 1) TRF	↓2.2%	NT	O	NT	NT	NT	O	NT	NT	NT
N = 50 (ad 80%)	12 week	Single arm 1) TRF	↓2.5kg	NT	O	O	O	NT	NT	NT	NT	NT
N = 101	3 week	RCT, 3 groups 1) TRF 2) ADF (25%) 3) Control	1)↓2.7kg 2)↓4.9kg	NT	O	1) O 2) O	1) O 2) ↓0.27	1) ↓0.34 2) O	1)O 2)↓0.13	NT	NT	NT
N = 20	12 week	RCT, 2 groups 1) TRF 2) Control	↓3.7%	↓EO 21.9%	O	O	O	O	O	O	NT	NT
N = 90 (ad 78%)	14 week	RCT, 2 groups 1) TRF 2) control (ER)	O	NT	↓6mmhg DBP	O	O	O	O	O	NT	NT
N = 90 (ad 85%)	14 week	RCT, 2 groups 1) early TRF (+ER) 2) control (+ER)	↓2.3kg	O	↓4mmhg DBP	O	O	O	O	O	NT	NT
N = 46	12 week	Historical control trial 1) TRF 2) Control	↓2.6%	↓341kcal	↓7mmhg SBP	O	O	O	O	O	NT	NT

Table 1

Significant values mentioned in the table are when P<0.05 when compared to control or alternative intervention.

O = no significant change, NT = not tested, RCT = randomised controlled trial, ad = adherence, ADF = alternate day fasting, LDL = low density lipoproteins, HDL = high density lipoproteins, TG = triglycerides, TRF = time restricted feeding, ER = energy restriction, DBP = diastolic blood pressure, SBP = systolic blood pressure, EO = eating occasions



TRF

- Only 1 RCT showed statistically significant weight loss compared to CER.
- 2 RCT performed by Lowe et al. and Steger et al. showed no significant difference in bodyweight following a prolonged TRF period compared to a control group.
- 2 studies highlighted statistically significant reduction in energy intake compared to the controls
- 3 trials showed statistically significant reductions in blood pressure compared to controls

5:2 Intermittent fasting												
Patients	Diet length	Design and intervention group	Body weight	Energy intake	Blood pressure	Plasma lipids			Gluoregulatory markers		Inflammation	Oxidative stress
						LDL	HDL	TG	Fasting glucose	Fasting insulin		
N = 112	1 year	RCT, 2 groups 1) IF (400-600kcal fast) 2) CER	O Both ↓wt (IF 8-9kg)	O	O	O	O	O	O	O	O	O
N = 121 (ad 51%)	1 year	RCT, 2 groups 1) IF (500kcal fast) 2) CER	O Both ↓wt (IF 3.2-4.8kg)	NT	NT	NT	NT	NT	O	O	NT	NT
N = 34	16 week	RCT, 3 groups 1) IF (500-600kcal fast) 2) Normal intake + HIT 3) IF + HIT	1) ↓6%	O	O	O	O	O	O	O	NT	NT
N = 43	4 week	RCT, 2 groups 1) IF (600kcal fast) 2) CER	O Both ↓wt (IF 1.8-3kg)	O	O	O	O	O	2) ↓0.25	O	O	O
N = 24 (ad 73%)	24 week	RCT, 2 groups 1) IF (600kcal fast) 2) CER	O Both ↓wt (IF 5.2-5.5kg)	O	O	O	O	O	O	O	NT	NT
N = 37	12 week	RCT 1) IF (25% ER fast) 2) CER	1) ↓5.9% 2) ↓2.3%	NT	NT	NT	NT	NT	NT	NT	NT	NT
N = 40	4 week	RCT 1) IF (0% fast) 2) Control	BMI ↓0.5	1) ↓406kcal	NT	NT	NT	NT	NT	NT	NT	NT
N = 197 (ad 33%)	24 week	Cohort study, 2 groups 1) IF (~600kcal fast) 2) CER	1) ↓5.4% 2) ↓2.8%	O	1) SBP ↓7 2) SBP ↑6	O	O	O	O	O	NT	O
N = 107 (ad 58%)	24 week	RCT, 2 groups 1) IF (~600kcal fast) 2) CER	O Both ↓wt (IF 6.4-5.6)	1) ↓716kJ	O	O	O	O	O	1) ↓2.1 2) ↓1.1	O	O
N = 150	24 week	RCT, 3 groups 1) IF (~25% ER fast) 2) CER 3) Control	1) ↓7% 2) ↓5% 3) O	1) ↓35% 2) ↓25% 3) O	O	O	O	O	O	O	O	NT

Table 2

Significant values mentioned in the table are when P<0.05 when compared to control or alternative intervention.

