RELATIVE EFFECT OF PHYSICAL ACTIVITIES AND LIFESTYLE MODIFICATION ON SELECTED PHYSIOLOGICAL VARIABLES AMONG OBESE INDIVIDUALS

Nongmaithem Aristotle Singh[1], Dr. A. Subramanian[2] and Dr. Y. Wise Blessed Singh[3]

[1]Ph.D. Research Scholar, Department of Physical Education, Annamalai University, Tamil Nadu, India
[2](Research Guide) Professor, Department of Physical Education, Annamalai University, Tamil Nadu, India
[3]Associate Professor, Department of Physical Education, Annamalai University, Tamil Nadu, India

Abstract

The aim of the study was to see the relative effect of physical activities and lifestyle modification on selected physiological variables among obese individuals. Eighty obese individuals from residential school of Kakching District, Manipur were chosen at random as subjects, and their ages ranging from 15 to 18 years. The subjects (N=80) were divided into four groups, each with 20 obese individuals: experimental group I, experimental group II, experimental group III, and control group IV. Physical activities training was given to the experimental group I (PAG), lifestyle modification training was given to the experimental group II (LMG), and combined physical activities with lifestyle modification training was given to the experimental group III (PALMG) for an hour in the morning for each session. The control group (CG) did not took part in any type of training. The training lasted twelve weeks and followed a set programme (six and seven session in the morning for three experimental group). Before and after the training period, data on selected dependent variables were collected. The collected data were statistically analysed by using paired 't' test and Analysis of Covariance (ANCOVA) statistics. To find out the paired mean difference, the Scheffe's post hoc test was used. The level of confidence was fixed at 0.05. According to the findings, it is concluded that physical activities, lifestyle modification and combined physical activities with lifestyle modification training had significantly improved mean arterial pressure and peak exploratory flow rate among obese individuals. It is also concluded that combined physical activities with lifestyle modification training had better improvement than isolated physical activities and lifestyle modification training among obese individuals on mean arterial pressure and peak exploratory flow rate.

Keywords: *Physical Activities, Lifestyle modification, Mean arterial pressure, Peak exploratory flow rate.*

INTRODUCTION

In modern scientific age in every field of human endeavour, as the utilization of technology is increasing day by day, human being are facing lots of health related problems. All are busy in their work and not getting time to engage in physical workout. Without any workout or physical exercises life become worthless, so it is important to perform well planned physical exercises or workout of average strength or power like doing walk or strolling, bicycling or peddling, or sports activities is very helpful in the development of healthy body. Doing physical exercises in well planned manner results in the improvement of healthy body and also helps in improving overall bodily problems. Workout and physical exercises now has become the important aspect of life which plays crucial role in improving behavioral aspects of health and body and also fitness helps in reducing risk factors such as mortality and morbidity from diseases (Sundland et al., 2008).

Obesity is basically intake of excess fat, the stored fat becomes a reason for obesity. Obesity is a state of abnormal or excessive fat accumulation (mainly in the form of triglycerides) in subcutaneous and/or visceral adipose tissue, usually resulting from a sustained positive energy balance (energy intake > energy expenditure) due to biological, behavioral, socioeconomic, psychological and environmental factors to the extent that health and quality of life may be impaired (WHO, 2000). When our body mass index (BMI) is 30 or greater, we are considered obese. To calculate our BMI, multiply our weight in pounds by our height in inches squared, then multiply by 703. Alternatively, multiply our weight in kilogrammes by our squared height in metres.

Lifestyle modification is changing long-term behaviours, such as eating or exercising, and sticking to the new routine for months or years. Obesity is one of the diseases that can be treated with lifestyle changes. The terms lifestyle modification, behavioral treatment, and behavioral weight control are often used interchangeably. An accumulating body of evidence shows that modest weight loss through dietary changes and exercise is an effective means for preventing and managing obesity-associated disorders.

