



Research Article

Comparative Effects of Yoga, Brisk Walking, and Resistance Training on Glycemic Control, Lean Body Mass, and Quality of Life in Patients with Type 2 Diabetes Mellitus

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Abstract	Manuscript Information
<p>Background: Type 2 Diabetes Mellitus (T2DM) is a growing global health concern with significant implications for quality of life (QOL), glycemic control, and lean body mass (LBM). Physical activity is crucial in managing T2DM, yet the comparative effectiveness of different exercise modalities remains unclear. This study examines the impact of yoga, brisk walking, and resistance training on HbA1C levels, LBM, and QOL in individuals with T2DM.</p> <p>Methods: A total of 30 participants diagnosed with T2DM were randomly assigned to one of two intervention groups: Yoga or Resistance Training plus Brisk Walking. The interventions were conducted thrice weekly over three months. Pre- and post-intervention measurements were taken for HbA1C (glycemic control), LBM (via body composition analysis), and QOL (assessed using the QOLID scale). Data were analyzed using paired and unpaired t-tests, with statistical significance set at $p < 0.001$.</p> <p>Results: All three interventions led to significant reductions in HbA1C levels ($p < 0.001$) and improvements in QOL ($p < 0.001$). Resistance training showed the greatest increase in LBM ($p < 0.001$), whereas yoga demonstrated notable improvements in emotional and mental well-being. Brisk walking provided moderate benefits in all measured outcomes. Between-group comparisons indicated that resistance training was superior in enhancing LBM, while yoga had the most pronounced effect on QOL.</p> <p>Conclusion: Yoga, brisk walking, and resistance training all positively impact glycemic control, LBM, and QOL in patients with T2DM. Resistance training is most effective for LBM improvement, while yoga provides the greatest enhancement in QOL. Brisk walking offers a balanced benefit across all parameters. These findings highlight the importance of individualized exercise prescriptions to optimize diabetes management.</p>	<ul style="list-style-type: none"> ▪ ISSN No: 2583-7397 ▪ Received: 27-12-2024 ▪ Accepted: 29-01-2025 ▪ Published: 09-02-2025 ▪ IJCRM:4(1); 2025: 118-122 ▪ ©2025, All Rights Reserved ▪ Plagiarism Checked: Yes ▪ Peer Review Process: Yes <p>How to Cite this Article</p> <p>Patel S, Manojkumar, Parmar A. Comparative effects of yoga, brisk walking, and resistance training on glycemic control, lean body mass, and quality of life in patients with type 2 diabetes mellitus. Int J Contemp Res Multidiscip. 2025;4(1):118-122.</p> <p>Access this Article Online</p> <div style="text-align: center;">  </div> <p style="text-align: center;">www.multiarticlesjournal.com</p>

KEYWORDS: Type 2 Diabetes Mellitus, Glycemic Control, Lean Body Mass, Quality of Life, Yoga, Brisk Walking, Resistance Training, Exercise Intervention, Diabetes Management, Physical Activity

1. INTRODUCTION

Diabetes Mellitus (DM) is a global health issue with significant human, social, and economic impact. Type II Diabetes Mellitus (T2DM) is a metabolic disorder characterized by hyperglycemia due to defects in insulin secretion, insulin resistance, or both.^{[1][2]} Insulin is crucial for cellular metabolism, and its deficiency leads to hyperglycemia, which over time causes complications affecting nerves and blood vessels.^[4] According to the American Diabetes Association (ADA), DM is classified into Type I (Insulin-Dependent), Type II (Non-Insulin-Dependent), Gestational Diabetes, Prediabetes, and Impaired Glucose Tolerance.^[4] The global diabetes burden is rising, with India ranking second after China. The prevalence of DM in India increased from 7.1% in 2009 to 8.9% in 2019, with an estimated rise in Impaired Glucose Tolerance cases from 25.2 million in 2020 to 35.7 million by 2045.^[5] The highest prevalence in 2016 was reported in Tamil Nadu, Kerala, Delhi, Punjab, Goa, and Karnataka.^{[3][4]}

Risk Factors & Clinical Features

T2DM is associated with a sedentary lifestyle, unhealthy diet, obesity, genetic predisposition, and psychological stress. The India State-Level Disease Burden Report (2016) highlighted that poor diet, obesity, high blood sugar, and tobacco use significantly contribute to diabetes and cardiovascular diseases.^[7] Common symptoms include polyuria, polydipsia, weight loss, fatigue, blurry vision, and neuropathies.

