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RESEARCH ARTICLE

AYURVEDIC CDC MULTIMODAL PROTOCOL FOR TYPE 2 DIABETES MELLITUS AT MADHAVBAUG CLINIC: GLYCAEMIC AND CARDIOMETABOLIC OUTCOMES IN 97 DM PACKAGE PATIENTS — A RETROSPECTIVE OBSERVATIONAL STUDY

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Abstract

Background: Gandhinagar, Gujarat's capital city, serves a large popula tion of government employees, administrative professionals, and their families, characterized by predominantly sedentary desk -based occupat Ions and stable incomes a demographic with high T2DM risk despite r elatively controlled environmental exposures. The Gandhinagar cohort is the largest by patient number (n=97) in the Gujarat RIC DM network and the youngest (mean age 42.8 years), making it the most critical site for evaluating early intervention outcomes.

Objective: To evaluate the effect of the Madhavbaug CDC Panchakar ma based multimodal protocol on glycaemic, anthropometric, haemody namic, and cardiometabolic parameters, and antidiabetic medication reduction, in 97 DM Package patients at Gandhinagar Pramukh Clinic.

Methods: Retrospective observational study. 97 patients with Type 2 diabetes mellitus enrolled in the DM Package (CDC SP Base/1/2/3, CDC KP Base/1/2/3) at Gandhinagar Pramukh Clinic. Paired Student's t-test (two-tailed) for within-group pre–post comparisons. Significance: $p<0.05$.

Results: In this largest (n=97) and youngest (mean age 42.8 years) Gujarat RIC DM cohort: HbA1c declined from 8.73±1.90% to 8.00±1.79% (Δ −0.73%, −8.3%, p=0.003, n=37). RBS reduced from 195.71±94.90 to 173.22±75.27 mg/dL (Δ −22.49 mg/dL, −11.5%, p=0.043, n=82). Weight fell by −1.98 kg (−2.6%, p<0.001). BMI −0.73 kg/m² (−2.6%, p<0.001). SBP −3.38 mmHg (−2.6%, p=0.039). Heart rate −2.73 bpm (−3.0%, p=0.042).

Conclusion: The Gandhinagar Pramukh Clinic, with the largest (n=97) and youngest (mean age 42.8 years) DM Package cohort in the Gujarat RIC network, achieved statistically significant improvements in HbA1c (−8.3%,

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p=0.003), RBS (−11.5%, p=0.043), weight (p<0.001), BMI (p<0.001), SBP (p=0.039), and heart rate (p=0.042). The protocol's significant efficacy in this young, government-employee-predominant population establishes a strong case for early Ayurvedic intervention in the young-onset T2DM phenotype prevalent in Gandhinagar.

Introduction:-

Type 2 diabetes mellitus (T2DM) represents one of India's most significant public health challenges, with over 101 million individuals living with diabetes. Gandhinagar, the planned capital of Gujarat, houses a large concentration of state government employees, public sector workers, and professionals. The city's planned layout, institutional infrastructure, and stable income demographics create a unique health profile: while less exposed to the extreme dietary excesses of commercial hubs like Surat, the population's sedentary professional lifestyle, administrative stress, and institutional canteen-based diets contribute to a rising T2DM prevalence — particularly in the young-onset age group.

Ayurveda conceptualises diabetes as Prameha — specifically Madhumeha — a metabolic disorder of Kapha-Meda imbalance obstructing the MedovahaSrotas. The Madhavbaug CDC protocol operationalises this classical understanding through BMI-stratified Panchakarma (Snehan with Neem Siddha Taila, Swedana with DashmulaKwath, and Kwath-based or oil-based Basti with Gudmar, Daru Haridra, and Yashti Madhu), an approximately 800 kcal/day low-carbohydrate Prameha Diet Box, and individualised herbal medication. Prior evidence from the Mira Road clinic (n=67) showed HbA1c reduction from 9.37% to 6.72% (p<0.001) with 83.3% antidiabetic drug reduction. Across 316 Central RIC DM Package patients, HbA1c declined by 17.7% (p<0.001). The present study provides the first dedicated retrospective outcomes analysis from Gandhinagar Pramukh Clinic, examining all 97 DM Package patients.

Materials and Methods:-

Study Design and Setting:-

Retrospective observational study. Electronic patient records from Gandhinagar Pramukh Clinic, Gujarat RIC. Study period: 2024–2026. Only CPType = 'DM Packages' included.

Study Participants:-

N = 97 DM Package patients with at least one paired pre–post clinical measurement. Demographics: Male: 63 (64.9%), Female: 34 (35.1%). Age: 42.8 ± 11.0 years (Range: 20–72 years, Median: 41 years).

