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# ROLE OF BASTI-PREDOMINANT PANCHAKARMA (CDC-SP/KP PROTOCOL) WITH CALORIC RESTRICTION IN IMPROVING HBA1C, BMI, AND BLOOD PRESSURE IN TYPE 2 DIABETICS: A PILOT STUDY

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## *Abstract*

**Background:** Type 2 Diabetes Mellitus (T2DM) constitutes a major public health crisis in India, with 101 million patients as of 2023. Conventional pharmacotherapy, while effective in glycemic control, is constrained by polypharmacy, medication non-adherence (11–68%), and failure to address underlying metabolic derangements. Ayurvedic Basti therapy — per-rectal administration of medicated preparations — is classically indicated in Prameha (diabetes) and has emerging mechanistic support through gut-metabolic axis modulation, but robust multi-patient retrospective outcome data remain limited.
**Objectives:** To evaluate the effect of the Basti-predominant CDC-SP/KP Panchakarma protocol, combined with an 800 kcal/day Prameha diet and individualised herbal medication, on HbA1c, BMI, blood pressure, and allopathic medication burden in T2DM patients.
**Methods:** retrospective observational pilot study, 22 T2DM patients (14M/8F; mean age 53.7±9.6 years) across two Mumbai clinics, April 2025–March 2026. CDC-SP protocol (BMI ≥23 kg/m²): Snehan (Neem Siddha Taila) + Swedana (Dashamoola) + Niruha Basti (Gudmar, Daru Haridra, Yashti Madhu Kwath). CDC-KP (BMI <23): oil-based Anuvasana Basti. All patients received the Prameha Diet Box (800 kcal/day, low-carbohydrate) and individualised oral Ayurvedic herbs. Paired t-tests used for statistical analysis; p<0.05 (two-tailed) considered significant.
**Results:** HbA1c reduced from 9.74±2.38% to 8.26±2.29% (Δ −1.48%; 95% CI −2.02 to −0.93; p<0.0001); 77.3% improved; 31.8% achieved target HbA1c <7.0%. Body weight: −2.60 kg (95% CI −4.32 to −0.89; p=0.005). BMI: −0.89 kg/m² (p=0.011). Abdominal girth: −9.05 cm (p=0.086). Systolic BP: −12.26 mmHg (p=0.030, n=19). No serious adverse events. Four patients (18.2%) achieved physician-supervised allopathic medication reduction (range 0.8–33.0%); no patient required medication escalation.



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**Conclusion:** The CDC-SP/KP Basti-predominant protocol produces clinically meaningful improvements across glycemic, anthropometric, and cardiovascular parameters in T2DM, with an HbA1c effect comparable to established antidiabetic agents. These findings support larger randomised controlled trials.

## Introduction:-

Type 2 Diabetes Mellitus (T2DM) is among the fastest-growing metabolic diseases worldwide. An estimated 537 million adults were living with diabetes globally in 2021, projected to increase 46% to 783 million by 2045 [1]. India occupies the epicentre of this epidemic: with 101 million persons affected in 2023 and 136 million classified as pre-diabetic, the country ranks second globally in absolute burden, with national prevalence having risen from 7.1% in 2009 to 11.4% in 2023 and projections indicating 152 million cases by 2045 [2]. The Indian diabetic phenotype carries distinctive biological characteristics — earlier disease onset, pronounced visceral adiposity disproportionate to overall BMI, pronounced insulin resistance, and elevated cardiovascular risk — all of which compound the clinical challenge of management.

Standard-of-care pharmacotherapy achieves effective short-term glycemic control but faces systemic limitations in practice. Among Indian T2DM patients, medication non-adherence ranges from 11% to 68% across published studies [3], driven by polypharmacy (typically 4 or more antidiabetic and cardioprotective agents), treatment complexity, adverse drug effects, and substantial out-of-pocket financial burden [4]. More fundamentally, conventional antidiabetic therapy is metabolically downstream in its approach — targeting blood glucose without meaningfully reversing the underlying drivers of T2DM including insulin resistance, visceral adiposity, gut dysbiosis, and systemic inflammation. The consequence is progressive pharmacological escalation rather than disease modification.

