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Therapeutic Effect of *Virechana* (Therapeutic purgation) on Insulin Resistance among Prediabetic Individuals: A Case Series

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ABSTRACT

Background: Prediabetes is a state of impaired glucose regulation strongly linked with insulin resistance, obesity, and metabolic dysfunction. It carries a high risk of progression to type 2 diabetes mellitus (T2DM) and associated cardiovascular and microvascular complications. Conventional management relies on lifestyle modification, but adherence is often challenging. Ayurveda describes *Prameha* as a *Bahudoshaja Vyadhi*, in which *Shodhana* therapies are recommended in the early stages. Among these, *Virechana Karma* (therapeutic purgation) is considered the prime intervention for *Kapha–Pitta* predominant conditions. **Objective:** To evaluate the effect of *Virechana Karma* on insulin resistance, glycaemic indices, and lipid parameters in individuals with prediabetes. **Methodology:** This case series included three prediabetic patients aged 39–52 years who met the American Diabetes Association (ADA) criteria and were clinically fit for *Virechana*. The intervention involved a standard protocol comprising *Deepana-Pachana*, *Snehapana*, *Abhyanga*, *Swedana*, and administration of *Trivrut Lehyam* for purgation, followed by *Samsarjana Krama*. Key assessment parameters included fasting serum insulin, HOMA-IR, fasting and postprandial blood sugar, and lipid profile, measured before and after therapy. **Results:** All participants achieved *Madhyama Shuddhi* and demonstrated improvements in metabolic parameters. Fasting serum insulin and HOMA-IR values decreased, indicating enhanced insulin sensitivity. Both fasting and postprandial blood sugar levels declined, reflecting better glycemic control. Lipid parameters showed favorable modulation, with reductions in total cholesterol, triglycerides, LDL, and VLDL levels. HDL changes varied, though overall cholesterol/HDL and LDL/HDL ratios improved, suggesting a healthier cardiometabolic profile. **Conclusion:** *Virechana Karma* produced a notable reduction in insulin resistance and improved glycemic and lipid parameters among prediabetic individuals. These findings support its potential role as an early Ayurvedic intervention to restore metabolic balance and delay progression to T2DM. Larger clinical studies are warranted to validate these preliminary observations.

INTRODUCTION

Prediabetes (PDM) is a metabolic condition characterized by intermediate hyperglycemia, with glucose levels above the normal range but below the diagnostic threshold for diabetes mellitus.[1] It is clinically important due to its strong association with microvascular and macrovascular complications, including nephropathy, cardiovascular disease, and retinopathy.[2] Individuals with PDM have a 5–6 times higher risk of developing type 2 diabetes mellitus (T2DM) compared to those with normal glucose tolerance.[3] In the absence of timely interventions, progression to overt T2DM occurs at an annual rate of 5–10%.[4] Rapid urbanization has contributed to lifestyle transitions marked by altered dietary habits and reduced physical activity, predisposing populations to lifestyle-related diseases. Prediabetes is a prime example, reflecting rising trends of dysglycemia in developing nations. The Indian Diabetes Prevention Programme-1 (IDPP-1) reported an annual diabetes incidence of nearly 18% among individuals with impaired glucose tolerance.[5] Epidemiological estimates suggest that approximately 77.2 million people in India are currently affected by prediabetes. With 10–15% of the population at risk, India has one of the highest global progression rates, with nearly 18% of prediabetics converting annually to diabetes.[6] The underlying mechanism of PDM is predominantly insulin resistance, defined as reduced cellular responsiveness to insulin despite normal or elevated secretion. Closely associated with sedentary lifestyle, obesity, and visceral adiposity, insulin resistance not only drives hyperglycemia but also

contributes to broader metabolic dysfunction. This increases susceptibility to T2DM as well as cardiovascular and microvascular complications. Given its asymptomatic course and strong link to insulin resistance, early identification and intervention are critical to delaying or preventing disease progression.

Prameha is described as a *Bahudoshaja Vyadhi*, involving the vitiation of multiple *Doshas*. In the early stage of the disease, *Shodhana* therapy is considered the treatment of choice, as during this phase, there is a predominant involvement of *Kapha* and *Pitta Dosha* in the patient's constitution.[7] Among the *Shodhana* procedures, *Virechana* holds a prime role, as it serves as the most effective method for eliminating aggravated *Doshas* through the alimentary canal. By facilitating the expulsion of excessive *Kapha* and *Pitta*, *Virechana* helps in clearing the obstructive channels (*Avarana*) created by deranged *Vata*. Through this mechanism, *Virechana* therapy not only reduces the burden of vitiated *Doshas* but also prevents further derangement of *Dushyas*.

