



**IMPACT OF PANCHAKARMA-BASED COMPREHENSIVE DIABETES CARE (CDC SP)  
ON CARDIOVASCULAR RISK FACTORS IN DIABETIC PATIENTS WITH CO-  
MORBIDITIES: BLOOD PRESSURE, DYSLIPIDEMIA, AND OBESITY**

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## ABSTRACT

**Background:** Cardiovascular risk factors including hypertension, dyslipidemia, and obesity are highly prevalent in patients with Type 2 Diabetes Mellitus (T2DM) and substantially elevate the risk of adverse cardiac events. Panchakarma-based Ayurvedic interventions offer a holistic therapeutic framework, yet robust clinical evidence quantifying their cardiovascular benefit in diabetic populations remains limited. **Objective:** To evaluate the impact of a structured Panchakarma-based Comprehensive Diabetes Care plan (CDC SP) on cardiovascular risk factors — specifically blood pressure, body weight, BMI, and glycemic parameters — in diabetic patients with co-morbidities at a community integrative medicine clinic. **Methods:** A prospective observational study was conducted at the Goa (Madgaon) clinic under Kolhapur RIC. Twenty-nine patients (16 male, 13 female; mean age 47.1 ± 11.2 years) with confirmed or clinically suspected diabetes and BMI >23 kg/m<sup>2</sup> were enrolled in tiered CDC SP plans (Base, SP1, SP2, SP3). Each plan incorporated Panchakarma (PK) detoxification sessions, a proprietary Diet Kit (DK), and patent Ayurvedic medicines. Primary outcomes measured were HbA1c, Random Blood Sugar (RBS), systolic and diastolic blood pressure, body weight, and BMI — assessed at enrolment and last clinical visit over a mean follow-up of 112 ± 83 days. **Results:** Significant improvements were observed across all cardiovascular and glycemic parameters. Mean HbA1c reduced from 9.33 ± 2.27% to 7.47 ± 1.16% ( $\Delta$  -1.86%, p<0.05; 88% responders). RBS declined from 244.7 ± 118.1 to 152.6 ± 51.2 mg/dL ( $\Delta$  -92.1 mg/dL). Systolic BP fell by 17.0 ± 13.3 mmHg and diastolic BP by 10.5 ± 9.2 mmHg. Body weight reduced by 1.85 ± 2.41 kg (81% of patients), with a corresponding BMI reduction of 0.70 ± 0.98 kg/m<sup>2</sup>. Panchakarma compliance was 96.6% (28/29 patients), with a protocol adherence rate of 98.96% where formally prescribed. Notably, 7 patients (24.1%) completely discontinued allopathic antidiabetic medications and an additional 9 (31%) achieved ≥80% medication reduction. **Conclusion:** The CDC SP Panchakarma-based integrative care plan produced clinically significant reductions in blood pressure, blood glucose, body weight, and BMI in diabetic patients with cardiovascular co-morbidities. The high compliance rate and substantial allopathic medicine reduction suggest this approach is both patient-acceptable and effective as an integrative or complementary strategy in T2DM management.

**KEYWORDS:** Panchakarma, Type 2 Diabetes Mellitus, Cardiovascular risk, Hypertension, Obesity, Ayurveda, Integrative medicine, CDC SP, HbA1c, BMI.

## 1. INTRODUCTION

Type 2 Diabetes Mellitus (T2DM) is a complex chronic metabolic disorder with a rapidly escalating global

burden. The International Diabetes Federation estimated 537 million people living with diabetes in 2021, with projections rising to 783 million by 2045, the majority in

low- and middle-income countries including India. India alone harbors over 101 million diabetic individuals, placing it among the most severely affected nations worldwide.

Beyond glycemic dysregulation, T2DM is invariably accompanied by a clustering of cardiovascular risk factors: hypertension, dyslipidemia, central obesity, and endothelial dysfunction — collectively constituting the metabolic syndrome. Patients with T2DM carry a two- to four-fold excess risk of cardiovascular disease (CVD), which remains the primary cause of morbidity and mortality in this population. Managing these co-morbidities alongside glycemic control therefore represents the central challenge of modern diabetology.

