



EFFECT OF YOGIC TECHNIQUE ON THE GLYCAEMIC LEVEL: A PILOT, RANDOMIZED AND COMPARATIVE STUDY BETWEEN THE WALKING AND YOGA IN ADULT FEMALE WITH THE TYPE 2 DIABETES MELLITUS

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Abstract:

Introduction: Nearly 80% of type 2 diabetes is either preventable or controllable by changing the diet, increasing physical activity and improving the living environment. The present study is aimed to ascertain and compare the effect of walking and yogic exercises on the glycaemic level of adult female with the type 2 diabetes mellitus. **Methodology:** A total of 20 diabetic patients are asked to carryout either yoga or walking based on the randomization for the 15 consecutive days for 1 hour daily between 6 am and 7 am with an empty stomach. Blood glucose level of the participants are measured using calibrated glucometer about 10 minutes prior to treatment on the first day (Baseline) and after the treatment on the 15th day. **Results:** Blood glucose level of the participants has been reduced from its baseline at the end of 15th day in both the walking and yogic exercise. However the yoga group shows a significant post treatment blood glucose reduction ($p < 0.0458$) than the walking group ($p < 0.4505$) at 90%, and 95% confidence level. **Conclusion:** The findings conclude that the yogic exercises have enhanced the blood glucose lowering capacity along with the pharmacological treatment and may be practiced as a adjuvant therapy for the Type 2 diabetic population to reduce or prevent the long term complications. However, the results of pilot study needs to be validated by a pivotal study.

Key Words: Yoga, Blood Glucose, Type 2 Diabetes Mellitus, Walking.

Introduction:

Antiquity of the traditional medicine dates back to over 4000 years, as evidence in the Atharva Veda (the science of life). The aim of the traditional medicine according to the Charak is to maintain the health of healthy person and relieve the suffering.

“Swasthasya swasthya rakshanam athurasya vyadhi parimokshanam” - Charak

The ancient Indian physicians had a sound knowledge of Diabetes. They described the clinical features and complications of diabetes vividly. Both the Sushruth and Charak emphasized the importance of diet and exercise in the management of diabetes. The science of yoga is an ancient one. It is a rich heritage of our culture. Several older books make a mention of the usefulness of yoga in the treatment of certain diseases and preservation of health in normal individuals. It has now become the subject of modern scientific evaluation.

The claim of curing diabetes in yogic exponents is perhaps an expression of the good control of diabetes achieved on the type 2 diabetes subjects, who also respond to diet and exercise. Studies have been carried out in our country to evaluate the effect of yoga on diabetes. Most of these studies were done on small number of patients, over a small period of time and just relied on blood sugar estimations to assess the results. These studies had also combined Pranayama and several other yogic practices which

mode it difficult to interpret the individual contributions.

Diabetes is one of the major causes of premature illness and death worldwide. The prevalence of diabetes in adult was estimated around 285 million (6.4%) in 2010 and the number is expected to grow 439 million (7.7%) by 2030. India is the world's largest diabetes population with 50.8 million, followed by China with 43.2 million. Adult diabetes is expected to increase about 69% in developing countries and 20% in developed countries which may be due to the population growth, aging, urbanization, increasing prevalence of obesity, physical inactivity and hereditary nature of the disease. Type 2 diabetes accounts for the 85-95% in all the diabetes in the high income countries and even in higher percentage in the low and middle income countries. Diabetic research across the globe confirm that then uncontrolled diabetes leads to the diabetic related complications either acute or chronic which increases the burden, cost of the treatment and finally results in premature death. About 80% of type 2 diabetes is either preventable or controllable by changing the diet, increasing physical activity and improving the living environment.

Physical activity includes walking which is the most widely recommended physical activity for the people with diabetes. Hence the walking increases the blood sugar utilization by the muscles which help in controlling the weight which in turn can reduce the health risks.

Other form of physical activities includes yoga which is being practiced all over the world and has established beneficial effects on human. Many clinical research has suggested that the yoga may be equally effective as or better than the exercises which in improves a variety of health related outcome measures including the heart rate variability, blood glucose, blood lipids, salivary cortisol, oxidative stress, fatigue, pain, and sleep both in the healthy and ill populations.

The present study is aimed to ascertain and compare the effect of walking and yogic exercise on the glycaemic level of adult female with the type 2 diabetes mellitus.

Methodology:

This descriptive observational study was carried out prospectively for the period of 15 consecutive days. A total of 20 diabetic patients who met all the inclusion criteria and none of the exclusion criteria was included in the study.

Inclusion Criteria:

Female diabetic patients above 18 years of age, who were medically eligible for walking and yogic exercise (Certified by Qualified Physician) were included in the study.

