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Research Article

Investigating the Role of Lifestyle Modifications and Yoga Intervention in the Management of Type 2 Diabetes: A Comprehensive Review

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ABSTRACT

Type 2 diabetes mellitus (T2DM) is a long-term metabolic disorder marked by insulin resistance and impaired beta-cell function, leading to sustained high blood sugar levels. The global rise in T2DM cases is largely attributed to sedentary lifestyles, obesity, and an aging population. This study examines the role of lifestyle changes and yoga interventions in diabetes management. A systematic review of recent research highlights the impact of dietary adjustments, physical activity, and yoga postures on glycemic regulation and overall disease progression. The findings indicate that combining lifestyle modifications with yoga leads to better diabetes management outcomes. However, further exploration is necessary to personalize treatment plans and integrate advanced technologies such as artificial intelligence for optimized diabetes care.

Keywords: Type 2 Diabetes, Lifestyle Interventions, yoga postures, Glycemic Control, Insulin Resistance.

INTRODUCTION

Problem / Context

Type 2 diabetes mellitus (T2DM) is one of the most prevalent chronic diseases worldwide, affecting over 537 million people. The condition is primarily driven by insulin resistance and progressive pancreatic beta-cell dysfunction, leading to long-term complications such as cardiovascular disease, neuropathy, nephropathy, and retinopathy. Despite advancements in diabetes care, there is no single cure, making management strategies crucial in preventing complications and improving quality of life. This paper examines the effectiveness of lifestyle interventions and pharmacological treatments in managing T2DM.

Research Objective

Diabetes is increasing at a phenomenal rate as there are many pre-diabetic patients who are not aware that they will be having diabetes in future and diabetic patients who live on medicine and regular exercise. The objective is to propose a solution that will minimize stress related to diabetes. To make the patients relax and reduce the burden of having diabetes.

Hypothesis

H1 – Yoga postures and its conduct regularly controls blood sugar level in Type-2 diabetes patient.

H2 – Yoga postures and its conduct regularly fails to control blood sugar level in Type-2 diabetes patient.

LITERATURE REVIEW

ICMR-INDIAB Study:

The Indian Council of Medical Research (ICMR) conducted a study (ICMR-INDIAB) to assess the prevalence of diabetes in India, finding a high weighted prevalence rate in North India.

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National Family Health Survey (NFHS-5):

The NFHS-5 data shows in India many adults are suffering from Type 2 diabetes. The estimates in 2019 showed that 77 million individuals had diabetes in India, which is expected to rise to over 134 million by 2045. Type 2 diabetes in majority of cases lead to multiorgan failures leading to multiorgan complications and it is divided into microvascular and macrovascular complications. The complications due to diabetes are increased premature morbidity and mortality among individuals , leading to reduced life expectancy and financial and other costs of diabetes leading to profound economic burden on the Indian health care system. The risk for diabetes is largely influenced by ethnicity, age, obesity and physical inactivity, unhealthy diet, and behavioral habits in addition to genetics and family history. Good control of blood sugar blood pressure and blood lipid levels can prevent and/or delay the onset of diabetes complications. Figure 1 shows the health data of India.