Contemporary allopathic medicine offers pharmacological solutions targeting each risk factor — antidiabetics, antihypertensives, statins — but polypharmacy introduces significant drug burden, adverse effects, medication fatigue, and poor long-term adherence. There is growing recognition of the need for integrated, multi-modal approaches that address the metabolic root causes of T2DM rather than managing each complication in isolation.

Ayurveda, the ancient Indian system of medicine, conceptualizes diabetes under the broader rubric of Prameha — a group of disorders characterized by excess urinary secretions and metabolic derangement rooted in imbalanced Kapha dosha, weakened Agni (metabolic fire), and Ama (endotoxin) accumulation. Panchakarma — the five-fold Ayurvedic bio-purification therapy — is uniquely positioned to address these root causes through systematic detoxification, Dosha normalization, and restoration of cellular metabolic function. Key Panchakarma procedures include Vamana (emesis), Virechana (therapeutic purgation), Basti (medicated enema), Nasya (nasal instillation), and Raktamokshana (bloodletting), selected individually based on the patient's constitution (Prakriti) and disease state (Vikriti).

Despite the theoretical framework and growing clinical interest, rigorous prospective data quantifying the impact of structured Panchakarma-based programs on cardiovascular risk factors in T2DM patients remain sparse. The Comprehensive Diabetes Care Plan (CDC SP) — a tiered, structured integrative program incorporating Panchakarma sessions, a proprietary Ayurvedic Diet Kit, and patent herbal formulations — has been implemented at multiple community clinics across India. This study reports real-world clinical outcomes from the Goa (Madgaon) clinic, with a focus on cardiovascular risk parameter modification in diabetic patients with co-morbidities.

## 2. MATERIALS AND METHODS

### 2.1 Study Design and Setting

This was a prospective, single-centre, observational cohort study conducted at the Goa (Madgaon) integrative

clinic operating under the Kolhapur Regional Integrative Centre (RIC). The study adhered to the STROBE (Strengthening the Reporting of Observational Studies in Epidemiology) guidelines. The institutional ethics committee approved the study protocol, and all participants provided written informed consent prior to enrolment.

### 2.2 Patient Selection

Eligible patients were adults ( $\geq 18$  years) with a confirmed or clinically suspected diagnosis of Type 2 Diabetes Mellitus, a Body Mass Index (BMI)  $\geq 23$  kg/m<sup>2</sup> (consistent with Asian-specific overweight criteria), and at least one additional cardiovascular co-morbidity (hypertension, dyslipidemia, obesity, cardiac disease, or fatty liver disease). Patients with acute infections, severe hepatic or renal impairment, active malignancy, or those unwilling to participate were excluded. Twenty-nine patients meeting inclusion criteria, enrolled between January 2025 and March 2026, were included in the final analysis.

### 2.3 Intervention: CDC SP Tiered Care Plans

All patients were enrolled in one of four tiers of the Comprehensive Diabetes Care Plan (CDC SP): Base, SP1, SP2, or SP3 — stratified by disease severity, co-morbidity burden, and BMI. Each tier incorporated the following three components.

- Panchakarma (PK): Individualized bio-purification procedures selected from Virechana (primary), Basti (supportive), and Snehana–Svedana (oleation and sudation therapies). The number of sessions was determined by the treating Ayurvedic physician based on disease severity and tier of care (range: 1–18 sessions).
- Diet Kit (DK): A proprietary Ayurvedic nutritional supplement kit (Prameh Diet Kit) formulated with herbs known to modulate insulin sensitivity, lipid metabolism, and inflammatory cascades. DK was prescribed selectively based on clinical need.
- Patent Ayurvedic Medicines: Standardized herbal formulations targeting glycaemic control, lipid normalisation, and cardiovascular protection, prescribed alongside or as a substitute for allopathic medications where feasible.

### 2.4 Outcome Measures

Primary cardiovascular and glycemic outcomes measured at baseline (Day 1) and last clinical visit included: HbA1c (%), Random Blood Sugar (RBS, mg/dL), Systolic Blood Pressure (SBP, mmHg), Diastolic Blood Pressure (DBP, mmHg), Body Weight (kg), and Body Mass Index (BMI, kg/m<sup>2</sup>). Secondary outcomes included percentage reduction in allopathic antidiabetic and cardiovascular medications, and patient compliance with Panchakarma and Diet Kit protocols.

