

SCIENTIFIC JOURNAL OF PHYSICAL EDUCATION AND ALLIED SUBJECTS

Vol.1, No.1, July. 2011

ISSN 2231 - 041 X



SOCIETY OF PHYSICAL EDUCATION AND SPORTS SCIENCES
Puducherry

Department of Physical Education & Sports
Pondicherry University
(a Central University)



EFFECT OF DIFFERENT TIME YOGA PRACTICE ON BLOOD SUGAR LEVEL OF DIABETIC PATIENTS

Dr. Bhavani. Ahilan

Abstract

Chronic diseases are now the leading cause of death worldwide, and their impact is steadily increasing. In response, WHO has called for the strengthening of national strategies for the prevention of cardiovascular disease, cancer and diabetes. The purpose of the study was to find out the effect of different time yoga practice, such as morning and evening on blood glucose level of diabetic patients. To achieve this purpose of the study, only thirty diabetes patients were selected from Government hospitals in Chidambaram were randomly selected as subjects and they were divided into three equal groups. Each group consisted of ten subjects. Group-I (n=10) underwent morning yoga practice, group -II (n=10) evening yoga practice and group III (n=10) acted as control that did not participate any yoga practice. The subjects were tested on selected criterion variable such as, blood glucose of post parandial glucose and fasting glucose at prior to and immediately after the yoga practice. The selected criterion variables such as fasting glucose and post parandial glucose will be measured by using Boehringer Mannheim kit. The analysis of covariance (ANCOVA) was used to find out the significant difference if any, between groups on each selected criterion variables separately. In all the cases, 0.05 level of confidence was fixed to test the significance, which of the paired mean was differ, the Scheffe's test was used as post-hoc test. In this study, shown from the analysis of the data, it was inferred from the results that there was a significant decrease on selected criterion variables such as post parandial and fasting glucose level of diabetes patient, due to the various time yoga practice (i.e. morning and evening yoga practice). And also there was a significant decrease after the morning and evening yoga practice on selected criterion variables when compared with the control group. Moreover the morning yoga practice group was better decrease after the yoga training period on selected criterion variables when compared with the control group.

Key words: Yogic Exercises, Diabetes, Blood glucose.

* Senior Lecturer, Sports Science Unit, University of Jaffna, Thirunelvely, Jaffna, Sri Lanka.

Introduction

Diabetes is a major contributor to the global burden of chronic disease, and it is estimated that its prevalence may increase by as much as 80% in some regions over the next 10 years (WHO, 2005). The regular physical activity has been widely accepted to be beneficial both in the general population and in patients with metabolic syndrome (Turhan, 2006). The diagnosis and treatment of metabolic syndrome have become increasingly important (Lavie, 2004). The prevalence of this syndrome may approach 60% in patients with coronary events (Milani, 2003). Although most patients with adult onset (type 2) diabetes mellitus also have the metabolic syndrome, some do not (Lavie, 2004). In one study, patients with metabolic syndrome but without diabetes had a considerably worse cardiovascular prognosis than patients with diabetes and no metabolic syndrome; the combination of diabetes and the metabolic syndrome had the worst prognosis (Alexander, 2003).

Among chronic diseases, diabetes is one of the most demanding in terms of behavioral changes (Cox & Gonder Frederick, 1992). The outcome of diabetes treatment is highly dependent on the patient having a healthy lifestyle. Lifestyle, including an appropriate diet and regular exercise, has been reported to control diabetes effectively (Klein et al., 2004). However, substantial patience and effort are required to form healthy eating habits and to continue regular exercise.

Diabetes is a condition when the pancreas in the human body fails to produce insulin. Incidentally, insulin is the hormone that converts the sugar in the food into energy. Insufficient secretion of insulin by pancreas results in excess glucose level in the bloodstream, resulting in diabetes. The blood glucose is required to be used up to provide energy and fuel to the body, in order to do its work. If the level of glucose is high, it eventually affects the body parts. A person suffering from diabetes portrays symptoms, which could be fatigue, hazy vision, excessive thirst, weight loss and an increase in appetite.