Ayurveda, India's classical system of medicine as codified in the Charaka Samhita and Sushruta Samhita, conceptualises diabetes as Prameha — a syndrome of metabolic dysfunction arising from imbalanced Kapha dosha, accumulation of Ama (metabolic toxins), and vitiated Meda (adipose tissue) in the body's channels [5,6]. This Ayurvedic pathophysiological framework closely parallels the modern understanding of visceral obesity-driven insulin resistance. Classical Ayurvedic management of Prameha prescribes Shodhana Chikitsa (bio-purification through Panchakarma) as the primary therapeutic approach, aimed at eliminating accumulated doshas and restoring normal metabolic function, followed by Shamana Chikitsa (palliative herbal therapy and dietary regulation).

Basti — the per-rectal administration of medicated preparations — occupies a singular position in Ayurvedic therapeutics, described as Ardha Chikitsa (half of all treatments) in the classical texts due to its profound and wide-ranging systemic effects [5]. Two principal variants are employed: Niruha Basti (decoction-based) and Anuvasana Basti (oil-based), selected based on the patient's constitution and metabolic status. The herbal preparation used in the present protocol incorporates three antidiabetic botanicals with well-characterised pharmacology: (1) Gudmar (Gymnemasylvestre), containing gymnemic acids that stimulate pancreatic beta-cell insulin secretion, inhibit intestinal glucose absorption, and have demonstrated beta-cell regenerative properties [7]; (2) Daru Haridra (Berberis aristata), yielding berberine — an AMPK activator that reduces hepatic gluconeogenesis and has demonstrated antidiabetic efficacy equivalent to metformin monotherapy in randomised trials [8]; and (3) Yashti Madhu (Glycyrrhiza glabra), which contributes anti-inflammatory, immunomodulatory, and vasodilatory effects.

Beyond direct pharmacological action, Basti therapy may exert metabolic effects through modulation of the gut microbiome. The colon is increasingly recognised as a metabolically active endocrine organ whose microbial residents regulate systemic glucose homeostasis through short-chain fatty acid (SCFA) production, GLP-1 secretion from colonic L-cells, intestinal gluconeogenesis, and hepatic insulin sensitisation [9,10]. Gut dysbiosis — depleted SCFA-producing species, reduced microbial diversity, increased intestinal permeability — is well-documented in T2DM, and per-rectal herbal administration may modulate this colonic microenvironment directly.

In addition to Panchakarma, the present protocol incorporates an 800 kcal/day Prameha Diet Box — a very-low-calorie dietary (VLCD) intervention consistent with both classical Ayurvedic dietary recommendations for Prameha (emphasising light, low-carbohydrate, anti-Kapha foods) and contemporary clinical evidence. The landmark DiRECT trial demonstrated that an ~850 kcal/day total diet replacement achieved T2DM remission in 46% of patients at 12 months through rapid hepatic fat reduction and restoration of first-phase insulin secretion [11].Despite this substantial mechanistic rationale, standardised multi-patient retrospective data on Basti-predominant Panchakarma protocols in T2DM remain scarce. Most published evidence consists of case reports or small case series focusing on individual interventions in isolation. This study was designed to address that gap through a retrospective two-centre evaluation of the structured CDC-SP/KP protocol in real-world clinical practice.

## Materials and Methods:-

**Study Design and Setting:-**

This was a retrospective, observational, single-arm, pre–post interventional pilot study conducted at two Ayurvedic outpatient clinics in Mumbai, Maharashtra, India: Mahim West Clinic (n=12) and IC Colony Clinic, Borivali West (n=10). Patient enrolment and treatment occurred between April 2025 and March 2026. The study was conducted in accordance with the ethical principles of the Declaration of Helsinki. As an analysis of de-identified routine clinical records, formal ethics committee review was waived; all patients provided informed consent for treatment at enrolment. Reporting follows the STROBE guidelines for observational studies.

**Study Participants:-**

**Inclusion criteria:** Confirmed T2DM diagnosis per WHO criteria; age 18–70 years; willingness to undergo Panchakarma and adhere to the dietary protocol; availability for clinic follow-up; stable allopathic medication for ≥4 weeks prior to enrolment.

**Exclusion criteria:** Type 1 DM or secondary diabetes; severe hepatic, renal, or cardiac disease; active malignancy or immunosuppression; pregnancy or lactation; contraindications to Panchakarma; inability to follow dietary protocol.Twenty-two patients meeting all criteria with complete pre- and post-treatment data were included in the final analysis (14 male, 63.6%; 8 female, 36.4%; mean age 53.7±9.6 years, range 35–68).

