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TO STUDY THE EFFECT OF YOGA ON HBA1C, SERUM INSULIN LEVEL AND LIPID PROFILE IN DIABETIC PATIENTS IN A TERTIARY CARE CENTRE

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Abstract

Introduction-Diabetes mellitus is a worldwide health problem predisposing to markedly increased cardiovascular mortality and morbidity. Exercise is a major therapeutic modality in the treatment of diabetes mellitus. Regular physical exercise has been reported to be effective in the prevention and delay of onset of type 2 diabetes, increases insulin sensitivity, and ameliorates glucose metabolism.Yoga has become increasingly popular in Western cultures as a means of exercise and training fitness.The aims of the present study were therefore to investigate the effects of Hatha yoga on Hba1c,Serum insulin level & lipid profile after 3 and 6 months of intervention in patients with type 2 diabetes mellitus.

Material and method-Was a prospective study done in LLRM Medical College Meerut in year 2019-20. 200 patients with type 2DM on T/t were assessed thoroughly with proper history, clinical examination and required investigation. Patients were divided in two groups of 100 patients each.

Group A patients took yoga therapy and antidiabetic drugs.

Group B patients were control group they were diabetic patients on routine anti diabetic treatment who attended our hospital but not practiced yoga.

Both the group were followed for the period of 6 months and were compared in terms of HbA1c, serum insulin levels and lipid profile.

Result- The patients in the yoga group showed a significant improvement in HbA1c level (18.36% reduction from the mean baseline of 10.194; paired t-test p-value<0.001), they also revealed significant improvement in lipid profile. Regarding insulin level also there was significant decrease in both the groups individually (p value <0.001). And although the decrease was more for the yoga group, the mean difference between both the groups was not significant at the end of 6 months(p value =0.86432).

Conclusion- In the present study we found that yoga therapy (in conjunction with conventional drug treatment for diabetes mellitus) is an effective and safe modality for improvement of various clinical and biochemical parameters like HBA1c,total cholesterol serum triglyceride, serum HDL and

LDL- cholesterol in patients of diabetes mellitus..

INTRODUCTION

Yoga is an ancient system of relaxation, exercise and healing with origins in Indian philosophy.

The philosophy of yoga is sometimes pictured as a tree with eight branches. These eight limbs are: *pranayama* (breathing exercises), *asana* (physical postures), *yama* (moral behavior), *niyama* (healthy habit), *dharana* (concentration), *prathyahara* (sense withdrawal), *dhyana* (contemplation), and s*amadhi* (higher consciousness).

Diabetes mellitus is a worldwide health problem predisposing to markedly increased cardiovascular mortality and morbidity . Lipid abnormalities significantly contribute to the increased risk of cardiovascular disease and other morbidity in diabetics . It has been demonstrated that high levels of serum Total cholesterol, triglycerides, LDL, VLDL, glycated haemoglobin (HbA_{1c}), microalbuminuria, hypertension, low concentration of HDL and increased body mass index (BMI) are significantly associated with coronary heart disease . Exercise is a major therapeutic modality in the treatment of diabetes mellitus . Regular physical exercise has been reported to be effective in the prevention and delay of onset of type 2 diabetes, increases insulin sensitivity, and ameliorates glucose metabolism . Yoga has become increasingly popular in Western cultures as a means of exercise and training fitness . It has been used clinically as a therapeutic intervention and its practice includes muscle stretching, breathing exercises, behavioural modification, and dietary control through mental discipline .

A growing number of research studies have shown that yoga can improve strength and flexibility, and may help control physiological variables such as blood pressure, respiration and heart rate, and metabolic rate to improve overall exercise capacity . Studies carried out on medium or long-term effect of yoga exercise on oxidative stress parameters and antioxidant status in type 2 diabetic patients are sparse. The aims of the present study were therefore to investigate the effects of yoga on Hba1c,Serum insulin level & lipid profile, oxidative stress parameters and antioxidant status after 3 and 6 months of intervention in patients with type 2 diabetes mellitus

AIM AND OBJECTIVE

To study the effect of yoga on Hba1c,serum insulin level and lipid profile in Diabetic patients.

MATERIAL AND METHODS

This study was conducted on patients attending Medicine/Endocrine OPD and admitted in Medicine/Endocrine ward at LLRM Medical College, Meerut and included patients with type 2 diabetes mellitus on treatment. Study was conducted in a total of 200 patients in two groups of 100 patients each with following inclusion and exclusion criteria.