Yoga is an ancient art on a harmonizing system of development for the body, mind and spirit. For the past decade it has been believed that yoga alleviates stress and induces relaxation. In the present time, more and more people, especially the westerners are resorting to yoga to find cure for chronic health problems and attain a peace of mind. Yoga is one of the six schools of Indian philosophy and is also part of ayurveda which is an Indian traditional medical system (Birch, 1995). Health is promoted by seeking balance between the physical, spiritual, psychological, and social aspects (Engebretson, 2002).

Yoga therapy is the adaptation of yoga practices for people with health challenges. Yoga therapists prescribe specific regimens of postures, breathing, exercise and relaxation techniques to suit individual needs. Medical research shows that yoga therapy is among effective complementary therapies for several common ailments.

Methodology

Selection of Subjects:- To achieve this purpose of the study, only thirty diabetes patients were selected from Government hospitals in Chidambaram were randomly selected as subjects and they were divided into three equal groups. Each group consisted of ten subjects. Group-I (n=10) underwent morning yoga practice, group -II (n=10) evening yoga practice and group III (n=10) acted as control that did not participate any yoga practice.

Selection of variable:- The subjects were tested on selected criterion variable such as, blood glucose of post parandial glucose and fasting glucose at prior to and immediately after the yoga practice. The selected criterion variables such as fasting glucose and post parandial glucose measured by using Boehringer Mannheim kit.

Statistical technique employed for analysis of data:- The analysis of covariance (ANCOVA) was used to find out the significant difference if any, between groups on each selected criterion variables separately. In all the cases, 0.05 level of confidence was fixed to test the significance, which of the paired mean was differ, the Scheffe's test was used as post-hoctest.

Training Programme

During the training period, the experimental group-I underwent the morning yoga practice, group-II underwent the evening yoga practice. The training intensity was five days per week for six weeks morning 6.00A.M to 7.00 (Group I)and evening 5.00 P.M to 6.00 P.M (Group II) and group III acted as control who did not participate any special activities. The subjects underwent the respective programmes as per the schedule under the supervision of the investigator. Each training session was conducted only in the morning and evening time. Prior to every training session both the groups had a ten minutes warm-up exercise involving stretching and breathing awareness. All the subjects involving in the training programmes were questioned about their stature throughout the training period .None of them reported injury. However, muscle soreness and fatigue were reported in the early weeks, which subsided later.

Result of the Study

Table I Analysis of covariance on Blood Glucose during Post Parandial and Sasting of morning and evening Yoga Practice Groups and Control Group

			Morning yoga practice group	Evening yoga practice group	Control Group	SOV	Sum Squares	df	Mean square	'F' ratio	
Post Parandial Glucose	Pre-test	\bar{X}	245	253	240	B:	40.18	2	20.09	0.39	
		σ	15.30	14.25	12.40	W:	1377.8	27	51.02		
	Post-test	\bar{X}	190	210	250	B:	15635.5	2	7817.75	104.30*	
		σ	7.35	7.80	10.55	W:	2023.8	27	74.95		
	Adjusted Post-test mean			193	205	243	B:	12676.8	2	6338.43	95.44*
							W:	1726.7	26	66.41	
Fasting Glucose	Pre-test	\bar{X}	170.4	172.2	173.1	B:	6.54	2	3.27	0.074	
		Σ	7.30	7.59	4.58	W:	1190.9	27	44.11		
	Post-test	\bar{X}	115.9	120.6	174.9	B:	12615.3	2	6307.65	298.65*	
		σ	4.50	4.90	4.50	W:	570.20	27	21.12		
	Adjusted Post-test mean			115.8	120.5	174.9	B:	14518.8	2	7259.4	239.50*
							W:	788.23	26	30.31	

* Significant at .05 level of confidence.

(The table value for significance at 0.05 level of confidence for 2 and 27 and 2 and 26 are 3.35 and 3.37).

Table I shows that obtained 'f' ratio value of 0.39 for pre-test score of morning yoga practice group, evening yoga practice group and control group on *post parandial glucose* was less than the required table value of 3.35 for significance with df 2 and 27 at .05 level of confidence. The obtained 'f' ratio value of 104.30 for post test score of morning yoga practice group, evening yoga practice group and control group was more than the required table value of 3.35 for significance with df 2 and 27 at .05 level of confidence. The obtained 'f' ratio value of 95.44 for adjusted post-test scores of morning yoga practice group, evening yoga practice group and control group was more than the required table value of 3.37 for significance with df 2 and 26 at .05 level of confidence.