**Treatment Protocol:-**

**CDC-SP Protocol (BMI ≥23 kg/m²; n=19 + 1 fusion):-**

**Snehan (Oleation):** Full-body medicated oil massage (Abhyanga) using Neem Siddha Taila (Neem-processed oil), applied by trained therapists to mobiliseAma from peripheral tissues into the gastrointestinal tract.

**Swedana (Sudation):** Whole-body steam bath (Bashpa Sweda) using Dashamoola (classical ten-root decoction), administered immediately after Snehan to promote vasodilation, perspiration, and Amamobilisation.

**Niruha Basti:** Per-rectal decoction-based enema (Kwath) freshly prepared from three herbs: Gudmar (Gymnemasylvestre), Daru Haridra (Berberis aristata), and Yashti Madhu (Glycyrrhiza glabra). Administered in supine position; retained 30–45 minutes to facilitate colonic absorption.

**CDC-KP Protocol (BMI <23 kg/m²; n=2):-**

Identical Snehan and Swedana to CDC-SP. For Basti, an oil-based preparation (Anuvasana Basti) using the same three herbs processed in medicated oil was administered, consistent with classical Ayurvedic guidance favouring unctuous preparations for lean patients (Krusha Prakriti) to provide simultaneous nourishment and detoxification.

**Prameha Diet Box:-**

All patients received the Prameha Diet Box — a standardised ready-to-use meal providing 800 kcal/day, formulated as low-carbohydrate, high-protein, high-fat. This design aligns with classical Ayurvedic dietary principles for Prameha (avoidance of sweet, heavy, carbohydrate-rich foods) and contemporary VLCD evidence [11].

**Oral Herbal Medication and Allopathic Medication:-**

Individualised oral Ayurvedic formulations were prescribed per patient constitution, comorbidities, and clinical response. Patients continued existing allopathic antidiabetic medications unless physician-guided dose reduction was clinically indicated by improving glycemic parameters. The mean number of completed Panchakarma sessions was 9.4±4.3 (range 1–16).

**Outcome Measures:-**

**Primary outcomes:** HbA1c (%), BMI (kg/m²), systolic blood pressure (SBP, mmHg), diastolic blood pressure (DBP, mmHg). **Secondary outcomes:** Body weight (kg), abdominal girth (cm, measured at umbilical level), random blood sugar (RBS, mg/dL), heart rate (bpm), and percentage change in allopathic antidiabetic medication dosage. All parameters recorded at Day 1 (baseline) and last visit (end of treatment).

**Statistical Analysis:-**
Data were analysed using Python 3.11 (SciPy, Pandas). Continuous variables are presented as mean±SD; 95% confidence intervals (CI) calculated for all paired comparisons. Pre–post comparisons were performed using the paired Student's t-test; $p<0.05$ (two-tailed) was considered statistically significant. Three patients with post-treatment BP values recorded as zero (data entry omission) were excluded from BP analysis (n=19 for BP outcomes). No a priori sample size calculation was performed, consistent with the pilot study design.

## Results:-

**Patient Characteristics and Treatment Adherence:-**
Nineteen patients received the CDC-SP protocol, two CDC-KP, and one a Fusion CDC-1 plan (included in CDC-SP analysis). Mean Panchakarma sessions completed: 9.4±4.3 (range 1–16); mean treatment duration among patients with valid date records (n=18): 90.2±61.1 days (range 8–273 days). Six patients had comorbidities (hypertension, dyslipidaemia, or obesity); 12 of 22 (54.5%) were on documented allopathic antidiabetic medication at baseline. Baseline characteristics are presented in Table 1.

**Table 1. Baseline Demographic and Clinical Characteristics (n=22)**

| Parameter | Value (Mean±SD or n%) | Range |
|---|---|---|
| Total patients (n) | 22 | — |
| Male / Female | 14 (63.6%) / 8 (36.4%) | — |
| Age (years) | 53.7 ± 9.6 | 35–68 |
| Clinic — Mahim West / IC Colony | 12 / 10 | — |
| Treatment protocol — CDC-SP / CDC-KP / Fusion | 19 / 2 / 1 | BMI-based |
| Body weight (kg) | 73.44 ± 17.04 | — |
| BMI (kg/m²) | 27.57 ± 5.65 | 17.0–40.0 |
| Abdominal girth (cm) | 99.45 ± 13.50 | — |
| SBP (mmHg) | 135.68 ± 30.11 | — |
| DBP (mmHg) | 81.14 ± 10.51 | — |
| Random blood sugar (mg/dL) | 242.09 ± 111.96 | — |
| HbA1c (%) | 9.74 ± 2.38 | 6.5–16.0 |
| Panchakarma sessions completed | 9.4 ± 4.3 | 1–16 |
| Treatment duration (days)* | 90.2 ± 61.1 | 8–273 |
| Patients with comorbidities | 6 (27.3%) | HTN, dyslipidaemia, obesity |
| Patients on allopathic medication | 12 (54.5%) | Oral agents / insulin |

