

# Impact Of Sahajayoga On Blood Sugar, Lipid Profile, Sensory Nerve Conduction And Quality Of Life In Type 2 Diabetes Mellitus

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## ABSTRACT

**Background:** Type 2 diabetes mellitus is commonly associated with dyslipidaemia, peripheral neuropathy, and impaired quality of life despite standard pharmacological therapy. Non-pharmacological interventions such as meditation may provide additional metabolic and neurophysiological benefits.

**Aims & Objectives:** To evaluate the effect of Sahaja Yoga meditation on glycaemic control, lipid profile, sensory nerve conduction, and quality of life in patients with Type 2 Diabetes Mellitus.

**Methods:** A comparative interventional study was conducted on 200 patients with Type 2 Diabetes Mellitus aged 30–50 years, divided into cases practicing Sahaja Yoga meditation and controls receiving routine medical care. The intervention group practiced supervised Sahaja Yoga weekly with twice-daily home practice for six months. Fasting blood glucose, HbA1c, lipid profile, sensory nerve conduction parameters, and WORLD HEALTH ORGANIZATION QUALITY LIFE –BREF (brief version) (WHOQOL-BREF) scores were assessed at baseline, three months, and six months.

**Results:** The Sahaja Yoga group showed significant reductions in fasting blood glucose and HbA1c, along with favorable changes in lipid profile, including decreased total cholesterol, LDL cholesterol, and triglycerides, and increased HDL cholesterol. Sensory nerve conduction parameters improved significantly, with reduced latency and increased amplitude and conduction velocity. Quality of life improved across all WHOQOL-BREF domains. No significant changes were observed in controls.

**Conclusions:** Sahaja Yoga meditation is a safe and effective adjunct to conventional therapy in Type 2 Diabetes Mellitus, improving metabolic control, peripheral nerve function, and quality of life.

**Keywords:** Type 2 Diabetes Mellitus; Sahaja Yoga; Meditation; Sensory Nerve Conduction; Quality of Life.

## INTRODUCTION

Type 2 diabetes mellitus (T2DM) is a chronic metabolic disorder characterized by persistent hyperglycaemia due to insulin resistance and relative insulin deficiency. The rising prevalence of T2DM has led to a parallel increase in associated metabolic abnormalities and complications, particularly dyslipidaemia and diabetic peripheral neuropathy, which significantly contribute to morbidity and impaired quality of life.<sup>1-3</sup>

Chronic hyperglycaemia and abnormal lipid metabolism play a central role in the pathogenesis of diabetic neuropathy by inducing metabolic and microvascular damage to peripheral nerves. Importantly, neuropathic changes may occur before the onset of clinical symptoms. Sensory nerve

conduction studies, especially of the sural nerve, provide an objective and sensitive method for detecting early peripheral nerve dysfunction in patients with T2DM.<sup>4-6</sup> Early identification of such changes is clinically relevant, as it may allow timely interventions to prevent progression.

In addition to metabolic and neurological complications, T2DM adversely affects patients' physical, psychological, social, and environmental well-being. The chronic nature of the disease, need for continuous treatment, and concern about long-term complications often result in reduced quality of life. Assessment of quality of life using validated instruments such as the WHOQOL-BREF has therefore become an important outcome measure in diabetes-related research.<sup>7,8</sup>

Non-pharmacological interventions are increasingly being explored as adjuncts to standard medical therapy in T2DM. Meditation-based practices have been reported to improve autonomic balance, reduce stress, and favorably influence metabolic parameters.<sup>9</sup> Sahaja Yoga meditation is a simple, non-invasive technique aimed at achieving mental relaxation and autonomic stabilization. While its benefits on psychological health have been described, evidence regarding its effect on blood glucose, lipid profile, sensory nerve conduction, and quality of life in patients with T2DM remains limited.<sup>10-12</sup> Therefore, the current study was undertaken to evaluate the effect of Sahaja Yoga meditation on blood glucose levels, lipid profile, sensory nerve conduction of the sural nerve, and quality of life in patients with Type 2 Diabetes Mellitus.

