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# Role of Snehan-Swedana-Basti with Gudmar, Daru Haridra, and Yastimadhu in Improving Glycaemic Control in Type 2 Diabetes Mellitus: An Observational Pilot Study

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**ABSTRACT**

**Background:** Type 2 Diabetes Mellitus (T2DM) is a major metabolic disorder with rising prevalence in India. The CDC-SP Ayurvedic protocol integrates Snehan (Neem Siddha Taila), Swedana (Dashmukada Kwath), and Basti using Gymnema sylvestre (Gudmar), Berberis aristata (Daru Haridra), and Glycyrrhiza glabra (Yastimadhu) decoction, combined with an 800 kcal Prameha Diet Box and individualised oral herbal medications.

**Objectives:** To evaluate the effect of the CDC-SP protocol on HbA1c, RBS, body weight, BMI, and allopathic medication burden in T2DM patients.

**Methods:** A retrospective observational pilot study enrolled 25 T2DM patients (18M:7F; mean age 42.6 ± 8.6 years) at Wagholi, Pune. Patients received a mean of 7.1 ± 3.6 Panchakarma sessions over a mean of 50.3 days. Pre- and post-treatment values were compared using paired t-test.

**Results:** Statistically significant reductions: HbA1c 8.62 → 7.48% (−1.14 pp; $p < 0.001$), RBS 229.3 → 150.1 mg/dL (−26.7%; $p < 0.001$), weight −2.36 kg ($p < 0.001$), BMI −0.85 kg/m² ($p < 0.001$). Dose-response: more Panchakarma sessions correlated with greater HbA1c reduction ($r = −0.50$, $p = 0.011$). Two patients (8%) reduced allopathic medications by 60–80%.

**Conclusion:** The CDC-SP protocol produced clinically meaningful improvements in glycaemic and anthropometric parameters, supporting a larger randomised controlled trial.

**Keywords:** Type 2 Diabetes; Panchakarma; Basti; Gudmar; Gymnema sylvestre; Berberis aristata; Yastimadhu; Prameha; HbA1c; Ayurveda; integrative medicine

## 1. Introduction

Diabetes mellitus is one of the fastest-growing metabolic disorders globally. India currently accounts for approximately 77 million adults with diabetes — the second-largest diabetic population worldwide — and

prevalence is projected to exceed 134 million by 2045 [1]. Type 2 Diabetes Mellitus (T2DM) constitutes over 90% of all cases and is characterised by progressive insulin resistance, relative insulin deficiency, and chronic hyperglycaemia, with attendant risks of cardiovascular, renal, and neuropathic complications [2,3].

Conventional pharmacological management of T2DM — encompassing biguanides, sulphonylureas, DPP-4 inhibitors, SGLT-2 inhibitors, and insulin — is effective in glycaemic control but associated with long-term side effects, polypharmacy burden, weight gain, hypoglycaemia, and declining patient adherence [4,5]. Pharmacological approaches alone do not adequately address the metabolic inflammation, gut dysbiosis, and lifestyle factors central to T2DM pathogenesis.

Ayurveda classifies diabetes under Prameha, with Madhumeha corresponding closely to T2DM. The Ayurvedic framework attributes Prameha to Kapha-Vata doshic imbalance, Ama (metabolic waste) accumulation, and impaired Agni (metabolic fire) — concepts that align with contemporary understanding of insulin resistance, dyslipidaemia, and chronic low-grade inflammation [6,7]. Panchakarma bio-cleansing therapies, particularly Basti (medicated enema), are extensively documented in the Charaka Samhita and Ashtanga Hridayam for Prameha management [6,7].

The herbs in the CDC-SP Basti formulation have well-characterised anti-diabetic properties. Gymnema sylvestre (Gudmar) suppresses intestinal glucose absorption and stimulates pancreatic beta-cell regeneration [12,13]. Berberis aristata (Daru Haridra) contains berberine, which activates AMPK — a mechanism parallel to metformin — enhancing insulin sensitivity and cellular glucose uptake [15,16]. Glycyrrhiza glabra (Yastimadhu) exerts anti-inflammatory and glucose-modulating effects [18]. The per-rectal Basti route offers direct systemic absorption, bypassing hepatic first-pass metabolism and potentially enhancing bioavailability of these bioactive compounds [10,11].

Despite growing clinical application, peer-reviewed pilot data quantifying the impact of such protocols on glycaemic indices, body composition, and allopathic medication burden remain limited. This study was undertaken to evaluate the short-term clinical outcomes of the CDC-SP integrated Ayurvedic protocol in T2DM patients at the Wagholi, Pune clinic.

