

Effect of Siddha Samadhi Yoga Camps on Health and Nutritional Status of Obese and Diabetic Subjects

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Abstract: Yoga and meditation have long been considered to have beneficial effects on health. Many yoga camps in India banking on this belief claim to have the powers of reversing the ill effects of degenerative diseases. This paper examines the cumulative beneficial effects of Yoga, Meditation and changed food habits designed by one such camp, the Siddha Samadhi Yoga (SSY) camp on Obese and Non Insulin Dependent Diabetes Mellitus (NIDDM) subjects. Thirty obese and thirty NIDDM male subjects free from additional complications belonging to twenty five to forty five years of age were selected from two camps conducted in Mahaboob Nagar and Tirupathi. The BMI of all subjects was assessed. Blood samples were analyzed for post prandial blood glucose; serum cholesterol; serum iron and haemoglobin levels. Diet Survey was conducted on the basis of food intake record provided by the subjects. The food habits of obese and NIDDM subjects before and after the SSY camp of 18 days was also studied. There was a significant difference in pre and post prandial blood glucose level of obese subjects ($t = 7.6582 > 2.05$) and NIDDMs ($t = 24.4962 > 2.05$). The percent reduction in BMI is 7.8 and 4.1 in obese and NIDDM subjects respectively. Serum cholesterol levels among NIDDM subjects reduced by 4.1% and by 3.4% in obese subjects. Serum Iron and haemoglobin levels improved by 1.2% and 14.7% respectively in obese subjects while by 5% and 7.5% respectively in NIDDM subjects. The SSY camp has a significant effect in decreasing the post-prandial blood glucose and serum cholesterol levels, intake of calories, carbohydrates, cholesterol, fat and significant increase in the intake of fiber, vitamin C, iron and B-carotene.

Key words: Blood glucose, NIDDM, Obese, Serum Cholesterol, Siddha Samadhi Yoga Camp.

I. INTRODUCTION

Degenerative diseases and cancer are emerging as major causes of death not only in India but in other South and Southeast Asian countries as well. If present trends continue, India could emerge as one of the countries with the highest concentration of cases of diabetes mellitus and coronary heart disease (CHD) within the next three decades¹.

Obesity threatens to become the foremost cause of chronic disease in the world. Being obese can induce multiple metabolic abnormalities that contribute to cardiovascular disease, diabetes

mellitus, and other chronic disorders. Reasons for the rising prevalence include urbanization of the world's population, increased availability of food supplies, and reduction of physical activity^[2].

Evidence from several studies indicates that obesity and weight gain are associated with an increased risk of diabetes^[3,4] and that intentional weight loss reduces the risk that overweight people will develop diabetes^[5].

Obesity is generally regarded as one of the most common and serious nutritional problems confronting many communities today. Adults in India suffer from a dual burden of malnutrition; more than one-third of adults are too thin, and more than 10 percent are overweight or obese^[6].

Diabetes mellitus is one of the most common chronic diseases across the world and number of diabetic patients is on rise. In 2011 there were 366 million people with diabetes globally, and this is expected to rise to 552 million by 2030. Most people with diabetes live in low- and middle-income countries like India, and these countries will also see the greatest increase over the next 19 years^[7]. The estimate of the actual number of diabetics in India is around 40 million^[8].

Yoga, a form of physical exercise, is rapidly gaining popularity all over the world, not only for health and physical fitness, but also for therapeutic purposes. Yoga interventions are generally effective in reducing body weight, blood pressure and glucose level^[9]. Yogic training tends to reduce the cholesterol level which is significant in individuals having above normal limits^[10]. Yoga, a simple and economical therapy can be considered a beneficial adjuvant for NIDDM patients^[11]. Meditation reduces bodily stress which is evident with reduced blood levels of cortisol and a lowered rate of urinary excretion of nitrogen and may prove useful for persons suffering from anxiety state and depression^[12].

Antioxidant deficiency and free radical stress may be a risk factor for the development of diabetes and cardiovascular disease. It is possible that treatment with antioxidant vitamins may be protective^[13]. Now-a-days a new way of life comprising of *yogasana*, *pranayama*, meditation and changed food habits which is expected to lead a happy purposeful life with heightened consciousness and perceptiveness. One such yoga camp is Siddha Samadhi Yoga (SSY) camp which is said to invoke the true intellectual, emotional, mental and physical potential in each individual. These yoga camps claim to have the powers of reversing the ill effects of degenerative diseases^[14].

