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EVALUATION OF THE EFFECTIVENESS OF SELECTED YOGA EXERCISES IN THE MANAGEMENT OF OVER-WEIGHT AND OBESITY

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ABSTRACT

OBJECTIVES: This study was focused to evaluate the effect of the practice of Yoga exercises on the signs and symptoms of overweight and obesity. SUBJECTS AND METHODS: Thirty subjects diagnosed as overweight or obesity were randomly selected from the Gampaha Wickramarachchi Ayurvedic Teaching Hospital, Gampaha, Sri Lanka, and they were treated with seven types of yoga asana, pranayama, and meditation with a prescribed dietary plan for the period of one month continuously. Body Mass Index, Waist-hip ratio, Skin fold thickness, Pulse rate, and Blood pressure were assessed before and after the treatments as objective parameters. RESULTS AND DISCUSSION: All the assessment parameters were observed as remarkable improvements in the signs and symptoms of overweight and obesity. And, calculated p-values of all the objective parameters were statistically significant. CONCLUSION: Hence, it can be concluded that the practice of these selected yoga exercises has a significant effect on the management of overweight and obesity.

Keywords: Obesity, BMI, Yoga, Pranayama, Meditation

INTRODUCTION

Obesity is a metabolic disorder with excessive fat accumulation in different parts of the body, and it is a risk factor for cardiovascular and metabolic disorders [1]. One-third of the world's population is now categorized as overweight, and all signs point to a further escalation of this situation in the years to come [1]. This health problem is increasing worldwide, especially in developing countries and newly industrializing countries [2]. Improvements in living standards and changes in lifestyle, physical inactivity, sedentary behavior, and excessive energy intake have resulted in a rapid increase in overweight and obesity rates among children and adolescents.

Yoga is one such intervention, with studies reporting long-term adherence and benefits in various health conditions, including obesity. The various postures of yoga, especially forward bending, twisting and backward bending, help reduce fat near the abdomen, hips, and other areas [3]. Therefore, yoga is a solution for a healthy lifestyle because the practice of yoga is a complete package with wonderful cardiovascular, dynamic workouts that do not require any machines or much space [4].

Therefore, it is necessary to study forms of yoga exercise that are appropriate and beneficial for weight loss. The present study examined the effects of continuous yoga exercises on weight loss and body composition.

Aims and Objectives: This study was focused to evaluate the effect of the practice of Yoga exercises on the signs and symptoms of overweight and obesity

What are Over-weight and Obesity?

Overweight and obesity are defined as abnormal or excessive fat accumulation that may impair health. Body mass index (BMI) is a simple index of weight-for-height that is commonly used to classify overweight and obesity in adults. It is defined as a person's weight in kilograms divided by the square of his height in meters (kg/m^2) [5].

For adults: WHO defines overweight, and obesity as follows: overweight is a BMI greater than or equal to 25; and obesity is a BMI greater than or equal to 30. BMI provides the most useful population-level measure of overweight and obesity as it is the same for both sexes and all ages of adults. However, it should be considered a rough guide because it may not correspond to the same degree of fatness in different individuals [5].

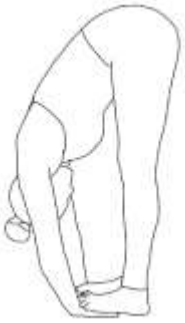
For children: Age needs to be considered when defining overweight and obesity. *Children under 5 years of age*: overweight is weight-for-height greater than 2 standard deviations above the WHO Child Growth Standards median; and obesity is weight-for-height greater than 3 standard deviations above the WHO Child Growth Standards median. *Children aged between 5–19 years*: overweight is BMI-for-age greater than 1 standard deviation above the WHO Growth Reference median; and obesity is greater than 2 standard deviations above the WHO Growth Reference median [5].