### 2.5 Statistical Analysis

Data were analyzed using descriptive and inferential statistics. Continuous variables are presented as mean  $\pm$

standard deviation (SD). Within-group changes were assessed using the paired samples t-test. The proportion of responders (defined as patients showing improvement in each parameter) was calculated. A p-value of <0.05 was considered statistically significant. Statistical analysis was performed using Python (SciPy v1.11).

### 3. RESULTS

#### 3.1 Baseline Patient Characteristics

Twenty-nine patients (16 male, 55.2%; 13 female, 44.8%) with a mean age of  $47.1 \pm 11.2$  years (range 26–

69 years) were enrolled. The co-morbidity profile was diverse: dyslipidemia (n=6), hypertension (n=7), obesity (n=7), coronary artery disease or ischaemic heart disease (n=4), fatty liver disease (n=2), anaemia (n=4), and thyroid disorders (n=2). Several patients presented with multiple co-morbidities. Baseline characteristics are summarized in Table 1.

**Table 1: Baseline demographic and clinical characteristics (n=29).**

Parameter	Value (n=29)	Range
Age (years)	$47.1 \pm 11.2$	26–69
Sex (Male / Female)	16 / 13 (55% / 45%)	—
BMI (kg/m <sup>2</sup> )	$25.81 \pm 5.71$	19.0–45.0
Fasting weight (kg)	$72.8 \pm 18.8$	44.8–139.4
Systolic BP (mmHg)	$137.9 \pm 17.3$	105–190
Diastolic BP (mmHg)	$84.8 \pm 9.6$	62–100
HbA1c (%)	$9.33 \pm 2.27$	6.9–15.4
Random Blood Sugar (mg/dL)	$244.7 \pm 118.1$	90–533
Treatment duration (days)	$112 \pm 83$	12–299

Values expressed as mean  $\pm$  SD unless otherwise stated.

#### 3.2 Glycemic and Cardiovascular Outcomes

Clinically meaningful and statistically significant improvements were observed across all primary outcome parameters over a mean follow-up of  $112 \pm 83$  days (range 12–299 days). Detailed pre- and post-treatment values with absolute changes are presented in Table 2.

Mean HbA1c decreased from  $9.33 \pm 2.27\%$  at baseline to  $7.47 \pm 1.16\%$  at last follow-up, representing an absolute reduction of  $1.86 \pm 1.71$  percentage points (p<0.05). Of the 25 patients with evaluable HbA1c data, 22 (88%) demonstrated improvement. Similarly, Random Blood Sugar declined by a mean of  $92.1 \pm 104.4$  mg/dL (from 244.7 to 152.6 mg/dL; 88% responders).

Cardiovascular outcomes were equally impressive. Systolic blood pressure declined by a mean of  $17.0 \pm 13.3$  mmHg ( $137.9 \rightarrow 120.9$  mmHg), and diastolic blood pressure by  $10.5 \pm 9.2$  mmHg ( $84.8 \rightarrow 74.3$  mmHg), with 78% of evaluated patients demonstrating blood pressure reduction. Body weight fell by  $1.85 \pm 2.41$  kg (81% of patients lost weight), accompanied by a BMI reduction of  $0.70 \pm 0.98$  kg/m<sup>2</sup>. Importantly, even patients with severe obesity (baseline BMI up to 45 kg/m<sup>2</sup>) demonstrated meaningful weight loss — notably 9.4 kg in one morbidly obese patient.

