

# Effectiveness of Yoga and Brisk Walking On Blood Sugar among Hypertensive Men

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## Abstract

More than 30 million people have now been diagnosed with diabetes in India where maximum are having co-morbidity with hypertension. The crude prevalence rates in rural and urban areas in India are 9% and 3% respectively of the total population. The therapeutic interventions of these disorders are routine, continuous and costly. Thus an alternative source of reducing the hypertension is necessary. This study was to find out the effect of yogic practices and brisk walking on blood sugar among hypertensive Men. Three sets were designed with 30 subjects each where set I underwent yogic practices, set II underwent brisk walking and set III as control. This investigation was prepared by random designing that consisting of a pre and post test. The pre test was conducted for all the 90 subjects on blood sugar (both fasting and post prandial). The experimental sets were participated in their respective yogic practices and brisk walking exercises for a period of twelve weeks. The post tests were conducted for all the subjects by which the blood sugar (Fasting and post prandial) respectively after experimentation of yogic practices and brisk walking exercises. The data obtained were analyzed by Analysis of Covariance to assess the significant difference among the sets on post test for blood sugar to find out the effects of yogic practices and brisk walking among hypertensive men. Further, it was concluded that yogic practices controlled effectively the blood sugar of both fasting and post prandial among hypertension middle aged men than the control set. Brisk walking also effectively controlled blood sugar among hypertension middle aged men. As a conclusion, it was found that yogic practices are slightly effective than brisk walking on the selected blood sugar.

**Keywords:** *Yoga, Brisk walking, Blood Sugar (Fasting and post prandial), Hypertension.*

## 1. Introduction

The experience of oneness or unity with inner thoughts and feelings are well determined in Yoga. The dissolving nature of duality of mind and matter into the supremo is considered as unity. As a descriptive manner, it was determined that it is science of truth [1]. Many physical, physiological and psychological remedies are documented and mild to observable changes are noted while doing various asanas, pranayamas and meditation. It also defined the disciplining of the mind, intellect, the emotions, the will, which yoga presupposes, it means a poise of the soul which enables one to look at life in all its aspects evenly [2]. The major eight stages of yoga are yama (universal moral commandments), niyama (self purification and discipline), asana (postures), pranayama (control and regulation of breath), pratyahara (control of five senses), dharana (concentration), dhyana (meditation) and samathi (super conscious mind) [3].

The major biochemical benefits of yoga are decrease in blood glucose, sodium, total cholesterol, triglycerides, LDL cholesterol, VLDL cholesterol, catecholamines; whereas the increasing in HDL cholesterol,

cholinesterase, ATPase, hematocrit, hemoglobin, lymphocyte count, total white blood cell count, thyroxin, vitamin C and total serum protein were well documented [4,5].

Walking is generally distinguished from running in that only one foot at a time leaves contact with the ground: Human walking is accomplished with a strategy called the double pendulum [6]. During forward motion, the leg that leaves the ground swings forward from the hip. This sweep is the first pendulum. Then the leg strikes the ground with the heel and rolls through to the toe in a motion described as an inverted pendulum. The motion of the two legs is coordinated so that one foot or the other is always in contact with the ground. The process of walking recovers approximately sixty per cent of the energy used due to pendulum dynamics and ground reaction force [6,7].

In today's fast paced life, people are leading a very unhealthy lifestyle. The increasing rates of health diseases, stress levels, lack or inadequate sleep are caused due to the fast paced life style. People get so engrossed in coming up in life and forget the individuals' health. There is a popular saying 'If wealth is lost, something is lost, but if health is lost, everything is lost'. It is the apt time that people start concentrating on their health and well being. The major benefits of the walking are helps overcome depression, helps fight against stress and aids in relaxation, helps over come sleepless nights, helps to increase the body activity and provides flexibility, helps toning the body and helps to burn fat [8,9].

The fasting blood sugar or glucose (FBS) level is the most commonly used as indication of overall glucose homeostasis, largely because disturbing events such as food intake are avoided [10]. Abnormalities in these test results are due to problems in the multiple control mechanism of glucose regulation. Blood sugar (post prandial) is the metabolic response to a carbohydrate challenge is conveniently assessed by a postprandial glucose level drawn 2 hours after a meal or a glucose load. In addition, the glucose tolerance test, consisting of several timed measurements after a standardized amount of oral glucose intake, is used to aid in the diagnosis of diabetes [10,11]. The major aim of the study was to find out the effect of yogic practices and brisk walking on blood sugar (fasting and post prandial) among Hypertensive Men.

