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Impact of Intermittent Fasting on Metabolic Syndrome Reversal in Older Adults

Adnan Saeed Shakir[1], Mehr Un Nisa Mustafa[2], Abdul Baqi[3], Aisha Akhter[4], Zubia Begum[4], Hinza Shamraz[5]

[1]Department of Endocrinology, Services Hospital, Lahore, Punjab, Pakistan.
[2]DHQ Teaching Hospital, Mardan, KP, Pakistan.
[3]Department of Orthopedics, Sheikh Zayed Hospital, Lahore, Punjab, Pakistan.
[4]Department of Pharmacology, Faculty of Pharmacy, Jinnah University for Women, Karachi, Sindh, Pakistan.
[5]Sir Syed College of Medical Sciences for Girls, Karachi, Sindh, Pakistan.

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Correspondence to: Adnan Shakir, Department of Endocrinology, Services Hospital, Lahore, Punjab, Pakistan.
Email: dr.adnansaeedshakir@gmail.com

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ABSTRACT

Background: The reasons behind the increased prevalence of metabolic syndrome in older individuals are cumulative metabolic stress, a drop in insulin sensitivity, and inactive lifestyles. Intermittent fasting has become one of the possible non-pharmacological approaches, although the evidence was scarce in older age groups. **Objective:** To evaluate the impact of a structured intermittent fasting regimen on metabolic syndrome reversal and related metabolic parameters in older adults. **Methodology:** The prospective interventional study was planned to take place between November 2024 and May 2025 at the department of Endocrinology, Services Hospital, Lahore, Pakistan. A total of seventy two adults between the ages of 60 years and older with metabolic syndrome were enrolled. The subjects were put on a 16:8 intermittent fasting program in 12 weeks. Before and after the intervention, anthropometric measurements and glycemic parameters, lipid profile, and blood pressure were monitored. Paired statistical tests were used in comparing outcomes. **Results:** Intermittent fasting was associated with great weight, BMI, waist circumference, fasting glucose and HbA1c, insulin resistance, total cholesterol, LDL, triglycerides, systolic and diastolic blood pressure reductions (all $p < 0.05$). Twenty-five percent of the participants had full reversal of their metabolic syndrome and 58% had partial improvement. Compliance was excellent and negative events were low and mild. **Conclusion:** There were significant changes in metabolism observed with intermittent fasting and some degree of recovery or complete recovery of metabolic syndrome in a considerable percentage of older adults. The regimen was highly accepted and can provide an effective lifestyle intervention to reduce the metabolic risk in ageing communities.

INTRODUCTION

Metabolic syndrome is an increasing menace in elderly individuals and it represents an intersection of central obesity, glucose intolerance, dyslipidaemia, and hypertension. These metabolic imbalances do not only augment the risk of cardiovascular disease but also expose older adults to a higher degree of vulnerability to functional impairment and low quality of life. With the increasing life expectancy, there is a renewed interest in sustainable interventions, pragmatic, non-disabling, and enhancing of metabolic health with no extra treatment burden [1-4].

Intermittent fasting (IF) is one of the nutrition trends of recent years that has become a flexible diet with possible metabolic advantages. The approach can help to promote insulin sensitivity, mobilise fat and alter hormonal pathways associated with metabolic processes by establishing prolonged fasting and shorter consumption intervals. Although a number of studies have been conducted on the middle-aged adults with positive results, results on older adults are less and especially on reversal of metabolic syndrome [5-7].

Aging adults commonly have challenges with mobility, taking drugs, and being able to follow a high, calorie-limited diet, and the ease of the time-limited dietary choice can be attractive. There are still concerns about safety, compliance and whether the physiologic responses seen in younger adults can be relevant to an older cohort, however [8, 9].

The aim of this study was to determine the effects of a systematic intermittent fasting program in reversing metabolic syndrome in adults aged above 60 years after one year. The analysis of anthropometric changes, glycaemic regulation, lipid levels, and blood pressure

would bring the idea about the perspective of intermittent fasting as a possible lifestyle intervention in this age group.

METHODOLOGY

It was a prospective interventional study that would be carried out in the department of Endocrinology, Services Hospital, Lahore, Pakistan between November 2024 and May 2025. The article examined how a structured intermittent fasting program has an impact on the reversal of metabolic syndrome in the elderly. Ethical procedures were applied in all the procedures and participants were enrolled through written informed consent. A total of 72 older adults diagnosed with metabolic syndrome were recruited. Eligibility included adults aged ≥60 years who fulfilled at least three metabolic syndrome criteria according to international classification. Individuals with uncontrolled chronic illness, recent hospitalization, or inability to follow a fasting routine were excluded.