Mean arterial pressure (MAP) is the average arterial pressure throughout one cardiac cycle, systole, and diastole. MAP is influenced by cardiac output and systemic vascular resistance, each of which is influenced by several variables. The steady component, estimated by mean arterial pressure (MAP), is a function of left ventricular contractility, heart rate, and vascular resistance and elasticity averaged over time. MAP is an important measurement that accounts for flow, resistance, and pressure within our arteries. It allows doctors to evaluate how well blood flows through our body and whether it's reaching all our major organs.

Peak expiratory flow rate (PEFR) is the most commonly used method to monitor lung function. PEFR is the maximal expiratory flow rate achieved with a maximally forced effort from a position of maximal inspiration and is expressed in litres/min. PEFR measurement is very popular in primary care and is commonly applied as a quick screening method for assessing lung function in the clinic or at the bedside. Males reach their highest PEFR by about 25 years, while the females achieve it a little earlier, at about 20 years of age. PEFR is one such parameter that can be easily measured by a peak flow meter and is a convenient tool to measure lung functions in a field study. The PEFR values are also affected by various other factors, such as sex, body surface area, obesity, physical activity, posture, environment, and racial differences.

METHODOLOGY

Subjects and variables

Based on the above mentioned concept, the purpose of this study was to analyse the isolated and combined effect of physical activities and lifestyle modification on selected physiological variables. To achieve the above statement, eighty obese individuals from residential school of Kakching District, Manipur, India were randomly selected as a subjects. The selected obese individuals age ranged from 15 to 18 years. Physical activities group (Group I), lifestyle modification group (Group II), combined physical activities with lifestyle modification group (Group III), and control group (Group IV) were all separated into four equal groups of twenty subjects each. The consent form for the proposed research study was collected from all the participants. The subjects were selected by calculating BMI. After that they were assigned to undergo specific training program which was helpful in the improvements of their health.

Physical activities and lifestyle modification were selected as independent variables in the study. As dependent variables, physiological variables such as mean arterial pressure and peak exploratory flow rate were selected. The training programme lasted for a total of twelve weeks. A standard digital blood pressure monitor and a peak flow metre were used to collect data on the selected physiological variables. The pre-test were collected before the commencement of training programme and post-test were collected right after the twelve weeks training programme from three experimental groups and a control group.

Training Program

Physical activities

Experimental group-I performed physical activities six days per week for twelve weeks. The physical activities consists of brisk walking and three set of four exercises (jumping jack, high knee, half burpee, sit-up) starting with slow followed by fast repetitions. To determine the training load for the experimental group-I, the subjects were assessed for their exercise heart rate in response to various work bouts, proposed repetitions and sets. The subject's training zone was calculated using the Karvonen formula and set to 50 to 80 percent of HRmax. The work-to-rest ratio was set at 1:1 between exercises and 1:3 between sets.

Lifestyle modification

Experimental group-II underwent meditation and diet plan for seven days a week for twelve weeks. The meditation took place in the morning, starting at 5:30 a.m. Every three weeks, the time of the meditation was increased from 2 to 5 minutes. Between meditation sessions, there is a 1:1 work-to-rest ratio. And constructed diet plan was implemented as their daily diet plan.

Combined physical activities with lifestyle modification

Experimental group-III has performed the combination of physical activities and lifestyle modification six days and seven days respectively in a week for twelve weeks. The subjects in the combined physical activities with lifestyle modification group (PALMG) trained at the same volume, intensity, and frequency as the subjects in the physical activity group (PAG) and lifestyle modification group (LMG).

Experimental design and statistical technique

Pre and post-test random group design was used as experimental design. A paired "T" test was used to determine differences within groups from pre-test to post-test. The collected data from the four groups prior to and after the experiment on selected dependent variables was statistically analysed to determine the paired mean difference, if any by using the Analysis of Covariance (ANCOVA). Since there are four groups, the Scheffe's test was used as a post hoc test to determine paired mean differences, if any, whenever the obtained 'F' ratio value was found to be significant for adjusted post-test means. In all cases, the level of confidence was fixed at 0.05 for significance.