## 2. Materials and Methods

After obtaining the institutional ethical clearance, the investigation was conducted to analyze the variations in blood glucose level before and after yogic practices and brisk walking. For that purpose, 90 hypertensive middle aged men were selected from a tertiary care teaching hospital and from other hospitals of Tiruchirapalli district, India. The subjects were seted into three sets (each set comprised of 30 men). The age sets of the test sets were from 35 to 45 years. Set I underwent yogic practices, set II underwent brisk walking and set III act as control. However all the three sets were advised to continue the medicines as per the recommendations of regular doctors. The individuals of the control set were considered as inactive rest. Further, the study was formulated by the random design, consisting of a pre test and post test. Pre test were conducted for all the 90 subjects on selected biochemical variable – blood sugar (both fasting and post prandial) by laboratory tests. The experimental sets were requested to participate in their respective yogic practices and brisk walking exercises for a period of twelve weeks. The post test was conducted for all the subjects after successful experimentation of yogic practices and brisk walking exercises. The data obtained were analyzed by Analysis of Covariance (ANCOVA) to assess the significant differences among

the sets on post test for blood sugar to find out the effects of yogic practices and brisk walking among hypertensive men especially to decrease in blood sugar level.

### 2.1. Training Programme - Yogic training

The experimental set I was given yogic practices between 5.45am to 6.45am and experimental set II was given brisk walking practices between 7.00 am to 8.00am for duration of approximately one hour (5 days a week) for 12 weeks and set III was not given any training (control). Yogic programs and brisk walking for selected sets were depicted in table 1.

**Table 1: Training programme for experimental sets**

Sets	Training programmes
Experimental Set - I	Loosening Exercises, Surya Namaskar, Asanas, Pranayama and Meditation.
Experimental Set - II	Brisk Walking
Control Set	No training but inactive rest

The detailed description of the yogic training, its duration and rest given between practices among the subjected included were interpreted in table 2. The details of repetitions were also determined thereby 2 repetitions were given in the first four weeks, 3 repetitions in the second four weeks and 4 repetitions in the third four weeks.

**Table 2: Details of yogic training**

S. No	Yogic Training	Duration	Rest between practices	Descriptions
1	Sitilikarana Vyayama	5 minutes	-	Loosening Exercises
2	Surya Namaskar	4 minutes	1 minute	Warming up
3	Padmasana	30 seconds	45 seconds	Lotus posture
4	Sasangasana	30 seconds	45 seconds	Rabbit posture
5	Padahastasana	30 seconds	45 seconds	Forward bending
6	Bhujangasana	30 seconds	45 seconds	Snake posture
7	Chandra badhana Pranayama	1 minute	45 seconds	Left nostril breathing
8	Nadishodana Pranayama	1 minute	45 seconds	Alternate breathing
9	Bhramari Pranayam	1 minute	45 seconds	Honey bee breathing
10	Japa Meditation	5 minutes	45 seconds	Mantra technique
11	Savasana	5 minutes	-	Corpse posture

### 2.2. Brisk walking training

The experimental sets for brisk walking were required to undergo brisk walk for 45 minutes continuously without any rest. They underwent this training from Monday to Friday every week and the experimental period was extended upto 12 weeks. Proper warm up and warm down procedures were strictly followed to the subjects during the experimental period. The brisk walking program was scheduled in the morning between 7.00 to 8.00 for 45 minutes and warm up and cool down practices were also given. For every 4 weeks the intensity and duration of the training program was gradually increased by repetitions. The detailed brisk walk training and its duration were tabulated (Table 3).

**Table 3: Brisk walk training modules and descriptions**

Module(s)	Description	
<b>General information</b>		
Duration	12 weeks	
Mode of exercise	Walking on flat surface	
Frequency	Five days per week	
Duration	45 minutes	
Intensity	Mild (50-55%)	
<b>Walking details</b>		
Warm up	5 minutes	
Brisk walking	45 minutes	
Warm down	10 minutes	
<b>Load dynamics</b>		
<b>Week(s)</b>	<b>Intensity</b>	<b>Duration</b>
1 <sup>st</sup> to 4 <sup>th</sup> Week	40 – 45%	45 minutes
5 <sup>th</sup> to 8 <sup>th</sup> Week	45 – 50%	50 minutes
8 <sup>th</sup> to 12 Week	50 – 55%	55 minutes

### 2.3. Procedure for blood glucose level

This test requires a 12 hours fast. The subjects should wait to eat and/or take a hypoglycemic agent (insulin or oral medication) until after test has been drawn, unless told otherwise. Diabetes is a disease that occurs when either the pancreas (an organ in your body) is not able to produce insulin or the pancreas makes insulin, but it does not work as it should. Fasting blood sugar is a part of diabetic evaluation and management. An FBS greater than 126 mg/dL on more than one occasion usually indicates diabetes. The same procedure was followed for post prandial also after the time duration described above.