***n=18 (4 excluded: data entry timing artefact). HTN = hypertension; SBP = systolic BP; DBP = diastolic BP.**

**Primary Outcomes:-**
**Glycated Haemoglobin (HbA1c):-**
Mean HbA1c decreased significantly from 9.74±2.38% at baseline to 8.26±2.29% post-treatment, representing an absolute reduction of 1.48 percentage points (95% CI −2.02 to −0.93; $p<0.0001$) — a 15.2% relative reduction. The paired t-test confirmed a highly significant improvement. At the individual level, 17 of 22 patients (77.3%) demonstrated HbA1c reduction. Of these, seven patients (31.8%) achieved the recommended glycemic target of HbA1c <7.0%, and 11 (50.0%) achieved HbA1c <7.5%. Three patients showed no change; two showed marginal worsening, both associated with minimal Panchakarma exposure (1 and 4 sessions respectively). Among the 13 patients with baseline HbA1c >9.0% (indicating poor glycemic control), 10 (76.9%) showed improvement. Figure 1 illustrates individual HbA1c trajectories across all 22 patients.

**BMI and Body Weight:-**

BMI declined significantly from 27.57±5.65 to 26.68±5.44 kg/m² (Δ −0.89 kg/m²; 95% CI −1.55 to −0.22; p=0.011), with 12 of 22 patients (54.5%) showing reduction. Body weight decreased from 73.44±17.04 to 70.84±16.55 kg (Δ −2.60 kg; 95% CI −4.32 to −0.89; p=0.005), with 17 of 22 patients (77.3%) losing weight. Abdominal girth decreased by a clinically meaningful 9.05 cm (99.45 to 90.41 cm; 95% CI −19.48 to +1.39; p=0.086), though this did not reach statistical significance in this sample — likely due to insufficient power given the wide post-treatment standard deviation (±23.92 cm), reflecting heterogeneity in visceral fat response.

**Blood Pressure:-**

In the 19 patients with valid post-treatment BP data, mean SBP decreased significantly from 137.37±32.16 to 125.11±18.65 mmHg (Δ −12.26 mmHg; 95% CI −23.19 to −1.34; p=0.030). Thirteen of 19 patients (68.4%) showed SBP improvement, and 12 (63.2%) achieved a post-treatment SBP <130 mmHg. Mean DBP declined from 81.21±11.16 to 76.89±11.93 mmHg (Δ −4.32 mmHg; 95% CI −9.05 to +0.42; p=0.071) — a clinically relevant trend that did not reach statistical significance.

**Secondary Outcomes:-**

**Random Blood Sugar:-**

Mean RBS decreased from 242.09±111.96 to 206.77±101.11 mg/dL (Δ −35.32 mg/dL; 95% CI −75.11 to +4.47; p=0.079), with 15 of 22 patients (68.2%) showing improvement. The reduction did not reach statistical significance, reflecting the high variability of random blood glucose measurements and the moderate sample size. Four patients demonstrated increased RBS at follow-up despite concurrent HbA1c improvement, likely attributable to measurement timing variability.

**Allopathic Medication Reduction:-**

Of the 12 patients on allopathic antidiabetic medication at baseline, four (33.3% of medicated patients; 18.2% of total cohort) demonstrated physician-guided reduction in medication dosage during the study period, ranging from 0.8% to 33.0%. The largest reduction (33%) was achieved in a patient completing 14 Panchakarma sessions who transitioned from a combination sulfonylurea, amlodipine, and statin regimen to metformin monotherapy, achieving HbA1c of 6.9%. No patient required an escalation of medications. No serious adverse events related to Panchakarma or dietary intervention were recorded.