RESULT

The descriptive analysis shows means, percentage of improvement and 't' ratio of the collected data on mean arterial pressure and peak exploratory flow rate among experimental and control groups are presented in Table I.

Table I: Descriptive Analysis of the data on Mean Arterial Pressure and Peak Exploratory Flow Rate of experimental and control group

Variable	Training	Pre-test	Post-test	M.D	% change	T-ratio
Mean arterial pressure	**PAG**	98.00	95.85	2.15	2.19	8.82*
	LMG	98.17	95.85	2.32	2.36	10.64*
	PALMG	98.02	94.52	3.5	3.57	12.78*
	CG	97.97	98.15	0.18	0.18	1.23
Peak exploratory flow rate	**PAG**	341.25	364.75	23.5	6.88	11.43*
	LMG	366.00	396.75	30.75	8.40	18.37*
	PALMG	356.75	388.75	32	8.96	17.85*
	CG	369.00	369.25	0.25	0.06	0.11

***Significant at 0.05 level for the df of 1 & 19 is 2.093*

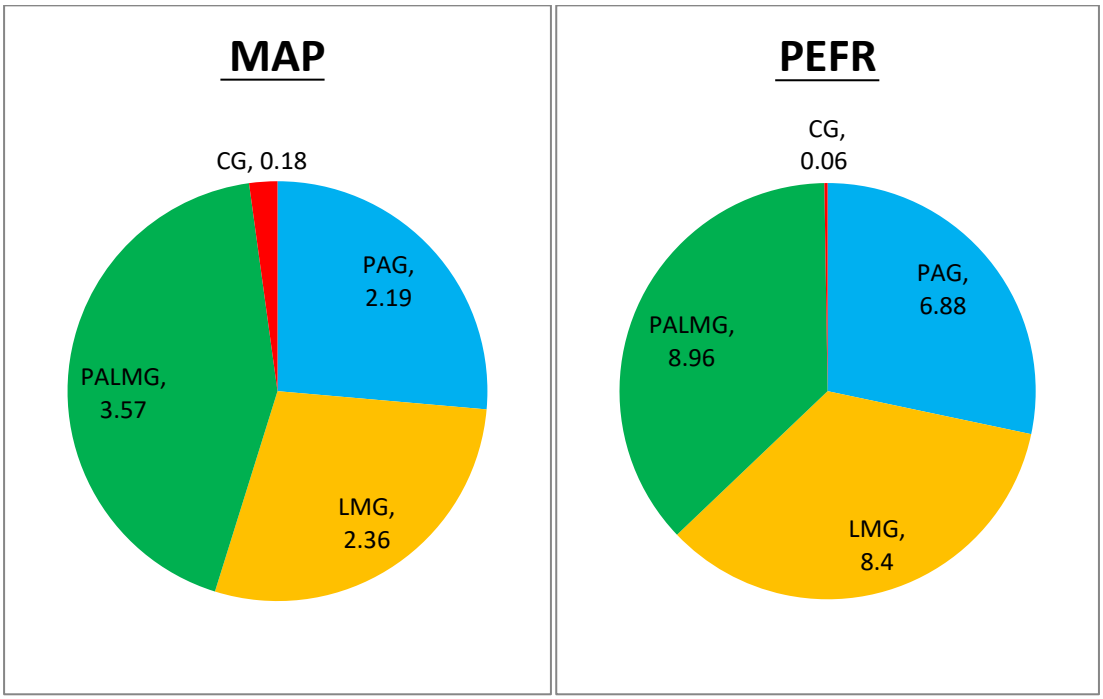
The obtained t-ratio of 8.82, 10.64, and 12.78 are greater than the required table value of 2.093 at 0.05 level of significance for df 1 and 19. It is clear that there was a significant difference between pre-test and post-test on mean arterial pressure of physical activities group, lifestyle modification group, and combined physical activities with lifestyle modification group. However, the 't' ratio of the control group was 1.23, which was less than the required table value of 2.093 for df 1 and 19 at the 0.05 level of significance. As a result, it's clear that it was found insignificant.