## 3. Results and Discussion

### 3.1. Fasting blood glucose

The biochemical variable blood sugar (Fasting) was measured through blood test in study institution. The results on the effect of yogic practices and brisk walking among hypertensive male patients are presented in table 4.

**Table 4: Computation of mean and analysis of covariance of blood sugar (fasting) of experimental and control sets (scores in mg/dl)**

Test	Experimental set – I (Varied Yogic Practices)	Experimental set – II (Brisk Walking)	Control set	Source of variance	df	Sum of square	Mean square	F
Pre-test mean	133.9667	134.37	134.93	Between	2	14.16	7.078	0.54
				Within	87	1131.80	13.01	
Post-test mean	127.4	128.63	134.37	Between	2	829.27	414.63	42.38*
				Within	87	851.13	9.78	
Adjusted mean	127.59	128.66	134.15	Between	2	735.79	367.89	48.37*
				Within	86	654.154	7.61	
Mean Gain	6.566667	5.73	0.57					

\*Significant at 0.05 level of confidence. (Table F- ratio at 0.05 level of confidence. For 2 and 87 (df) = 3.1, 2 and 86 (df) = 3.103)

Table showed that the pre test mean scores of blood sugar (fasting) of experimental set I yogic practices were 133.96, experimental set II brisk walking was 134.37. The 134.93 post test means showed differences due to twelve weeks of yogic practices and brisk walking and mean values recorded were 127.4, 128.63 and 134.37 respectively. The obtained F value on pre test scores 0.54 was lesser than the required F value of 3.1 to be significant at 0.05 level. This proved that there was no significant difference between the sets at initial stage and the randomization at the initial stage was equal. The post test scores analysis proved that there was significant difference between the sets as the obtained F value at 42.38 was greater than the required F value at 3.1. This proved that the differences between the post test mean at the subjects were significant.

Taking into consideration the pre and post test scores among the sets, adjusted mean scores were calculated and subjected to statistical treatment. The obtained F value at 48.37 was greater than the required F value at 3.1. This proved that there were significant differences among the means due to twelve weeks of yogic practices and brisk walking on blood sugar (fasting).

### 3.2. Post prandial blood glucose

The biochemical variable blood sugar (post prandial) was measured through blood test and the results on the effect of yogic practices and brisk walking among hypertensive men are presented in figure 1.

**Figure 1: Bar diagram showing pre, post and adjusted post-test values of control set, two experimental sets on blood sugar (post prandial)**

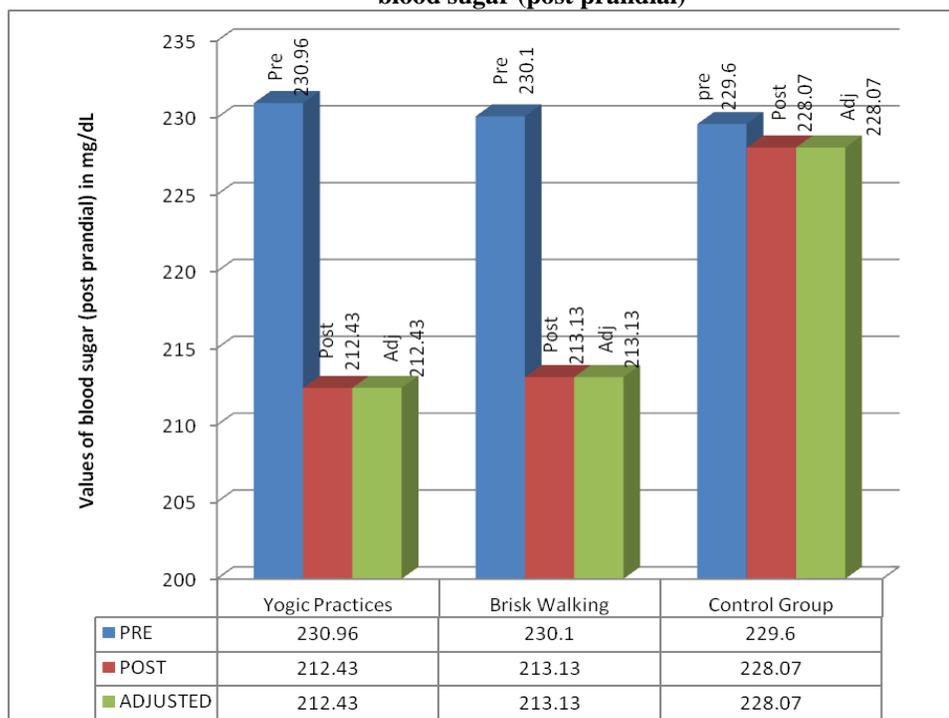


Figure showed that the pre test mean scores of blood sugar (post prandial) of experimental set I yogic practices were 230.967. Experimental set II brisk walking was 230.10 and control set was 229.60. The post test means showed differences due to twelve weeks of yogic practices and brisk walking and mean values recorded were 212.433, 213.13 and 228.07 respectively. The obtained F value on pre test scores 0.73 was lesser than the required F

value of 3.1 to be significant at 0.05 level. This proved that there was no significant difference between the sets at initial stage and the randomization at the initial stage was equal.