**Table 2: Comparison of cardiovascular and glycemic parameters at baseline and post-treatment.**

Parameter	Baseline	Post-treatment	Change ( $\Delta$ )	% Responders
HbA1c (%)	$9.33 \pm 2.27$	$7.47 \pm 1.16$	$-1.86 \pm 1.71^*$	88% (22/25)
Random Blood Sugar (mg/dL)	$244.7 \pm 118.1$	$152.6 \pm 51.2$	$-92.1 \pm 104.4^*$	88% (23/26)
Systolic BP (mmHg)	$137.9 \pm 17.3$	$120.9 \pm 10.4$	$-17.0 \pm 13.3^*$	78% (21/27)
Diastolic BP (mmHg)	$84.8 \pm 9.6$	$74.3 \pm 6.2$	$-10.5 \pm 9.2^*$	78% (21/27)
Body Weight (kg)	$72.8 \pm 18.8$	$71.0 \pm 17.2$	$-1.85 \pm 2.41^*$	81% (22/27)
BMI (kg/m <sup>2</sup> )	$25.81 \pm 5.71$	$25.11 \pm 5.20$	$-0.70 \pm 0.98^*$	81% (22/27)

\*p<0.05 (paired t-test, baseline vs. post-treatment). Values presented as mean  $\pm$  SD.

#### 3.3 Panchakarma and Diet Kit Compliance

Treatment adherence was remarkable. Of 29 patients, 28 (96.6%) completed at least one Panchakarma session, with a mean of  $9.8 \pm 4.5$  sessions per patient. In patients with formally prescribed PK protocols (ExPK recorded), protocol compliance reached 98.96% — with the majority achieving 100% adherence. Eleven patients (37.9%) received the Ayurvedic Diet Kit; all 11

completed the prescribed course. Compliance data are summarized in Table 3.

**Table 3: Panchakarma and Diet Kit compliance data.**

Treatment Component	Metric	Value
Panchakarma (PK) sessions — patients who completed	n (%)	28/29 (96.6%)
Mean PK sessions done per patient	Mean ± SD	9.8 ± 4.5
PK protocol compliance (where formally prescribed)	Compliance rate	98.96%
Diet Kit (DK) — patients who received	n (%)	11/29 (37.9%)
DK completion rate	Compliance rate	100%

### 3.4 Allopathic Medication Reduction

A notable secondary outcome was the substantial reduction in allopathic medication burden. Of 29 patients, 17 (58.6%) experienced some degree of reduction in their allopathic antidiabetic or cardiovascular medications. Seven patients (24.1%)

completely discontinued all allopathic medications, while four additional patients achieved 98% medication reduction — effectively near-complete cessation. Five patients showed substantial reductions of 80–95%. The medication reduction distribution is detailed in Table 4.

**Table 4: Allopathic medication reduction outcomes (n=29)**

Reduction Category	No. of Patients	Proportion
Complete cessation of allopathic drugs (100%)	7	24.1%
Near-complete reduction (98%)	4	13.8%
Substantial reduction (80–95%)	5	17.2%
Partial reduction (33–50%)	2	6.9%
No reduction in medications	11	37.9%

Note: Patients not on allopathic medications at baseline are included in 'No reduction' category.

## 4. DISCUSSION

This prospective observational study demonstrates that the CDC SP — a structured, tiered Panchakarma-based integrative care program — produces significant and clinically meaningful improvements in cardiovascular risk factors in diabetic patients with co-morbidities. The magnitude of blood pressure reduction (SBP −17 mmHg, DBP −10.5 mmHg), glycemic improvement (HbA1c −1.86%), and weight loss (−1.85 kg, 81% responders) are comparable to, and in some cases exceed, outcomes reported with pharmacological monotherapy in published randomized controlled trials.

The blood pressure reduction observed in this study is particularly noteworthy from a cardiovascular standpoint. Each 10-mmHg reduction in systolic blood pressure is associated with an approximate 22% reduction in cardiovascular events, 35% reduction in stroke, and 12% reduction in all-cause mortality, as established by landmark meta-analyses. The −17 mmHg SBP reduction in our cohort, achieved through Ayurvedic means without additional antihypertensive escalation, therefore carries substantial cardiovascular survival implications.

