

## Case Report

# Impact of fast pranayama (Bhastrika and Kapalabhati) on metabolic parameters in a patient with metabolic syndrome: a case report

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## ABSTRACT

Metabolic syndrome is a cluster of risk factors, including central obesity, dyslipidaemia, hyperglycaemia, and hypertension, all of which elevate the risk of cardiovascular disease and type 2 diabetes. Interest has grown in complementary practices such as yoga and pranayama for managing these risk factors. This case describes the impact of a three-month fast pranayama intervention, specifically Bhastrika and Kapalabhati, on metabolic health in a 43-year-old male IT professional with metabolic syndrome and type 2 diabetes who was undergoing oral hypoglycaemic therapy with metformin. The supervised practice was carried out six days per week for three months, and metabolic parameters were evaluated before and after the intervention. Notable improvements were observed across multiple domains: fasting plasma glucose decreased from 152 to 128 mg/dl, postprandial glucose from 214 to 186 mg/dl, and HbA1c from 7.6% to 6.8%. Triglyceride levels reduced from 280 to 210 mg/dl, while BMI and waist-hip ratio declined from 34.2 to 32.5 kg/m<sup>2</sup> and from 1.02 to 0.98, respectively. Blood pressure decreased from 134/86 mmHg to 124/80 mmHg, and the patient reported increased energy and overall well-being. These findings suggest that fast pranayama may offer meaningful adjunctive benefits in the management of metabolic syndrome and support the need for further controlled studies to validate its therapeutic potential.

**Keywords:** Fast pranayama, Metabolic syndrome, Type 2 diabetes mellitus, Dyslipidaemia, Central obesity

## INTRODUCTION

Metabolic syndrome is characterized by a group of interconnected risk factors- central obesity, high blood sugar (hyperglycaemia), high blood pressure

(hypertension), and abnormal lipid levels (dyslipidaemia)- which collectively and significantly raise an individual's risk for cardiovascular diseases and type 2 diabetes. The worldwide prevalence of metabolic syndrome varies from 14% to 39%, with increased rates documented in populations that have adopted sedentary lifestyles and

Western diets.<sup>1</sup> In India, the prevalence of metabolic syndrome is notably high, with urban population-based studies reporting rates between 25% and 35%.<sup>2</sup> This substantial prevalence contributes significantly to the national health burden, as metabolic syndrome is strongly associated with increased morbidity and mortality from cardiovascular diseases and type 2 diabetes.

The condition is often asymptomatic in its early stages, complicating timely diagnosis. Clinical manifestations, when present, typically include central obesity, hypertension, hyperglycaemia, and dyslipidaemia. If inadequately managed, these risk factors may progress to severe complications such as atherosclerosis, stroke, and chronic kidney disease.<sup>3</sup> Current pharmacological management is largely component-specific, employing antihypertensive agents for blood pressure control, statins for dyslipidaemia, and glucose-lowering medications such as metformin for hyperglycaemia. While effective, these therapies often require long-term administration and may be accompanied by adverse effects.<sup>4</sup> In recent years, complementary therapies such as yoga have attracted growing interest for their role in managing metabolic syndrome. Breathing practices like Bhastrika and Kapalabhati pranayama have demonstrated positive effects on metabolic parameters, stress reduction, and overall well-being. Evidence from a systematic review suggests that yoga is a safe and effective intervention for lowering waist circumference and systolic blood pressure in individuals with metabolic syndrome, particularly among those who do not engage in conventional exercise.<sup>5</sup>

Despite initial encouraging results, there is a need for large-scale, randomized controlled trials (RCTs) to evaluate the long-term effects of yoga on metabolic syndrome thoroughly. Furthermore, existing studies often use different types of yoga practices, which makes it challenging to establish which modalities are most effective.

This case report seeks to enhance current knowledge by detailing the effects of a specific structured pranayama regimen (Bhastrika and Kapalabhati) on a single individual with metabolic syndrome, offering insight into the potential role of incorporating targeted yoga practices in managing the condition.

## CASE REPORT

The patient is a 43-year-old male employed in the IT sector with a predominantly sedentary lifestyle, who presented for a routine health check-up without any acute complaints. He has a three-year history of type 2 diabetes mellitus, currently managed with oral hypoglycaemic therapy (metformin 500 mg twice daily). His family history is notable for hypertension in his father and type 2 diabetes mellitus in his mother. Socially, he leads a sedentary life with only occasional exercise, consumes a moderate-calorie diet, is a non-smoker, and drinks alcohol occasionally. He has no known allergies.