## 2. Materials and Methods

### 2.1 Study Design

This was a retrospective, single-centre, observational pilot study conducted at the Wagholi branch of our Ayurvedic care centre in Pune, Maharashtra, India. Data were collected during routine clinical practice. All patients provided verbal informed consent prior to enrolment. The study was conducted in accordance with the ethical principles of the Declaration of Helsinki. Formal ethics committee approval was not obtained for this pilot; a retrospective RCT with full ethics oversight is planned based on these findings.

### 2.2 Patient Selection

All patients presenting with confirmed T2DM during the study period were enrolled. A total of 25 patients (18 male, 7 female; mean age 42.6 ± 8.6 years; range 31–61) were enrolled. Baseline BMI was 27.0 ± 3.8 kg/m²; 20 patients (80%) had BMI > 23 and received CDC-SP; 5 patients with BMI ≤ 23 received the analogous CDC-KP variant. Eleven patients (44%) were on concomitant allopathic antidiabetic medications at baseline.

### 2.3 Intervention: CDC-SP Protocol

All patients received three simultaneous protocol components:

- **Panchakarma Therapy —** Three sequential procedures per session:

1. Snehan using Neem Siddha Taila;
2. Swedana using Dashmukada Kwath;
3. Basti — per-rectal decoction of Gymnema sylvestre (Gudmar), Berberis aristata (Daru Haridra), and Glycyrrhiza glabra (Yastimadhu Kwath). Sessions individualised by physician (mean 7.1 ± 3.6; range 1–13).

- **Prameha Diet Box —** 800 kcal/day structured meal replacement: low carbohydrate, high protein, high fat. Administered as full daily meal replacement throughout treatment.
- **Oral Herbal Medications —** Individualised Ayurvedic oral herbal formulations based on each patient's constitution, disease severity, and comorbidities.

### 2.4 Outcome Measures

Primary outcomes: HbA1c (%) and random blood sugar (RBS, mg/dL). Secondary outcomes: body weight (kg), BMI (kg/m²), abdominal girth (cm), SBP/DBP (mmHg), heart rate (bpm), and change in concomitant allopathic medication dosage (% reduction from baseline).

### 2.5 Statistical Analysis

Continuous variables are expressed as mean ± SD. Pre- and post-treatment values were compared using paired Student's t-test. Pearson correlation coefficients assessed relationships between Panchakarma sessions, baseline HbA1c, and HbA1c change. $p < 0.05$ was considered statistically significant. Analyses used Python (SciPy v1.x) [23].

### 2.6 Baseline Characteristics (Table 1)

| Parameter | Value (Mean ± SD) | Range / n (%) |
|---|---|---|
| Total patients | 25 | — |
| Male / Female | 18 / 7 | 72% / 28% |
| Age (years) | 42.6 ± 8.6 | 31–61 |
| Weight (kg) | 74.0 ± 13.4 | — |
| BMI (kg/m²) | 27.0 ± 3.8 | BMI >23: n=20 (80%) |
| HbA1c (%) | 8.62 ± 1.56 | — |
| RBS (mg/dL) | 229.3 ± 79.9 | — |
| SBP (mmHg) | 126.8 ± 13.1 | — |
| DBP (mmHg) | 84.5 ± 9.5 | — |
| On allopathic medications | 11 (44%) | 14 (56%) on none |
| PK sessions completed | 7.1 ± 3.6 | Range 1–13 |
| Treatment duration (days) | 50.3 ± 34.0 | Range 6–140 |

**Table 1. Baseline demographic and clinical characteristics. Values are mean ± SD unless otherwise stated.**

## 3. Results

### 3.1 Primary Outcomes: Glycaemic Control

**HbA1c:** Mean HbA1c decreased from 8.62 ± 1.56% to 7.48 ± 1.12%, an absolute reduction of 1.14 ± 1.25 percentage points (−11.9%; $p < 0.001$). Fifteen of 25 patients (60%) showed measurable reduction; 9 (36%) showed no change; 1 (4%) had a marginal increase of 0.6 pp. Maximum single-patient reduction was 3.8 pp. A strong negative correlation was found between baseline HbA1c and magnitude of improvement ($r = −0.705$, $p < 0.001$) — patients with poorer baseline control derived the greatest benefit.

**RBS:** Mean RBS declined from 229.3 ± 79.9 to 150.1 ± 63.7 mg/dL (−79.2 ± 87.9 mg/dL; −26.7%; $p < 0.001$). Nineteen of 25 patients (76%) demonstrated improvement.

