

Evaluation Of Effect of Yoga on Body Mass Index and Serum Adiponectin Levels in Obese Individuals

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Abstract

INTRODUCTION

The global epidemic of Obesity is increasing and reaching critical proportions, affecting all sections of population. Adiponectin, a potent anti-inflammatory adipokine secreted by the adipose tissue whose levels are negatively correlated with visceral fat, obesity & insulin resistance. Yoga which is an ancient discipline that gives emphasis upon general wellbeing by way of integration of its three major components namely physical postures, breathing exercises and meditation. Regular practice of certain yogic postures and pranayama limits the inflammatory changes in obese by its potential anti-inflammatory actions and thus increasing Adiponectin levels. Based on this aim of our study is to evaluate the effect of Yoga on Pulmonary Function Tests & Serum Adiponectin levels in Obese Individuals.

MATERIALS & METHODOLOGY:

Prospective interventional study, done at Endocrine OPD of Rajiv Gandhi Govt General Hospital. The study included 30 obese individuals with BMI ≥ 25 of both gender in the age group of 18-35 years. A detailed history was taken & a complete physical examination was done before initiating Yoga training. Blood sampling was done to assess serum Adiponectin using ELISA method. The participants were subjected to Yoga training under the supervision of an experienced Yoga therapist for about 45 minutes per day, 6 days / week for a total period of 3 months. At the end of three months all parameters were reassessed.

RESULTS:

All the data obtained before & after yoga intervention were statistically analysed by using paired t test in SPSS Software. Results obtained showed that there was a significant reduction in anthropometric parameters like Weight, BMI, Waist Circumference & Waist Hip Ratio (p value < 0.01). Also, there was a significant improvement in serum Adiponectin also improved significantly (p value < 0.001).

CONCLUSION:

The results of this study clearly indicate that Yogasanas if practiced regularly reduces the possibility of Obesity related complications. Incorporation of yoga as part of our lifestyle promotes positive health and also useful in the treatment of many other systemic disorders

Keywords: Obesity, Yoga, Adiponectin

INTRODUCTION

Obesity may be defined as "A condition with excessive fat accumulation in the body to an extent that health and wellbeing are adversely affected". Obesity has emerged as a major public health problem with significant health and economic implications. The global epidemic of Obesity is increasing and reaching critical proportions, affecting all sections of population including children, adolescents and adults

in different socio-economic groups¹. "Obesity was recognized as a global epidemic in the year 1997 by the WHO". India, is right now in the period of rapid epidemiological transition.² The prevalence of obesity is increasing in different regions of our country. Studies done in India have shown that the prevalence of obesity in adults in the age group of 18-64 years ranges from 10-50 %.³ The „Chennai Urban Rural

Epidemiology Study (CURES)⁶ reported age standardized prevalence of generalized obesity and abdominal obesity to be 45.9% and 46.6% respectively. There are various studies that have demonstrated increased prevalence of obesity in women in India. Apart from genetic predisposition, sedentary life style and excess intake of calorie rich junk food have been attributed to the development of obesity.

Obesity can be measured by methods include skin fold thickness measurements, weight to height ratios, waist circumference, waist to hip ratio and hip circumference. "Body Mass Index (BMI) provides an estimate of composition of body which correlates a person's weight and height to lean body mass. Calculation of BMI is done according to the formula,¹⁰ $BMI = \text{Weight in kg} / \text{Height in m}^2$ ". BMI is also called "Quetelet Number or Quetelet Index" WHO has recognized BMI as the best epidemiological measure of obesity. Since Asians are prone to develop health complications even at a lower BMI, a BMI of ≥ 25 kg/m² may be classified as obesity (James et al, 2001)⁵. Large scale epidemiologic studies suggest that cardiovascular and metabolic morbidities begin to rise when BMI is ≥ 25 .

Adipose tissue is no longer considered as a mere tissue of fat storage. Adipose tissue secretes many biologically active molecules called adipocytokines that includes Leptin, Tumour necrosis factor- α (TNF- α), Plasminogen activator inhibitor-1 (PAI-1) & Adiponectin. Adiponectin is a 30 KD which is synthesized by adipocytes and its levels are negatively correlated with visceral fat, insulin resistance and type II diabetes mellitus. Adiponectin is a potent anti-inflammatory adipokine. Adiponectin reduces TNF- α mediated macrophage attachment to endothelial cells and thus protects against vascular injury which is an early event in the process of atherosclerosis. Studies have shown that plasma adiponectin levels are reduced in obese subjects than when compared to non-obese subjects. Since Adiponectin levels in obesity plays a critical role in the development of insulin resistance, vascular disorders and poor lung functions it becomes imperative that we examine the relation between adiponectin levels and obesity.

Even though advances have been made in the care and prevention of obesity, medical treatments become often unsuccessful even in patients who are compliant.