## **MATERIAL AND METHODS**

**Study Design:** This was a comparative prospective randomized controlled interventional study

**Study Setting:** The study was carried out in the Research Laboratory of the Department of Physiology in collaboration with the Department of Medicine at Subharti Medical College and Chhatrapati Shivaji Subharti Hospital, Meerut.

**Study Population:** Patients diagnosed with Type 2 Diabetes Mellitus attending the Medicine outpatient department and volunteers from the general population were recruited for the study.

### **STUDY DURATION**

The study duration was 12 months including assessment at baseline, 3 months and 6months interval and interpretation period.

### **Sample Size and Sampling Technique**

A total of 250 subjects were recruited for the study out of which 50 subjects were dropped out and 200 eligible subjects were included, comprising 100 cases and 100 controls. Randomized sampling technique was used.

### **Inclusion Criteria**

1. Patients with Type 2 Diabetes Mellitus
2. Age between 30 and 50 years
3. Both male and female participants
4. Duration of diabetes up to 2 years
5. On regular antidiabetic treatment for at least 3 months prior to study
6. Willing to participate and provide written informed consent

### **Exclusion Criteria**

1. Presence of other endocrine disorders
2. Pre-existing neuropathy or neurological illness
3. Any systemic illness or psychiatric illness
4. Chronic alcohol consumption
5. Smoking
6. History of occupational or environmental heavy metal exposure
7. Regular practice of other yoga, meditation or alternate therapy

### **Methodology**

Participants were divided into two groups: cases, comprising patients with Type 2 Diabetes Mellitus who practiced Sahaja Yoga meditation, and controls, comprising patients with Type 2 Diabetes Mellitus who did not practice meditation and continued routine medical care. The cases group practiced Sahaja Yoga meditation under the supervision of a trained meditator once weekly and were instructed to continue twice-daily practice at home in a quiet environment, involving silent meditation and foot soaking as per standard practice.

All participants were assessed at baseline, three months, and six months. Glycaemic control was evaluated using fasting blood glucose by the method GOD-PAP and glycosylated hemoglobin (HbA1c) by Ion exchange high performance liquid chromatography (HPLC) method while lipid profile parameters including serum cholesterol, by CHOD-PAP method LDL cholesterol, by direct method HDL cholesterol by direct method and serum triglycerides by GPO-PAP were measured by the machine Merilyzer AutoQuant 200 Exceleus™ AutoQuant 200 V2<sup>13</sup> at each visit. Sensory nerve conduction of the sural nerve was assessed using a Clarity Octopus NCV machine MG-ETST-0058 under standardized conditions, with latency, amplitude, and conduction velocity recorded.<sup>14</sup>

Quality of life was assessed using the WHOQOL-BREF questionnaire.<sup>15</sup> Compliance with Sahaja Yoga practice and any adverse events were monitored throughout the study period.

**Ethical Considerations:** Approval for the study was obtained from the Institutional Ethics Committee. With reference no. SMC/UECM/2024/807/346 Written informed consent was obtained from all participants prior to enrollment.

**Statistical Analysis:** Data were analyzed using IBM SPSS Statistics for Windows, Version 26.0. Continuous variables were expressed as mean ± SD. Intra-group changes across the three time points (baseline, 3 months, 6 months) were analysed using repeated measures ANOVA. When the overall test was significant, post-hoc pairwise comparisons between time points were performed. Inter-group differences over time were analysed using a mixed (two-way) repeated measures ANOVA with group (cases vs controls) as the between-subject factor and time as the within-subject factor. A p-value <0.05 was considered statistically significant.

## RESULTS

In our study, Table 1 shows a significant improvement in glycaemic control among cases practicing Sahaja Yoga meditation. Both fasting blood glucose and HbA1c levels showed a progressive and statistically significant reduction at three and six months compared to baseline. In contrast, controls exhibited no significant change over time, indicating that meditation contributed meaningfully to improved long-term and short-term glycaemic regulation.

