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Effect Of Yoga On Lipid Profile In Type 2 Diabetes Mellitus

Author

Abstract:
Recent studies have explored yoga as an adjunctive therapeutic approach for type 2 diabetes mellitus, with potential benefits in reducing medication dependency and slowing disease progression. This study assessed the impact of yoga on lipid profiles in 60 individuals with type 2 diabetes, divided into two groups: 30 participants engaged in a 3-month yoga regimen in addition to standard medical treatment (intervention group) and 30 participants receiving only standard medical care (control group). The intervention group, with a mean age of 53.40 ± 7.95 years, showed statistically significant reductions in serum cholesterol, triglycerides, and LDL levels compared to baseline measurements. In contrast, the control group, with a mean age of 55.40 ± 11.30 years, did not exhibit similar improvements. Comparative analysis revealed that the mean changes in lipid profiles were significantly more favourable in the yoga group than in the control group. These findings suggest that integrating yoga into the management plan for type 2 diabetes can significantly enhance lipid profiles and potentially improve cardiovascular health outcomes.

Keywords: *Yoga, Type 2 Diabetes mellitus, lipid profile*

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I. Introduction:

Yoga has increasingly been explored as a therapeutic intervention in modern medicine, offering patients potential benefits such as reduced medication dependency and slowed disease progression. The practice of yoga involves postural exercises (asanas) and breath control techniques (pranayama), which are thought to have various health benefits. However, the impact of yoga on the management of diabetes and dyslipidemia remains under-researched.

Diabetes mellitus, particularly type 2 diabetes, is a chronic condition characterized by hyperglycemia, dyslipidemia, impaired insulin secretion, peripheral insulin resistance, and obesity. This complex disorder necessitates ongoing medical management, patient education, and support to prevent acute complications and mitigate the risk of long-term complications, as highlighted by the American Diabetes Association. Current conventional treatments for diabetes focus on regulating blood glucose levels through dietary modifications, insulin therapy, oral hypoglycemic agents, weight management, regular physical exercise, and self-monitoring of blood glucose. Despite these measures, achieving optimal glucose control can be challenging for many individuals.

Yoga, an ancient practice with origins in India, has been traditionally used for managing chronic conditions such as diabetes and hypertension. It is hypothesized that various yoga postures may enhance pancreatic cell function, potentially improving glucose metabolism in peripheral tissues, the liver, and adipose tissues through enzymatic processes. While extensive research on yoga's therapeutic effects has been conducted globally, there is a notable scarcity of data concerning its impact on lipid profiles and diabetes management, particularly in northeastern India. Further investigation is needed to elucidate the potential benefits of yoga for these health conditions in this region. In view of these observations, the present study was undertaken to assess the effect of yoga on lipid profile in type 2 diabetes mellitus.

II. Materials & Methods:

A longitudinal study was conducted in collaboration between the Regional Institute of Medical Sciences (RIMS), Imphal, and the Yoga Training and Research Centre (YTRC), Kwakeithel, Imphal, registered under no. 38 of 1987. The study spanned from August 2019 to June 2022 and aimed to assess the impact of yoga on lipid profiles in patients with type 2 diabetes mellitus, comparing those undergoing yoga training with those receiving conventional pharmacological treatment alone.

Inclusion criteria:
1. Type 2 diabetes mellitus patients coming to Medicine department, RIMS Imphal, not doing yoga but on diabetic medication with/without statins between the age group 25 – 70 years, irrespective of sex.
2. Type 2 diabetes mellitus patients who are starting to do yoga at YTRC, Kwakeithel and on diabetic medication with/without statins between the age group 25 – 70 years, irrespective of sex.

Exclusion criteria:
1. Those who do not want to participate
2. Patients undergoing any other form of physical exercises
3. Patients with any other chronic illness like uncontrolled hypertension, angina, stroke, renal failure, COPD, tuberculosis, coronary artery disease and musculo- skeletal chest deformity.

Sample size:
No. of 1st study population (Diabetic patients not doing yoga) = 30
No. of 2ndstudy population (Diabetic patients doing yoga) = 30

Study variables:
Lipid profiles: Serum cholesterol, Serum triglyceride, Serum HDL, Serum LDL & Serum VLDL

Operational definition:
Lipid status: The following values are taken for abnormal lipid profile[5]:
Serum Total cholesterol: ≥ 200 mg/dl
Serum Triglycerides: >150 mg/dl
Serum HDL: <40mg/dl
Serum LDL: >100 mg/dl
Serum VLDL: >30 mg/dl

Study tools:
i. Lipid profile:
ii. Lipid profile parameters were measured by Digital Photo Colorimeter, Model LT-12 (LABTRONICS, Panchkula Haryana)
iii. Mercury sphygmomanometer (Diamond, Industrial Electronic & Allied products, Pune, India).
iv. Stethoscope
v. Rossmax Weighing scale: calibrated before each reading and recording to the nearest 0.1 kg.
vi. Stadiometer: recording will be made in centimeters (cm)