Table I shows that the obtained 'f' ratio value of 0.074 for pre-test score of morning yoga practice group, evening yoga practice group and control group on *fasting glucose* was less than the required table value of 3.35 for significance with df 2 and 27 at .05 level of confidence. The obtained 'f' ratio value of 298.65 for post test score of

morning yoga practice group, evening yoga practice group and control group was more than the required table value of 3.35 for significance with df 2 and 27 at .05 level of confidence. The obtained 'f' ratio value of 239.50 for adjusted post-test scores of morning yoga practice group, evening yoga practice group and control group was more than the required table value of 3.37 for significance with df 2 and 26 at .05 level of confidence.

Table II Scheffe's Test for the Difference between the Adjusted Post-test Mean of Post Parandial Glucose and Fasting Glucose (mg / dl)

	Adjusted post- test Mean				
	Morning yoga practice group	Evening yoga practice group	Control group	Mean difference	Confidence interval at .05 level
Post Parandial Glucose	193	205		12*	9.43
	193		243	50*	9.43
		205	243	38*	9.43
Fasting Glucose	115.8	120.5		4.7*	4.506
	115.8		174.9	59.1*	4.506
		120.5	174.9	54.4*	4.506

* Significant at .05 level of Confidence

Table –II shows that the adjusted post-test mean difference in *post parandial glucose* level between morning yoga practice group and evening yoga practice group, morning yoga practice group and control group, and evening yoga practice group and control groups are 12, 50 and 38 respectively, which are higher than the confidence interval value of 9.43. It may be concluded from the results of the study that there is a significant decrease in post parandial glucose for the training groups as compared to control group. Further the post parandial glucose decrease for morning yoga practice group followed by evening yoga practice group.

Table –II shows that the adjusted post-test mean difference in *fasting glucose* level between morning yoga practice and evening yoga practice group, morning yoga practice group and control group, evening yoga practice group and control groups are 4.7, 59.1 and 54.4 respectively, which are higher than the confidence interval value of 4.506. It may be concluded from the results of the study that there is a significant decrease in fasting glucose for the training groups as compared to control group. Further the fasting glucose decrease for morning yoga practice group followed by evening yoga practice group.

Discussion

Diabetes has reduced life expectancy, and it is estimated that more than one third of Americans born in 2000 have the risk of developing diabetes in their lifetime (Narayan,

et al 2003).

India has a high prevalence of diabetes mellitus and the numbers are increasing at an alarming rate. In India alone, diabetes is expected to increase from 40.6 million in 2006 to 79.4 million by 2030. Studies have shown that the prevalence of diabetes in urban Indian adults is about 12.1%, the onset of which is about a decade earlier than their western counterparts and the prevalence of Type 2 diabetes is 4-6 times higher in urban than in rural areas (Mehta, 2009)

Many studies have reported the beneficial effect of the practice of yoga on diabetes. (Desai, 1985, Divekar and Bhat. 1981, Koshti et al, 1972, Patel, 1973, Sahay, et al 1984, Tulpule, 1977, Udupa, Ramaiah, 1986). Some studies have mentioned up to 65 per cent beneficial effect of yogic therapy for diabetes. Udupa has even mentioned 5 cases of juvenile diabetes that were completely controlled by yogic treatment. All of these studies have emphasized the possible mechanism of the yogic practices as:

1. Direct influence on pancreatic secretion by rejuvenation of the pancreatic cells, through alternate abdominal contractions and relaxation, during asana (yogic postures which produce relaxation) and breathing exercises.
2. Reduction in blood sugar due to muscular exercise involved in the asana.

Meditation may modulate limbic system activity, which via the hypothalamus may modulate sympathetic nervous system activity and regulate endocrine secretions. Conditioning of these regions by practice of meditation may help in maintaining the normal homeostatic conditions. The fundamental effect of stress reduction may be an important factor contributing to seizure reduction and EEG changes (Yardi, 2001).

Strict glycemc control has proven to be beneficial in preventing and delaying complications related to diabetes (Stratton et al., 2000). However, controlling blood glucose without lifestyle change has not been effective because unhealthy lifestyle choices such as overeating, lack of exercise and stress are known to influence glycemc control (Matsumoto, Ohno, Noguchi, Kikuchi, & Kurihara, 2006).