II. MATERIALS & METHODS

Thirty obese and thirty NIDDM male free from further complications of twenty five to forty five years of age were selected from two camps conducted in Mahaboob Nagar and Tirupathi, Andhra Pradesh, India. General information regarding economic status, educational status, occupation, family size etc. was elicited using General information questionnaire.

The BMI of all subjects were calculated based on the heights and weights recorded. Blood samples were analyzed for post prandial blood glucose; serum cholesterol; serum iron and haemoglobin levels. Diet Survey was conducted on the basis of food intake record provided by the subjects before and at the end of the SSY camp of 18 days.

The height and weight of all subjects were recorded following the methods of Jellifee^[15] BMI was calculated using the formula weight in kg / height in (m²) and compared with standard classification of James et al(1998). Five ml of the blood was drawn from each subject and divided into three portions, one for estimation of blood glucose by Nelson and Somayagi^[16] method, second for the estimation of serum cholesterol by Carr and Dreker^[17] Method and the other for serum iron by $\hat{a} - \hat{a} -$ dipyrldly method^[18], and finger prick samples were collected to estimate haemoglobin levels by cyanomethaemoglobin method^[19].

Diet survey was conducted to note down the food items consumed over a period of three days (2 working days + 1 holiday) before and at the end of the SSY camp using standard cup to measure the food they consumed. Based on the food intake record food consumed per day was computed. The mean nutrients were calculated by using the tables of food values.

The data on BMI, blood glucose; serum cholesterol; serum iron and haemoglobin levels, Dietary pattern and intake and personal well being of obese and NIDDM subjects was analyzed statistically. The percentages, mean, standard deviation, t- value and their test of significance were calculated.

III. RESULTS & DISCUSSION

The results on the effect of yoga camp on health status of obese and NIDDM subjects with reference pre and post levels of blood glucose and serum cholesterol is presented in Table 1 & 2.

Table 1: Pre and post levels of blood glucose levels of obese and NIDDM Subjects (n=30)

Details of subjects	Levels	Blood Glucose		
		Mean \pm SD	Difference in pre & post mean \pm SD	t' value
Obese Subjects	Pre-level	149.03 \pm 6.20	3.63 \pm 2.59	7.66
	Post-level	145.40 \pm 5.44		
NIDDM Subjects	Pre-level	233.43 \pm 19.84	35.38 \pm 7.91	24.49
	Post-level	198.05 \pm 6.21		

The mean difference between the pre and post blood glucose level of obese and NIDDM subjects were 3.64mg/dl and

35.38mg/dl respectively. The percent reduction of blood glucose was 2.44 \pm 2.59 in obese and 15.2 \pm 7.9 in NIDDM subjects.

Statistically there is a significant difference in pre and post prandial blood glucose level of obese subjects (t = 7.6582 > 2.05) and NIDDM subjects (t = 24.4962 > 2.05). The 't' value is greater than 't' critical value at 5 percent level.

Generally among normal subjects before breakfast blood usually contains about 80mg/dl glucose. After a meal the concentration rises because, the glucose absorbed from the gut passes through the liver in to general circulation, it may reach 132mg or even more, but rarely exceeds 177mg at which point glucose usually into the urine and in NIDDM subjects the mean fasting blood glucose level is very high, 120mg/dl and the post prandial level is higher 180mg/dl. It is observed that half of the subjects have above the normal range of post-prandial blood glucose level and in NIDDM subjects were having above the limits.

Table 2: Pre and post levels of serum cholesterol levels of obese and NIDDM Subjects (n=30)

Details of subjects	Levels	Serum Cholesterol		
		Mean \pm SD	Difference in pre & post mean \pm SD	t' value
Obese Subjects	Pre-level	258.97 \pm 8.84	8.92 \pm 4.2	11.60
	Post-level	250.05 \pm 7.82		
NIDDM Subjects	Pre-level	225.83 \pm 4.56	9.13 \pm 3.25	15.48
	Post-level	216.64 \pm 6.18		

The mean difference between the pre and post serum cholesterol level of obese and NIDDM subjects were 8.92mg/dl and 9.19 mg/dl respectively. The percent reduction of serum cholesterol level in obese was 3.44 \pm 4.20 and 4.069 \pm 3.249 in NIDDM subjects.