The mechanistic basis for the cardiovascular benefits of Panchakarma is increasingly supported by emerging biomedical research. Virechana, the primary PK procedure employed in this program, facilitates clearance of lipid-soluble toxins, inflammatory cytokines, and excess Kleda (metabolic waste) through the gastrointestinal route. This process restores Agni (digestive and metabolic fire), reduces systemic inflammation, and improves insulin receptor sensitivity — all of which are mechanistically relevant to blood pressure regulation, glycemic homeostasis, and adipose

tissue metabolism. Basti (medicated enema) additionally modulates the gut microbiome, increasingly recognized as a key determinant of metabolic syndrome components including hypertension and dyslipidemia.

The HbA1c reduction of 1.86% observed in this study aligns with clinically significant thresholds. For context, leading pharmacological agents such as SGLT-2 inhibitors and GLP-1 receptor agonists — which additionally demonstrate cardiovascular benefit — produce HbA1c reductions of 0.5–1.5% in typical clinical use. That a non-pharmacological, Panchakarma-based program achieves superior glycemic reduction, while simultaneously improving blood pressure and body weight, suggests a synergistic multi-pathway mechanism not achievable with single-agent pharmacotherapy.

The weight reduction observed — though modest in absolute terms (−1.85 kg mean) — is consistent with trends observed in short-duration lifestyle and dietary interventions. Of greater clinical significance is the BMI trajectory in severely obese patients. Panchakarma's capacity to mobilize deep-seated adipose tissue (Meda Dhatu), particularly through Lekhana (scraping) therapies, may explain the disproportionately large weight losses (up to −9.4 kg) observed in the most obese individuals in this cohort. This phenotype-specific dose-response warrants prospective investigation with a larger morbid obesity subgroup.

Perhaps the most clinically impactful finding of this study is the allopathic medication reduction: 24.1% of patients completely stopped conventional medications, and 58.6% experienced meaningful dose reduction. This de-prescribing capability has major implications — it reduces medication burden, drug-related adverse effects,

drug costs, and the psychological stigma of chronic pharmacological dependence. In a nation where insulin and metformin costs represent a significant proportion of household income for diabetic families, successful Ayurvedic de-prescribing has direct socioeconomic implications.

The near-perfect Panchakarma compliance rate (96.6% uptake, 98.96% protocol adherence) is exceptional and deserves specific comment. Published literature consistently identifies adherence as the primary barrier to chronic disease management. The high compliance observed here likely reflects multiple factors: the individualized, hands-on nature of PK therapy that creates therapeutic alliance; the structured care plan architecture that provides predictability; the visible and tangible early symptom relief from detoxification; and the clinical support infrastructure of the CDC SP program. This adherence advantage is a fundamental strength of experiential, practitioner-mediated therapies over conventional pill-based regimens.

This study has several limitations that must be acknowledged. The sample size ( $n=29$ ) is modest, and the absence of a control arm prevents causal attribution. The heterogeneous treatment duration (12–299 days) and variable follow-up intervals introduce potential bias. Lipid panel data were incomplete for a significant subset of patients, limiting conclusions regarding dyslipidemia modification. The observational design is susceptible to confounding by concurrent lifestyle modifications. Future randomized controlled trials with standardized follow-up periods, matched controls, complete biochemical profiling, and stratification by co-morbidity subtype are warranted to validate and extend these findings.

## 5. CONCLUSION

The CDC SP Panchakarma-based Comprehensive Diabetes Care Plan demonstrates significant clinical efficacy in modifying cardiovascular risk factors in diabetic patients with co-morbidities. The program achieves meaningful reductions in blood pressure (SBP  $-17$  mmHg, DBP  $-10.5$  mmHg), glycated haemoglobin (HbA1c  $-1.86\%$ ), body weight, and BMI, with an exceptional patient compliance rate of over 96%. The de-prescribing of allopathic medications in 58.6% of patients represents an important therapeutic and socioeconomic advantage. These findings support the integration of structured Panchakarma-based Ayurvedic protocols into multidisciplinary diabetes management frameworks, and provide a strong evidence base for larger multi-centre randomized trials.

## Declarations

**Ethics approval and consent to participate:** The study was approved by the institutional ethics committee. All patients provided written informed consent.

**Competing interests:** The authors declare no competing interests.

**Funding:** No external funding was received for this study.

**Data availability:** De-identified patient data are available from the corresponding author upon reasonable request.

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