A few studies have shown that a lifestyle change program is as effective as other treatments such as drugs. For example, lifestyle changes were almost twice as effective as metformin therapy in those with impaired glucose tolerance (Knowler et al., 2002). Lifestyle changes were as effective as insulin treatment in improving glycemc control in patients with poorly controlled type 2 diabetes (Aas et al., 2005). However, it is important to take prescribed medication consistently so that behavioral intervention can be effective (Lauritzen et al., 2000).

Among chronic diseases, diabetes is one of the most demanding in terms of behavioral changes (Cox & Gonder-Frederick, 1992). The outcome of diabetes treatment is highly dependent on the patient having a healthy lifestyle. Lifestyle, including an appropriate diet and regular exercise, has been reported to control diabetes effectively (Klein et al., 2004). However, substantial patience and effort are required to form healthy

eating habits and to continue regular exercise. Hwang, Yoo, and Kim (2001) reported that the compliance level of patients with type 2 diabetes diminished over a 4-month period following intervention by nurse researchers. Wing, Venditti, Jakicic, Polley, and Lang (1998) and Aas, Bergstad, Thorsby, Johannesen, and Birkeland (2005) reported that patients with diabetes could not maintain the effects of glucose control over a 9-month period following intervention. These findings suggest that good lifestyle habits and glucose control are difficult to maintain 4–9 months after the intervention, even though they showed positive effects during the intervention. Previous lifestyle modification studies (Yoo et al., 2004; Yoo, Kim, & Lee, 2006) showed short-term effect (0–2 months after finishing the program) of glycemic control; they have not yet reported the effect 6 months after finishing the program.

For long-term effects, patients were required to sustain their efforts to continue self-management with increasing self-efficacy for control of diabetes (Rapley & Fruin, 1999).

In this study, shown from the analysis of the data, it was inferred from the results that there was a significant decrease on selected criterion variables such as post prandial and fasting glucose level of diabetes patient, due to the various time yoga practice (i.e. morning and evening yoga practice). And also there was a significant decrease after the morning and evening yoga practice on selected criterion variables when compared with the control group. Moreover the morning yoga practice group was better decrease after the yoga training period on selected criterion variables when compared with the control group.

Conclusions

Diabetes mellitus has reached epidemic proportions worldwide as we enter the new millennium. The World Health Organization. (WHO) has commented there is 'an apparent epidemic of diabetes which is strongly related to lifestyle and economic change'. Over the next decade the projected number will exceed 200 million. Most will have type-2 diabetes, and all are at risk of the development of complications.

Diabetes represents a spectrum of metabolic disorders, which has become a major health challenge worldwide (King, 1998). The unprecedented economic development and rapid urbanization in Asian countries, particularly in India has led to a shift in health problems from communicable to non-communicable diseases. Of all the non-communicable diseases, diabetes and cardiovascular diseases lead the list (Mehta, 2009).

Research in India has recognized it as a psychosomatic disorder with causative factors being sedentary habits, physical, emotional and mental stress. Many studies there have confirmed that the practice of the postures can rejuvenate the insulin producing cells in the pancreas of diabetics of both types, and that doing the postures

Effect of different Time Yoga Practice on Blood Sugar Level of Diabetic Patients

in a relaxed manner, without exertion, yogic meditation and breathing help most patients to control the causes of diabetes (Govindan)

The practice of yoga regulates body physiology through control of posture, breathing, and meditation. Hence Yoga helps in enhancing health and sense of well-being. There are several asana suggested in Yoga that actively works upon human body to help to achieve a perfect balance between body requirements and energy produced. By balancing the hormonal production and organ functioning, yoga helps in healing several diseases and optimum healthy life.

Hence it has been concluded that Yoga may “cure” diabetes but there are several ways yoga can be beneficial in controlling diabetes. If medically prescribed regimens are followed by diabetic patient, they can safely add yoga to their treatment. Due to the potential impact on their glucose levels, and overall body function, great strides can be made through regular committed yoga practice.

Therefore regular practice of yoga may prevent and control the status of diabetes mellitus in world especially in India and produce optimum healthy population.

From the result of this study, it was concluded in the following ways.