YOGIC PRACTISES TO BE UNDERTAKEN:
A) On Monday, Tuesday, Thursday and Friday
Breathing practices = 5 minutes Surya Namaskar = 3 minutes
Instant relaxation technique = 1 minute Asanas = 30 minutes
Loosening exercises = 10 minutes Deep relaxation technique= 7 minutes
Quick relaxation technique = 5 minutes
B) On Wednesday – C) On Saturday –
Loosening exercises = 30 minutes Loosening exercise = 7 minutes
Quick relaxation technique = 5 minutes Surya Namaska = 3 minutes
Surya Namaskar = 5 minutes Pranayama = 50 minutes
Deep relaxation technique = 15 minutes

Statistical analysis: Data entered and analysed using IBM SPSS statistics version 21. Inferential statistics like Chi- square tests for categorical data, Student's t- test for data with normal distribution, Mann Whitney U- test for data with skewed distribution and Paired t- test was used. A p value of < 0.05 taken as statistically significant.

Ethical issues: The study was carried out after getting clearance from the Research Ethics Board, RIMS, Imphal.

III. Results:

Table 1: Comparison of baseline characteristics between groups (N=60)

Baseline chracteristics	Interventional group (N=30)	Control group (N=30)	p value
Age (years) (m±sd)	53.40±7.95	55.40±11.30	0.431
Gender N (%)			0.184
Male	14 (60.9%)	9 (39.1%)	
Female	16 (43.2%)	21 (56.8%)	
Religion N (%)			0.739
Hindu	25 (51%)	24 (49%)	
Others	5 (45.5%)	6 (54.5%)	
Education N (%)			0.000
Illiterate	4 (18.2%)	18 (81.8%)	
Literate	26 (68.4%)	12 (31.6%)	
Occupation N (%)			0.432
Unemployed	16 (45.7%)	19 (54.3%)	
Employed	14 (56%)	11 (44%)	
Duration of Diabetes mellitus (years) median(IQR)	5 (1.37-8.5)	4 (1.75-9)	0.406
Comorbidities N (%)			0.605
Yes	13 (46.4%)	15 (53.6%)	
No	17 (53.1%)	15 (46.9%)	
Family history N (%)			1.000
Yes	16 (50%)	16 (50%)	
No	14 (50%)	14 (50%)	
Dietary habits N (%)			1.000
Veg	3 (60%)	2 (40%)	
Non-veg	27 (49.1%)	28 (50.9%)	
Smoking N (%)			1.000
Yes	2 (50%)	2 (50%)	
No	28 (50%)	28 (50%)	
Alcohol N (%)			1.000
Yes	4 (44.4%)	5 (55.6%)	
No	26 (51%)	25 (49%)	
Diabetic medications N (%)			1.000
Yes	28 (50%)	28 (50%)	
No	2 (50%)	2 (50%)	
Statins N (%)			0.472
Yes	24 (47.1%)	27 (52.9%)	
No	6 (66.7%)	3 (33.3%)	
BMI (m±sd)	24.91±2.13	25.44±2.69	0.401

Table 1 shows comparison of baseline characteristics between groups. Mean age in interventional group - 53.40±7.95 and in control group - 55.40±11.30. Gender, religion, occupation, duration of diabetes mellitus, comorbidities, family history, dietary habits, smoking, alcohol, diabetic medications & statins – There are no statistical difference between intervention & control groups. Education – There is statistical difference between interventional & control group. Median for duration of DM is 5 years in interventional group and 4 years in control group.

Table 2: Baseline comparison of lipid profile between groups (N=60)

Lipid profile	Interventional group (N=30) (m±sd) / median(IQR)	Control group (N=30) (m±sd) / median(IQR)	p value*
Serum cholesterol	176.30±31.08	184±54.33	0.503
Serum triglyceride	112 (100-145.25)	151 (105-178.5)	0.088
Serum HDL	50 (45.5-53.25)	42 (39.5-48.25)	0.011
Serum LDL	90 (83.75-97)	98 (79-104)	0.329

*Independent samples test / Mann-whitney U test

Table 2 shows the baseline comparison of lipid profile between groups. Serum cholesterol, serum triglyceride and serum LDL levels are more in control group which is not stasistically significant. Serum HDL more in interventional group and stasistically significant.