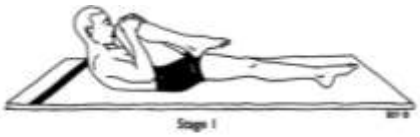
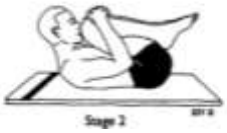
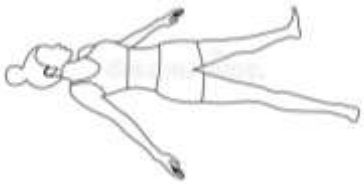
Prevalence of Over-weight and Obesity:

In 2016, more than 1.9 billion adults aged 18 years and older (39% of men and 40% of women) were overweight. Of these over 650 million adults (11% of men and 15% of women) were obese. And the worldwide prevalence of obesity nearly tripled between 1975 and 2016[5]. In 2019, an estimated 38.2 million children under the age of 5 years were overweight or obese. Once considered a high-income country problem, overweight and obesity are now on the rise in low- and middle-income countries, particularly in urban settings. In Africa, the number of overweight children under 5 years has increased by nearly 24% percent since 2000. Almost half of the children under 5 years who were overweight or obese in 2019 lived in Asia. Over 340 million children and adolescents aged 5-19 were overweight or obese in 2016[5]. The prevalence of overweight and obesity among children and adolescents aged 5-19 has risen dramatically from just 4% in 1975 to just over 18% in 2016. The rise has occurred similarly among both boys and girls: in 2016 18% of girls and 19% of boys were overweight. While just under 1% of children and adolescents aged 5-19 were obese in 1975, more

than 124 million children and adolescents (6% of girls and 8% of boys) were obese in 2016[5]. Being overweight and obese are linked to more deaths worldwide than being underweight. Globally there are more people who are obese than underweight; this occurs in every region except parts of sub-Saharan Africa and Asia [5].

Selected Yoga Exercises for the Study

Standing positions		
01.	Hasta-uttasana (raised arms pose): Raise and stretch arms above the head and keep the arms separated, shoulder width apart and bend the head, arms, and upper trunk backward. Inhale while raising the arms [6].	
02.	Pada-hastasana (hand to foot pose): Bend forward until the fingers or palms of the hands touch the floor on either side of the feet. Try to touch the knees with the forehead. Do not strain. Keep the knees straight. Exhale while bending forward. Try to contract the abdomen in the final position to expel the maximum amount of air from the lungs [6].	
Sitting positions		
01.	Shashankasana (pose of the moon or hare pose): Sit in Vajrasana with hands on the thighs. The upper body is straight and relaxed. Inhaling raise both arms above the head. Exhaling keeps the back straight and bends the upper body and arms forward from the hips until the arms and forehead touch the floor. The buttocks remain on the heels. Breathing normally remains in this position for a while. Relax the whole body, especially the shoulders, neck, and back. Inhaling keeps the back straight and raises the upper body and arms. Exhaling return to the starting position [6].	

02.	Druta halasana (dynamic plough pose): Lie flat on the back with the legs and feet together. Place the arms close to the body with the palms facing down. Relax the whole body. Press down on the arms. Rapidly roll the legs over the head, keeping the legs straight, and touch the floor behind the head with the toes. Hold the position for 1 or 2 seconds. Roll the body rapidly back to the starting position. Immediately sit up and bend the body forward into *Paschimottanasana*. Keep the legs straight and try to touch the knees with the fore-head. Resume the seated position. Inhale and exhale deeply in the lying position before starting [6].	
Lying-down positions		
01.	Supta-pavanamuktasana (leg lock pose): Lie flat on your back on the mat. Slowly inhale and hug the right knee to your chest and raise your head slightly off the ground. Try and touch your nose to the knee. Then exhale and relax back down to *Shavasana*. Repeat this on the other side. Can do this pose hugging both knees into the chest, as well [6].	 
02.	Salabhasana (locust pose): Lie down on the floor or the yoga mat on the belly and keep your arms along the side of your body with your palms facing downwards. Now, as you breathe in, lift your upper torso and legs. Make sure that knees are straight, and arms are lifted alongside the body. Make sure that the weight of the body is resting on the lower ribs, belly, and pelvis. Try to hold the *Salabhasana* yoga pose for a few breaths. Slowly, bring your legs and head down to the floor and come back to the starting position. This is one rep and repeats the posture two to three times [6].	
03.	Shavasana (corpse pose): Lying on the back, let the arms and legs drop open, with the arms about 45 degrees from the side of the body. Make sure to be warm and comfortable, if need to place blankets under or over your body. Close the eyes and take slow deep breaths through the nose. Allow the whole body to become soft and heavy, letting it relax on the floor. As the body relaxes, feel the whole body rising and falling with each breath. Scan the body from the toes to the fingers to the crown of the head, looking for tension, tightness, and con-tracted muscles. Consciously release and relax any areas that find. If need to, rock or wiggle parts of the body from side to side to encourage further release. Release all control of the breath, the mind, and the body. Let the body move deeper and deeper into a state of total relaxation. Stay in *Shav-asana* for 5 to 15 minutes [6].	