The obtained t-ratio of 11.43, 18.37, and 17.85 are greater than the required table value of 2.093 at 0.05 level of significance for df 1 and 19. It is clear that there was a significant difference between pre-test and post-test on peak exploratory flow rate of physical activities group, lifestyle modification group, and combined physical activities with lifestyle modification group. However, the 't' ratio of the control group was 0.11, which was less than the required table value of 2.093 for df 1 and 19 at the 0.05 level of significance. As a result, it's clear that it was found insignificant.

From the findings, it shows that physical activities caused 2.19 % changes in mean arterial pressure, 2.36 % changes in lifestyle modification, 3.57 % changes in combined physical activities with lifestyle modification, and 0.18 % changes in the control group. It also shows that physical activities caused 6.88 % changes in peak exploratory flow rate, 8.40 % changes in lifestyle modification, 8.96 % changes in combined physical activities with lifestyle modification, and 0.06 % changes in the control group.

The percentage of changes on mean arterial pressure and peak exploratory flow rate of physical activities, lifestyle modification, combined physical activities with lifestyle modification group and control group are given in figure I.

Figure I: Pie Diagram showing the Percentage of Changes on Mean Arterial Pressure and Peak Exploratory Flow Rate of Experimental and Control groups



The data collected from four groups on mean arterial pressure and peak exploratory flow rate was statistically analyzed by ANCOVA and the results are presented in Table II.

Table II: Analysis of Covariance on Mean Arterial Pressure and Peak Exploratory Flow Rate of Experimental and Control groups

	PAG	LMG	PALMG	CG	SOV	SOS	df	M.S	f-ratio
MAP	95.78	95.73	94.54	98.20	**BG**	141.99	3	47.33	55.11*
					WG	64.40	75	0.85	
PEFR	381.19	389.25	390.20	358.85	**BG**	12656.54	3	4218.84	56.17*
					WG	5632.60	75	75.10	

***Significant at 0.05 level of confidence.*

(The table value required for significance at 0.05 level of confidence with df 3 and 75 is 2.73)

The adjusted post-test mean values on mean arterial pressure of physical activities group, lifestyle modification group, combined physical activities with lifestyle modification group, and control group are 95.78, 95.73, 94.54 and 98.20 respectively. The obtained 'F' ratio of 55.11 for adjusted post-test score was greater than the required table value of 2.73 for df 3 and 75 for significance at 0.05 level of confidence on mean arterial pressure. It was concluded that, the differences exist among the adjusted

post-test means of physical activities group, lifestyle modification group, combined physical activities with lifestyle modification group, and control group on mean arterial pressure.

The adjusted post-test mean values on peak exploratory flow rate of physical activities group, lifestyle modification group, combined physical activities with lifestyle modification group, and control group are 381.19, 389.25, 390.20 and 358.85 respectively. The obtained 'F' ratio of 56.17 for adjusted post-test score was greater than the required table value of 2.73 for df 3 and 75 for significance at 0.05 level of confidence on peak exploratory flow rate. It was concluded that, the differences exist among the adjusted post-test means of physical activities group, lifestyle modification group, combined physical activities with lifestyle modification group, and control group on peak exploratory flow rate.

The 'F' value in the adjusted post-test means was found significant, hence Scheffe's test was applied to assess the paired mean of MAP and PEFR difference and the results are presented in Table III.