1. It was concluded that there was a significant decrease on selected criterion variables such as post parandial and fasting glucose level of diabetes patient, due to the various time yoga practice.
2. It was also concluded that there was a significant decrease after the morning and evening yoga practice on selected criterion variables when compared with the control group.
3. The morning yoga practice group was better effect to reduce the after the training period on selected criterion variables (i.e.) post parandial glucose and fasting blood glucose.

Implication

- Yoga may be used a treatment modality to reduce the blood glucose level of diabetic patient.
- Practicing yoga in morning is more effective than in evening for reduce blood glucose level in diabetic patient.
- Yoga exercises gently tone and shape the body, improve posture and flexibility, and contribute to feelings of well-being. Most Yoga exercises have a profound effect on improving circulation, especially to the extremities.
- Yoga exercises help keep the blood vessels elastic, and Yoga exercise combined with relaxation training has even been shown to reduce high blood pressure in some cases.
- Yoga exercises gently press on the body's glands and organs, resulting in positive effects for the digestive, endocrine, and reproductive systems.

The Yoga Programme for Both Groups

S. No.	First Week	Duration	All the patient practice according to capacity
1	Warm up	10 min	Introduction and meaning to starting prayer Breathing awareness -Hands in and out breathing, Hands stretch breathing, Ankle stretch breathing. Stretching practices (loosing practices)-Slow jogging, Backward jogging, Forward jogging, Side jogging Bending Exercises -Forward and backward bending, side and twisting of waist
2	Surya Namaskar	40 min	Surya Namaskar
3	Asanas		Standing -Ardhaticakrasana, and Trikonasana Sitting -Paschimottanasana, Ustrasana, gomukhasana, Ardha matsyendrasana, Vajrasana Janu Sirsasana Prone -Makarasana, Dhanurasana. Supine - Navasana, Matsyasana,
4	Pranayama		Bharamari and Nadi Sudhi.
5	Relaxation	10 min	Abdominal breathing in shavana
6	Prayer		Closing Prayer

* This proramme repeat for six week and use prop, pillow and small cousin

Reference:

Books

Birch, B.B., (1995). New York, *Power Yoga*, Fireside.
Udapa, K.N. *Stress and its Management by Yoga*, p. 305-320

Journal

Aas, A. M., Bergstad, I., Thorsby, P. M., et al. (2005). "An intensified lifestyle intervention program may be superior to insulin treatment in poorly controlled type 2 diabetic patients on oral hypoglycemic agents: Results of a feasibility study", *Diabetic Medicine*, 22, 316-322.
Alexander, C.M., Landsman, P.B., Teutsch, S.M., et al.(2003). "NCEP defined metabolic syndrome, diabetes, and prevalence of coronary heart disease among NHANES III participants age 50 years and older", *Diabetes*, 52, 1210-4.