Pranayama		
01.	Nadi shodana pranayama: Sit relaxed with a gentle smile on your face. Keep shoulder loose and spine straight. Place the left hand on the left knee. The palm should be open towards the sky or in a chin pose. Put the middle and index finger between the eyebrows. Also, keep a thumb on the right side of the nostril and a little finger and ring finger on the left nostril. For opening and closing of the left nostril, the ring finger and little finger will be used. Also, for the right nostril, the process is done by the thumb. By pressing the right nostril with the thumb, exhale through the left nostril. After breathing through the left side, press the left portion of the nostril gently with a little index finger. Now exhale from the right side by releasing the thumb from the right side. Breathe in from the right side and exhale from the left nostril [6].	
Meditation		
	Sukhasana (easy pose): Sit with the legs straight in front of the body. Bend the right leg and place the foot under the left thigh. Bend the left leg and place the foot under the right thigh. Place the hands on the knees in the chin or *Jnana mudra*. Keep the head, neck, and back upright and straight, but without strain. Close your eyes. Relax the whole body. The arms should be relaxed and not held straight. Concentration on normal breathing [6].	

SUBJECTS AND METHODS

Selection of Patients: Thirty patients diagnosed as overweight or obesity were randomly selected from the out-patient department of Gampaha Wickramarachchi Ayurvedic Teaching Hospital, Gampaha, Sri Lanka. And then, all the selected patients were informed about this study and obtained their consent to participate in this study.

Inclusion criteria: Patients suffering from overweight or obesity without any other complications, aged between 20-50 years, and both male and female patients were included in the current study.

Exclusion criteria: Patients suffering from overweight or obesity with any other complications, ages below 20 years and above 50 years, smoking and alcohol-addicted patients, and both pregnant and lactating mothers were excluded.

Method of Treatment: Patients were advised to practice prescribed Yoga exercises daily in the morning at least for 30 minutes per day and for the period of one month continuously with the given diet plan. The prescribed schedule of Yoga exercises was as follows: Three times of two standing positions, two sitting positions, and lying down positions / next 10 minutes in *Savasana* position / after that, *Pranayama* should be done 10 rounds / finally Meditation at least 5 minutes.

Assessment of improvement: To assess the improvement of treatment BMI and following signs and symptoms related to being over-weight and obesity were developed as objective parameters.

OBJECTIVE PARAMETERS: Body Mass Index (BMI), Waist-Hip Ratio (WHR), Skin Fold Thickness (SFT), Pulse Rate (PR), and Blood Pressure (BP).

Data processing and analysis: Data analysis was done using SPSS-16 statistical software parametric independent sample T-test and paired sample T-test.

OBSERVATIONS AND RESULTS

Age-wise distribution of patients: About 30 patients having confirmed Obesity and overweight conditions were selected for the study and all patients were between 20 – 55 years of age (Table 1 and Figure 1). The majority of patients were between 26 -30 years of age.

Age	Total	Percentage
20-25	7	23.33
26 -30	15	50
31-40	5	16.66
Above 40	3	10

Table 1: Age-wise distribution of patient

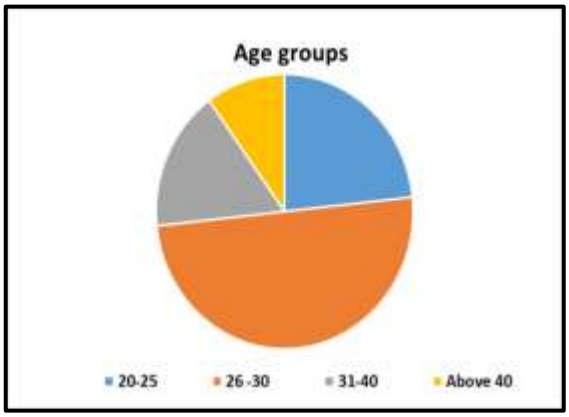


Figure 1: Age-wise distribution of patient

Gender-wise distribution of the patients: About 56.66% of patients selected for the study were female and others are male.