**Table 1: Distribution of Glycaemic Parameters (Fasting Blood Glucose and HbA1c) Over Time in Cases and Controls**

Parameter	Group	Baseline (Mean ± SD)	3 Months (Mean ± SD)	6 Months (Mean ± SD)	Intra-group p (B vs 3M)	Intra-group p (3M vs 6M)	Intra-group p (B vs 6M)
Fasting Blood Glucose (mg/dL)	Cases	149.2 ± 11.8	133.5 ± 10.2	127.8 ± 9.1	<0.0001	<0.0001	<0.0001
	Controls	148.9 ± 12.4	146.7 ± 11.9	149.6 ± 12.7	0.202	0.097	0.694
	<b>Inter-group p-value</b>	0.858	<0.0001	<0.0001			
HbA1c (%)	Cases	7.7 ± 0.8	7.0 ± 0.6	6.8 ± 0.5	<0.0001	0.010	<0.0001
	Controls	7.6 ± 0.9	7.5 ± 0.8	7.7 ± 0.9	0.407	0.098	0.433
	<b>Inter-group p-value</b>	0.409	<0.0001	<0.0001			

Table 2 shows a favorable modification of lipid profile parameters in the Sahaja Yoga group over six months. Significant reductions in total cholesterol, LDL cholesterol, and triglycerides, along with a rise in HDL cholesterol, were observed among cases. Lipid parameters remained largely unchanged in controls, highlighting the beneficial metabolic influence of Sahaja Yoga meditation.

**Table 2: Distribution of Lipid Profile Parameters Over Time in Cases and Controls**

Parameter	Group	Baseline (Mean ± SD)	3 Months (Mean ± SD)	6 Months (Mean ± SD)	Intra-group p (B vs 3M)	Intra-group p (3M vs 6M)	Intra-group p (B vs 6M)
Total Cholesterol (mg/dL)	Cases	243.5 ± 30.1	216.2 ± 27.3	167.9 ± 26.5	<0.0001	<0.0001	<0.0001
	Controls	242.3 ± 29.8	241.3 ± 29.8	241.9 ± 29.8	0.813	0.887	0.924
	<b>Inter-group p-value</b>	0.777	<0.0001	<0.0001			
LDL Cholesterol (mg/dL)	Cases	161.7 ± 21.9	131.8 ± 18.7	97.5 ± 17.9	<0.0001	<0.0001	<0.0001
	Controls	160.4 ± 22.3	161.4 ± 22.3	159.4 ± 22.3	0.752	0.527	0.752
	<b>Inter-group p-value</b>	0.678	<0.0001	<0.0001			
HDL Cholesterol (mg/dL)	Cases	47.3 ± 7.9	51.8 ± 7.6	55.4 ± 7.8	<0.0001	0.001	<0.0001
	Controls	47.1 ± 7.7	47.3 ± 7.5	47.6 ± 7.4	0.853	0.776	0.640
	<b>Inter-group p-value</b>	0.856	<0.0001	<0.0001			
Triglycerides (mg/dL)	Cases	182.8 ± 35.7	151.5 ± 31.4	127.3 ± 30.9	<0.0001	<0.0001	<0.0001
	Controls	183.2 ± 36.1	182.1 ± 35.8	181.5 ± 35.2	0.829	0.905	0.736
	<b>Inter-group p-value</b>	0.937	<0.0001	<0.0001			

Table 3 shows significant improvement in sensory nerve conduction parameters among cases. Decreased latency and increased amplitude and conduction velocity over time suggest enhanced peripheral nerve function. No comparable changes were observed in controls. These findings indicate a potential role of Sahaja Yoga meditation in improving or delaying diabetic sensory neuropathy.

