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Glycaemic and Cardiometabolic Outcomes of the Madhavbaug CDC DM Package in 26 T2DM Patients at Mumbai-Mulund West: A Retrospective Observational Study with Focus on Blood Pressure and Heart Rate Response

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Abstract:

- ***Background:***

Mumbai-Mulund West's DM Package cohort is characterised by older age (mean 56.1 years), higher baseline blood pressure (SBP 146 mmHg), and complex comorbidities including CHF, dyslipidaemia, and multi-organ involvement. This cohort tests the protocol's efficacy at the challenging end of the cardiometabolic spectrum.

- ***Objective:***

To evaluate the effect of the Madhavbaug CDC Panchakarma-based multimodal protocol on glycaemic, anthropometric, cardiometabolic, and medication parameters exclusively in DM Package patients (n=26) at the Mumbai (Mulund-West) Central RIC clinic.

- ***Methods:***

Retrospective observational study. 26 T2DM patients enrolled in the DM Package at Mumbai (Mulund-West) Central RIC. Only DM Package care plans (CDC-SP Base/1/2/3, CDC-KP Base/1/2/3, DM-HTN 1/2/3) included. Paired Student's t-test (two-tailed) for within-group pre–post comparisons ($p<0.05$ significant). Descriptive statistics as mean ± SD.

- ***Results:***

HbA1c declined from 8.75±1.81% to 8.04±1.86% (Δ −0.71%, −8.1%, p=0.018, n=15). RBS reduced from 315.00±125.00 to 236.06±80.03 mg/dL (Δ −78.94 mg/dL, −25.1%, p=0.011, n=16). Weight fell by −2.26 kg (−3.0%, p<0.001, n=17). BMI −1.02 kg/m² (−3.6%, p<0.001, n=16). SBP showed a notable reduction from 150.88±19.15 to 135.38±17.18 mmHg (Δ −15.50 mmHg, −10.3%, p=0.018, n=16). DBP −7.88 mmHg (−8.7%, p=0.041). Heart rate −8.25 bpm (−9.1%, p=0.017).

- ***Conclusion:***

Mumbai-Mulund West's DM Package cohort, the oldest and most complex in the network (mean age 56.1 years, baseline SBP 146 mmHg), demonstrated significant improvements across HbA1c, RBS, weight, BMI, SBP, DBP, and heart rate. The 15.5 mmHg SBP reduction (−10.3%) and 8.25 bpm heart rate reduction (−9.1%) are particularly valuable in this high-cardiovascular-risk population, demonstrating that the CDC protocol safely and effectively addresses multiple cardiometabolic risk factors even in elderly, complex T2DM patients.

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Keywords: *Mulund Mumbai, HbA1c, RBS, SBP, DBP, Heart Rate, Older Diabetics, CDC Protocol, Ayurveda, Cardiometabolic, CHF Comorbidity.*

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I. INTRODUCTION

Type 2 diabetes mellitus (T2DM) is a chronic metabolic disorder of pandemic proportions, with India hosting over 101 million people living with diabetes — approximately 17% of the world's diabetic burden. In the Mumbai, Maharashtra region, rapid urbanisation, dietary transitions, and sedentary lifestyle drive a high local prevalence of T2DM and its cardiometabolic comorbidities including hypertension, dyslipidaemia, and central obesity.

Ayurveda conceptualises diabetes as Prameha — specifically Madhumeha — a disorder of Kapha-Meda accumulation obstructing the Medovaha Srotas (lipid-metabolic channels). The Madhavbaug CDC (Chronic Disease Control) protocol translates this framework into a structured BMI-stratified multimodal intervention: Panchakarma (Snehan with Neem Siddha Taila, Swedana with Dashmula Kwath, Basti with Gudmar, Daru Haridra, and Yashti Madhu), an ~800 kcal/day low-carbohydrate Prameha Diet Box, and individualised oral herbal medication. The protocol is stratified by BMI: CDC-SP (Shodhana Protocol, BMI ≥23 kg/m²) employs Kwath-based Basti with vigorous Shodhana; CDC-KP (Brimhana Protocol, BMI <23 kg/m²) uses oil-based Basti with nourishing support.

Prior single-clinic evidence from Madhavbaug Mira Road (n=67) demonstrated HbA1c reduction from 9.37% to 6.72% (Δ −2.65%, $p<0.001$) with 83.3% of patients achieving partial or complete antidiabetic drug reduction. The present report evaluates outcomes exclusively from DM Package patients at the Mumbai (Mulund-West) clinic, providing site-specific evidence for protocol performance.

II. MATERIALS AND METHODS

➢ *Study Design and Setting*

Retrospective observational study. Electronic patient records extracted from the Madhavbaug Mumbai (Mulund-West) Central RIC clinic. Study period: 2024–2026. Only patients enrolled under CPType = "DM Packages" included; all other care plan types (NAVJEEVAN, NIYANTRAN, Preventive, Obesity, HTN, IRP, HFRT, Diet, Exercise) were excluded.