Gender	Total	Percentage
Male	13	43.33
Female	17	56.66

Table 2: Gender-wise distribution of patient

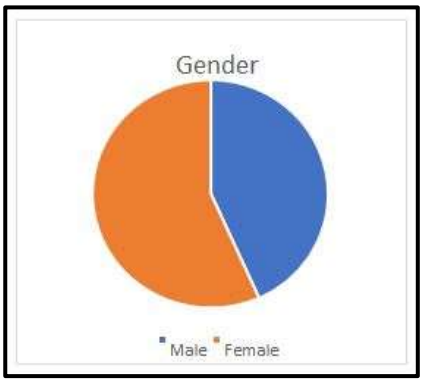


Figure 2: Gender-wise distribution of patient

Body mass index levels of patients: Following table and figure denote the Mean value, Standard deviation, and Standard error of the mean of BMI, before treatment (BT) and after treatments (AT) of all the patients.

BMI	N	Mean	Std. deviation	Std. Error of Mean
BT	30	27.6997	4.54453	0.82971
AT	30	26.3027	4.24491	0.77501

Table 3: BMI results in BT & AT

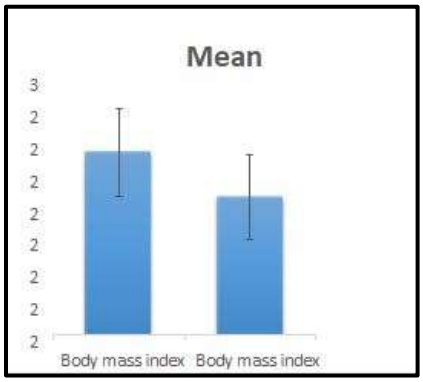


Figure 3: BMI results in BT & AT

Waist-Hip ratio levels of patients: Following table and figure denotes the Mean value, Standard deviation, and Standard error of the mean of the Waist-hip ratio, before treatment (BT) and after treatments (AT) of all the patients.

BMI	N	Mean	Std. deviation	Std. Error of Mean
BT	30	1.0003	0.07591	0.01386
AT	30	0.9477	0.07133	0.01302

Table 4: Waist-hip ratio levels BT & AT

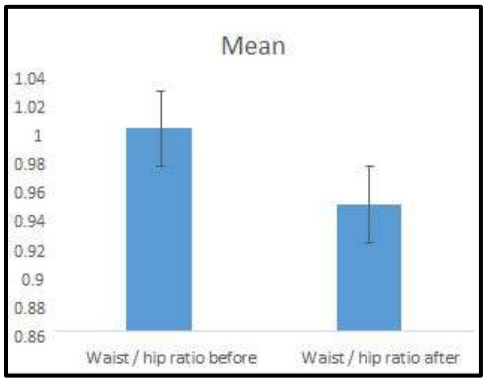


Figure 4: Waist-hip ratio levels BT & AT

The pulse rate of patients: This table and figure denote the Mean value, Standard deviation, and Standard error of the mean of the Pulse rate, before treatment (BT) and after treatments (AT) of all the patients.

BMI	N	Mean	Std. deviation	Std. Error of Mean
BT	30	73.4	4.931	0.9
AT	30	71.53	3.181	0.581

Table 5: Pulse rate, BT & AT

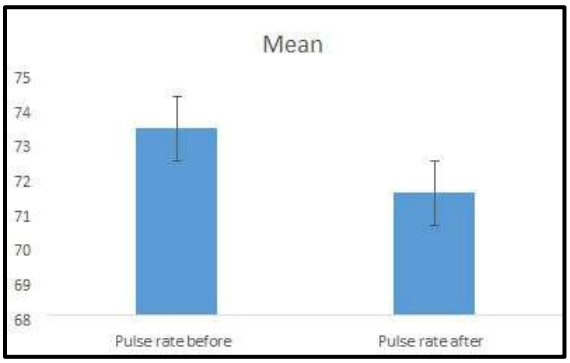


Figure 5: Pulse rate, BT & AT

Skin fold thickness: This table and figure denote the Mean value, Standard deviation, and Standard error of the mean of the Skin fold thickness, before treatment (BT) and after treatments (AT) of all the patients.