O = no significant change, NT = not tested, RCT = randomised controlled trial, ad = adherence, TRF = time restricted feeding, IF = intermittent fasting, CER = continuous energy restriction, ER = energy restriction, HIIT = high intensity interval training, BMI = Body mass index, LDL = low density lipoproteins, HDL = high density lipoproteins, TG = triglycerides, SBP = systolic blood pressure, ↓wt = weight

5:2 IF

- All studies showed a significant weight loss from baseline
- Only 1 RCT showed statistically significant weight loss compared to CER,
- 5 studies showed no difference in the weight lost with 5:2 IF, compared to CER
- 2 studies showed reduced energy intake in 5:2 IF vs CER
- Where tested, 5:2 IF reduced lipid levels, with no significant difference to CER
- 1 study showed reduced fasting insulin levels, compared to the CER group.

Alternate day fasting												
Patients	Diet length	Design and intervention group	Body weight	Energy intake	Blood pressure	Plasma Lipids			Gluoregulatory markers		Inflammation	Oxidative stress
						LDL	HDL	TG	Fasting glucose	Fasting insulin		
N = 100 (ad 69%)	12 month	RCT, 3 groups 1) ADF (25%) 2) CER 3) control	O (Both ↓wt 5-6%)	O	O	1) ↑1.2 2) ↓10.3	O	O	O	O	O	NT
N = 26 (ad 92%)	8 week	RCT, 2 groups 1) ADF (0%) 2) CER	O	1) ↓47% 2) ↓28%	NT	O	O	O	O	O	NT	NT
N = 74	8 week	RCT, 3 groups 1) ADF (25%) Lunch 2) ADF Dinner 3) ADF small meal	O All ↓wt (3.5-4.1kg)	O	O	O	O	O	O	O	NT	NT
N = 16	10 week	Single arm 1) ADF (25%)	↓5.7%	NT	NT	↓34	O	↓48	NT	NT	NT	NT
N = 60 (ad 82%)	12 week	RCT, 4 groups 1) ADF (25%) 2) CER 3) Exercise 4) Control	1) ↓5.2kg 2) ↓5 kg 3) ↓5.1kg 4) ↓0.2kg *Not compared against each-other	NT	NT	1) ↓10 2) ↓8	3) ↑16	1) ↓17	NT	NT	NT	NT
N = 101	3 week	RCT, 3 groups 1) TRF (600kcal) 2) ADF 3) Control	1) ↓2.7kg 2) ↓4.9kg	NT	NT	O	1) O 2) ↓0.27	1) ↓0.34 2) O	1) O 2) ↓0.13	NT	NT	NT
N = 16	10 week	Single arm 1) ADF (25%)	↓5.6kg	NT	NT	↓25%	O	↓32%	NT	NT	NT	NT
N = 64	12 week	RCT, 4 groups 1) ADF (25%) + exercise 2) ADF 3) Exercise 4) Control	1) ↓6kg 2) ↓3kg 3) ↓1kg 4) O	NT	O	NT	NT	NT	NT	NT	NT	NT
N = 42	24 week	RCT, 2 groups 1) ADF (25%) 2) Control	↓6.8kg	NT	NT	NT	NT	NT	O	↓4.5	O	NT

Table 3
Significant values mentioned in the table are when $P < 0.05$ when compared to control or alternative intervention. (Unless mentioned otherwise)
O = no significant change, NT = not tested, RCT = randomised controlled trial, ad = adherence, ADF 0% = alternate day fasting, ADF 25% = modified alternate day fasting, TRF = time restricted feeding, IF = intermittent fasting, CER = continuous energy restriction, ER = energy restriction, HIIT = high intensity interval training, BMI = Body mass index, LDL = low density lipoproteins, HDL = high density lipoproteins, TG = triglycerides, SBP = systolic blood pressure, ↓wt = weight reduction

ADF

- All studies showed a significant weight loss from baseline.
- No studies showed statistically significant weight loss compared to CER
- Only 1 RCT comparing 2 different IF protocols, showed ADF was superior to TRF in producing weight loss
- ADF consistently reduced SPB in studies, however this was not statistically significant compared to CER or exercise
- ADF reduced both LDL and TG levels, with 1 RCT showing ADF was superior to CER or exercise.

DISCUSSION

- ADF, 5:2 IF and TRF all show modest weight loss results
- Lack of consistent results
- Little evidence to suggest any IF strategy is superior to traditional methods of dieting such as CER
- Safe and feasible alternative to calorie restriction diets and could provide structure and routine for patients
- A 3-arm comparative clinical trial is required to see if any one protocol delivers clinically significant superior results.



Questions?