INCLUSION CRITERIA:

Patients suffering from type 2 DM
Age >30 year of age
Patients who were cooperative
Patients who gave written informed consent
Non-Smoker and Non-Alcoholic

EXCLUSION CRITERIA :

Type 2 diabetes mellitus with malnutrition or severe complications of the disease (cardiovascular, renal, visual and cerebral).
Patients on hyperlipidaemia drug
Age < 30 Years
Uncooperative/Unable to provide informed written consent.

Study Procedure:200 patients with type 2DM on T/t attending Medicine /Endocrine OPD or admitted in medicine /Endocrine ward were assessed thoroughly with proper history, clinical examination and required investigation. Patients were divided in two groups of 100 patients each.**Group A**

patients took yoga therapy and anti diabetic drugs.**Group B** patients were control group they were diabetic patients on routine anti diabetic treatment who attended our hospital but not practiced yoga.The managed group (yoga) was trained by a professional. The class was of 60 minutes duration which included 20 minutes of pranayama, followed by 40 minutes of asanas. The asanas include 10 minutes of sitting postures{Sthitta Konasana,Paschimottasana), 8 minutes of standing postures{Trikonasana,Konasana,Padhastasana},7 mins of prone postures {Bhujangasana,Salabhasna} and 15 minutes of supine postures { Shavasna,Dwicakriasana,Padavrattasana) for first 15 days five times a week and they were asked to do the same at home for the rest of study duration. They were also advised to practice yoga based lifestyle including correct routines sleep habits,cultivation of faith and positive attitude,saatvik yogic diet as explained by the instructor. Patients were assessed at beginning of study, at completion of 3 months of study & at completion of 6 months of study by using FBS,PPBS,FLP,HbA1c and serum insulin levels.

OBSERVATIONS: The study is based on 200 patients. For the purpose of study the patients were randomly allocated to either Group A (Study Group/ Yoga Group) or Group B (Control Group). Out of 200 patients 170 patients completed the study. The details of patients enrolled and completing the study is depicted in Table 1.

TABLE-1:DISTRIBUTION OF PATIENTS

	Number of patient in beginning	Patients at the end of 6 month	% of patients completed study
Yoga group	100	84	84%
Control group	100	86	86%

RESULTS OF INDIVIDUAL PARAMETRS

1)**Fasting Blood Sugar**-It is evident from Table 2 that there is significant decrease of 35.69% (from mean fasting blood sugar of 178.45 at baseline to 114.76 at six months; paired t-test p-value < 0.05 in FBS of patients in the yoga group (Group A) at the end of six months. In the control group patients also, there was a statistically significant decrease in fasting blood sugar of 30.07% from baseline value (paired t-test p-value <0.05).

Table-2

Fasting Blood Sugar at baseline,3 month and 6 month

Group	Pre study (baseline) Mean FBS(mg/dl)	Post study (at 6 months) Mean FBS (mg/dl)	Mean difference	Difference in percentage	P- value within the group (paired t-test)
Yoga group (Group A)	178.452±35.244	114.762±14.596	63.69	35.69%	<0.0001
Control group (Group B)	175.558± 42.858	122.762 ±43.932	52.796	30.07%	<0.0001
P- value (independent t-test)	0.63088	0.11472			

It is also evident from the result of independent t-test depicted in Table 2 that at baseline, there was no statistically significant difference between the yoga and control groups (independent t-test p- value>0.05), the difference was also insignificant at the end of six months (independent t-test p-value >0.05) so although the Yoga therapy results in a significant decrease in fasting blood sugar of yoga group at the end of six months. But the difference between both groups is not significant.

2.) Post Prandial Blood Sugar(PPBS)

Table 3

Post Prandial Blood Sugar at baseline and 6 months

Group	Pre study (baseline) PPBS (mg/dl)	Post study (at 6 months) PPBS (mg/dl)	Mean difference	Difference in percentage	P- value within the group (paired t-test)
Yoga group (Group A)	294.298±65.283	201.131±32.688	93.167	31.65%	<0.001
Control group (Group B)	285.744±45.889	205.584±20.991	80.16	28.05%	<0.001
P- value (independent t-test)	0.3235	<0.29097			

3.) HbA1c level-It can be seen from Table 5 that there is a significant reduction of 18.36% (paired t-test p-value < 0.001) in HbA1c in the patients in the yoga group (Group A) at the end of six months. In the control group patients also there was a statistically significant but a lesser reduction of 13.4% from baseline value (paired t-test p-value <0.001).