Inclusion Criteria

- Adults aged 60 years and above
- Diagnosis of metabolic syndrome (≥3 components)
- Ability to adhere to intermittent fasting
- Consent to participate

Exclusion Criteria

- Unstable cardiovascular, renal, or hepatic disease
- Insulin-treated diabetes
- Recent major surgery or hospitalization
- Cognitive impairment affecting compliance

The participants received an intermittent fasting diet of 16:8, with 8-hour daily eating periods. There was no limitation on dietary preferences, but a nutrition counselling that supported balanced meals and not excessive sugar or saturated fats. The physical activities were maintained at a constant over the duration of the study to isolate the effect of fasting.

At the start of the study and the end of the 12 weeks fasting intervention, anthropometric measurements (weight, BMI, waist circumference), and clinical measurements (blood pressure, fasting glucose, HbA1c, insulin level, and lipid profile) were measured. All measurements were made in the morning, and the measurements were made following an overnight fast. Follow-up visits at every month followed the adverse events and adherence.

Main result was metabolic syndrome reversal, or the decrease of less than three diagnostic elements or total curing. Secondary outcomes consisted of the improvement of glycemic control, lipid profile, blood pressure and anthropometric indicators. The monthly symptom checklists were used to measure safety and tolerability.

The SPSS version 22 was used in the analysis of data. Mean and standard deviation were used to represent continuous variables and were compared with paired t - tests. The chi-square tests were used to analyse categorical outcomes. A p-value of less than 0.05 was taken as significant.

RESULTS

The demographic landscape reveals that the sample was predominantly middle aged in their mid-sixties which presented a representative elderly demographic of both genders. The values of baselines BMI and waist circumference mean that the greatest number of people reached the obesity level, which is a normal pattern of metabolic syndrome in this age. There was no significant imbalance based on a demographic variable and thus the subsequent improvements could be conveniently interpreted.

Table 1

Demographic Characteristics

Variable	Mean / n (%)	p-value
Age (years)	63.8 ± 6.4	0.42
Gender (Male)	38 (52.8%)	0.51
BMI (kg/m^2)	30.6 ± 4.1	0.38
Waist Circumference (cm)	104.2 ± 9.7	0.47
Metabolic Components (No)	3.8 ± 0.9	0.44

Intermittent fasting led to noticeable weight, BMI, and waist circumference decreases, which shows that something of physiological importance is changing. The gradual decrease in all anthropometric indices does favor better metabolic well-being. Such results would be a positive sign of metabolic syndrome reversal in part.

Table 2

Anthropometric Changes

Variable	Pre-IF Mean ± SD	Post-IF Mean ± SD	p-value
Weight (kg)	82.4 ± 11.2	77.3 ± 10.7	<0.001
BMI (kg/m^2)	30.6 ± 4.1	28.7 ± 3.9	<0.001
Waist Circumference (cm)	104.2 ± 9.7	98.6 ± 9.1	<0.001
Waist-Hip Ratio	0.96 ± 0.06	0.92 ± 0.05	0.002

Glycemic parameter showed a significant improvement after the fasting program with a decrease in the fasting glucose, HbA1c, and insulin resistance. Such changes cannot but suggest the enhancement of insulin sensitivity, which should be aimed at during the reversal of the metabolic syndrome. The statistical significance of all markers supports the metabolic beneficial effects of intermittent fasting in older people.

Table 3

Glycemic Control

Variable	Pre-IF Mean ± SD	Post-IF Mean ± SD	p-value
Fasting Glucose (mg/dL)	118.6 ± 14.2	104.3 ± 12.8	<0.001
HbA1c (%)	6.8 ± 0.7	6.2 ± 0.6	<0.001
Insulin Level (µIU/mL)	18.4 ± 4.9	14.2 ± 4.1	<0.001
HOMA-IR	5.4 ± 1.6	3.7 ± 1.3	<0.001

The lipid parameters were significantly improved and the total cholesterol, LDL, and triglycerides decreased. The small increase in HDL could indicate the improved cardiometabolic protection. Taken near glycemic improvements, all these changes serve to support the metabolic intervention of intermittent fasting.

Table 4

Lipid Profile

Variable	Pre-IF Mean ± SD	Post-IF Mean ± SD	p-value
Total Cholesterol (mg/dL)	207.5 ± 32.4	189.2 ± 28.7	<0.001
LDL (mg/dL)	131.6 ± 27.9	118.3 ± 25.4	0.003
HDL (mg/dL)	41.7 ± 7.6	45.2 ± 8.1	0.01
Triglycerides (mg/dL)	182.4 ± 36.3	154.7 ± 31.5	<0.001

The decrease in blood pressures was consistent and clinically significant, especially at those who had high baseline scores. An example of a known downstream outcome of metabolic recovery is improved vascular function. These findings are in line with cardiometabolic benefits of lipid and glycemic capacities.