Exclusion Criteria:

Diabetic patients below 18 years of age, who were mentally retarded and differently-abled were excluded from the study.

Data Collection Form:

The data were collected using a well-designed 'Data Collection Form' organized under four sections (Table 1).

Table 1: Organization of the Data Collection Form

Section	Contents
1	Brief introduction about the study, procedures planed on the participants and written informed consent
2	Demographic data of the diabetic patients
3	Disease status
4	Study related data entry

Study Design:

Enrolled participants were allotted the identification number based on first come

first serve basis and were equally divided into two groups (Group 1: Walking Group and Group 2: Yoga Group) based on randomization. The study protocol was explained to the participants and written informed consent was obtained from the each participant prior to study related activities. The study participants were trained under the guidance of a certified yoga teacher to carryout yoga (which are listed in the Table 2) the day prior to start of the study. The study participants were asked to carryout either yoga or walking based on the randomization for 15 consecutive days for 1 hour daily between 6 am and 7 am with an empty stomach. Blood glucose level of thestudy participants were measured using calibrated glucometer on 10 minutes prior to the treatment on the first day (Baseline) and on the 15th day after the treatment. Participants were requested to continue their pharmacological treatment as per the daily scheduled.

Table 2: Treatment of Yoga Group

S.No	Yogic Exercises
1	Pawanmuktasana
2	Surya Namaskar
3	Ardha Mastyendrasana
4	Bhujangasana
5	Dhanurasana
6	Paschimottanasana
7	Salabhasana
8	Uttanpadasana
9	Yogamudra
10	Shavasana

Study Hypothesis and Statistical Analysis:

The hypothesis set prior to the start of the study was ‘Yogic Exercises significantly reduces the blood glucose level along with the pharmacological treatment than the walking’. The hypothesis was tested using the t test (Designed by Dr. C.E. Efstathiou, Department of Chemistry, National and Kapodistrian University of Athens, Greece) at 90%, 95% and 99% confidence level.

Results:

All the 20 participants completed the the study and none of them withdrew the consent till the end of the study. Data collected from the 20 diabetic patients were compiled, analyzed and discussed below. Table 3 reveals the participant’s general information.

Table 3: Summary of the Participant’s General Information

Age (in years)	Number of Patients (Percentage)
18-30	02 (10.00 %)
31-40	11 (55.00 %)
41-50	07 (35.00 %)
Diabetic since (in years)	Number of Patients (Percentage)
< 01	5 (25.00 %)
> 01-02	1 (05.00 %)
> 02-03	2 (10.00 %)
> 03-04	4 (20.00 %)
> 04-05	4 (20.00 %)
> 05-10	3 (15.00 %)
> 10-20	1 (05.00 %)
Blood Glucose Level (in mg/ml)	Number of Patients (Percentage)
> 120-150	1 (05.00 %)
> 151-175	5 (25.00 %)
> 176-200	5 (25.00 %)
> 201-250	1 (05.00 %)

> 251-300	8 (40.00 %)
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Around 90% of the participants were between the ages of 31 to 50 years and 40% of the participants had been diagnosed with diabetes around 3-5 years before nearly 50% participants of the Baseline blood glucose level was noticed between 151-200 mg/dl.

Effect of Walking and Yogic Exercises on the Blood Glucose Level:

Blood glucose level of the participants has been reduced from its baseline at the end of the 15th day in both walking and yogic exercises (Table 4).

Table 4: Summary of the Acute Effect of Walking and Yogic Exercise on Blood Glucose Level

Participant Identification Number	Group	Blood Glucose Value (in mg/dl)		P Valve
		Pre-Treatment	Mean Post Treatment	
01	walking	148	140	0.450528
03	walking	195	179	
04	walking	179	165	
05	walking	261	240	
09	walking	181	163	
11	walking	291	263	
12	walking	293	271	
14	walking	187	168	
15	walking	284	263	
16	walking	296	270	
02	Yoga	155	139	0.045897
06	Yoga	162	140	
07	Yoga	248	203	
08	Yoga	275	225	
10	Yoga	170	135	
13	Yoga	224	179	
17	Yoga	174	145	
18	Yoga	248	200	
19	Yoga	200	160	
20	Yoga	175	140	

However, the yoga group shows significant post treatment blood glucose reduction [(p = 0.0458), (p < 0.05), (Figure 1)] than the walking group [(p = 0.4505), (p > 0.05), (Figure 2)] at 90%, and 95% CL.