The post test scores analysis proved that there was significant difference between the sets as the obtained F value at 86.58 was greater than the required F value at 3.1. This proved that the differences between the post test mean at the subjects were significant. Taking into consideration the pre and post test scores among the sets, adjusted mean scores were subjected to statistical treatment. The obtained F value at 84.70 was greater than the required F value at 3.1.

The results presented in table 4 showed that the obtained adjusted means on blood sugar (fasting) among yogic practices set was 127.59 followed by brisk walking set with the mean value of 128.66 and control set mean value of 134.15. The difference among pre test scores, post test scores and adjusted mean scores of the subjects were statistically treated using ANCOVA and F values obtained were 0.54, 42.38 and 48.37 respectively. It was found that obtained F value on pre test score was not significant at 0.05 level of confidence as the obtained value was lesser than the required table value and post test scores was significant at 0.05 level of confidence as the value was greater than the required table F value of 3.1.

The results presented in figure 1 showed that the obtained adjusted means blood sugar (post prandial) among Yogic practices set was 212.43 followed by brisk walking set with the mean value of 213.13 and control set mean value of 228.07. The difference among pre test scores, post test scores and adjusted mean scores of the subjects were statistically treated using ANCOVA and F values obtained were 0.73, 86.58 and 84.70 respectively. It was found that obtained F value on pre test score was not significant at 0.05 level of confidence as the obtained value was lesser than the required table value and post test scores was significant at 0.05 level of confidence as the value was greater than the required table F value of 3.1.

The post hoc analysis through Scheffe's confidence test proved that due to Twelve weeks treatment the yogic practices set and brisk walking set there was significant improvement in blood sugar (fasting and post prandial) than control set and the differences were significant at 0.05 level. The post hoc analysis between the experimental set namely yogic practices set and brisk walking proved that there was significant difference.

In view of individuals embracing sedentary life style and lessening the treatment efficacy, the role of regular exercise including yoga seems to be better and economical concert in the management of diabetes [11,12]. Same like other studies, in this investigation also the blood glucose level get reduced after performing yogic practices and brisk walking [13].

Despite minor differences in the number of samples, time of exercise and the individual characteristics of the subjects, their results were similar. As can be seen, the results of this work suggest the positive effects of yoga on blood glucose levels that are consistent with the results of this study. The reason of this consistency between these studies on blood glucose levels can be explained as the following that, perhaps muscle contraction and dilation in asana and pranayama exercises stimulate the pancreas gland, so that the relaxation, deep breathing, bending and twists and turns of the spine where the pancreas is located, directly stimulate pancreatic cells, thus performing the asana increases insulin secretion and regulation [14]. Moreover, skeletal muscles have great ability in glucose uptake during exercise which is independent of insulin.

The impact of exercise is to stimulate and reshape the glucose transports (GLUT-4) carrier of cell membrane from their intracellular storage location. Mechanisms of exercise are different messaging that rooted in an increase in calcium concentration caused by activation of the muscle fibers of the related motor neurons [14,15]. In fact, the intracellular muscle GLUT-4, typically, does not move from the cytoplasm to the plasma membrane unless the mRNA has a normal state. The phosphatization of the insulin receptor compound (IRS - 3) in this process is a crucial step. IRS-1 acts as an inhibitor protein that facilitates the phosphatization of other intracellular proteins such as Phosphatidylinositol (PL3 - kinas). PL3 - kinas plays a role in the path where GLUT - 4 transporters enter to plasma membrane. Abnormalities in IRS - 1 or other combinations of insulin receptors have been identified in insulin resistance. Therefore, by adjusting its sensitivity and increased insulin secretion and increases glucose uptake by glucose transporter of the plasma membrane and oxidative enzymes during yoga, the reduction of blood glucose seems reasonable [14,16]. Further the detailed biochemical including molecular mechanisms are well analyzed in future to understand the exact picture of the diabetic situation to overcome.

#### 4. Conclusion

Further the study was concluded by highlighting that yogic practices and brisk walking have made significant positive differences on the blood sugar (fasting and post prandial) among hypertensive middle aged men. It is also found that yogic practices are slightly effective than brisk walking.

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