Insulin resistance is central to the development of prediabetes, and the Homeostasis Model Assessment of Insulin Resistance (HOMA-IR) is widely used to quantify this dysfunction. A study in Asian Indian youth reported significantly higher HOMA-IR in prediabetic individuals compared to those with normal glucose tolerance, along with increased BMI, waist circumference, and fasting insulin levels, highlighting the role of insulin resistance prior to type 2 diabetes mellitus (T2DM).[8] Similarly, an Indian study on metabolic syndrome found that individuals progressing to prediabetes or diabetes had higher HOMA-IR and reduced insulin sensitivity (QUICKI) and β-cell function (HOMA-B) compared to those with normal glucose tolerance.[9] These findings suggest that elevated HOMA-IR in prediabetes reflects impaired insulin action and declining β-cell function, serving as an early marker of risk for progression to diabetes. Based on this background, the present study was planned to evaluate the effect of *Virechana* therapy on insulin resistance and metabolic parameters in individuals with prediabetes. The study aims to assess changes in fasting insulin, HOMA-IR, blood glucose, and lipid profile, thereby exploring the potential of *Virechana* as an early intervention to prevent progression to type 2 diabetes mellitus.

OBJECTIVES:

1. To study the effect of *Virechana* (Medicated purgation) on HOMA-IR and fasting serum insulin levels.
2. To study the effect of *Virechana* (Medicated purgation) on lipid profile, fasting and post prandial blood sugar.

METHEDOLOGY:

A total of three patients were included in the case series from the outpatient and inpatient of department from April 2025 to May 2025. Informed consent was obtained from the patients before starting the intervention.

Selection of patients:

Individuals of either sex, between 18 and 60 years of age, who fulfilled the diagnostic criteria for prediabetes as laid down by the American Diabetes Association (ADA) [10] were considered for inclusion. Participants underwent preliminary assessment to evaluate their suitability for *Virechana*, and only those who clinically assessed as fit for *Virechana* (*Virechana Yogya*) [11] and who provided written informed consent were finally included in this case series.

Individuals with a known history of diabetes mellitus or those undergoing *Virechana* for indications other than prediabetes were excluded. Likewise, prediabetic patients with associated major systemic illnesses—such as ischemic heart disease, uncontrolled hypertension, or other significant endocrine disorders—were considered ineligible for inclusion.

Treatment plan:

The planned intervention was *Virechana*, a classical Ayurvedic purificatory therapy intended for the expulsion of vitiated *Doshas*. The process commenced with *Deepana-Pachana* until the attainment of *Nirama Lakshana*, followed by *Snehapana* continued until the appearance of *Samyak Snigdha Lakshana*. After adequate internal oleation was ensured, *Abhyanga* (therapeutic oil massage) and *Swedana* (sudation therapy) were administered to facilitate the mobilization of *Doshas*. Subsequently, the principal procedure, *Virechana Karma*, was performed using *Trivrut Lehyam*. The therapy was executed in accordance with the hospital's standard operating protocol for *Virechana Karma*. Following the purificatory phase, *Samsarjana Krama* was prescribed to gradually restore and stabilize digestive function, tailored to the degree of *Shuddhi* attained, as outlined in Table 1.

Table 1: Treatment plan

No.	Procedure	Medicine	Days
1	*Deepan-Pachan*	*Trikatu Churna* [12] (6 gm twice a day aftermeal with warm water)	Until *Nirama Lakshana* appear
2	*Snehapana*	*Murchhita Go-Ghrita* [13]	Seven days or till *Samyak SnigdhaLakshanas* [14] whichever is earlier
3	*Sarvanga Abhyanga*	*Murchhita Tila Taila* [15]	For three days after completion of *Snehapana*
4	*Sarvanga Swedana*	*Bashpa Sweda*	
5	*Virechana Yoga*	*Trivrut Lehyam* [16]	For one day
6	*Samsarjana Krama*	-	Upto seven days on basis of *Shuddhi*