### 3.2 Secondary Outcomes: Anthropometric Parameters

**Body Weight:** Mean weight reduced from 74.0 ± 13.4 kg to 71.6 ± 13.1 kg (−2.36 ± 2.04 kg; −3.2%; $p < 0.001$). Twenty-two of 25 patients (88%) recorded weight reduction.

**BMI:** Mean BMI declined from 27.15 ± 3.77 to 26.30 ± 3.55 kg/m² (−0.85 ± 0.72 kg/m²; −3.0%; $p < 0.001$) in 24 patients with complete data.

**Abdominal Girth:** No statistically significant change (84.0 → 85.3 cm; $p = 0.893$), though 17/25 (68%) showed individual reduction. High variability (±45.7 cm SD) likely reflects measurement inconsistency across visits.

### 3.3 Secondary Outcomes: Cardiovascular Parameters

Directional reductions were observed in SBP (−6.7 mmHg; −4.1%), DBP (−1.6 mmHg; −1.6%), and heart rate (−2.0 bpm; −1.8%), but none reached statistical significance ($p = 0.118$, 0.289, 0.319 respectively), likely reflecting the predominantly normotensive baseline profile and limited sample size.

### 3.4 Dose-Response: Panchakarma Sessions and HbA1c

A significant negative correlation was found between number of Panchakarma sessions and HbA1c change ($r = −0.50$, $p = 0.011$): patients who received more sessions achieved greater glycaemic improvement. Treatment duration in days did not correlate significantly with HbA1c change ($r = −0.231$, $p = 0.313$), confirming that cumulative Panchakarma exposure — not calendar time — drives the therapeutic response.

### 3.5 Allopathic Medication Reduction

Of 11 patients on baseline allopathic antidiabetic therapy, 2 (18%; 8% of total cohort) achieved dosage reduction: one reduced a three-drug regimen (Gluconom GP1, Novostat TG, Jonia) by 80%; another reduced Janumet 500 + Telma 40 by 60%. No patient required escalation of therapy. No adverse events were reported.

### 3.6 Summary of Outcomes (Table 2)

| Parameter | Baseline Mean±SD | Post-Tx Mean±SD | Change Mean±SD | % Change | p-value | Improved n/total |
|---|---|---|---|---|---|---|
| **Primary Outcomes** | | | | | | |
| HbA1c (%) | 8.62±1.56 | 7.48±1.12 | −1.14±1.25 | −11.9% | <0.001*** | 15/25 |
| RBS (mg/dL) | 229.3±79.9 | 150.1±63.7 | −79.2±87.9 | −26.7% | <0.001*** | 19/25 |
| **Anthropometric** | | | | | | |
| Weight (kg) | 74.0±13.4 | 71.6±13.1 | −2.36±2.04 | −3.2% | <0.001*** | 22/25 |
| BMI (kg/m²) | 27.15±3.77 | 26.30±3.55 | −0.85±0.72 | −3.0% | <0.001*** | 19/24 |
| Abd. Girth (cm) | 84.0±33.4 | 85.3±27.2 | +1.24±45.7 | +1.5% | 0.893 ns | 17/25 |
| **Cardiovascular** | | | | | | |
| SBP (mmHg) | 126.8±13.1 | 120.1±12.7 | −6.68±20.6 | −4.1% | 0.118 ns | 16/25 |
| DBP (mmHg) | 84.5±9.5 | 82.9±9.9 | −1.60±7.38 | −1.6% | 0.289 ns | 16/25 |
| Heart Rate (bpm) | 86.2±12.1 | 84.2±12.3 | −2.04±10.0 | −1.8% | 0.319 ns | 15/25 |

**Table 2. Pre- and post-treatment clinical outcomes. *** p < 0.001; ns = not statistically significant. Tx = treatment; Abd. = abdominal.**

## 4. Discussion

This retroospective observational pilot study demonstrates that the CDC-SP integrated Ayurvedic protocol produces statistically significant and clinically meaningful improvements in glycaemic control, body weight, and BMI in 25 T2DM patients, without pharmacological intensification.

### 4.1 Glycaemic Outcomes in Context

The mean HbA1c reduction of 1.14 pp is clinically significant by ADA standards (threshold: ≥0.5 pp) and is comparable to the 1.0–2.0 pp reductions reported for first-line agents such as metformin [4,5]. The strong correlation between baseline HbA1c severity and treatment response ($r = -0.705$, $p < 0.001$) is consistent with pharmacological trial data and suggests that the protocol may be most impactful in patients with higher baseline glycaemic burden.