The effect of yoga camp of obese and NIDDM subjects on the pre and post serum iron is presented in Table 3.

Table 3: Serum iron levels before and after SSY camp (n=30)

Details of Subjects	Levels	Serum Iron		
		Mean \pm SD	Difference in pre & post mean \pm SD	t' value
Obese Subjects	Pre-Levels	139.41 \pm 7.97	6.69 \pm 3.23	11.35
	Post-Levels	146.10 \pm 7.28		
NIDDM Subjects	Pre-Levels	138.79 \pm 8.90	6.94 \pm 3.43	11.06
	Post-Levels	145.73 \pm 8.17		

The difference in pre and post serum iron levels was 1.69 μ g/dl in obese and 145.73 μ g/dl in group II. The percent increase in serum iron levels was 1.2 \pm 7.28 in obese against an increase of 5.0 \pm 3.43 in NIDDM subjects. There was a significant between pre and post serum iron levels of obese (t = 11.354 > 2.05) and NIDDM (11.063 > 2.05) subjects.

The effect of yoga camp of obese and NIDDM subjects on the pre and post levels of dietary pattern are presented in Table 4.

Table 4: Blood Haemoglobin levels of male subjects before and after SSY camp (n=30)

Details of Subjects	Levels	Blood Haemoglobin Levels		
		Mean ± SD	Difference in pre & post mean ±SD	t' value
Obese Subjects	Pre-Levels	10.16±0.87	1.49±0.62	7.85
	Post-Levels	11.66±0.89		
NIDDM Subjects	Pre-Levels	10.23±0.98	0.77±0.61	6.69
	Post-Levels	10.99±0.97		

The mean pre blood haemoglobin levels of obese and NIDDM subjects were 10.16g/dl and 10.23g/dl respectively. The post levels were 11.66g/dl and 10.99 g/dl respectively. Healthy normal adult man has about 13 – 14g% blood haemoglobin¹¹. The difference between pre and post level among obese subjects was 1.49g/dl and percent increase in haemoglobin was 14.71±0.87 and the difference between pre and post levels of NIDDM subjects was 0.77g/dl and percent increase in haemoglobin was 7.55±0.61 among NIDDM subjects.

In diabetics as the concentration of glucose in blood rises, more of it gets attached to haemoglobin and the combined molecule chemically estimated as glycosylated haemoglobin. In normal population the glycosylated haemoglobin concentration varies from 4 to 7%, while in diabetics it ranges from 8 to 18% of the total haemoglobin depending on the blood sugar level.

The effect of yoga camp of obese and NIDDM subjects on the pre and post levels of dietary pattern are presented in Table 5.

Table 5: Mean Nutrient intake of Subjects before and during SSY program (n=30)

Nutrients	Obese Subjects		NIDDM Subjects	
	Before	During	Before	During
Energy(Kcal)	1954.55	1667.51	1786.63	1576.84
Carbohydrate(g)	264.79	211.82	247.76	193.89
Protein (g)	59.89	57.95	53.45	50.60
Fat (g)	58.94	43.43	50.03	53.38
Fiber (g)	1.70	4.34	1.69	3.52
Iron(mg)	26.8	28.10	19.89	25.20
B- Carotene(µg)	1711.8	1940.38	1735.00	2002.2
Vitamin C(mg)	26.49	35.58	28.30	39.70

14.71 percent reduction of calories was observed in obese and 11.74 in NIDDM subjects. Percent reduction in carbohydrate intake was 20 & 21.74; Protein (3.24 & 5.33); Fat (26.31 & 29.28) dietary cholesterol (12.89 & 12.02) was observed in obese and NIDDM subjects respectively. Percent increase in intake of fiber (60.82 & 51.89) and Iron (31.83 & 26.69) was observed in obese and NIDDM subjects respectively. The percent intake of carotene was 14.71 in obese and 13.4 in NIDDM subjects but these values are still lower than the standard recommended intake which may be due to lowered intake of diet.

IV. SUMMARY

The SSY camp has a significant effect in decreasing the post-prandial blood glucose and serum cholesterol levels, intake of calories, carbohydrates, cholesterol, fat and significant increase in the intake of fiber, vitamin C, iron and B-carotene. The correlations obtained between the health parameters, hematological parameters and the energy and nutrient intakes are very obvious and significant.