Intervention Protocol:-

CDC-SP (BMI ≥23 kg/m²): Kwath-based Basti with Gudmar, Daru Haridra, and Yashti Madhu; Abhyanga with Neem Siddha Taila; Swedana with Dashmula Kwath. CDC-KP (BMI <23 kg/m²): Oil-based Basti with identical herbal composition. DM-HTN protocol: Applied for concurrent hypertension management. All protocols supplemented by: Prameha Diet Box (~800 kcal/day, low carbohydrate <30%, high protein ≥30%), individualised oral herbal medication (Gudmar, Vijayasar, Haridra, Triphala, Amalaki), and lifestyle counselling.

Outcome Measures:-

Primary: HbA1c (%) and RBS (mg/dL). Secondary: Weight (kg), BMI (kg/m²), Abdominal girth (cm), SBP (mmHg), DBP (mmHg), Heart rate (bpm), Lipid profile. Tertiary: Antidiabetic medication reduction (complete 100%, partial 1–99%, no change 0%).

Statistical Analysis:-

Python (pandas, scipy.stats). Descriptive statistics as mean ± SD. Paired Student's t-test (two-tailed); p<0.05 significant. Parameters with <5 paired observations excluded from inferential testing.

Results:-

Baseline Patient Characteristics:-

Parameter	Value
Total DM Package Patients	97
Sex Distribution	Male: 63 (64.9%) | Female: 34 (35.1%)
Age — Mean ± SD	42.8 ± 11.0 years

Age — Median / Range	41 years | 20–72 years
Baseline HbA1c (Mean ± SD)	8.73 ± 1.90% (n=37)
Baseline RBS (Mean ± SD)	195.71 ± 94.90 mg/dL (n=82)
Baseline Weight (Mean ± SD)	76.55 ± 13.15 kg
Baseline BMI (Mean ± SD)	28.58 ± 4.81 kg/m²
Baseline SBP (Mean ± SD)	128.82 ± 15.09 mmHg
Baseline DBP (Mean ± SD)	80.46 ± 10.43 mmHg
Clinic / RIC	Gandhinagar Pramukh Clinic, Gujarat RIC
Study Period	2024–2026

Age Distribution:-

Table 2 presents the age distribution. This is the youngest DM cohort in the Gujarat RIC network — 47.4% are below 40 years. Young-onset T2DM patients carry the highest cumulative lifetime disease burden and benefit maximally from early effective intervention.

Age Group	n	% of Cohort	Clinical Note
<40 years	46	47.4%	Largest group; young-onset T2DM; early intervention critical
40–50 years	28	28.9%	Peak working-age metabolic burden
50–60 years	15	15.5%	Established T2DM with comorbidities
60+ years	8	8.2%	Elderly diabetics; conservative management

CDC Protocol Distribution:-

Table 3 shows the CDC protocol variant distribution. CDC SP 2 is the most common protocol (34.0%), with broad representation across Base, 1, 2, and 3 phases. The near-equal CDC-KP participation (14.4%) reflects the lower baseline BMI in younger patients.

CDC Protocol / Care Plan	n	%
CDC SP 2 (Shodhana Phase 2)	33	34.0%
CDC SP 3 (Shodhana Phase 3)	24	24.7%
CDC SP 1 (Shodhana Phase 1)	15	15.5%
CDC SP Base (Shodhana Baseline)	11	11.3%
CDC KP 2 (Brimhana Phase 2)	6	6.2%
CDC KP 3 (Brimhana Phase 3)	4	4.1%
CDC KP Base	3	3.1%
CDC KP 1	1	1.0%

CDC-SP: BMI ≥23 kg/m² (Sthula Pramehin). CDC-KP: BMI <23 kg/m² (Krisha Pramehin). DM-HTN: Concurrent hypertension management.

Diagnosis and Comorbidity Profile:-

Table 4 presents the diagnosis profile. The Obesity + DM comorbidity pattern (9.3%) and DM + Dyslipidaemia (7.2%) reflect the metabolic phenotype prevalent in younger administrative professionals, consistent with the desk-work lifestyle of Gandhinagar's government employee population.

Diagnosis / Comorbidity	n	%
Diabetes Mellitus (DM) — Pure	15	15.5%
Obesity + DM	9	9.3%
DM + Dyslipidaemia	7	7.2%
DM + Obesity	4	4.1%
DM + Hypertension	2	2.1%
Obesity + DM + Dyslipidaemia + HTN	1	1.0%
Obesity + DM + Dyslipidaemia	1	1.0%
Not Specified / Other	58	59.8%

Pre-Treatment vs Post-Treatment Outcomes:-

Table 5 presents the complete paired analysis. *** p<0.001 | ** p<0.01 | * p<0.05 | ns = Not Significant.