Assessment parameters:

- Blood investigations – Serum insulin (fasting), lipid profile levels and BSL (FBS and PP2BS) were measured before *Virechana* and after the completion of *Samsarjanakrama*.
- HOMA-IR ratio (HOMA-IR was calculated using the formula: [Fasting Insulin (μIU/mL) × Fasting Glucose (mg/dL)] ÷ 405.) [17]

OBSERVATION AND RESULTS:

Participants characteristics: All three participants had prediabetes, with HbA1c levels ranging from 5.7 to 6.4%. The group included two males and a female. The remaining medical histories were unremarkable. After comprehensive health assessments, all participants were considered clinically suitable for *Virechana* therapy.

Outcomes: All participants demonstrated notable improvements across a range of metabolic parameters following the intervention. Fasting serum insulin levels, HOMA-IR values, and blood glucose measurements showed significant changes, reflecting enhanced glycemic control; these results are summarized in Table 2. In addition, alterations in lipid profile parameters, including total cholesterol, triglycerides, HDL, and LDL levels, were observed and are presented in Table 3. Together, these findings suggest that the intervention had a positive impact on both glucose metabolism and lipid homeostasis in the study participants.

Patient 1:51 year old male patient achieved Madhyama Shuddhi with 18 Vega in the *Virechana Karma* and followed *Samsarjana Krama* for 5 days. Here, improvements were evident across multiple glycemic indicators following the intervention. Fasting and postprandial blood sugar levels showed a downward trend, accompanied by a reduction in fasting serum insulin. These changes were reflected in a decline in HOMA-IR, suggesting enhanced insulin sensitivity. Overall, the findings point toward favorable modulation of glucose metabolism and insulin

resistance. While, the lipid profile revealed elevated levels of total cholesterol, serum triglycerides and low-density lipoprotein. After *Samsarjana Krama*, there was a significant decrease in total cholesterol, triglyceride and LDL levels, along with a notable increase in HDL levels.

Patient 2:52 year old female patient achieved Madhyama Shuddhi with 12 Vega in the *Virechana Karma* and followed *Samsarjana Krama* for 5 days. In this case, consistent improvements were observed in glycemic regulation after the intervention. Both fasting and postprandial blood sugar levels demonstrated a clear downward trend, accompanied by a reduction in fasting serum insulin. This was reflected in a marked decline in HOMA-IR, indicating improved insulin sensitivity. In terms of lipid profile, there was a considerable reduction in total cholesterol, triglycerides, LDL, and VLDL levels, while the cholesterol/HDL and LDL/HDL ratios improved notably. Although HDL showed a marginal decline, the overall pattern reflected a favorable modulation of lipid metabolism.

Patient 3:39 year old male patient achieved Madhyama Shuddhi with 11 Vega in the *Virechana Karma* and followed *Samsarjana Krama* for 5 days. In the third case, improvements were also seen across multiple metabolic parameters. Fasting and postprandial blood glucose values decreased following the intervention, alongside a substantial reduction in fasting serum insulin levels. The fall in HOMA-IR indicated a clear enhancement in insulin sensitivity. The lipid profile revealed a significant reduction in total cholesterol, triglycerides, LDL, and VLDL values, coupled with better cholesterol/HDL and LDL/HDL ratios. Although HDL levels showed a decline, the overall lipid changes pointed towards a healthier cardiometabolic profile.

Table 2: Blood sugar levels before and after treatment

Blood Sugar Levels	Case 1		Case 2		Case 3	
	Before	After	Before	After	Before	After
Glycated Hemoglobin (HbA1c-%)	6.3 %		5.8 %		6.0 %	
Serum Insulin Fasting (µIU/mL)	12.9	11.7	9.9	8.7	11.4	8.4
HOMA-IR	3.9	3.4	2.6	2.0	3.5	2.2
Fasting Blood Sugar (mg/dl)	123	118	107	94	123	104
Post-Prandial Blood Sugar (mg/dl)	147	121	137	112	119	117