Table 5

Blood Pressure

Variable	Pre-IF Mean ± SD	Post-IF Mean ± SD	p-value
Systolic BP (mmHg)	146.2 ± 12.7	135.4 ± 11.4	<0.001
Diastolic BP (mmHg)	88.6 ± 8.1	82.3 ± 7.4	<0.001

The large percentage of the participants had full or partial reversed metabolic syndrome components. The further reduction in mean components/participants also proves the systemic metabolic improvement. These results indicate the intermittent fasting as a promising and effective intervention among the elderly.

Table 6

Metabolic Syndrome Reversal

Outcome Category	n (%)	p-value
Full Reversal (0 components)	18 (25.0%)	<0.001
Partial Improvement	42 (58.3%)	<0.001
No Improvement	12 (16.7%)	0.12
Mean Components Pre vs Post	3.8 → 2.1	<0.001

The intermittent fasting was generally very tolerable and the side effects were mild and rare. There were high adherence rates meaning that the regimen was highly feasible among the older adults. It had no severe complications, which makes it safer.

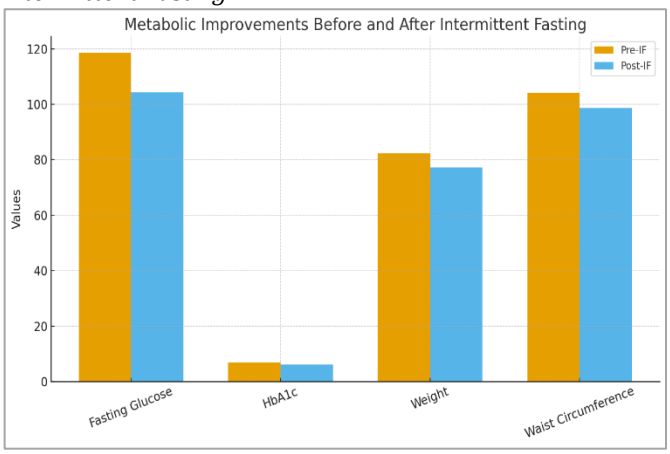
Table 7

Adverse Events and Adherence

Variable	n (%)	p-value
Good Adherence (>80%)	56 (77.8%)	0.003
Mild Hypoglycemia	6 (8.3%)	0.21
Dizziness/Fatigue	9 (12.5%)	0.18
Dropouts Due to Side Effects	3 (4.2%)	0.32

Figure 1

Changes in Key Metabolic Indicators Before and After Intermittent Fasting



As shown in Figure 1, the key parameters of metabolism in older adults improved after a comprehensive intermittent fasting regimen. Fasting glucose and HbA1c showed significant improvements, and it was indicative of improved glycemic control, whereas weight and waist were reported to reduce, and it indicated the provision of better anthropometric changes. All these moves are aimed at justifying the presence of intermittent fasting in the reversal of metabolic syndrome components.

DISCUSSION

The results of this research demonstrate that the favorable effect of intermittent fasting conducted in a structured manner can be used to achieve significant metabolic effects in older adults with metabolic syndrome. Weight, waist, fasting glucose and insulin resistance improve are signs on reductions which indicate that fasting is useful in restoring metabolic flexibility, which is frequently lost with age. The positive changes in both lipid profile and blood pressure also contribute to the hypothesis that fasting may induce a multicardioprovincial reaction instead of specific biochemical alterations [10-13].

It is noteworthy that the degree of glycemic response is parallel with those that have found improved insulin sensitivity following time-restricted feeding. The ever-problematic factors of compliance with lifestyle change in older adults were found to have been reported as rather high, which implies that the 16:8 fasting schedule is arguably more acceptable than the old-fashioned metacaloric methods. The rate of adverse events was relatively low indicating that intermittent fasting is not particularly dangerous provided that it is properly monitored although mild side effects were observed including fatigue and acute hypoglycemia [14-16].

This reversal pattern of metabolic syndrome which shows total resolution in one quarter of the study participants and some partial improvements in the other participants indicate the possible usefulness of fasting as an extension of non-pharmacological intervention [17-19]. These findings are a promising avenue to community-based approaches of managing metabolic syndrome in the ageing populations because the burden of the syndrome is increasingly becoming more significant. Nevertheless, sustaining long-term and examining the persistence of metabolic benefits after the accomplishments of the fasting regimen are softened was not assessed by this study and the field of future research [20].

CONCLUSION

Over one year, intermittent fasting participants demonstrated significant metabolic improvements among the older people, which included glycemic control, lipid parameters, anthropometric performance, and the overall metabolic syndrome condition. Most of the interviewees reported full or partial reversal of metabolic syndrome and the regimen was well-tolerated and had few adverse effects. Such results promote intermittent fasting to be a practical and efficient lifestyle intervention of older adults, but extended follow-ups are necessary to comprehend long-term effects and compliance in real-life.

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