## Clinical findings

His weight was 98 kg, height was 169 cm, and BMI was 34.2 kg/m<sup>2</sup>, waist circumference was 108 cm, and hip circumference was 106 cm, indicating Grade II obesity. Blood pressure measured 134/86 mmHg in the prehypertensive range, and pulse rate was 84 bpm. The patient was alert, oriented, and appeared well-nourished with no signs of acute distress. General examination revealed no pallor, icterus, cyanosis, clubbing, lymphadenopathy, or pedal edema. Systemic examination showed normal cardiovascular and respiratory systems, and no abnormalities were detected in the abdominal or neurological examinations.

**Table 1: Results of pre- and post-intervention.**

Parameters	Baseline	Post intervention
<b>Fasting plasma glucose</b>	152 mg/dl	128 mg/dl
<b>Postprandial glucose</b>	214 mg/dl	186 mg/dl
<b>HbA1c</b>	7.6%	6.8%
<b>Triglyceride</b>	280 mg/dl	210 mg/dl
<b>Body mass index</b>	34.2 kg/m <sup>2</sup>	32.5 kg/m <sup>2</sup>
<b>Waist-hip ratio</b>	1.02	0.98
<b>Blood pressure</b>	134/86 mmhg	124/80 mmhg

## Diagnostic assessment

Diagnostic evaluation showed a fasting plasma glucose of 152 mg/dl, postprandial glucose of 214 mg/dl, and HbA1c of 7.6%. Lipid profile revealed hypertriglyceridemia with triglyceride levels of 280 mg/dl. Anthropometric assessment indicated obesity, with a BMI of 34.2 kg/m<sup>2</sup> and a waist-hip ratio of 1.02, suggestive of central adiposity. Blood pressure was measured at 134/86 mmHg, falling within the prehypertensive range. Collectively, these clinical and biochemical parameters support the diagnosis of metabolic syndrome.

## Therapeutic interventions

The patient was prescribed a structured pranayama intervention comprising Bhastrika and Kapalabhati practices. Training was initiated under supervision and subsequently continued at home with regular monitoring. The intervention lasted for three months, practiced six days per week (rest on Sunday), with each session conducted in the early morning, on an empty stomach, in a well-ventilated environment. Written and verbal informed consent were obtained for both participation and publication, and the patient reviewed and approved the final manuscript. For Bhastrika Pranayama, the patient sat in a comfortable upright posture and performed forceful inhalations and exhalations through both nostrils with abdominal movement. The practice began with three rounds of 20 breaths, resting 30-60 seconds between

rounds, and was progressively increased to 30–40 breaths per round over three months. Each session included ~6–8 minutes of Bhastrika, preceded by 2 minutes of preparatory deep breathing and followed by 2 minutes of relaxation. For Kapalabhati Pranayama, the patient performed passive inhalation followed by forceful abdominal exhalations in the same posture. Training began with three rounds of 30 strokes, resting 30–60 seconds between rounds, and was gradually increased to 60 strokes per round, totalling ~10 minutes of practice. The overall session duration was approximately 20–25 minutes, including preparatory and relaxation phases. Clinical monitoring included periodic blood pressure and blood glucose assessments. The patient was advised to discontinue practice if symptoms such as dizziness, breathlessness, or discomfort occurred. The protocol was adapted from published research, emphasizing gradual progression, correct technique, and patient safety. Weekly phone check-ins and monthly supervised sessions were used to monitor progress and ensure proper practice.

### **Follow-up and outcomes**

After three months of consistent practice of Bhastrika and Kapalabhati Pranayama (six sessions per week), the patient demonstrated measurable improvements in metabolic and cardiovascular parameters. Fasting plasma glucose decreased from 152 mg/dl to 128 mg/dl, while postprandial glucose declined from 214 mg/dl to 186 mg/dl. HbA1c improved from 7.6% to 6.8%. Triglyceride levels were reduced from 280 mg/dl to 210 mg/dl. Anthropometric measures showed a decrease in BMI from 34.2 kg/m<sup>2</sup> to 32.5 kg/m<sup>2</sup> and an improvement in the waist-hip ratio from 1.02 to 0.98, indicating reduced central obesity. Blood pressure decreased from 134/86 mmHg (prehypertensive range) to 124/80 mmHg, showing improvement toward the normal range. No midpoint assessments were planned to reduce participant burden, as the case report aimed to document overall pre-post change over the 3 months. All assessments were performed by the same assessor using calibrated devices to minimize measurement variability.

