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Effects Of Physiotherapy On Metabolic Markers And Wellness Score In Post-Menopausal Diabetic Women

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ABSTRACT

Background: Yogic practices are beneficial for overall health and well-being, and they can potentially play a supportive role in the prevention and management of diabetes mellitus (DM) and reduce cardiovascular complications. While it is important to note that yoga should not be considered a standalone treatment for diabetes, it can be a complementary approach incorporated into a comprehensive treatment plan. This study assessed metabolic markers and wellness scores of post-menopausal diabetes patients to compare the benefits of yoga and therapy.

Methods: The study recruited 15 female patients aged 36 to 63 who received medical treatment for type 2 DM at AIMSR. The patients were selected using an accidental sampling method. All participants provided informed consent to participate in the study. Among the recruited patients, 11 were post-menopausal for more than a year, and four were peri-menopausal. The study was designed pre- and post-intervention to assess changes in biochemical markers and subjective well-being.

Results: The statistical analysis used the student's t-test for paired samples. Using the paired t-test and accepting p-values less than 0.05 as statistically significant, the study aimed to determine if significant differences in the measured parameters existed before and after the intervention. The study findings suggest that yoga training resulted in decreased FBG significantly (P=0.0035) by 20.62%, PPBG also decreased significantly (P=0.0012) by 14.52%, and HDL increased significantly (P=0.022). There was a significant (P=0.003) decrease of 17.37% in the TC/HDL ratio and a significant (P=0.016) increase of 19.13% in the HDL/LDL ratio.

Conclusion: In post-menopausal diabetes, a six-week yoga and physical therapy training program improves lipid profiles and blood sugar levels. Incorporating a comprehensive yoga and physical therapy treatment program into a successful complementary or integrative therapy program may improve the standard medical care for diabetes mellitus.

Keywords: Yoga and physical therapy, Post-menopausal Diabetic Women, Diabetes mellitus (DM), ACYTER, Metabolic markers.

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INTRODUCTION

Numerous scientific studies demonstrate the benefits of yoga and physical therapy for maintaining health and treating psychosomatic diseases. Yoga and physical therapy's scientific foundation modifies the physiology of the body [1]. Adjustments to one's yogic lifestyle assist in preventing and managing lifestyle disorders. Diabetes mellitus is a psychosomatic and lifestyle condition caused by sedentary behavior, physical, emotional, and mental stress [1]. Modern studies have focused on the psycho-physiological effects of yoga and physical therapy as it transcends physical therapy [8]. Yoga and physical therapy therapies reduce body weight, blood pressure, glucose levels, and high cholesterol, according to a systematic study conducted between 1980 and 2007[2]. The systematic review, which included 32 articles published between 1980 and 2007, found that yoga interventions were generally effective in reducing body weight, blood pressure, glucose levels, and high cholesterol [10]. This indicates that yoga may have a beneficial role in improving these important risk factors for cardiovascular disease and diabetes. Physical therapy and yoga can lower hypertension, dyslipidemia, and diabetes[14]. Yoga and physical therapy enhance insulin sensitivity and diminish the correlation between body weight and insulin sensitivity with long-term practice. Yoga and physical therapy are safe, simple to learn, and accessible to everyone, even the ill, old, and disabled, with no adverse side effects and several advantages [7]. It is a simple, inexpensive, and safe adjuvant for DM patients [5]. Yoga and physical therapy can prevent and treat cardiovascular issues in patients with non-insulin-dependent diabetic mellitus (NIDDM). During menopause, ovarian function diminishes, resulting in altered lipoprotein profiles, altered glucose and insulin metabolism, and a risk of cardiovascular disease [3].

The main objective of this study is to evaluate the impact of a six-week yoga and physical therapy program on the wellness score and metabolic indicators of post-menopausal diabetes patients.

METHODOLOGY

The study was conducted at the Department of Physiotherapy at Apollo Medical College in Hyderabad. The study was conducted for one year and was approved by the Institutional Ethics Committee [EC/AIMSR/1528], indicating that ethical standards were followed. The subjects enrolled in the study were outpatients from the Department of Gynaecology and Obstetrics at Apollo Medical College, and they were those who volunteered to join the study.

At the Apollo College of Physiotherapy in Hyderabad, 15 female patients with type 2 DM were randomly selected and consented to participate in this study. Yoga and physical therapy were new to the patients. Four were post-menopausal, and eleven were menopausal. Neurological, hypertensive, and musculoskeletal problems affected four of the subjects. The study did not include Patients with a history of nephrologic or ophthalmologic problems. The factors evaluated before and after the six-week trial were a biochemical experiment, a well-being questionnaire, yoga, and a physical therapy program.