V. CONCLUSION

A conscious sustained effort practiced through attitudinal changes implemented on right food habits and choices, exercise, yoga and meditation may have a cumulative impact on the continued beneficial effect on health and over all wellbeing.

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REFERENCES

- [1] **Gopalan C.**, Diet related chronic diseases in India changing trends *Bulletin of the Nutrition Foundation of India.*, 199617(3): 1-5
- [2] **Faisal Al-Mahroon, Khaldon Al-Rooni** Obesity among adult behavioural population. Impact of physical activity and educational level. *Annals of Saudi Medicine*, 2001, 21(3-4): 183-187.
- [3] **Ford ES, Williamson DF, Liu S.** Weight change and diabetes incidence: findings from a national cohort of US adults. *Am J Epidemiol.*1997;146:214-222.
- [4] **Resnick HE, Valsania P, Halter JB, Lin X.** Relation of weight gain and weight loss on subsequent diabetes risk in overweight adults. *J Epidemiol Community Health.*2000;54:596-602.
- [5] **Will JC, Williamson DF, Ford ES, Calle EE, Thun MJ.** Intentional weight loss and 13-year diabetes incidence in overweight adults. *Am.J Public Health.*2002;92:1245-1248.
- [6] **Whiting DR, Guariguata L, Weil C, Shaw J.** IDF Diabetes Atlas: Global estimates of the prevalence of diabetes for 2011 and 2030. *Diabetes Res Clin Pract* 2011;94:311-21
- [7] **Anjana RM, Pradeepa R, Deepa M, Datta M, Sudha V, Unnikrishnan R, Bhansali A, Joshi SR, Joshi PP, Yajnik CS, Dhandhanika VK, Nath LM, Das AK, Rao PV, Madhu SV, Shukla DK, Kaur T, Priya M, Nirmal E, Parvathi SJ, Subhashini S, Subashini R, Ali MK, Mohan V; ICMR-INDIAB Collaborative Study Group.** Prevalence of diabetes and prediabetes (impaired fasting glucose and/or impaired glucose tolerance) in urban and rural India: phase I results of the Indian Council of Medical Research-INDIA DIABetes (ICMR-INDIAB) study. *Diabetologia* 2011 Dec;54(12):3022-7
- [8] <http://www.diabetes.co.uk/global-diabetes/diabetes-in-india.html>.
- [9] **Kyeongra Yang** A Review of Yoga Program for four leading risk factors of chronic disease. *Evidence-Based Complementary & Alternative Medicine.* Vol 4 (2007), 4:487-491.
- [10] **Udupa, KN Singh, RH Singh MB (1978)** Physiological studies on the effort of a Yogic relaxation posture Savasana *J. Res. Ind. Med. Yoga & Homoeo* 13/1:147
- [11] **Suresh CJ, Alla U, Bharathnagar SOD, Talukdar B.** A study of responsive pattern of Non Insulin Dependent Diabetes Mellitus to Yoga therapy. *Diabetes Research & Clinical Practice* Vol 19 (1993), 1:69-74/
- [12] **Udupa, KN Singh, RH Singh MB and Shettiwar, RM (1995)** A comparative study on the effect of some individual yogic practices. *Ind. Jour. Med. Res.* 63:1060.

- [13] **Maritim AC, Sanders RA and Watkins JB (2003)** Diabetes, Oxidative stress and antioxidants: A Review *J Biochem Molecular Toxicology*, 17:1
- [14] **Yogeswar (1981)** Textbook of Yoga, Madras
- [15] **Jellifee (1996)** Assessment of Nutritional Status of the Community: with special reference to field surveys in the developing regions of the world, WHO, Geneva
- [16] **Nelson N and Somayagi M (1965)** Determination of Glucose, Hawk's Physiological Chemistry, Osler B2 Ed., New York, Mc Graw Hill Book Company, 14th Edition, 1054 – 55
- [17] **Carr JJ and Dreker IJ (1956)** Simplified Rapid Technic for the Extraction and Determination of Serum Cholesterol without Saponification, *Clinical Chemistry*, 2, 353
- [18] **Ramsay WNM (1973)**, The measurement of serum transferrin by iron binding capacity *Journal of Clinical Pathology*, 26:691 – 696
- [19] **Crosby,WH, E. Munn and Furth FW (1954)**. Standardizing a method for hemoglobinometry, *US Armed Forces Med J* 9 5:693.

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