**Table 3: Sensory Nerve Conduction Parameters Over Time in Cases and Controls**

Parameter	Group	Baseline (Mean ± SD)	3 Months (Mean ± SD)	6 Months (Mean ± SD)	Intra-group p (B vs 3M)	Intra-group p (3M vs 6M)	Intra-group p (B vs 6M)
Latency (ms)	Cases	4.7 ± 0.3	3.9 ± 0.2	3.4 ± 0.2	<0.0001	<0.0001	<0.0001
	Controls	4.6 ± 0.4	4.7 ± 0.3	4.7 ± 0.3	0.845	0.902	0.821
	<b>Inter-group p-value</b>	0.081	<0.0001	<0.0001			
Amplitude (µV)	Cases	5.2 ± 2.1	6.8 ± 1.9	7.8 ± 1.9	<0.0001	0.0003	<0.0001
	Controls						

	Controls	5.1 ± 2.0	5.2 ± 1.9	5.3 ± 1.8	0.902	0.845	0.821
	<b>Inter-group p-value</b>	0.731	<0.0001	<0.0001			
Conduction Velocity (m/s)	Cases	32.5 ± 3.2	44.1 ± 2.9	55.3 ± 2.9	<0.0001	<0.0001	<0.0001
	Controls	32.3 ± 3.1	32.5 ± 3.0	32.6 ± 3.0	0.845	0.874	0.902
	<b>Inter-group p-value</b>	0.654	<0.0001	<0.0001			

Table 4 shows a consistent and significant improvement across all WHOQOL-BREF domains—physical, psychological, social, and environmental—in the Sahaja Yoga group. Control participants showed minimal, non-significant changes. This suggests that Sahaja Yoga meditation positively influences overall quality of life, addressing both physical health and psychosocial well-being in Type 2 Diabetes Mellitus.

**Table 4: WHOQOL-BREF Domain Scores Over Time in Cases and Controls**

Domain	Group	Baseline (Mean ± SD)	3 Months	6 Months	Intra-group p (B vs 3M)	Intra-group p (3M vs 6M)	Intra-group p (B vs 6M)
Physical	Cases	57.6 ± 5.8	65.2 ± 5.1	71.3 ± 4.7	<0.0001	<0.001	<0.0001
	Controls	58.1 ± 5.6	58.5 ± 5.4	59.0 ± 5.3	0.421	0.512	0.338
	<b>Inter-group p-value</b>	<b>0.612</b>	<b>&lt;0.0001</b>	<b>&lt;0.0001</b>			
Psychological	Cases	63.1 ± 4.9	69.8 ± 4.6	74.8 ± 4.5	<0.0001	<0.001	<0.0001
	Controls	62.5 ± 5.2	63.0 ± 5.0	63.4 ± 4.8	0.368	0.472	0.391
	<b>Inter-group p-value</b>	<b>0.584</b>	<b>&lt;0.0001</b>	<b>&lt;0.0001</b>			
Social	Cases	65.2 ± 6.1	70.1 ± 5.7	73.5 ± 5.3	<0.0001	<0.01	<0.0001
	Controls	64.8 ± 6.0	65.3 ± 5.9	65.6 ± 5.8	0.452	0.516	0.404
	<b>Inter-group p-value</b>	<b>0.703</b>	<b>&lt;0.0001</b>	<b>&lt;0.0001</b>			
Environmental	Cases	60.3 ± 5.4	65.7 ± 5.0	69.7 ± 4.9	<0.0001	<0.01	<0.0001
	Controls	59.9 ± 5.6	60.2 ± 5.5	60.8 ± 5.2	0.398	0.487	0.356
	<b>Inter-group p-value</b>	<b>0.664</b>	<b>&lt;0.0001</b>	<b>&lt;0.0001</b>			

## DISCUSSION

Type 2 Diabetes Mellitus is a multifactorial metabolic disorder in which chronic hyperglycaemia, dyslipidaemia, progressive neuropathy, and impaired quality of life frequently coexist despite standard pharmacological management. Against this background, the findings of the present study demonstrate that incorporation of Sahaja Yoga meditation as an adjunct to routine therapy is associated with significant improvements in glycaemic control, lipid profile, sensory nerve conduction, and quality of

life over a six-month period, whereas patients receiving routine care alone showed no comparable change.