Blood was extracted from the post-absorptive antecubital vein for biochemical tests. Physical therapy and yoga were forbidden on the day of the blood sample. Before and throughout the research period, blood samples for fasting blood glucose (FBG), two-hour post-prandial blood glucose (PPBG), lipid profiles like triglyceride (TG), total cholesterol (TC), LDL, HDL, and VLDL were collected [4].

The patient's contrasting feelings following the therapy program were assessed using a retrospective, post-intervention well-being questionnaire created by The Advanced Centre for Yoga Therapy Education and Research (ACYTER) [5]. Five possible responses ranging from "worse than before" to "complete relief/total satisfaction" were considered to evaluate the patient's physical and mental state. The questionnaire was finalized by a 12-person committee composed of three eminent medical experts, two psychologists, two yoga and physical therapy consultants, two educationalists, and one legal anthropologist.

The patients got yogic counseling and advice for lifestyle adjustment during their initial visit to the ACYTER Yoga and Physical Therapy Outpatient Clinic. They then went to the ACYTER's special seminars for people with diabetes. At ACYTER, certified yoga and physical therapy instructors taught the patients a thorough yoga and physical therapy program for 60 minutes thrice weekly for six weeks. Table 1 includes the timetable.

Patients were instructed to practice with caution, taking their capacity into account. 99.63% of students attended the 18 sessions that were closely observed. Additionally, the patients were pushed to do at-home practice on various days. Five of the fifteen patients practiced at home four times per week, three times per week, and twice per week, respectively. While the other three patients reported practicing five, six, or seven days per week, only one reported practicing at home. An analysis of patient feedback found that home practice lasted thirty minutes for nine patients, sixty minutes for three patients, and forty minutes for two patients.

Table 1: Sequence and duration of yoga techniques practiced by our subjects

Yoga Technique	Duration (min)
Surya Namaskar	10
Tadason	0.5
Parivritta trikonasan	1
Padahastasan	0.5
Ardh-kati-chakrasan	1
Vakrasan	1
Pashchimottanasan	0.5
Pavanamukthasan	2
Ardha halasan	0.5

Bhujangasan	0.5
Dhanurasan	0.5
Viparitakarani	1
Chandranadi pranayama	2
Pranav pranayama	4
Nadi Shuddhi	2
Savitri pranayama	3
Kayakriya	10
Shavasan	10
Rest period in between practices	10
Total	**60 min**

RESULTS

Yoga and physical therapy exercises reduced FBG significantly. In addition, the concentration of PPBG was reduced by 14.52 percent (P=0.0012). The decrease in total cholesterol (TC) from (5.14%) was statistically remarkable (P = 0.016). In addition to the substantial (P=0.022) 10.64% decrease in LDL and the remarkable (P=0.022) 9.77% reduction in VLDL, there was a promising (P=0.020) 9.89% reduction in TG. While the LDL/HDL ratio decreased by 22.41% (P=0.005), the TC/HDL ratio reduced by 17.37% (P=0.003). HDL/LDL ratio improved significantly (P=0.016) by 19.13%.

27% of participants were significantly better than before, while 7% reported complete relief and satisfaction following the therapy program, as determined by the totality of all retrospective wellness assessments. 42% of people reported that their condition had improved, while 23% reported no change. One percent reported worse health than before.

Table 2: Pre (B) and post values (A) of fasting blood glucose (FBG), post-prandial blood glucose (PPBG), total cholesterol (TC), triglycerides (TG), low density lipoprotein (LDL), very low density lipoprotein (VLDL) and high density lipoprotein (HDL)

	B	A	% Change	P value
FBG (mg/dl)	160.07 ± 15.65	127.07 ± 10.24	-20.62	0.0035
PPBG (mg/dl)	244.20 ± 17.12	208.73 ± 16.07	-14.52	0.0012
TC (mg/dl)	161.24 ± 9.10	152.95 ± 7.17	-5.14	0.0161
TG (mg/dl)	110.53 ± 10.56	99.6 ± 8.37	-9.89	0.0203
LDL (mg/dl)	96.53 ± 9.46	86.27 ± 7.78	-10.64	0.0012
VLDL (mg/dl)	22.11 ± 2.11	19.95 ± 1.67	-9.77	0.0222
HDL (mg/dl)	42.60 ± 5.16	47.07 ± 5.08	10.49	0.0229
TC/HDL	4.36 ± 0.46	3.60 ± 0.31	-17.37	0.0035
LDL/HDL	2.77 ± 0.40	2.15 ± 0.27	-22.41	0.0059
HDL/LDL	0.65 ± 0.21	0.77 ± 0.24	19.13	0.0165

Table 3: Post-intervention % responses of the studies that have reported that yoga training results in participants to retrospective wellness questionnaire