Various treatment approaches are: Caloric restriction & physical exercise, pharmacological agents and bariatric surgical procedures. Alternative therapy like yoga, which is an ancient discipline, is designed in such a way to bring both balance and health to the physical, mental and spiritual dimensions of a human being. Yoga training limits the inflammatory changes in obese by its potential anti-inflammatory actions & increases Adiponectin levels. This study is designed in such a way to explain & demonstrate the positive effects of Yoga on health particularly levels of adiponectin, whose levels tend to be reduced in obese individuals. Yoga has the potential to dampen the stress related changes in obesity & raises the circulating levels of Adiponectin thereby producing substantial health benefits. Bijilani RL et al⁶ showed that short term yoga based comprehensive lifestyle intervention caused a reduction in body mass index, blood pressure & blood glucose & improves lipid profile. Yadav R K et al⁷ observed that a short-term yoga-based intervention reduces stress & inflammatory markers like IL-6 and TNF- α in obese individuals. Based on this aim of our study is to evaluate the effect of Yoga on serum adiponectin in obese individuals.

MATERIALS AND METHODS

This study was conducted for a period of one year in the Institute of Physiology and Experimental Medicine and Department of Yoga and Naturopathy, Madras Medical College, the study protocol was approved by the Institutional Ethics Committee. Thirty Obese individuals of both sexes with BMI ≥ 25 in the age group of 18- 35 years were included in the study. Equal number of men and women (15 men and 15 women) participated in the study. Age Group: 18- 35 years, in healthy males and females with BMI ≥ 25 .

While pregnancy, post-partum period, patient with diabetes and hypertension, cardiovascular disorder or any other medical illness, Hypothyroidism, Anemia, PCODs in females, infectious diseases, history of drug intake like steroids, anti-diabetics, OCPs, anti-obesity drugs were excluded

Once the subjects were selected, they were briefed about the protocol and informed written consent was taken from the participants before commencement of the study. Demographic information and a detailed history with emphasis on symptoms of medical illness were obtained. Body Mass Index (BMI) was

calculated using Quetelet Index. Waist – Hip ratio was calculated. A complete general and systemic examination was done. About 5ml of fasting venous blood sample was collected from each of the participant to determine the serum Adiponectin level. RayBio R Human Adiponectin /ACRP30 ELISA kit was used for assaying serum Adiponectin levels.

The study group was made to participate in Yoga training of 45 minutes duration each day (6 days per week) that was conducted by an experienced & qualified Yoga and Naturopathy physician for a period of 3 months. The Yoga protocol was designed according to Bihar school of Yoga. The Yogasanas were performed in lying, sitting and standing postures. Each session was started with Surya Namaskar, followed by Asanas, Pranayama, Mudra and Relaxation. During the study period the participants were frequently advised about the importance of having a healthy nutritious diet comprising of fresh fruits and vegetables. At the end of 3 months serum Adiponectin levels were revaluated in the study group.

Using the Statistical Package for Social Sciences (SPSS) software version 21, all the data obtained from serum Adiponectin Levels done before & after Yoga were analyzed with paired t test.

RESULTS

In our study the patient's demographic data shows that the study group included thirty patients (M: F, 15:15) in the age range of 18- 35 years. The mean fasting blood sugar in our study group was 80.03 ± 6.8 , mean systolic BP was 120.8 ± 10.8 , mean diastolic BP was 79.2.

Anthropometric measure were taken before yoga intervention in our study group, mean weight was 79.3 ± 8.46 , mean height was 1.6 ± 0.05 , and mean body mass index was 30.82 ± 3.24 . We also analysed the waist circumference which was 101.7 ± 6.01 , hip circumference was 104.1 ± 5.2 and Waist Hip ratio was 0.97 ± 0.01 .

TABLE 1: Anthropometric parameters before and after yoga

PARAMETRS	BEFORE YOGA	AFTER YOGA	P VALUE
WEIGHT	79.30 ± 8.46	75.46 ± 8.52	<0.001
BMI	30.82 ± 3.24	29.10 ± 3.26	<0.001
WAIST CIRCUMFERENCE	101.77 ± 6.02	99.12 ± 5.83	<0.001
HIP CIRCUMFERENCE	104.17 ± 5.29	103 ± 5.23	0.02
WAIST HIP RATIO	0.97 ± 0.15	0.94 ± 0.01	0.002

We further analysed above anthropometric measurements before and after yoga for three months duration. The mean values of weight were found to be significantly reduced ($p < 0.001$) in the study group following Yoga therapy. The mean values of BMI were found to be significantly reduced ($p < 0.001$), in the study group following Yoga therapy. The mean values of WC, HC & WHR reduced significantly following yoga

TABLE 2: COMPARISON OF ADIPONECTIN BEFORE AND AFTER YOGA

VARIABLE	GROUP	NUMBER	MEAN	SD	
Adiponectin ($\mu\text{g/ml}$)	Before Yoga	30	8.23	1.16	<0.001***
	After Yoga	30	9.28	1.49	

The mean values of Adiponectin were found to be significantly improved ($p < 0.001$) in the study group after yoga therapy with an substantial increase in adiponectin levels after three months of yoga.