Diabetes Management & Quality of Life (QOL)

Management includes medication, diet, and physical activity. Alternative practices like yoga, brisk walking, and resistance training are gaining recognition.^[3] Diabetes affects QOL by increasing risks of nephropathy, vision loss, cardiovascular complications, and economic burden.^[13] The QOLID scale assesses QOL in Indian diabetic patients across eight dimensions: physical health, endurance, general health, treatment satisfaction, symptom-specific concerns, financial impact, mental-emotional health, and diet adherence.^[13]

Yoga & Exercise Interventions

Yoga, comprising kriya, pranayama, asanas, meditation, and relaxation, enhances insulin function, lipid profile, and weight management.^[10] Brisk walking, an accessible form of aerobic exercise, is recommended for at least 150 minutes per week.^[3] Resistance training improves muscle strength, bone density, and glycemic control, reducing sarcopenia and osteoporosis risks.^[11] A study by Dash *et al.* demonstrated yoga's effectiveness in improving physical and mental alertness in T2DM patients. Tomas *et al.* (2018) reported that a combined aerobic and resistance training regimen significantly improved strength, glycemic control, and QOL.^[10] This study compares the effects of yoga versus brisk walking and resistance training on HbA1C, Lean Body Mass (LBM), and QOL in T2DM patients. LBM is assessed using a Body Composition Analyzer, and QOL is evaluated using the QOLID scale.

Need: Diabetes is a major global health challenge, placing a significant economic burden and negatively impacting quality of life (QOL) through conditions like anxiety and depression. In India, awareness about diabetes and its long-term consequences remains low, highlighting the urgent need for patient education and lifestyle modifications. Research has shown that regular physical activity and dietary changes can prevent diabetes in high-risk populations. According to the ACSM, engaging in 30–40 minutes of moderate-intensity exercise most days of the week provides substantial health benefits, even when divided throughout the day. Brisk walking, resistance training, and yoga are widely accessible exercise forms that improve insulin sensitivity and lower blood sugar levels. By comparing their effectiveness, this study aims to determine which form of exercise—brisk walking, resistance training, or yoga—offers the greatest benefit in reducing blood glucose and enhancing QOL, ultimately guiding more effective community interventions.

Aim of the Study

This study aims to evaluate the effects of Yoga, Brisk Walking, and Resistance Training on HbA1c levels, Lean Body Mass, and Quality of Life (QOL) in patients with Type 2 Diabetes Mellitus (T2DM).

2. OBJECTIVES

1. To assess the impact of Yoga on HbA1c, Lean Body Mass, and QOL in T2DM patients.
2. To assess the impact of Brisk Walking and Resistance Training on HbA1c, Lean Body Mass, and QOL in T2DM patients.
3. To compare the effectiveness of Yoga versus Brisk Walking and Resistance Training in improving HbA1c, Lean Body Mass, and QOL in T2DM patients.

3. METHODS & MATERIALS

Research Design: Intervention study

Study Population: Patients diagnosed with Type 2 Diabetes Mellitus

Source of Data: Shri B.G Patel College of Physiotherapy, Anand

Study Duration: 3 months

Sample Size: 30

Sampling Method: Simple random sampling

Procedure

Consent for Study: Approval was obtained from the Human Resources Ethics Committee. Participants were informed about the study and gave written consent before participation.