Table 3: Lipid profile levels in interventional group (N=30)

Lipid profile	Baseline (m±sd)	After 3 months (m±sd)	p value*
Serum cholesterol	176.30±31.08	162.60±23.34	0.000
Serum triglyceride	123.57±41.38	108.17±24.04	0.000
Serum HDL	48.67±8.91	49.77±6.48	0.054
Serum LDL	97.20±29.27	90.33±15.59	0.014

*Paired t test

Table 3 shows lipid profile levels in interventional group. Serum cholesterol, serum triglyceride and serum LDL levels are lesser after 3 months compared to baseline and found to be statistically significant. Serum HDL higher in after 3 months compared to baseline and statistically not significant.

Table 4: Lipid profile levels in control group (N=30)

Lipid profile	Baseline (m±sd)	After 3 months (m±sd)	p value*
Serum cholesterol	184±54.33	182.23±44.58	0.488
Serum triglyceride	180.23±175.20	163.67±122.16	0.110
Serum HDL	45.60±16.09	45.20±12.74	0.577
Serum LDL	97±33.53	97.73±27.66	0.644

*Paired t test

Table 4 shows lipid profile levels in control group. Serum cholesterol and serum triglyceride are lesser in after 3 months compared to baseline and statistically not significant. Serum HDL lesser in after 3 months compared to baseline and statistically not significant. Serum LDL higher in after 3 months compared to baseline and statistically not significant.

Table 5: Comparison of mean change in lipid profile between two groups (N=60)

Lipid profile	Interventional group (N=30) Median (IQR)	Control group (N=30) Median (IQR)	p value*
Serum cholesterol	-12 (-20.75 - -6)	3 (-9.25 – 6.25)	0.000
Serum triglyceride	-10.5 (-24.25 - -3.75)	-0.5 (-10 – 4)	0.003
Serum HDL	2 (-2.0 – 2.5)	0.0 (-2 – 2)	0.180
Serum LDL	-3 (-6.5 – 1)	2 (-2.5 – 7.25)	0.007

*Mann-whitney U test

Table 5 shows comparison of mean change in lipid profile between two groups. Serum cholesterol, serum triglyceride and serum LDL are lesser in interventional group compared to control group and found to be statistically significant. Serum HDL higher in interventional group compared to control group and statistically not significant.

IV. Discussion:

The present study investigated the effects of yoga on lipid profiles in a cohort of 60 participants diagnosed with type 2 diabetes mellitus. The participants were randomized into two groups of 30 individuals each. Group 1 comprised 30 patients from the Medicine Outpatient Department (OPD) at RIMS, Imphal, who were administered conventional pharmacological treatment for type 2 diabetes. Group 2 included 30 patients from YTRC, Kwakeithel, who, in addition to receiving standard medication, engaged in a structured yoga program incorporating asanas (postures), pranayamas (breath control exercises), and meditation.

Lipid profiles, including serum cholesterol, serum triglycerides, serum high-density lipoprotein (HDL), and serum low-density lipoprotein (LDL), were assessed in both groups. The control group (Group 1) continued with their usual medical treatment, while the interventional group (Group 2) combined medication with yoga practice. After a 3-month intervention period, the results demonstrated that the interventional group experienced a statistically significant reduction in serum cholesterol, serum triglycerides, and serum LDL levels compared to baseline values. These reductions were in line with findings reported by Vyas, who noted that raja yoga meditation led to decreased serum cholesterol levels. Similarly, Sahay and Bijlani observed that yoga practice was associated with significant reductions in free fatty acids, LDL, and very-low-density lipoprotein (VLDL), and an increase in HDL levels.

Comparison between the two groups revealed that the interventional group exhibited more pronounced improvements in lipid profiles, with significant reductions in serum cholesterol, triglycerides, and LDL after 3 months of yoga practice, relative to the control group. This suggests that the incorporation of yoga into the management regimen has a beneficial effect on lipid metabolism. These findings corroborate the results of previous studies, including those by Singh et al., Vaishali et al., and Dash, who documented significant improvements in lipid profiles among participants engaging in yoga practice. Specifically, Singh et al. reported

notable enhancements in lipid profiles following 45 days of yoga practice, further supporting the therapeutic potential of yoga in managing lipid dysregulation in individuals with type 2 diabetes mellitus.

V. Conclusion:

The present study concluded that type 2 diabetic patients who participated in a 3-month yoga intervention, in conjunction with oral hypoglycemic agents, exhibited a significant improvement in lipid profiles compared to those who received only pharmacological treatment. This finding underscores the potential efficacy of integrating yoga as a complementary therapeutic modality in diabetes management.

Pharmacological treatments for diabetes are often accompanied by adverse side effects, which can impact patient adherence and overall treatment outcomes. In contrast, non-pharmacological interventions such as yoga offer a holistic approach that may mitigate some of these side effects while enhancing metabolic health. Therefore, the incorporation of yoga into routine diabetes care protocols should be encouraged as a valuable adjunct to conventional medical therapies, contributing to improved glycemic control and lipid profile management.

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