Figure 1: 't' Test between the Pre and Post Treatment of the Yoga Group

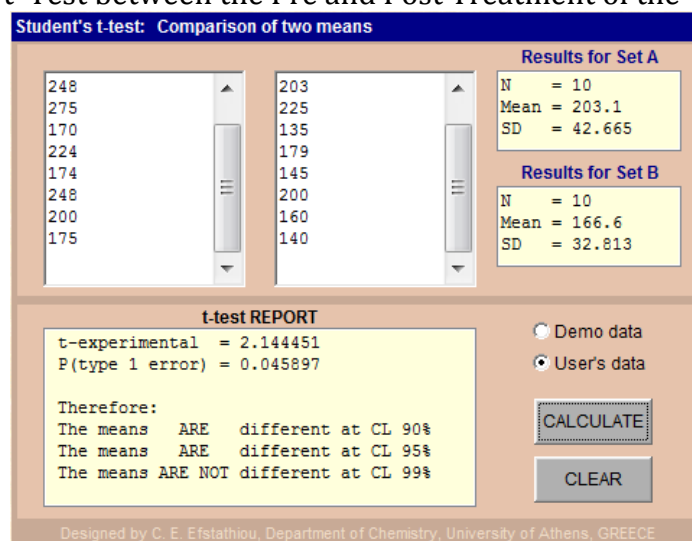
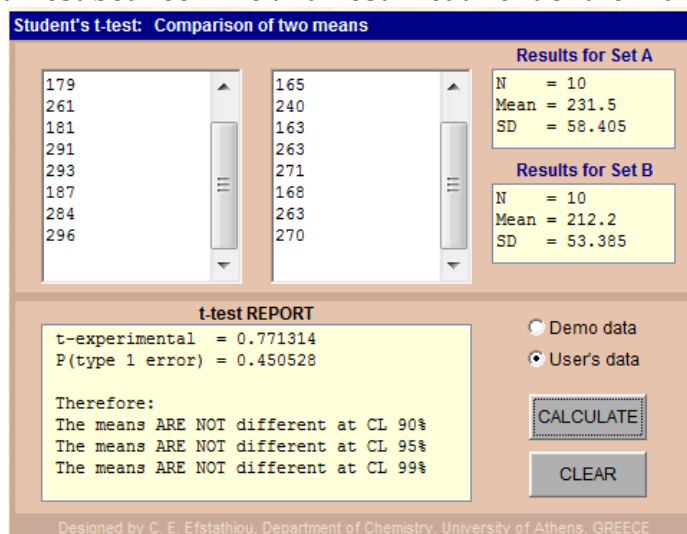


Figure 2: 't' Test between Pre and Post Treatment of the Walking Group



Discussion:

Pharmacological interventions along with the lifestyle modifications will be required to maintain normoglycemia and prevention of the diabetic complications. Diet and physical activities are the most recommended life style modification for the type 2 diabetes mellitus.

Life style modification includes walking, diet and yoga. However, during the walking, exercise muscles utilize the available glucose in the blood and burns out the calories which may substantially reduce the blood glucose level and provide a chance to decrease the complications of the uncontrolled type 2 diabetes. However, walking for an hour may not be possible for many of the diabetic patients due to the age and lack of the favorable environment in cities.

Yogacharya B.K.S Iyengar, the world's greatest living yoga master has included a group of 28 different yogic asanas in his book titled "Light on Yoga", It practiced under proper guidance would give relief to diabetes. Many international studies have reported the beneficial effect of the practice of yoga on diabetes. The basic mechanisms in which the yoga reduces the blood glucose level are listed in the Table 5 [15-17]. The study hypothesis was accepted as the yogic exercises significantly reduce the blood glucose level along with the pharmacological treatment than the walking.

Table 5: Mechanism of the Post Treatment Blood Glucose Reduction by the Yogic Exercise

S.No	Mechanisms of the Action
1	Abdominal contraction and relaxation produced by various yogic postures on the pancreas has a direct influence on pancreatic secretion by rejuvenation of the pancreatic cells.
2	Muscular relaxation, development and improved blood supply to the muscles might enhance the insulin receptor expression on the muscles causing the increased glucose uptake by muscles and thus reducing the blood sugar
3	Yogic postures reduce adrenaline, noradrenalin and cortisol in blood, which are termed as stress hormones which in turn decrease the glucagon secretion and possibly improving the insulin action.
4	Yogic postures reduce both the blood pressure and cholesterol levels which play a significant role in the development of diabetic and related complications.
5	Weight loss induced by the yoga is a well accepted mechanism

Conclusion:

The findings conclude that the yogic exercises will enhance the blood glucose lowering capacity along with the pharmacological treatment and may be practiced as a

adjuvant therapy for the Type 2 diabetic population to reduce or prevent the long term complications. However, the results of the pilot study need to be validated by a pivotal study.

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