Table 4:
HbA1c levels at baseline and 6 months

Group	Pre study (baseline) Mean HbA1c (%)	Post study (at 6 months) Mean HbA1c (%)	Mean difference	Difference in percentage	P- value within the group (paired t-test)
Yoga group (Group A)	10.194±1.96	8.185±1.23	-2.009	-18.36%	<0.001
Control group (Group B)	10.229±1.69	8.854±1.72	-1.375	-13.4%	<0.001
P- value (independent t-test)	0.9076	0.0039			

4.) Serum insulin level:

It can be seen from Table 6 that there is a significant reduction of 17.25% (paired t-test p-value< 0.001) in mean serum insulin levels of the patients in the yoga group (Group A) at the end of six months. In the control group patients, there was also statistically significant but lesser change from baseline value (paired t-test p-value <0.05). It is also evident from the same Table that at baseline, there was no statistically significant difference between the yoga and control groups (independent t-test p-value>0.05), the difference is also not significant at the end of six months (independent t-test p-value >0.05).Therefore although there is beneficial impact of yoga on serum insulin level but its not statistically significant as compared to control group.

Table 5

Serum insulin at baseline and 6 months

	BASELINE SERUM INSULIN	SERUM INSULIN AT 6 MONTH	MEAN DIFFERENCE IN %	P VALUE (PAIRED T TEST)
YOGA GROUP	70.021±30.99	57.941±29.04	17.25	<0.001
CONTROL GROUP	70.116±30.36	58.705±28.87	16.27	<0.001
P VALUE (INDEPENDENT T TEST)	0.84775	0.86342		

It can be seen from Table 6 that there is a significant reduction of 19.56% (paired t-test p-value< 0.0002) in mean serum total cholesterol levels of the patients in the yoga group (Group A) at the end of six months. In the control group patients, there was also statistically

significant but lesser change from baseline value (paired t-test p-value<0.05). It is also evident from the same Table that while at baseline, there was no statistically significant difference between the yoga and control groups (independent t-test p-value>0.05), the difference became significant at the end of six months (independent t-test p-value<0.05). This clearly brings therefore the significantly beneficial impact of yoga on serum total cholesterol level.

Table 6
Serum total cholesterol at baseline and 6 months

	BASELINE SERUM TC	SERUM TC AT 6 MONTH	DIFFERENCE IN %	P-VALUE (PAIRED T TEST)
YOGA GROUP	205.60±55.86	165.37±37.14	19.56	0.0002
CONTROL GROUP	207.40±55.44	185.00±47.66	10.80	0.0452
P VALUE (INDEPENDENT T TEST)	0.8812	0.0366		

5.) Serum triglyceride level -It can be seen from Table 7 that there is a significant reduction of 21.8% (paired t-test p-value< 0.0001) in mean serum triglycerides levels of the patients in the yoga group (Group A) at the end of six months. In the control group patients, there was also statistically significant but lesser change from baseline value (paired t-test p-value <0.05). It is also evident from the same Table that while at baseline, there was no statistically significant difference between the yoga and control groups (independent t-test p-value>0.05), the difference became significant at the end of six months (independent t-test p-value<0.05). This clearly shows that there is significant impact of yoga on serum triglycerides level.

Table 7
Serum triglyceride at baseline and 6 months

	BASELINE SERUM TG	SERUM TG AT 6 MONTH	DIFFERENCE IN %	P VALUE (PAIRED T TEST)
YOGA GROUP	162.93±42.91	127.37±28.78	21.8%	0.0001
CONTROL GROUP	163.77±41.94	145.93±38.44	10.89%	0.0405
P VALUE (INDEPENDENT T TEST)	0.9271	0.0134		

6.) HDL & LDL Levels- It can be concluded from Table 8 that there is a significant increase of 16.56% (paired t-test p-value< 0.0003)) in mean serum HDL cholesterol level of the patients in the yoga group (Group A) at the end of six months. In the control group patients

also, there was statistically significant change from baseline value (paired t-test p-value <0.05).
And also it can be seen from Table 9 that there is a significant reduction of 26.1% (paired t-test p-value< 0.0001) in mean serum LDL levels of the patients in the yoga group (Group A) at the end of six months. In the control group patients, there was also statistically significant but lesser change from baseline value (paired t-test p-value <0.05). It is also evident from the same Table that while at baseline, there was no statistically significant difference between the yoga and control groups (independent t-test p-value>0.05), the difference became significant at the end of six months (independent t-test p-value<0.05). This clearly brings therefore the significantly beneficial impact of yoga on serum LDL level.