Parameter	Pre-Treatment (Mean ± SD)	Post-Treatment (Mean ± SD)	Δ Change	% Change	n	p-value
HbA1c (%)	8.73±1.90	8.00±1.79	−0.73	−8.3%	37	**0.003**
RBS (mg/dL)	195.71±94.90	173.22±75.27	−22.49	−11.5%	82	**0.043**
Weight (kg)	76.55±13.15	74.57±12.91	−1.98	−2.6%	85	**<0.001**
BMI (kg/m²)	28.58±4.81	27.85±4.71	−0.73	−2.6%	85	**<0.001**
Abdominal Girth (cm) — trend	97.36±13.13	95.95±11.27	−1.41	−1.4%	84	0.089
SBP (mmHg)	128.82±15.09	125.45±14.40	−3.38	−2.6%	80	**0.039**
DBP (mmHg) — trend	80.46±10.43	78.39±10.28	−2.08	−2.6%	80	0.074
Heart Rate (bpm)	91.85±14.35	89.12±13.88	−2.73	−3.0%	84	**0.042**

***** p<0.001 | ** p<0.01 | * p<0.05 | ns = Not Significant | Green = beneficial | Red = adverse**

Sex-Stratified HbA1c Analysis:-

Male patients (n=18) HbA1c: 8.87% → 8.47% (Δ −0.40, p=0.048); female patients (n=19): 8.59% → 7.55% (Δ −1.04, p=0.020). Female patients showed greater HbA1c improvement, possibly reflecting higher dietary adherence to the Prameha Diet Box.

Parameter	Male (n=18)	Female (n=19)	Δ Male	Δ Female	p (M)	p (F)
HbA1c pre (%)	8.87	8.59	—	—	—	—
HbA1c post (%)	8.47	7.55	−0.40	−1.04	0.048	0.020

Antidiabetic Medication Reduction:-

Only 1 patient (1.0%) achieved partial medication reduction, reflecting the predominantly early-phase protocol stage at enrolment and younger cohort demographics where medication management is more conservative.

Medication Category	n	% of Cohort	Clinical Meaning
Complete cessation (100%)	**0**	**0.0%**	All antidiabetic drugs stopped
Partial reduction (1–99%)	1	1.0%	Dose or drug count reduced
No change (0%)	96	98.9%	Medications unchanged
Any reduction (≥1%)	**1**	**1.0%**	Clinically meaningful reduction

Discussion:-

Gandhinagar Pramukh Clinic's DM Package (n=97) is the largest cohort in the Gujarat RIC network by patient count and presents the most critical young-onset T2DM dataset, with 47.4% of patients below 40 years. This demographic profile — government employees and professionals in Gujarat's administrative capital — provides a distinct clinical context: these patients have stable incomes, access to healthcare, and lower acute metabolic stress compared to industrial workers, yet face the insidious cardiometabolic risk of sedentary professional lifestyles. The HbA1c reduction of 8.3% (8.73% → 8.00%, Δ −0.73%, p=0.003, n=37) and RBS reduction of 11.5% (195.71 → 173.22 mg/dL, p=0.043, n=82) are statistically significant but smaller in absolute magnitude compared to other Gujarat clinics. This finding requires contextual interpretation: the baseline HbA1c of 8.73% represents a lower severity of hyperglycaemia compared to clinics like Adajan (9.54%) or Himmatnagar (9.00%), providing less statistical room for improvement. Additionally, the smaller paired HbA1c sample (n=37 vs n=73 at Adajan) reduces statistical power.

The weight reduction of 1.98 kg (−2.6%, p<0.001, n=85) and BMI reduction of 0.73 kg/m² (p<0.001, n=85) are highly statistically significant in this large cohort, confirming anthropometric benefit. The heart rate reduction of 2.73 bpm (p=0.042) and SBP reduction of 3.38 mmHg (p=0.039) provide additional cardiometabolic evidence.

The female-greater HbA1c response (females Δ −1.04%, males Δ −0.40%, both significant) at this clinic likely reflects the Gandhinagar female patient population's higher dietary adherence — possibly driven by the household cooking role, which facilitates implementation of the Prameha Diet Box principles into daily meal preparation.

The near-zero medication reduction rate (1/97) reflects the cohort's predominantly early-stage protocol enrolment and the conservative pharmacological de-escalation approach for a government-employee population where medication compliance is institutional-norm-driven. Longer follow-up and subsequent CDC phases would be expected to demonstrate higher medication reduction rates.

Conclusion:-

The Gandhinagar Pramukh Clinic, with the largest (n=97) and youngest (mean age 42.8 years) DM Package cohort in the Gujarat RIC network, achieved statistically significant improvements in HbA1c (−8.3%, p=0.003), RBS (−11.5%, p=0.043), weight (p<0.001), BMI (p<0.001), SBP (p=0.039), and heart rate (p=0.042). The protocol's significant efficacy in this young, government-employee-predominant population establishes a strong case for early Ayurvedic intervention in the young-onset T2DM phenotype prevalent in Gandhinagar.

Limitations:-

This retrospective observational study is subject to: (1) Absence of randomised control group; (2) Variable follow-up durations across protocol phases; (3) Incomplete lipid panel documentation in a subset; (4) Retrospective data quality variability; (5) Single-centre design limits generalisability. Prospective controlled trials with standardised data collection are recommended.

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