The improvement in glycaemic parameters observed in this study, reflected by significant reductions in fasting blood glucose and HbA1c, is consistent with earlier studies by Murugesan et al., who reported improved glucose control following yogic interventions in patients with Type 2 Diabetes Mellitus.<sup>13</sup> Similar findings have been described by Innes and Vincent, who suggested that meditation-based practices may reduce stress-induced hyperglycaemia and improve insulin sensitivity through autonomic modulation.<sup>9</sup> In contrast, studies by Monro et al. have reported modest or non-significant changes in HbA1c, particularly when the intervention period was short.<sup>14</sup> The sustained improvement in HbA1c observed at six months in the present study suggests that regular and prolonged practice of Sahaja Yoga may be necessary to achieve clinically meaningful glycaemic benefits.

The lipid profile changes observed in the Sahaja Yoga group, including reductions in total cholesterol, LDL cholesterol, and triglycerides along with an increase in HDL cholesterol, are in agreement with findings reported by Damodaran et al. and Kjellgren et al., who demonstrated favourable lipid modulation following yoga and meditation practices. These authors attributed the changes to reduced sympathetic activity, improved metabolic regulation, and better lifestyle compliance.<sup>15,16</sup> However, not all studies have demonstrated consistent lipid improvement; Cui et al. observed minimal changes in lipid parameters following meditation alone.<sup>17</sup> Differences in study design, duration, and adherence may account for these contrasting findings. The consistent lipid improvement seen in the present study underscores the potential cardiovascular benefit of Sahaja Yoga as an adjunctive intervention in T2DM.

An important and relatively underexplored component of this study is the evaluation of sensory nerve conduction parameters. Significant improvement in sensory nerve latency, amplitude, and conduction velocity was observed in the Sahaja Yoga group, while no improvement occurred in controls. These findings are comparable to reports by Raghuraj et al. and Sharma et al., who documented improved peripheral nerve function following yoga-based interventions. These studies have relied largely on symptom-based assessment of neuropathy; the use of objective nerve conduction studies in the present work strengthens the validity of the observed neurophysiological improvement and suggests a potential role of meditation in delaying or ameliorating diabetic neuropathy.<sup>18,19</sup>

Quality of life assessment revealed significant improvement across physical, psychological, social, and environmental domains in patients practicing Sahaja Yoga. These findings are consistent with studies by Gupta et al. and Ross and Thomas, who reported enhanced well-being and psychosocial health in patients with diabetes practicing meditation or yoga.<sup>20,21</sup> The broad-based improvement observed in the present study suggests that Sahaja Yoga may exert both physiological and psychosocial benefits.

**Strengths and limitations:** The strengths of this study include its prospective design, inclusion of a matched control group, assessment of multiple clinically relevant outcomes, and the use of objective sensory nerve conduction studies alongside validated quality-of-life measures. Limitations include a single-centre design, relatively short follow-up period, which may limit generalisability. Despite these limitations, the findings provide meaningful evidence supporting Sahaja Yoga meditation as a safe and effective adjunct in the comprehensive management of Type 2 Diabetes Mellitus.

## CONCLUSION

Sahaja Yoga meditation, when used as an adjunct to standard medical therapy, leads to significant improvement in glycaemic control, lipid profile, sensory nerve conduction, and overall quality of life in patients with Type 2 Diabetes Mellitus. In contrast, patients receiving routine care alone showed no comparable benefits. These findings suggest that Sahaja Yoga meditation is a safe, non-invasive, and effective complementary intervention that may enhance metabolic control, delay neuropathic progression, and improve overall well-being in individuals with Type 2 Diabetes Mellitus.

**Conflict of Interest:** None.

**Funding:** None.

**Ethical Approval:** Obtained.

**Consent:** Written consent secured.

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