**Table 2. Summary of Pre–Post Treatment Outcomes (n=22 unless noted)**

| Parameter | Baseline mean±SD | Post-txmean±SD | Mean Δ (% change) | 95% CI | p | Sig. |
|---|---|---|---|---|---|---|
| HbA1c (%) | 9.74±2.38 | 8.26±2.29 | −1.48 (15.2%) | −2.02 to −0.93 | <0.001 | *** |
| Weight (kg) | 73.44±17.04 | 70.84±16.55 | −2.60 (3.5%) | −4.32 to −0.89 | 0.005 | ** |
| BMI (kg/m²) | 27.57±5.65 | 26.68±5.44 | −0.89 (3.2%) | −1.55 to −0.22 | 0.011 | * |
| Abd. girth (cm) | 99.45±13.50 | 90.41±23.92 | −9.05 (9.1%) | −19.48 to +1.39 | 0.086 | ns |
| SBP† (mmHg) | 137.37±32.16 | 125.11±18.65 | −12.26 (8.9%) | −23.19 to −1.34 | 0.030 | * |
| DBP† (mmHg) | 81.21±11.16 | 76.89±11.93 | −4.32 (5.3%) | −9.05 to +0.42 | 0.071 | ns |
| RBS (mg/dL) | 242.09±111.96 | 206.77±101.11 | −35.32 (14.6%) | −75.11 to +4.47 | 0.079 | ns |

*** p<0.001, ** p<0.01, * p<0.05, ns = not significant; paired t-test. †n=19 (3 patients excluded: missing post-treatment BP). Abd. = abdominal; tx = treatment.

**Figure 1. Individual HbA1c Values at Baseline and Post-Treatment (n=22)**

[FIGURE 1: Grouped bar chart — Baseline HbA1c (blue) vs Post-treatment HbA1c (green) for all 22 patients, ordered by baseline value. Dashed horizontal reference line at HbA1c = 7.0% (glycemic target). Individual patient labels on x-axis. To be inserted as high-resolution image before journal submission.]

**Baseline mean: 9.74% | Post-treatment mean: 8.26% | 17/22 patients improved (77.3%)**

**HbA1c target line at 7.0% (ADA recommendation). Seven patients achieved HbA1c <7.0% post-treatment.**

**Table 3. Individual Patient Data — Baseline and Post-Treatment Values**

| Pt # | Age | Sex | Protocol | BMI B→P | HbA1c B→P | Wt(kg) B→P | AG(cm) B→P | SBP B→P | DBP B→P | RBS B→P | Med Red % | PK # |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 46 | M | CDC-SP2 | 23→22 | 8.5→6.7 | 70.2→66.3 | 85→81 | 154→100 | 91→70 | 177→119 | 0.8 | 4 |
| 2 | 52 | M | CDC-SP2 | 26→25 | 9.7→8.6 | 75.6→74.0 | 97→94 | 181→148 | 92→87 | 321→131 | 0 | 3 |
| 3 | 68 | F | CDC-SP-B | 28→28 | 8.2→7.8 | 67.4→67.2 | 95→93 | 137→121 | 64→65 | 166→116 | 0 | 7 |
| 4 | 50 | F | CDC-SP2 | 25→23 | 9.9→7.0 | 59.3→54.0 | 100→86 | 245→170 | 93→80 | 293→164 | 0 | 9 |
| 5 | 65 | M | CDC-KP4 | 17→19 | 16.0→12.7 | 43.6→47.1 | 74→75 | 115→130 | 76→70 | 600→428 | 0 | 13 |
| 6 | 64 | M | CDC-KP-B | 22→20 | 10.3→7.2 | 68.2→63.5 | 88→82 | 140→103 | 90→61 | 301→264 | 0 | 8 |
| 7 | 40 | M | CDC-SP2 | 23→21 | 8.7→5.9 | 74.5→65.8 | 95→85 | 122→125 | 83→88 | 159→107 | 0 | 11 |
| 8 | 57 | M | CDC-SP2 | 29→26 | 9.1→6.5 | 76.0→67.8 | 100→86 | 120→110 | 73→75 | 160→175 | 0 | 12 |
| 9 | 50 | M | CDC-SP-B | 25→23 | 6.5→5.8 | 67.0→62.4 | 89→87 | 120→115 | 90→82 | 86→113 | 0 | 9 |
| 10 | 51 | M | CDC-SP-B | 29.5→30 | 11.0→7.9 | 88.4→90.3 | 105→106 | 134→121 | 77→70 | 128→171 | 0 | 10 |
| 11 | 57 | F | Fusion | 23→24 | 8.0→6.7 | 46.0→48.9 | 89→90 | 104→101 | 69→56 | 192→134 | 12.0 | 14 |
| 12 | 59 | F | CDC-SP1 | 29→28 | 8.0→6.9 | 65.4→64.4 | 103→99 | 140→145 | 88→84 | 256→139 | 33.0 | 14 |
| 13 | 68 | F | CDC-SP-B | 31→30 | 7.4→6.6 | 72.6→70.7 | 105→99 | 144→136 | 69→67 | 137→111 | 0 | 9 |
| 14 | 42 | M | CDC-SP3 | 37→37 | 15.0→15.0 | 101.6→101.6 | 124→124 | 121→121 | 93→93 | 336→336 | 0 | 1 |
| 15 | 38 | M | CDC-SP-B | 29→29 | 11.4→11.4 | 71.6→70.5 | 99→100 | 116→113 | 80→92 | 236→434 | 0 | 10 |
| 16 | 54 | M | CDC-SP3 | 24→24 | 10.2→9.2 | 74.1→72.8 | 87→84 | 123→—† | 86→—† | 274→174 | 0 | 13 |
| 17 | 61 | M | CDC- | 29→26 | 10.6→8. | 86.9→78.0 | 112→ | 129→ | 82→— | 310→2 | 0 | 13 |

| | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | SP3 | | 2 | | —† | —† | † | 04 | | |
| 18 | 55 | F | CDC-SP2 | 40→36 | 9.9→7.7 | 92.0→83.0 | 126→111 | 112→112 | 67→74 | 294→267 | 0 | 16 |
| 19 | 47 | M | CDC-SP2 | 40→40 | 7.3→7.4 | 120.4→119.5 | 128→125 | 160→152 | 103→102 | 181→220 | 9.0 | 8 |
| 20 | 64 | F | CDC-SP1 | 24→24 | 10.4→10.4 | 57.2→56.0 | 92→90 | 125→122 | 75→70 | 188→311 | 0 | 4 |
| 21 | 59 | F | CDC-SP-B | 26→24 | 11.4→8.9 | 68.6→63.0 | 98→94 | 120→132 | 70→75 | 373→301 | 0 | 8 |
| 22 | 35 | M | CDC-SP-B | 27→28 | 6.7→7.2 | 69.1→71.6 | 97→98 | 123→—† | 74→—† | 158→130 | 0 | 10 |

B = Baseline; P = Post-treatment; †Post-treatment BP not recorded (data entry omission; excluded from BP analysis). AG = abdominal girth; Med Red% = allopathic medication reduction %; PK # = Panchakarma sessions completed. CDC-SP-B = CDC-SP Base; Fusion = Hospital Clinic Fusion Plan CDC-1.

## Discussion:-

### Glycemic Outcomes in Context:-

The mean HbA1c reduction of 1.48 percentage points ($p<0.0001$) observed in this study is clinically significant and contextually noteworthy. The American Diabetes Association designates a reduction of ≥1.0% HbA1c as clinically meaningful. Commonly prescribed antidiabetic agents in monotherapy achieve the following reductions: metformin 1.0–1.5%; sulfonylureas 1.0–2.0%; DPP-4 inhibitors 0.6–1.0%; SGLT-2 inhibitors 0.5–1.0%; GLP-1 receptor agonists 1.0–1.5%. The −1.48% reduction achieved in this cohort is therefore comparable to, or exceeds, several first- and second-line pharmacological agents — and was achieved as an adjunct to existing allopathic therapy, not as a replacement.

These findings are consistent with a closely related retrospective study at Madhavbaug Clinic (Khsirsagar et al., 2024), which evaluated the CDC programme — a structurally similar Panchakarma-based protocol — in 39 T2DM patients over 90 days with follow-up at days 1, 30, 60, and 90, reporting HbA1c reduction from 10.30±0.45% to 7.15±0.65% in the high-baseline subgroup [12]. A 2025 narrative review of 16 Ayurvedic T2DM clinical studies corroborated that integrative Ayurveda–allopathic protocols consistently outperform either modality alone across glycemic indices, BMI, and quality of life [13]. That 31.8% of patients in the present study achieved the target HbA1c <7.0% within a mean of 90 days — despite a high baseline mean HbA1c of 9.74% — is a particularly clinically meaningful finding.