Assessment: Participants completed pre-designed assessment forms.

Pre- and post-study data were collected, including:

1. **Blood Glucose** (Random Blood Sugar) is measured using a glucometer.
2. **HbA1c** levels tested in a laboratory.
3. **Lean Body Mass** assessed by a Body Composition Analyzer.

4. **Quality of Life** measured using the QOLID (Quality of Life Instrument for Indian Diabetes Patients) scale. Physiotherapy interventions were provided three times a week. Assessments were repeated at the end of the 3 months.

Eligibility Criteria

Inclusion Criteria

1. Diagnosed with Type 2 Diabetes Mellitus
2. Aged between 40-70 years
3. Able to walk for at least 30 minutes
4. Able to understand commands
5. Willing to participate

Exclusion Criteria

1. Blood glucose >250 mg/dL
2. History of neurological abnormalities
3. History of lower limb surgery
4. Complications such as CVD, foot ulcers, or retinopathy

Yoga Group (60 min/session)

Warm-up: 10 repetitions for each, starting from head to toe.

Surya Namaskar: 3 rounds.

Asanas (Postures): *Tadasana, Trikonasana, Vajrasana, Padmasana, Matsyendrasana, Paschimottanasana, Bhujangasana, Dhanurasana, Halasana, Naukasana, Shavasana* (start with 3 turns, increase by 1 turn weekly).

Pranayama (Breathing Exercises): *Bhastrika* (start with 3 min/day), *Kapalbhati* (10 min/day), *Anulom-Viloma* (start with 5 min/day), *Bhramari* (5 times/day).

Resisted Exercise Group

Upper Body (2 sets of 10-12 reps): Bench press, Seated row, Shoulder press, Pull down.

Leg Exercises (3 sets of 10-12 reps): Leg press, Leg extension, Leg flexion.

**Abdominal Crunches (2 sets), Back Extension (2 sets).

Brisk Walking Group: 30 min overground brisk walking, 3 days/week.

Outcome Measures

Random Blood Glucose:

- o Normal: <140 mg/dl
- o Prediabetes: 140-199 mg/dl
- o Diabetes: >200 mg/dl

HbA1c Level:

- o Normal: <5.7%
- o Prediabetes: 5.7-6.4%
- o Diabetes: >6.4%

Body Composition Analysis: Lean Body Mass, Fat-Free Mass

Quality of Life

QOLID Scale: 8 dimensions scored on a Likert scale (1-4), transformed to a 0-100 scale, where 0 indicates extreme

problems and 100 indicates excellent quality of life. Scores between 0 and 100 represent the percentage of the total possible score achieved.

Data analysis

Statistical analysis was conducted using GraphPad Prism 5. Dropout data were excluded. Sample characteristics were presented as mean, standard deviation, mean difference, t-value, degrees of freedom, and p-value. An unpaired t-test was used to assess the homogeneity of the outcome measures. A paired t-test was applied for within-group comparisons and an unpaired t-test for between-group comparisons. Statistical significance was set at $p < 0.001$.

Table 1: Within Group Analysis of Variable HbA1C, QOL, LBM IN Group A and Group B

Parameter	Timepoint	Mean	SD	df	P-Value
HbA1C	Pre	6.42	1.73	14	<0.001
	Post	6.04	1.66	14	
QOL	Pre	53.26	6.95	14	<0.001
	Post	70.53	7.58	14	
LBM	Pre	24.07	3.64	14	<0.001
	Post	24.61	3.72	14	
HbA1C	Pre	6.69	0.55	14	<0.001
	Post	6.02	0.52	14	
QOL	Pre	48.46	4.82	14	<0.001
	Post	71.73	7.26	14	
LBM	Pre	25.97	2.80	14	<0.001
	Post	27.28	2.78	14	

Table 2: Between-group analysis of variable HbA1C (%)