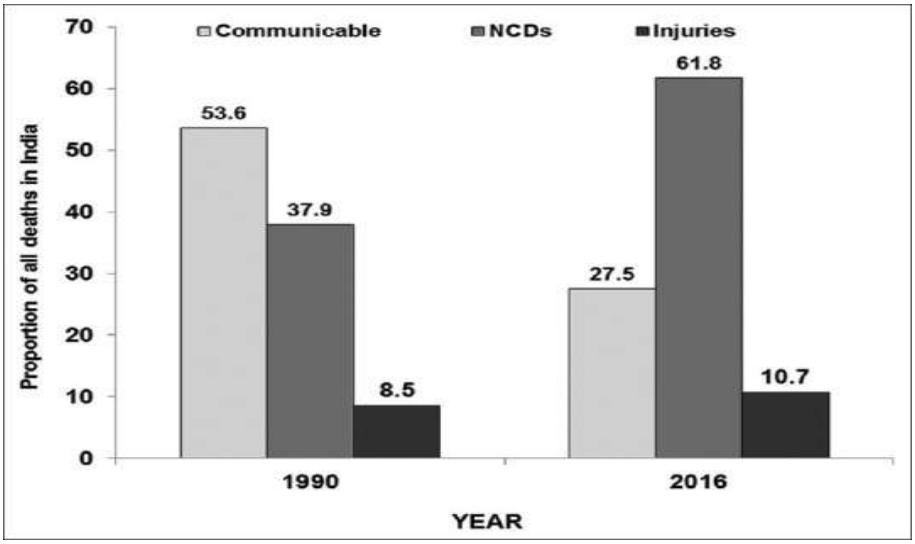

Figure 1

States/UT	Prevalence of diabetes (%)			Prevalence of prediabetes (%)		
	Urban	Rural	Overall	Urban	Rural	Overall
Andhra Pradesh	12.6	6.3	8.4	11.1	9.6	10.1
Arunachal Pradesh	5.8	4.9	5.1	14.2	12.3	12.8
Assam	12.4	4.4	5.5	13.6	11.6	11.9
Bihar	10.5	3.5	4.3	15.5	9.3	10
Chandigarh	14.2	8.3	13.6	14.5	14.7	14.6
Gujarat	9.5	5.1	7.1	8.4	11.5	10.2
Jharkhand	13.5	3	5.3	10.7	7.4	8.1
Karnataka	11.1	5.6	7.7	14.1	10.2	11.7
Maharashtra	10.9	6.5	8.4	15.2	11.1	12.8
Manipur	7.1	4.4	5.1	7.2	7.5	7.5
Meghalaya	8.9	3.5	4.5	7.4	10.6	10
Mizoram	7.9	3.6	5.8	6.2	5.8	6
Punjab	12	8.7	10	8.6	7.9	8.2
Tamil Nadu	13.7	7.8	10.4	9.8	7.1	8.3

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Tripura	15.5	7.2	9.4	16.2	14.2	14.7

Figure 2

METHOD

This study employs a systematic review approach, analyzing peer-reviewed articles from Scopus-indexed journals published between 2015 and 2024. Databases such as PubMed, Google Scholar, and Web of Science were used to extract relevant literature. Inclusion criteria included clinical trials, cohort studies, and dedicated journals of Yoga on lifestyle modifications and yoga interventions for T2DM. The participants in the conduct of research were of the age group 25 – 45 years. In the research program around 30 – 35 regular participants participated. The participants were suffering from non-insulin dependent Diabetes Mellitus and were taking medicines regularly (one tablet twice a day of METFORMIN – 500 mg). The fasting and post meal of all the participants were collected before the implementation of yoga asana and after 10 weeks of completion of course of Yoga. The blood sugar reading of the 20 regular participants who did their asana systematically as recommended by the researcher and were present on all days in the 10-week program.

FINDINGS

Findings indicate that lifestyle modifications combined with yoga postures yield superior glycemic control and reduced disease complications. The Mediterranean diet, high in unsaturated fats and fiber, significantly improves insulin sensitivity. Exercise interventions reduce HbA1c levels by 0.5%–1.0% on average. However, adherence to treatment plans remains a significant challenge in diabetes management

Normal values –

Fasting – 60 – 110 mg/dL

Postprandial – upto 160 mg/dL

The result of test conducted before application of Yoga postures

Participant	Before yoga	
	Fasting	Postprandial
1	126.50	217.6
2	168.6	415.52
3	117.8	200
4	127	164
5	136	270
6	144	179.60
7	136	189.36
8	132.63	168.56
9	128.73	182.55
10	147	313
11	153	225
12	133	242
13	122	146
14	132	162
15	112	158

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16	173	302
17	113	186
18	126	181
19	116	152
20	133	166