DISCUSSION

Weight reduction is considered as one of the effective means of reversing respiratory complications of obesity⁸. Yoga is also one form of physical activity gaining wide popularity. Yoga can be considered as an alternative to aerobic exercise and it focuses on relaxation and gives the practitioners a pleasurable experience and also relieves stress completely the purpose of this study was to evaluate changes in selected parameters and serum Adiponectin levels in obese individuals after 3 months of Yoga training. The parameters like Weight, BMI, Waist Circumference, Hip Circumference & Waist Hip ratio and Serum Adiponectin were compared in the study group before and after 3 months of yoga training.

Studies have shown that it takes generally 6-12 weeks for the positive effects of yoga to develop (Nagarathna et al 1985)⁹. Manoj et al¹⁰ studied the effect of duration of Yoga training on Pulmonary Function testing and demonstrated that a minimum of 8 weeks is required for significant improvement in PFTs and respiratory pressures in healthy sedentary adults. This is further supported by Visweswaraiah & Telles et al¹¹ who observed an increase of lung functions in patients with Tuberculosis after 2 months of yoga training. In accordance with these studies a duration of 3 months has been chosen for yoga training in this present study.

In this study, Yoga training included Surya namaskar Tadasana, Marjariasana Ardha Chakrasana, Ushtrasana, Bhujangasana, Naukasana, Pawanamuktasana, Matsyasana, and Paschimotanasana. In accordance with our study asanas like Matsyasana, Bhujangasana, Paschimotanasana, Marjariasana, and Ushtrasana were also included by Chanavirut et al¹²,

In this study there was a significant decrease in Weight and BMI after 3 months of Yoga training, Similar results were obtained in studies by Dhananjay et al, Benavides and Caballero¹³ et al & Lee JA et al. Mamta Mohan et al¹⁴ showed that there was a statistically significant reduction in weight, BMI, FBG & HbA1c and also a marked improvement in the cognitive state following a 60 day yoga regimen in

patients with Type 2 Diabetes mellitus. The decrease in body weight and BMI after Yoga training in this study may be related to abdominal stretching that occurs during Yogasanas that leads to regeneration of pancreatic cells, that in turn increases uptake and metabolism of glucose in target tissues; Expenditure of energy while performing yogasanas; Reduction in stress and improvement in mental status by yoga reduces the overeating associated with obesity and regulates the satiety centre (Dang K K et al)¹⁵

In this study, there was a significant reduction in waist and hip circumference and also waist hip ratio in the participants and the results were consistent with results of Vijay Tundwala et al¹⁶ who also demonstrated a significant reduction of waist hip ratio after 3 months of Yoga therapy in 75 obese subjects. Balaji PA et al¹⁷ also yielded reduction in waist-hip ratio after 3 months of yoga in patients with type 2 Diabetes. Yoga helps to reduce fat by burning fat from the waist region, and by changing abdominal obesity into peripheral „gynoid“ obesity because of change in insulin resistance. Asanas like Ardha chakrasana, Pawanamuktasana and Naukasana help to burn the fat in the waist region and help to reduce the waist circumference thereby reducing waist –hip ratio

In this study there was a significant improvement in Serum Adiponectin levels after 3 months of Yoga training and the results were in accordance with Lee JA et al¹⁸ who demonstrated that serum adiponectin levels significantly increased after 16 weeks of Yoga training in post-menopausal women with obesity. Similarly, Janice K. Kiecolt-Glaser et al¹⁹ observed that longer-term, yoga practice favourably changes the Leptin & Adiponectin levels in the body. Eizadi Mojtaba et al²⁰ showed that the role of aerobic exercise training in increasing adiponectin concentrations in obese asthmatic adults & concluded that since there is inverse relation between serum adiponectin levels, BMI & body fat percentage if exercise is accompanied by reduction of weight and body fat percentage it increases adiponectin levels.

The possible explanation for improvement in adiponectin levels may be that the expression of adiponectin mRNA in adipocytes increases with loss of weight which occurs with exercise and probably in yoga also.

CONCLUSION

The results of this study indicate that Yogasanas if practiced regularly can produce Weight loss, decrease BMI & Waist Hip ratio and increase the circulating levels of Adiponectin. As a result of these changes Yoga reduces the possibility of Obesity related complications. Incorporation of yoga as part of our lifestyle promotes positive health, also useful in the treatment of many other systemic disorders. Hence Yoga may be presented to any population as a culturally acceptable & economically feasible prescription for combating the consequences of many lifestyle & metabolic disorders. However further controlled studies on larger sample size are required to establish Yoga as an independent treatment modality in the management of diseases like obesity.

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