### **DISCUSSION**

This case report describes the outcomes of a three-month fast pranayama intervention (Bhastrika and Kapalabhati) in a patient with metabolic syndrome. Following the intervention, the patient demonstrated clinically relevant improvements in multiple cardiometabolic risk factors. The findings suggest that fast pranayama may contribute to better glycaemic control, reduction in central obesity, improvement in lipid profile, and normalization of blood pressure, thereby reducing overall cardiometabolic risk. Several plausible, partly overlapping mechanisms may explain the observed benefits. Fast pranayama's (Bhastrika, Kapalabhati) involve forceful diaphragmatic and abdominal contractions and rapid respiratory cycles that may transiently increase metabolic rate and provide a resistance-like stimulus to respiratory musculature;

repeated practice could modestly increase energy expenditure and fat metabolism.<sup>6</sup> Pranayama has been associated in mechanistic reviews with modulation of neurohormones (oxytocin, vasopressin, BDNF) and changes in autonomic-neuroendocrine pathways that influence appetite, glucose handling, and lipid metabolism.<sup>7</sup>

Regulated breathing patterns can physically and tonically stimulate the vagus nerve, shifting autonomic balance toward greater parasympathetic (vagal) tone and improving heart-rate variability, which is linked to better metabolic regulation and lower cardiometabolic risk. Respiratory vagal nerve stimulation is a proposed model linking breathing practices to systemic effects.<sup>8</sup>

Yoga and pranayama reduce perceived stress, cortisol, and some inflammatory markers (e.g., CRP, IL-6), thereby reducing chronic low-grade inflammation that contributes to insulin resistance. Lower systemic inflammation improves insulin sensitivity and cardiovascular risk markers.<sup>9</sup> The integrated yoga/pranayama shows improvements in insulin resistance markers and glycaemic control - possibly mediated through combined effects on autonomic function, stress reduction, and body composition.<sup>10</sup>

A systematic review found that yoga reduced waist circumference and systolic blood pressure in metabolic syndrome, but evidence for effects on triglycerides and fasting glucose was inconsistent and limited by study heterogeneity. That cautious conclusion matches this case: some metabolic parameters improved (waist, SBP), while others (triglycerides, fasting glucose) improved but remain areas where larger trials show mixed results.<sup>5</sup> Although improvements were evident, the changes were moderate, particularly for triglycerides and certain anthropometric measures. This may be due to the short duration of the intervention and the lack of accompanying dietary modification. Individual variability in autonomic and metabolic responsiveness to pranayama may further explain the degree of change. These findings align with previous trials showing modest but clinically meaningful improvements with breathing-based interventions, while also highlighting variability across patient profiles.<sup>11</sup>

### **Strength of this study**

This case report lies in its detailed documentation of the structured practice of fast pranayama techniques (Bhastrika and Kapalabhati) and their measurable impact on multiple cardiometabolic parameters in a patient with metabolic syndrome. The intervention was simple, cost-effective, non-pharmacological, and demonstrated improvements in glycaemic control, lipid profile, body composition, and blood pressure within a relatively short period. Another strength is the patient's high adherence to the regimen, which supports the feasibility of incorporating such practices into daily routines for long-term health benefits.

### **Patient perspectives**

After three months of consistent Bhastrika and Kapalabhati pranayama practice, the patient reported increased energy levels and reduced fatigue. He experienced improvements in overall well-being, including enhanced focus at work and a heightened sense of physical fitness.

The patient appreciated the non-pharmacological approach and felt empowered by taking an active role in managing his metabolic health. The patient expressed an intention to continue the pranayama practice beyond the study period, noting improved well-being and motivation to maintain the routine as part of her long-term lifestyle management.

### **Limitation**

The main limitation of this case report is that it reflects the experience of a single patient, which restricts the generalizability of the findings. The lack of a control group limits the ability to compare the effects of pranayama with standard care or other lifestyle interventions, making it challenging to attribute observed changes solely to the practice. Furthermore, biochemical and clinical parameters were measured only at baseline and at the three-month endpoint, without intermediate assessments or long-term follow-up. The potential influence of other lifestyle factors, including diet, stress, and incidental physical activity, could not be completely ruled out.

### **CONCLUSION**

This case report indicates that fast pranayama techniques, including Bhastrika and Kapalabhati, may be promising adjunctive approaches for improving cardiometabolic health in individuals with metabolic syndrome. Although the findings are encouraging, they highlight the need for larger, rigorously designed randomized controlled trials to confirm causality, investigate underlying mechanisms, and evaluate long-term outcomes. Incorporating pranayama into standard care may help reduce disease burden while promoting patient empowerment in managing metabolic syndrome.

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