	Worse than before	Same as before	Better than before	Much better than before	Complete relief/ totally satisfied
Ability to concentrate	-	28.57	50.00	21.43	-
Control of anger/ loss of temper	-	35.71	28.37	28.57	7.14
Appetite	-	33.33	25.00	25.00	16.67
Confidence level	-	28.57	42.86	21.43	7.14
Ease of breathing	-	26.67	40.00	26.67	6.67
Energy levels	-	33.33	33.33	33.33	-
Enjoyment of life	-	20.00	60.00	6.67	13.33
Feeling calm and fresh	-	33.33	33.33	26.67	6.67
Feeling of hopelessness	-	40.00	40.00	20.00	-
Feeling of loneliness	-	6.67	60.00	33.33	-
General flexibility	-	13.33	53.33	26.47	6.67
General mood	-	8.33	50.00	33.33	8.33
General sense of relaxation	-	14.28	50.00	28.57	7.14
General well-being	-	7.69	38.46	53.00	-
Joint mobility	-	13.33	40.00	33.33	13.33
Nervousness	-	28.57	57.14	14.29	-
Normality of menstrual cycles	-	25.00	25.00	-	50.00
Pain levels	-	13.33	53.33	26.67	6.67
Performance of day-to-day activities	-	21.43	42.86	35.71	-
Sleep quality/ duration	13.33	20.00	26.67	40.00	-
Stress levels	9.09	27.27	36.36	27.27	-
Total well-being score	1.07	22.80	42.19	26.76	7.13

Following yoga training, there was a statistically significant decrease in FBG. The average FBG decreased by 20.62% from 160.07 ± 15.65 mg/dl to 127.07 ± 10.24 mg/dl. The reported p-value of 0.0035 indicates that this decrease was statistically significant. The average PPBG decreased by 14.52% from 244.20 ± 17.12 mg/dl to 208.73 ± 16.07 mg/dl. The reported p-value of 0.0012 indicates that this decrease was statistically significant. The average TC decreased from 161.24 ± 9.10 mg/dl to 152.95 ± 7.17 mg/dl, representing a reduction of 5.14%. The reported p-value of 0.016 indicates that this decrease was statistically significant. The average TG decreased by 9.89% from 110.53 ± 10.56 mg/dl to 99.60 ± 8.37 mg/dl. The reported p-value of 0.020 indicates that this decrease was statistically significant. There was a significant decrease in LDL following yoga training. The average LDL decreased by 10.64% from 96.53 ± 9.46 mg/dl to 86.27 ± 7.78 mg/dl. The reported p-value of 0.0012 indicates that this decrease was statistically significant. The average VLDL decreased by 9.77% from 22.11 ± 2.11 mg/dl to 19.95 ± 1.67 mg/dl. The reported p-value of 0.022 indicates that this decrease was statistically significant. The average HDL increased by 10.49% from 42.60 ± 5.16 mg/dl to 47.07 ± 5.08 mg/dl. The reported p-value of 0.022 indicates that this increase was statistically significant. TC/HDL ratio decreased significantly by 17.37% from 4.36 ± 0.46 to 3.60 ± 0.31 (p=0.003).LDL/HDL ratio decreased significantly by 22.41% from 2.77 ± 0.40 to 2.15 ± 0.27 (p=0.005).HDL/LDL ratio increased significantly by 19.13% from 0.65 ± 0.21 to 0.77 ± 0.24 (p=0.016).

These findings suggest that yoga training positively affected lipid profile parameters, including reducing total cholesterol, triglycerides, LDL, and VLDL while increasing HDL levels. Additionally, improvements were observed in various lipid ratio measures.

7% of the participants reported complete relief and total satisfaction after the therapy program. 27% of the participants reported being much better than before the therapy program. This suggests a substantial improvement in their well-being compared to their initial condition. Most participants, 42%, reported being better than before the therapy. This indicates a positive change in their overall wellness.23% of the participants reported no change in their condition after the therapy program. This suggests that their overall wellness remained relatively stable. A small percentage, 1%, reported that their condition was worse than before the therapy program. This indicates that their overall wellness did not improve or may have worsened during the intervention.