Table 3: Lipid levels before and after treatment

Lipid Levels	Case 1		Case 2		Case 3	
	Before	After	Before	After	Before	After
Total Cholesterol (mg/dl)	231.7	187.6	294	212.7	212.4	173.2
Serum Triglycrides (mg/dl)	154.3	112.9	187	155.3	148.7	136.8
HDL (mg/dl)	48.4	49.2	58.2	54.9	49.2	42.5
LDL (mg/dl)	113.2	96.3	198.4	163.7	102.3	81.9
VLDL (mg/dl)	23.9	18.7	37.4	21.9	19.3	18.2
Cholesterol and HDL ratio (%)	4.78	3.81	5.05	3.87	4.3	4.07
LDL and HDL ratio (%)	2.33	1.95	3.4	2.98	2.07	1.92

DISCUSSION

Prediabetes is a condition of impaired glucose regulation, where blood glucose levels are higher than normal yet remain below the diagnostic threshold for diabetes mellitus. Increasing evidence indicates that prediabetes is not only a major risk factor for the future development of type 2 diabetes but also a pathophysiologically adverse state with its own clinical significance. [18]

Prameha begins with the accumulation of *Bahu Drava Shleshma*, which gradually disturbs all three *Doshas* due to *Sharira Shaithilyata*. The vitiated Doshas interact with *Medo Dhatu*, whose qualities of *Bahutva* and *Abaddhatva* aggravate Kapha further. Through the similarity of *Mamsa* and *Kleda*, excess moisture develops, making *Prameha* a *Bahudoshaja Vyadhi* with *Kapha* predominance.

Since it originates in the *Amashaya*, *Shodhana* is preferred, with *Virechana* being the most effective. By eliminating vitiated Doshas via the downward route, *Virechana* reduces both *Dosha* and *Dushya* vitiation, making it suitable for managing prediabetes (PreDM).

Insulin resistance plays a pivotal role in the development of prediabetes, as reflected by elevated fasting serum insulin levels and higher HOMA-IR values. These alterations are closely linked with hyperglycemia, particularly raised fasting (FBS) and postprandial blood sugar (PP2BS), as well as dyslipidaemic changes such as increased triglycerides, LDL, and VLDL with a concomitant fall in HDL cholesterol. In the present study, *Virechana Karma* produced a significant reduction in serum insulin and HOMA-IR, indicating improved insulin sensitivity. Along with this, FBS and PP2BS levels showed marked improvement, and lipid parameters (total cholesterol, triglycerides, LDL, VLDL) also decreased significantly, supporting its role in correcting metabolic imbalances. These outcomes suggest that *Virechana* addresses both glycemic and lipid derangements, thereby targeting the core pathophysiology of prediabetes.[19] Previous Ayurvedic studies

have primarily focused on changes in body weight, BMI, and glucose levels, with limited attention given to insulin resistance markers such as serum insulin and HOMA-IR. [20-21] The present findings, therefore, contribute novel insights by demonstrating that *Virechana* not only influences gross glycaemic indices but also improves surrogate markers of insulin resistance. This highlights its potential utility as a preventive strategy to halt or delay the transition from prediabetes to diabetes, warranting larger and longer-term clinical investigations.

One of the key challenges in prediabetes management is overcoming insulin resistance, which manifests as persistently elevated serum insulin and higher HOMA-IR values despite lifestyle interventions. While lifestyle modifications such as diet and exercise gradually improve insulin sensitivity, these changes often require sustained effort and long durations to achieve measurable results. In contrast, *Virechana Karma* (therapeutic purgation) offers a more direct intervention by effectively reducing serum insulin levels and lowering HOMA-IR within a shorter timeframe. By eliminating aggravated *Doshas* and correcting metabolic imbalances, *Virechana* helps restore insulin sensitivity and thereby addresses the root cause of prediabetes. This makes *Virechana* a promising Ayurvedic approach, particularly for individuals who face difficulties in adhering to long-term lifestyle modifications, providing both metabolic benefits and preventive potential against diabetes progression.

CONSLUSION

In this study, a significant reduction in serum insulin levels and HOMA-IR values was observed following *Virechana* therapy followed by *Samsarjana Krama*. Along with improvements in glycaemic markers such as fasting and postprandial blood sugar, favourable changes in lipid parameters were also noted. These outcomes suggest that *Virechana Karma* not only aids in glycaemic control but also improves insulin sensitivity, thereby addressing the underlying insulin resistance that drives the progression of prediabetes. Thus, *Virechana* plays an important role in restoring metabolic balance through its dual action on glucose regulation and lipid metabolism.

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