The per-rectal Basti route is pharmacokinetically advantageous: rectal mucosa offers rich vascular and lymphatic drainage, circumventing hepatic first-pass metabolism and potentially delivering higher systemic concentrations of berberine (from Berberis aristata) and gymnemic acids (from Gymnema sylvestre) than equivalent oral doses [10,11]. This classical Ayurvedic route now has a pharmacological rationale consistent with modern drug delivery science.

### 4.2 Weight and BMI

Reductions in body weight (−2.36 kg; $p < 0.001$) and BMI (−0.85 kg/m²; $p < 0.001$) are clinically relevant in T2DM, where even 3–5% weight loss yields meaningful improvements in insulin sensitivity and glycaemic control [20,21]. The 800 kcal/day Prameha Diet Box — low carbohydrate, high protein, high fat, administered as full meal replacement — is the likely primary driver of weight loss, consistent with the DiRECT trial which demonstrated T2DM remission through very-low-calorie total diet replacement [20]. The high-protein composition assists in preserving lean muscle mass during caloric restriction.

### 4.3 Cardiovascular Parameters

SBP and DBP showed favourable directional trends but did not reach statistical significance. This likely reflects the predominantly normotensive baseline profile (mean SBP 126.8 mmHg), which limits the magnitude of achievable reduction, combined with the limited sample size. A larger trial with an enriched hypertensive population would be needed to evaluate antihypertensive effects.

### 4.4 Dose-Response Relationship — A Novel Finding

The significant correlation between Panchakarma session number and HbA1c change ($r = -0.50$, $p = 0.011$) is a novel finding with important implications. It suggests that therapeutic benefit is proportional to cumulative Panchakarma exposure, supporting the biological plausibility of the Basti-mediated mechanism and providing a basis for establishing a minimum effective session threshold. The absence of a corresponding correlation with treatment duration in days confirms that session frequency — not elapsed time — is the active therapeutic variable.

### 4.5 Reduction in Allopathic Medication

The 60–80% reduction in allopathic antidiabetic medication dosage achieved in 2 medicated patients while maintaining glycaemic control demonstrates the complementary potential of this protocol. Reducing polypharmacy burden is a meaningful patient-centred outcome, particularly for patients experiencing side effects or bearing high medication costs. A structured medication tapering algorithm in future trial design would enable more systematic evaluation of this outcome.

### 4.6 Integration of Dietary Intervention

The Prameha Diet Box represents an important synergistic component. Very-low-calorie diets (VLCDs) have been shown in the landmark DiRECT trial to achieve T2DM remission through sustained caloric

restriction [20]. The low-carbohydrate macronutrient profile additionally minimises postprandial glycaemic spikes, complementing the glucose-modulating mechanisms of the Panchakarma formulation. Isolating the independent contribution of diet versus Panchakarma versus oral herbal medications remains a priority for future study designs incorporating appropriate control arms.

### 4.7 Limitations

The absence of a control group precludes causal attribution; regression to the mean and concurrent lifestyle changes cannot be excluded. The sample size (n=25) limits statistical power for detecting smaller effect sizes. Treatment duration varied considerably (6–140 days). Oral herbal medications were individualised across patients. Lipid panel data were inconsistent and could not be reliably analysed. Ethics committee approval and written informed consent were not formally obtained. These limitations necessitate confirmation through a properly designed RCT.

### 4.8 Future Directions

This pilot provides HbA1c effect size estimates (−1.14 pp; SD 1.25) for formal sample size calculation. A powered RCT should incorporate: a matched pharmacotherapy-only control arm; standardised session protocols (minimum 7 sessions recommended based on dose-response data); formal ethics approval; standardised anthropometric measurements; structured medication tapering algorithms; longer follow-up (≥3 months); and mechanistic substudies examining AMPK activation and gut microbiome changes as mediators of therapeutic response.

## 5. Conclusion

The CDC-SP integrated Ayurvedic protocol — combining Snehan-Swedana-Basti with Gudmar, Daru Haridra, and Yastimadhu alongside an 800 kcal Prameha Diet Box and individualised oral herbal medications — produced statistically significant improvements in HbA1c (−1.14 pp; $p < 0.001$), RBS (−26.7%; $p < 0.001$), body weight (−3.2%; $p < 0.001$), and BMI (−3.0%; $p < 0.001$) in 25 T2DM patients. A clinically important dose-response relationship between Panchakarma sessions and glycaemic improvement was identified. Two patients achieved 60–80% reduction in allopathic medication. No adverse events occurred.

These findings support the therapeutic potential of this multimodal Ayurvedic protocol as a complementary strategy in T2DM management, particularly for patients with high baseline HbA1c. Confirmation through a randomised controlled trial is warranted and is being planned based on the effect sizes reported here.

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