The researcher conducted two sample paired t-test to analyze the data collected before yoga and after yoga. The details of the t-test is presented –

T-Test result:

S. No		
1	t-score	6.1286
2	Standard Error of Difference	12.588
3	Degree of Freedom	19
4	Two tailed p-value	0

Confidence range:

1. Mean Difference - -77.1465
2. Confidence range – (- 103.4932) – (- 50.7998)

Two-Tailed p-Value (0)

- A **p-value of 0** (or very close to 0) means the probability of getting these results under the null hypothesis is **extremely low**.
- Since **p < 0.05**, we **reject the null hypothesis**, meaning there is a **statistically significant difference** between the groups.

The result of test conducted after application of Yoga posture.

Participant	After yoga	
	Fasting	Postprandial
1	100.68	189.6
2	146.8	289.68
3	98.69	164.50
4	107	120
5	99	177
6	121	163
7	124	178.6
8	114	143
9	113	164
10	128.69	264.86
11	139.22	196.33
12	122	182
13	102	114

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14	111	139
15	94	145
16	144	178
17	78	126
18	93	159
19	98	138
20	118	154

T-Test result:

S. No		
1	t-score	7.3657
2	Standard Error of Difference	7.6944
3	Degree of Freedom	19
4	Two tailed p-value	0

Confidence range:

1. Mean Difference - -56.6745
2. Confidence range – (- 72.7789) – (- 40.5701)

Two-Tailed p-Value (0)

- A **p-value of 0** (or extremely close to zero) means the likelihood of obtaining these results if the null hypothesis were true is **almost impossible**.
- Since **p < 0.05**, we **reject the null hypothesis**, confirming a **statistically significant difference**.

Yoga postures recommended by the researcher on regular basis for controlling blood sugar.

The yoga asana done by the participant for 10 weeks are described in detail. If a diabetic patient conducts sincerely these asana he will definitely control his sugar.

Asanas

Yoga Practices Recommended for Diabetes Management The following yoga postures were practiced daily for 10 weeks:

- ***Dhanurasana (Bow Pose): Strengthens abdominal organs and regulates digestion.***
- ***Balasana (Child Pose): Reduces stress and promotes relaxation.***
- ***Bhujangasana (Upward Facing Dog Pose): Enhances pancreatic function and stimulates insulin secretion.***
- ***Shavasana (Corpse Pose): Induces deep relaxation and reduces stress-related hormonal imbalances.***
- ***Viparita Karani (Legs Up the Wall Pose): Enhances blood circulation and improves metabolism.***
- ***Tadasana (Mountain Pose): Helps in maintaining balance and improving posture.***
- ***Mandukasana (Frog Pose): Stimulates abdominal organs and improves digestion.***
- ***Chakrasana (Wheel Pose): Improves flexibility and energizes the endocrine system.***

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LIMITATIONS

- Yoga should be practiced under professional supervision.
- Intensive yoga or hot-temperature practices are not recommended for diabetes and heart patients.
- Individuals should monitor their blood sugar levels regularly.
- Yoga should not be performed beyond one's physical capacity.
- Diabetic individuals should consume light snacks before yoga to prevent hypoglycaemia.
- Symptoms such as dizziness or headaches should be reported to a healthcare professional.

Benefits of Yoga in Diabetes

- Enhances insulin sensitivity and regulates glucose metabolism.
- Reduces stress and improves mental well-being.
- Supports cardiovascular health.
- Strengthens abdominal muscles and promotes digestive health.
- Improves overall physical and mental balance.

CONCLUSION

This study underscores the significant role of yoga in diabetes management. Regular yoga practice, combined with lifestyle modifications, can help control blood sugar levels, reduce complications, and enhance overall well-being. The simple yet effective yoga postures outlined in this research can be incorporated into daily routines by individuals of all age groups. By fostering discipline and mindfulness, yoga promotes long-term health benefits for individuals with Type 2 diabetes.

LIVE A HEALTHY LIFE.

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