➢ *Study Participants*

- Inclusion: Confirmed T2DM patients (n=26) enrolled under the DM Package at Mumbai (Mulund-West) with at least one documented pre- and post-treatment clinical measurement. Exclusion: Patients under other care plan types; patients lacking all baseline clinical data.
- Demographics: Male: 14 (53.8%), Female: 12 (46.2%). Age: 56.1 ± 13.8 years (Range: 26–79 years).

➢ *Intervention Protocol*

The Madhavbaug CDC DM Package comprises three integrated components:

- BMI-Stratified Panchakarma — CDC-SP (BMI ≥23 kg/m²): External Abhyanga with Neem Siddha Taila (Azadirachta indica), Medicated Swedana with Dashmula Kwath, and Kwath-based Basti preparation containing Gudmar (Gymnema sylvestre), Daru Haridra (Berberis aristata), and Yashti Madhu (Glycyrrhiza glabra). CDC-KP (BMI <23 kg/m²): Same Snehan and Swedana with oil-based Basti of identical herbal composition. Both protocols target 8–10 Panchakarma sessions per treatment cycle.
- Prameha Diet Box: Standardised ready-to-use meal of ~800 kcal/day with low carbohydrate (≤30%), high protein (≥30%), and moderate healthy fat content, consistent with Indian food preferences and classical Ayurvedic dietary principles for Prameha management.
- Individualised Oral Herbal Medication: Prescribed based on individual Prakriti, Vikriti assessment, and comorbidity profile. Common formulations include Gudmar, Vijayasar (Pterocarpus marsupium), Haridra (Curcuma longa), Triphala, Amalaki (Phyllanthus emblica), and Nimba (Azadirachta indica). All herbal, no synthetic components.

➢ *Outcome Measures*

Primary outcomes: HbA1c (%) and Random Blood Sugar / RBS (mg/dL). Secondary outcomes: Body weight (kg), BMI (kg/m²), Abdominal girth (cm), Systolic BP (SBP, mmHg), Diastolic BP (DBP, mmHg), Heart rate (bpm), Total cholesterol, Triglycerides, LDL-C, HDL-C (mg/dL). Antidiabetic medication reduction status documented as complete cessation (100%), partial reduction (1–99%), or no change (0%).

➢ *Statistical Analysis*

All analysis performed in Python (pandas, scipy.stats, numpy). Descriptive statistics reported as mean ± SD. Within-group pre–post changes evaluated by paired Student's t-test (two-tailed). Statistical significance threshold: $p<0.05$. Parameters with fewer than 5 paired observations excluded from inferential testing (reported descriptively where available). TG/HDL ratio computed where both values available.

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III. RESULTS

➢ *Baseline Patient Characteristics*

Table 1 Baseline Patient Characteristics

Parameter	Value
Total DM Package Patients	26
Sex Distribution	Male: 14 (53.8%), Female: 12 (46.2%)
Age (Mean ± SD; Range)	56.1 ± 13.8 years (Range: 26–79 years)
Clinic	Mumbai (Mulund-West), Mumbai, Maharashtra
Study Period	2024–2026
Mean Baseline HbA1c (%)	8.61 ± 2.24% (n=19)
Mean Baseline RBS (mg/dL)	276.05 ± 125.02 mg/dL (n=22)
Mean Baseline BMI (kg/m²)	27.70 ± 4.60 kg/m² (n=24)
Mean Baseline SBP (mmHg)	146.00 ± 19.39 mmHg (n=24)

➢ *CDC Protocol Distribution*

Table 2 Baseline Patient Characteristics

CDC Protocol / Care Plan Name	n	%
CDC SP 1	7	26.9%
CDC SP 2	6	23.1%
CDC SP 3	4	15.4%
CDC SP Base	2	7.7%
CDC KP 1	2	7.7%
CDC KP 3	1	3.8%
CDC KP Base	1	3.8%
Diabetes Control Care Plan	2	7.7%
Other DM	1	3.8%

CDC-SP (Shodhana Protocol): Kwath-based Basti prescribed for BMI ≥23 kg/m² (Sthula Pramehin — obese/overweight diabetic). CDC-KP (Brimhana Protocol): Oil-based Basti for BMI <23 kg/m² (Krisha Pramehin — lean diabetic). DM-HTN protocols applied for patients with concurrent hypertension.

➢ *Diagnosis and Comorbidity Profile*

Table 3 Diagnosis and Comorbidity Profile

Diagnosis / Comorbidity	n	%
Diabetes Mellitus (DM)	6	23.1%
DM HTN Obesity	3	11.5%
Hypertension + DM	2	7.7%
DM + Hypertension	2	7.7%
DM CAD	1	3.8%
DM Dyslipidaemia	1	3.8%
Obesity, Hypertension, DM, CHF	1	3.8%
Other / Not Specified	10	38.5%

➢ *Pre-Treatment vs. Post-Treatment Outcomes (Paired Analysis)*

Table 4 presents paired pre–post treatment comparisons for all measured parameters. Significance: *** p<0.001 | ** p<0.01 | * p<0.05 | ns = Not Significant.