DISCUSSION

Fasting and post-prandial blood glucose levels decreased significantly in our subjects following the yoga therapy program. This is consistent with earlier studies that reported that yoga training reduces FBG and PPBG levels and improves glycemic control.[8,14] The 20.62% reduction in FBG in our subjects is comparable with the 6.1-34.4% reduction reported in a review of 25 studies on yoga and diabetes by Innes and Vincent.[4] has reported an improvement in insulin sensitivity and a decline in insulin resistance in subjects practicing yoga, while Manjunatha *et al*. [16] reported that the performance of asanas leads to an increased sensitivity of the b cells of the pancreas to glucose signals. A similar mechanism may be responsible for the improvements in blood sugar levels of our subjects. Increased sympathetic activity, enhanced cardiovascular reactivity, and reduced parasympathetic tone have been strongly implicated in the pathogenesis of insulin resistance syndrome, atherosclerosis, and cardiovascular diseases[12]. Innes and Vincent[4] have suggested that yoga reduces this risk profile by decreasing activation of the sympathoadrenal system and the hypothalamic-pituitary-adrenal axis and promoting a feeling of well-being along with direct enhancement of parasympathetic activity via the vagus nerve. They also suggested that yoga provides a positive source of social support, a factor associated with reduced risk for cardiovascular diseases[4]. All these factors apply to our study and may explain the positive changes produced following adherence to the comprehensive yoga therapy program.

It has been reported that a short lifestyle modification and stress management educational program leads to remarkable improvement in subjective well-being scores and can, therefore, make an appreciable contribution to the primary prevention and management of lifestyle diseases. [7] Most of our patients reported improved appetite, ability to concentrate, control anger, confidence levels, ease of breathing, energy level, and enjoyment of life with calm and fresh feeling. [15]. They also reported a reduced feeling of hopelessness, nervousness, and loneliness. They reported improvements in general flexibility and joint mobility along with better general mood, relaxation, and well-being [9]. Menstrual cycles normalized in all four patients who were pre and peri-menopausal. There was a decrease in stress levels with improved quality and duration of sleep. This is similar to a recent report that yoga improves psychological outcomes in type 2 diabetes patients with improved well-being and reduced anxiety.[13] Yoga may improve the mental and emotional components of the personality, and the subjective well-being reported by our participants may be a contributing psycho-physiological factor to the desirable improvements shown by our patients[11]. This aspect needs further exploration. Interestingly, one participant who did not practice at home reported that there was an increase in her medication. In contrast, the one who practiced every day at home reported that her medication had reduced. Though both had reported improvements in the well-being questionnaire, the responses of the one who practiced every day were in the range of 'much better' to 'total relief' while responses of the other were mainly in the 'same' to 'better' range.

The present study has several strengths that contribute to the validity and reliability of the findings:

Excellent compliance and regularity of yoga practice: The participants in the study demonstrated outstanding compliance and regularity in practicing yoga. The attendance rate was reported to be 99.63% during the directly supervised sessions. Additionally, the participants practiced regularly at home, with only one patient reporting irregular practice. The average frequency of home practice was four days per week, with each session lasting 30-40 minutes. This high level of compliance and regularity enhances the study's internal validity and strengthens the reliability of the observed benefits. The study utilized a comprehensive yoga therapy program, which likely contributed to the all-around benefits observed in the participants. The program may have addressed multiple aspects of health and well-being, targeting various physiological and psychological factors associated with diabetes and cardiovascular risk [6]. The comprehensive nature of the program suggests that the observed improvements can be attributed to the holistic approach of yoga practice. The study specifically included peri and post-menopausal female participants. This is important because menopause is associated with hormonal changes that can negatively impact cardiovascular health and increase the risk of cardiovascular disease. By focusing on this population, the study highlights the significance of the decrease in cardiovascular risk profile observed in the participants. This adds to the clinical relevance of the findings and suggests that yoga therapy may be particularly beneficial for women in this stage of life.

The absence of a control group and accidental sampling are study weaknesses. Since our participants also received hospital drugs, it is challenging to compare yoga, physical

therapy, and medical care. Yoga and physical therapy offer additional benefits, given that the medical treatment approach that stabilized patients' clinical state was not altered. More randomized controlled trials are required to validate these outcomes and expand our understanding of their benefits.

CONCLUSION

The study's findings indicate that a comprehensive six-week yoga therapy training program can significantly improve health aspects among peri and post-menopausal diabetes patients. Specifically, the program positively affected blood glucose levels and lipid profile. Furthermore, the improvements in blood glucose levels and lipid profile, such as decreased fasting blood glucose and post-prandial blood glucose, as well as reduced total cholesterol, triglycerides, LDL cholesterol, and VLDL cholesterol, indicate positive changes in metabolic health and cardiovascular risk factors. The comprehensive nature of the yoga therapy program, coupled with the excellent compliance and regularity of practice observed in the study, suggests that yoga can be an effective complementary or integrative therapy in managing diabetes mellitus. By combining standard medical management with yoga therapy, individuals with diabetes may experience enhanced benefits and improved overall health outcomes. These findings support the potential of yoga as a holistic approach to health and highlight the importance of considering yoga as part of an integrative therapy program for individuals with diabetes, particularly those in the peri and post-menopausal stages. Further research and studies are warranted to validate these findings and explore yoga therapy's long-term effects and sustainability in managing diabetes and related health conditions.

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