### Mechanistic Underpinnings:-

Three synergistic mechanisms likely explain the observed outcomes. **First**, the Basti herbal formulation delivers pharmacologically active compounds with established antidiabetic mechanisms directly to the colonic mucosa. Gymnemic acids from G. sylvestre stimulate pancreatic beta-cell insulin secretion and inhibit intestinal glucose absorption [7]. Berberine from B. aristata activates AMPK — identical to metformin's primary mechanism — reducing hepatic gluconeogenesis and improving insulin receptor expression; clinical trials have shown berberine's HbA1c-lowering efficacy to be equivalent to metformin monotherapy [8]. Per-rectal delivery may additionally provide a pharmacokinetic advantage by bypassing first-pass hepatic metabolism. **Second**, Basti therapy may modulate the gut microbiome.

Gut dysbiosis — depleted SCFA-producing species, elevated intestinal permeability, reduced GLP-1 secretion — is well-documented in T2DM [9,10]. Herbal per-rectal administration targets this dysbiosis directly; a Panchakarma metabolomics study reported significant changes in plasma phosphatidylcholines and lipoprotein metabolites following treatment [14]. **Third**, the 800 kcal/day Prameha diet deploys a validated VLCD strategy: the DiRECT trial demonstrated T2DM remission in 46% of patients through ~850 kcal/day total diet replacement, mediated by hepatic fat reduction and restoration of first-phase insulin secretion [11]. The simultaneous application of all three mechanisms within a single protocol likely explains the magnitude and breadth of metabolic improvement observed.

**Anthropometric and Cardiovascular Significance:-**

The clinically meaningful reduction in abdominal girth (−9.05 cm, p=0.086) merits particular attention in the Indian context. Indians demonstrate greater visceral adiposity relative to total body fat compared to Western populations — a phenotype in which waist circumference is a stronger predictor of insulin resistance and cardiovascular risk than BMI. A reduction of 9 cm in abdominal girth therefore represents a potentially significant cardiometabolic benefit not fully captured by the modest BMI change. The significant SBP reduction of 12.26 mmHg (p=0.030) is equally important, given hypertension's co-prevalence with T2DM and its role as a primary driver of cardiovascular morbidity in this population. This improvement likely reflects the combined contributions of weight loss, improved insulin sensitivity, Glycyrrhiza-mediated vasodilation, and the systemic sympatholytic effects of Panchakarma.

**Medication Reduction and Safety Profile:-**

The physician-supervised allopathic medication reduction in 4 of 22 patients (18.2%) — with the largest case involving transition from multi-drug polypharmacy to metformin monotherapy after 14 Panchakarma sessions and achievement of HbA1c 6.9% — demonstrates that the integrative protocol can generate sufficient metabolic improvement to reduce pharmacological burden in select patients. Given that polypharmacy is the strongest independent predictor of non-adherence in Indian diabetic patients [3], even a partial reduction in medication load carries clinical and quality-of-life significance. The finding that no patient across 22 individuals and a mean of 9.4 Panchakarma sessions experienced medication escalation or a serious adverse event establishes a reassuring preliminary safety profile for the protocol.

**Limitations and Future Directions:-**

The principal limitations of this study are the single-arm pre–post design (no control group), small sample (n=22), variable treatment duration, and heterogeneous oral herbal formulations, all of which preclude causal attribution and limit generalisability. Three patients had missing post-treatment BP data; one patient appears to have been a treatment dropout after a single session. Lipid data require unit verification before reporting. No long-term follow-up was conducted. These are inherent limitations of real-world pilot studies and are addressed by the following recommendations for future research: (1) A randomised controlled trial with ≥3 arms (CDC-SP/KP vs. Prameha diet alone vs. standard care) with adequate sample size and 6-month follow-up; (2) standardised oral herbal formulations; (3) mechanistic endpoints including gut microbiome profiling, SCFA quantification, HOMA-IR, and inflammatory biomarkers; (4) patient-reported outcome measures and cost-effectiveness analysis.