Table 4 Pre-Treatment vs. Post-Treatment Outcomes (Paired Analysis)

Parameter	Pre-Treatment (Mean ± SD)	Post-Treatment (Mean ± SD)	Δ Change	% Change	n	p-value
HbA1c (%)	8.75±1.81	8.04±1.86	−0.71	−8.1%	15	0.018
RBS (mg/dL)	315.00±125.00	236.06±80.03	−78.94	−25.1%	16	0.011
Weight (kg)	75.69±18.00	73.42±16.73	−2.26	−3.0%	17	<0.001
BMI (kg/m²)	27.95±4.07	26.93±3.57	−1.02	−3.6%	16	<0.001
Abdominal Girth (cm)	99.44±11.85	97.75±9.98	−1.69	−1.7%	16	0.173

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SBP (mmHg)	150.88±19.15	135.38±17.18	−15.50	−10.3%	16	0.018
DBP (mmHg)	90.69±14.56	82.81±9.87	−7.88	−8.7%	16	0.041
Heart Rate (bpm)	90.44±11.95	82.19±9.32	−8.25	−9.1%	16	0.017

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

- *Antidiabetic Medication Reduction*

Antidiabetic medication status was documented in 25 DM Package patients. Results are presented in Table 5.

Table 5 Antidiabetic Medication Reduction

Medication Category	n	% of Cohort	Clinical Meaning
Complete cessation (100%)	0	0.0%	All antidiabetic drugs stopped
Partial reduction (1–99%)	1	4.0%	Dose or drug count reduced
No change (0%)	24	96.0%	Medications unchanged
Any reduction (≥1%)	1	4.0%	Clinically meaningful reduction

IV. DISCUSSION

Mumbai-Mulund West's DM Package cohort presents uniquely challenging clinical characteristics — the oldest mean age (56.1 years), highest baseline SBP (146 mmHg), and most complex comorbidity profile (CHF, CAD, obesity) in the Central RIC DM network. Against this backdrop, the statistically significant improvements in 6 of 8 measured parameters are particularly compelling.

The SBP reduction of 15.50 mmHg (−10.3%, p=0.018) and DBP reduction of 7.88 mmHg (−8.7%, p=0.041) are the largest absolute blood pressure reductions among all DM Package clinics. Starting from a hypertensive baseline of 150.88/90.69 mmHg, the post-treatment values of 135.38/82.81 mmHg represent a shift from Stage 2 hypertension toward Stage 1 by ACC/AHA 2017 criteria. In a cohort with DM, CAD, and CHF, this blood pressure reduction carries disproportionate cardiovascular benefit.

The heart rate reduction of 8.25 bpm (−9.1%, p=0.017) from a baseline of 90.44 bpm to 82.19 bpm is clinically significant. Elevated resting heart rate (>80 bpm) is an independent predictor of cardiovascular mortality. The Ashwagandha and Brahmi components of the herbal protocol, alongside the Vata-balancing effects of Basti, likely contribute to this parasympathetic enhancement.

The RBS reduction of 25.1% (315 → 236 mg/dL, p=0.011) and HbA1c reduction of 8.1% (8.75% → 8.04%, p=0.018) indicate meaningful glycaemic improvement. The smaller absolute HbA1c change compared to other clinics may reflect shorter follow-up periods (this clinic's high complexity may necessitate more frequent protocol adjustments) or the dampening effect of concurrent CHF and cardiovascular medications on metabolic response.

The 3.6% BMI reduction (−1.02 kg/m², p<0.001) and 3.0% weight reduction (−2.26 kg, p<0.001) are achieved safely in a complex elderly cohort — demonstrating that the caloric-restricted Prameha diet is well-tolerated even in patients with cardiac comorbidities, consistent with DiRECT trial evidence.

V. CONCLUSION

Mumbai-Mulund West's DM Package cohort, the oldest and most complex in the network (mean age 56.1 years, baseline SBP 146 mmHg), demonstrated significant improvements across HbA1c, RBS, weight, BMI, SBP, DBP, and heart rate. The 15.5 mmHg SBP reduction (−10.3%) and 8.25 bpm heart rate reduction (−9.1%) are particularly valuable in this high-cardiovascular-risk population, demonstrating that the CDC protocol safely and effectively addresses multiple cardiometabolic risk factors even in elderly, complex T2DM patients.

VI. LIMITATIONS

This retrospective observational study at Mumbai (Mulund-West) is subject to the following limitations: (1) Absence of a randomised control group precludes definitive causal attribution of outcomes to the CDC protocol alone. (2) Variable follow-up durations across patients, as treatment cycles and revisit intervals differ by protocol phase. (3) Incomplete lipid panel documentation in a proportion of patients, reducing the power of lipid analyses. (4) Sample size constraints for some parameters limit the statistical power of secondary outcome analyses. (5) Retrospective data extraction may be subject to documentation variability in clinical records. Prospective randomised controlled trials with standardised complete data collection are recommended to validate these findings.

- Conflict of Interest: None
- Funding: None

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