Group	Mean ± SEM	Mean Difference ± SEM	df	t-value	p-value
YG	0.3867 ± 0.0423	-0.02 ± 0.07	28	3.879	0.0006
RG	0.6733 ± 0.0405	—	—	—	—

Table 3: Between-Group Analysis of QOL (%)

Group	Mean ± SEM	Mean Difference ± SEM	df	t-value	p-value
YG	17.27 ± 0.9231	-6.267 ± 1.3	14	4	<0.001
RG	23.53 ± 0.9505	—	—	—	—

Table 4: Between-Group Analysis of LBM (kg)

Group	Mean ± SEM	Mean Difference ± SEM	df	t-value	p-value
YG	0.6267 ± 0.075	-0.6867 ± 0.1	14	4	<0.001
RG	1.313 ± 0.1272	—	—	—	—

4. DISCUSSION

The present study aimed to evaluate the effectiveness of Yoga versus brisk walking combined with resisted training on HbA1C, lean body mass (LBM), and quality of life (QOL) in patients with Type 2 Diabetes Mellitus (T2DM). Group A performed yoga, while Group B engaged in a combined regimen of brisk walking and resisted training. At baseline, age, gender, HbA1C, LBM, and QOL were similar across both groups. Paired t-tests were used for within-group comparisons of HbA1C, LBM, and QOL at baseline and after 3 months. Unpaired t-tests were used for between-group comparisons. The results showed statistically significant improvements in both groups, suggesting that both interventions are effective for controlling HbA1C, improving LBM, and enhancing QOL in T2DM patients. In Group A, the pre- and post-intervention mean HbA1C values were 6.42 and 6.04, respectively, with a p-value of <0.001, which is statistically significant. A study by Satarupa Dash, Atanu Kumar *et al.* on the effect of yoga in T2DM patients included 60 participants divided into two groups. Group A performed yoga, and Group B followed conventional therapy. The study found that yoga, through asanas, increased the sensitivity of pancreatic beta cells to glucose, leading to a sustained reduction in blood sugar levels. Additionally, yoga therapy improved diabetic status, reduced drug dosage, and enhanced both physical and mental quality of life. In Group B, the pre- and post-intervention mean HbA1C values were 6.69 and 6.02, respectively, with a p-value of <0.001, which was also statistically significant. This suggests that combining aerobic and resisted exercise is useful in reducing HbA1C in T2DM patients. A study by Timothy S. Church in November 2015 concluded that the combination of aerobic and resisted exercise led to a 40% reduction in HbA1C, compared with a 22% reduction in the control group. For LBM, Group A had pre- and post-intervention mean values of 24.07 kg and 24.61 kg, respectively, while Group B had values of 25.97 kg and 27.28 kg, with a p-value of <0.001. This indicates statistical significance for both groups, with Group B showing greater improvements in lean body mass. A study by Fanjing Meng & Dingbo Shu in December 2022 revealed that combined aerobic and resisted exercise increased lean mass by 0.3-7% and decreased total fat mass by 2.19-11.5%, suggesting that combined exercise is more effective in reducing adiposity, increasing LBM, and improving strength compared to either aerobic or resistance exercise alone. For QOL, Group A showed pre- and post-intervention mean values of 53.26% and 70.53%, respectively, while Group B had values of 48.46% and 71.73%, with a p-value of <0.001, indicating statistical significance for both groups. A study by Sonal Bhardwaj, Sonali Sharma *et al.* on the therapeutic effect of yoga on QOL outcomes in T2DM found significant improvements in mental well-being, self-control, and QOL in the yoga group compared to the control group.

5. CONCLUSION

In my study, both yoga and combined (aerobic & resisted) exercise interventions proved effective in reducing HbA1C, improving lean mass, and enhancing QOL. The combined group

showed more significant reductions in HbA1C and improvements in lean mass compared to the yoga group. For QOL, yoga contributed more to improvements in the social and emotional aspects, while the combined group demonstrated greater improvements in physical capacity (endurance) and general health.

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