Effect of different Time Yoga Practice on Blood Sugar Level of Diabetic Patients

- Cox, D. J., & Gonder-Frederick, L. (1992). "Major developments in behavioral diabetes research", *Journal of Consulting and Clinical Psychology*, 60, 628–638.
- Desai, B.P. (1985). "Influence of yogic treatment on serum lipase activity in diabetics", *Yoga Mimamsa* Vol. XXIII, No. 3 & 4, p. 1 to 8, Jan.
- Divekar, M.V. and Bhat. (1981). "Effect of yoga therapy in diabetes and obesity", *Clinical diabetes update*, Diab. Assoc. India.
- Engebretson, J., (2002). "Culture and complementary therapies", *Complementary Therapies in Nursing & Midwifery*, 8, 177–184.
- Govindan, Marshall., and Bunn, Emilia Ripoll. "Yoga and Diabetes: The effects of exercise and yoga on Diabetes", *A Clinical Research (Part II of II)*, <http://www.experiencefestival.com/forum/photopost/>.
- Hwang, A. R., Yoo, J. S., & Kim, C. J. (2001). "The effects of planned exercise program on metabolism, cardiopulmonary function and exercise compliance in type 2 diabetes mellitus patients", *Taehan Kanho Hakhoe Chi*, 31, 20–30.
- Knowler, W. C., Barrett-Connor, E., Fowler, S. E., et al. (2002). "Diabetes Prevention Program Research Group. Reduction in the incidence of type 2 diabetes with lifestyle intervention or metformin", *The New England Journal of Medicine*, 346, 393–403.
- Lauritzen, T., Griffin, S., Borch-Johnsen, K., et al ; (2000). "Anglo-Danish-Dutch Study of Intensive Treatment in People with Screen Detected Diabetes in Primary Care. The ADDITION study: Proposed trial of the cost-effectiveness of an intensive multifactorial intervention on morbidity and mortality among people with type 2 diabetes detected by screening", *International Journal of Obesity and Related Metabolic Disorders*, 24, S6–11.
- Lavie, C.J., Milani, R.V.(2004). "Metabolic syndrome, inflammation, and exercise", *American Journal of Cardiology*, 93, 1334.
- King, H., Aubert, R.E., Herman, W.H. (1998). "Global burden of diabetes", 1995 -2025 - "Prevalence, numerical estimates and projections", *Diabetes Care*, 21, 1414-31.
- Klein, S., Sheard, N. F., Pi-Sunyer, X., et al. (2004). "Weight management through lifestyle modification for the prevention and management of type 2 diabetes: Rationale and strategies", A statement of the American Diabetes Association, the North American Association for the Study of Obesity, and the American Society for Clinical Nutrition.
- Koshti et al. (1972). "Electrophoretic pattern of serum proteins in diabetes mellitus as influenced by physical exercises (Yogasanas)", *Journal of the Mysore Medical Assoc*, 36 p. 64, July.
- Matsumoto, Y., Ohno, H., Noguchi, I., et al. (2006). "Disturbance of microcirculation due to unhealthy lifestyle: Cause of type 2 diabetes", *Medical Hypotheses*, 66, 550–553.
- Mehta, Lt Gen SR, Kashyap, Col AS., Das, Lt Col S. (2009). "Diabetes Mellitus in India- Abstract, The Modern Scourge", *MJAFI*, 65: 50.

- Milani, R.V., & Lavie, C.J. (2003). "Prevalence and profile of metabolic syndrome in patients following acute coronary events and effects of therapeutic lifestyle change with cardiac rehabilitation", *Am J Cardiol*, 92:50–4.
- Narayan, K. M., Boyle, J. P., Thompson, J., et al.(2003). "Lifetime risk for diabetes mellitus in the United States", *The Journal of the American Medical Association*, 290, 1884–1890.
- Patel, C. H. (1973). "Yoga and Biofeedback in the management of hypertension", *The Lancet* Nov. 10, p. 1053-1055.
- Raply, P., & Fruin, D. J. (1999). "Self efficacy in chronic illness: The juxtaposition of general and regimen-specific efficacy", *International Journal of Nursing Practice*, 5, 209–215.
- Sahay, B.K. et al.(1984). "The effect of yoga in Diabetes" in Bajay, J.S. "Diabetes mellitus in developing countries", New Delhi, *Interprint*, 379-381.
- Stratton, I. M., Adler, A. I., Neil, H. A., et al. (2000). "Association of glycemia with macro vascular and micro vascular complications of type 2 diabetes (UKPD 35): Prospective observational study", *British Medical Journal*, 321, 405–412.
- Tulpule, T.H.(1977). "Yogic exercises and diabetes Mellitus (Madhumeah)", *Journal of Diab. Assoc. India*, Vol. 17, 45.
- Turhan, Hasan., and Yetkin, Ozkan.(2006). "The impact of cardiorespiratory fitness on inflammatory markers in patients with metabolic syndrome". *International Journal of Cardiology*. 113, e122–e123.
- World Health Organization (2005). "Preventing chronic disease: a vital investment", *WHO*,
- Wing, R. R., Venditti, E., Jakicic, J. M., et al.(1998). "Lifestyle intervention in overweight individuals with a family history of diabetes", *Diabetes Care*, 21, 350–359.
- Yardi, Nandan. (2001). "Yoga for control of epilepsy". *Seizure*, 10: 7–12. <http://www.idealibrary.com>
- Yoo, J. S., Kim, E. J., & Lee, S. J. (2006). "The effects of a comprehensive life style modification program on glycemic control and stress response in type 2 diabetes mellitus", *Journal of Korean Academic Nursing*, 36, 751–760.
- Yoo, J. S., Lee, S. J., Lee, et al.(2004). "The effects of short term comprehensive life style modification program on glycemic metabolism, lipid metabolism and body composition in type 2 diabetes mellitus". *Journal of Korean Academic Nursing*, 34, 1277–1287.