Table 8
HDL-Cholesterol at baseline and 6 months

	BASELINE SERUM HDL	SERUM HDL AT 6 MONTH	DIFFRENCE IN %	P VALUE (PAIRED T TEST)
YOGA GROUP	36.23±8.05	42.23±6.23	16.56%	0.0003
CONTROL GROUP	36.07±4.82	38.27±5.49	6.1%	0.0318
P VALUE (INDEPENDENT T TEST)	0.9108	0.0024		

Table 9
Serum LDL level at baseline and 6 months

	BASELINE SERUM LDL	SERUM LDL AT 6 MONTH	DIFFRENCE IN %	P VALUE (PAIRED T TEST)
YOGA GROUP	124.90±31.70	92.30±30.25	26.1%	0.0001
CONTROL GROUP	126.10±43.37	108.37±36.30	14.1%	0.0406
P VALUE (INDEPENDENT T TEST)	0.8843	0.0288		

Discussion:

The results of our study are consistent with those of the previously done studies. Our study reveals that there is significant decrease in FBS of 35.69% in the patients of the yoga group (Group-A) at the end of six months and also in the control group of 30.07% (paired t-test p-value<0.05). Although the decrease
was significant in both the groups individually and it was more in yoga group but the difference at the end of 6 months between both groups was not statistically significant (p value =0.11472).Same was the result for post prandial blood sugar.The patients in the yoga group showed a significant improvement in HbA1c level (18.36%; paired t-test p-value<0.001), also control group showed reduction of 13.4%;(paired t-test p-value<0.001) at the end of six months. And the mean difference at end of 6 months was statistically significant between both the groups.The patients in the yoga group *and* control group also revealed significant improvement in lipid profile at the end of six months. Regarding insulin level also there was significant decrease in both the groups individually (p value <0.001). And although the decrease was more for the yoga group, the mean difference between both the groups was not significant at the end of 6 months(p value =0.86432).Can yoga be used as adjunct to standard pharmacological care for effective and safe treatment of diabetic patients? Yoga and meditation have always been an essential part of life in traditional system of treatment but very little authentic research has been done on this. Yogic intervention as an adjunct to usual care appears to be safe and efficacious in improving the clinical and biochemical parameters in diabetics, as revealed by our study and previous studies (Agrawal et al. 2007, Murugeson et al. 2000, Satyanarayan et al. 1992, Singh et al. 2004, Bijlani et al. 2005). With no appreciable side effects and multiple collateral lifestyle benefits, yoga seem safe, is simple to learn, and can be practiced even by elderly, ill, or disabled individuals. Yoga can play an important role in better control of hyperglycemia in patients on multiple OHAs and better management of prediabetic patients.

Requiring little in the way of equipment or Professional personnel, yoga also seems easy and inexpensive to maintain.However, despite yoga's growing popularity and promise as a safe and cost-effective intervention for diabetes mellitus, systematic reviews are lacking. Diabetes mellitus & Metabolic syndrome have a chronic course and studies should be done over longer period of time to demonstrate the effect of yoga therapy on natural history of the disease.We recommend further large scale and multi-centric trials for longer follow up with comprehensive investigative approach to calibrate the benefits of yoga therapy in patients of diabetes mellitus.

Conclusion:

In the present study we found that yoga therapy (in conjunction with conventional drug treatment for diabetes mellitus) is an effective and safe modality for improvement of various clinical and biochemical parameters like HBA1c,total cholesterol serum triglyceride, serum HDL and LDL- cholesterol in patients of diabetes mellitus.We understand the limitations and constraints of our study. (We have taken a relatively smaller sample size of 200 patients,Ideally such lifestyle modification studies should be continued for several years to firmly establish a conclusive role of some therapy. Due to the time limit of thesis we could only follow these patients for six months)

So this study is a modest attempt in one of the important areas of role of yoga in diabetes mellitus and it hopes to encourage further research in this field. We recommend further large scale and multi centric trials for longer follow up with intensive investigative approach to calibrate the benefits of yoga therapy in patients of diabetes mellitus especially in prediabetic patients.

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