BMI	N	Mean	Std. deviation	Std. Error of Mean
BT	30	1.4747	0.14171	0.02587
AT	30	1.415	0.1291	0.02357

Table 6: Skin fold thickness, BT & AT

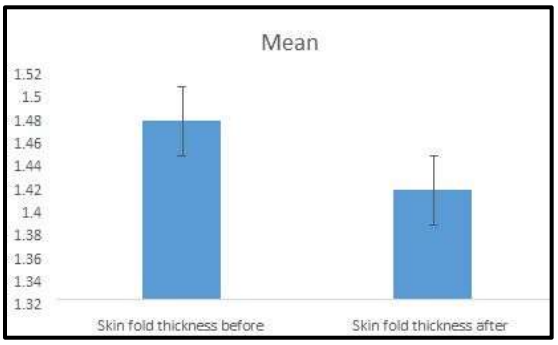


Figure 6: Skin fold thickness, BT & AT

Systolic blood pressure: These tables and figures denote the Mean value, Standard deviation, and Standard error of the mean of the Systolic blood pressure, before treatment (BT) and after treatments (AT) of all the patients.

BMI	N	Mean	Std. deviation	Std. Error of Mean
BT	30	119.33	8.683	1.585
AT	30	116.33	7.184	1.312

Table 7: Systolic blood pressure, BT & AT

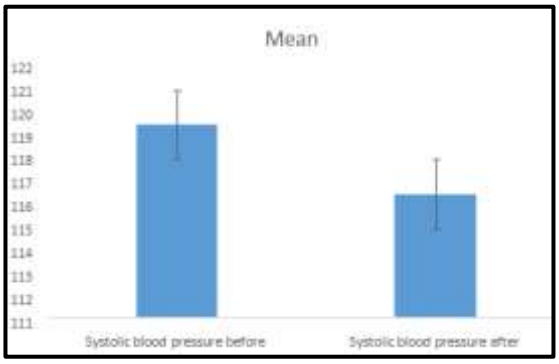


Figure 7: Systolic blood pressure, BT & AT

Diastolic blood pressure: This table and figure denote the Mean value, Standard deviation, and Standard error of the mean of the Diastolic blood pressure, before treatment (BT) and after treatments (AT) of all the patients.

BMI	N	Mean	Std. deviation	Std. Error of Mean
BT	30	79.33	5.208	0.951
AT	30	76	4.983	0.91

Table 8: Diastolic blood pressure, BT & AT

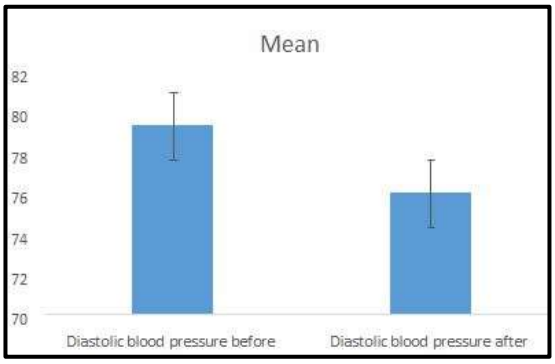


Figure 8: Diastolic blood pressure, BT & AT

DISCUSSION

The prevalence of over-weight and obesity is increasing worldwide, and it is an important risk factor for cardiovascular, metabolic disorders, and chronic NCDs. Therefore, alternative therapies for obesity prevention and management are highly important. There is so much evidence for the effectiveness of yoga for weight control, management of obesity, and improved body composition from survey studies [7] and clinical studies [8]. And also, Yoga exercises have the potential to increase fat loss, develop muscle tone and build flexibility, leading to better shape and good appearance. Many types of yoga also help build muscle strength and endurance [9]. The present study assessed the effect of a continuous yoga intervention on body composition in overweight and obesity participants. BMI is a parameter of body composition that may be used in the diagnosis of obesity [10]. BMI does not measure body fat directly, but it is moderately correlated with more direct measures of body fat. The preset study showed that significantly reduced BMI and other objective parameters after practicing selected yoga exercises in the given time period. According to analyze all the parameters have shown significant improvement after doing yoga postures, pranayama, and meditation. Hence, it is concluded that daily practice of Yoga exercises is highly beneficial in the management of being over-weight, obesity, and other related signs and symptoms related to obesity.

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