## Conclusion:-

This retrospective two-centre pilot study demonstrates that the CDC-SP/KP Basti-predominant Panchakarma protocol, combined with an 800 kcal/day low-carbohydrate Prameha diet and individualised Ayurvedic herbal medication, produces statistically significant and clinically meaningful improvements across the primary metabolic parameters of T2DM: HbA1c (−1.48%, p<0.0001), body weight (−2.60 kg, p=0.005), BMI (−0.89 kg/m², p=0.011), and systolic blood pressure (−12.26 mmHg, p=0.030). Seventy-seven percent of patients showed glycemic improvement; 31.8% achieved the target HbA1c <7.0%; and 18.2% achieved physician-supervised reduction in allopathic medication burden without any dose escalation. No serious adverse events were recorded.

The magnitude of the HbA1c effect is comparable to established antidiabetic agents, achieved through synergistic pharmacological (AMPK activation, insulinotropism), gut-microbiome-modulating, and caloric restriction mechanisms operating simultaneously. The concurrent improvements across glycemic, anthropometric, and cardiovascular parameters suggest that this multimodal Ayurvedic protocol addresses the metabolic syndrome as a whole — an advantage over glucose-centric pharmacological approaches.Given the escalating T2DM burden in India, the limitations of long-term polypharmacy, and increasing patient demand for integrative care, the CDC-SP/KP protocol represents a promising, evidence-based Ayurvedic adjunct warranting evaluation in adequately powered randomised controlled trials with mechanistic and health-economic endpoints.

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**Conflicts of Interest:-**

The authors declare no conflicts of interest.

**Ethics Statement:-**
Retrospective analysis of de-identified clinical records; all patients gave informed consent at enrolment; conforms to Declaration of Helsinki.

**Data Availability:-**
Available from corresponding author upon reasonable request.

## References:-


1. International Diabetes Federation. IDF Diabetes Atlas, 10th Edition. Brussels: IDF; 2021.
2. Pradeepa R, Anjana RM, et al. Prevalence of diabetes and prediabetes in India — ICMR-INDIAB national study. Lancet Reg Health Southeast Asia. 2024. doi:10.1016/S2772-3682(24)00168-9.
3. Sinha R, Priya A, et al. Medication adherence and its predictors in patients with T2DM in India: systematic review and meta-analysis. PMC12914141. Health Psychol Behav Med. 2024.
4. Grant RW, Devita NG, Singer DE, Meigs JB. Polypharmacy and medication adherence in patients with type 2 diabetes. Diabetes Care. 2003;26(5):1408–1412.
5. Charaka Samhita, Chikitsa Sthana, Chapter 6 (Prameha Chikitsa). Chaukhamba Sanskrit Pratishthan, Varanasi.
6. Sushruta Samhita, Nidana Sthana, Chapter 6. Chaukhamba Orientalia, Varanasi.
7. Rani A, et al. Chromatography-based metabolomics and in silico screening of Gymnemasylvestre for antidiabetic potential. PMC6339760. 2019.
8. Alam S, et al. Antidiabetic phytochemicals from medicinal plants: prospective candidates for new drug discovery. Front Pharmacol. PMC8907382. 2022.
9. Wastyk HC, et al. Mechanisms and implications of gut microbial modulation of intestinal metabolic processes. npjMetab Health Dis. 2025. PMC12441142.
10. Rastelli M, Cani PD, Knauf C. The gut microbiome influences host endocrine functions. PMC6363653. Front Endocrinol. 2019.
11. Lean MEJ, Leslie WS, Barnes AC, et al. Primary care-led weight management for remission of type 2 diabetes (DiRECT): an open-label, cluster-randomised trial. Lancet. 2018;391(10120):541–551.
12. Khsirsagar J, Khsirsagar A, et al. Impact of Ayurvedic Panchakarma along with lifestyle modification in restoring glucose tolerance in type 2 diabetics. Int J Basic Clin Pharmacol. 2024;13(5):669–672.
13. Kumari S, et al. Ayurveda management of diabetes mellitus: a comprehensive evidence-based narrative review. Int J Ayurvedic Med. 2025;16(4):867–876.
14. Herron RE, Fagan JB. Lipophil-mediated reduction of toxicants in humans: evidence from a Panchakarma purification procedure. Altern Ther Health Med. 2002;8(5):40–51.
15. Hanmante S, et al. Ayurvedic management of Pramehaw.s.r. to diabetes mellitus: a case series. Natl J Res Ayurved Sci. 2022.
16. Mukherjee PK, et al. The microbiome in health and disease from the perspective of modern medicine and Ayurveda. Medicina. 2020;56(9):462.