Table III: Scheffe's test for the Differences between Adjusted Post-test paired Means on Mean Arterial Pressue and Peak Exploratory Flow Rate

	PAG	LMG	PALMG	CG	M.D	C.I
Mean Arterial Pressure	95.78	95.73	-	-	0.05	0.80
	95.78	-	94.54	-	1.24*	
	95.78	-	-	98.20	2.42*	
	-	95.73	94.54	-	1.19*	
	-	95.73	-	98.20	2.47*	
	-	-	94.54	98.20	3.66*	
Peak Exploratory flow rate	381.19	389.25	-	-	8.06*	7.84
	381.19	-	390.20	-	9.01*	
	381.19	-	-	358.85	22.34*	
	-	389.25	390.20	-	0.95	
	-	389.25	-	358.85	30.4*	
	-	-	390.20	358.85	31.35*	

**Significant*

As shown in table III, the Scheffe's test post hoc analysis proved that significance mean differences existed between physical activities and combined physical activities with lifestyle modification groups; physical activities and control groups; lifestyle modification and combined physical activities with lifestyle modification groups; lifestyle modification and control groups; combined physical activities with lifestyle modification and control groups on mean arterial pressure. Since, the mean differences 1.24, 2.42, 1.19, 2.47 and 3.66 are higher than the confident interval value 0.80. However, the mean differences between physical activities and lifestyle modification group 0.05 is lesser than the confident interval value.

As shown in table III, the Scheffe's test post hoc analysis proved that significance mean differences existed between physical activities and lifestyle modification groups; physical activities and combined physical activities with lifestyle modification groups; physical activities and control groups; lifestyle modification and control groups; combined physical activities with lifestyle modification and control groups on peak exploratory flow rate. Since, the mean differences 8.06, 9.01, 22.34, 30.4 and

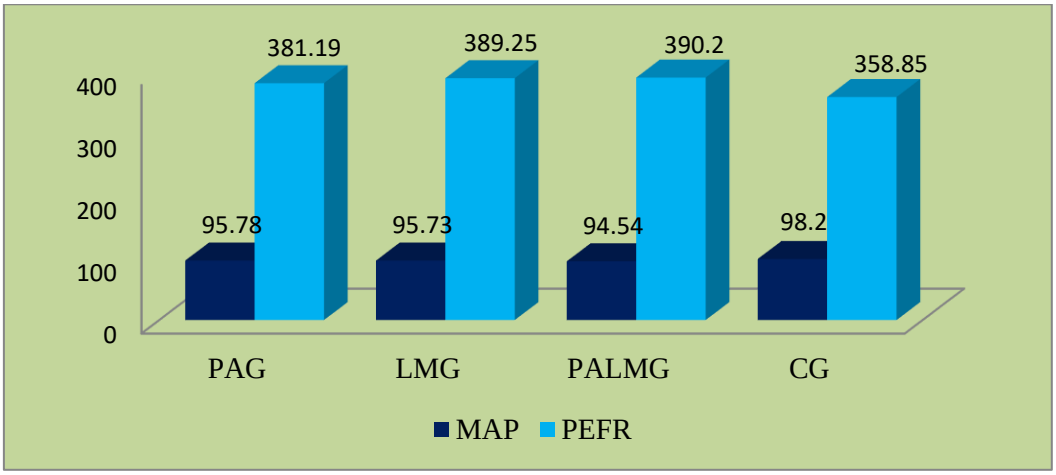
31.35 are higher than the confident interval value 7.84. However, the mean differences between lifestyle modification and combined physical activities with lifestyle modification group 0.95 is lesser than the confident interval value.

Hence, it is concluded that due to the effect of physical activities, lifestyle modification and combined physical activities with lifestyle modification training the mean arterial pressure was significantly reduced among obese individuals. It was also concluded that combined physical activities with lifestyle modification group was better than isolated physical activities and lifestyle modification groups in reducing MAP among obese individuals, whereas insignificant differences were found between isolated physical activities and lifestyle modification training.

It is also concluded that due to the effect of physical activities, lifestyle modification and physical activities with lifestyle modification training the peak exploratory flow rate was significantly improved among obese individuals. It was also concluded that combined physical activities with lifestyle modification group and isolated lifestyle modification group were better than isolated physical activities group in increasing PEFR of obese individuals. However, insignificant difference were found between combined physical activities with lifestyle modification group and lifestyle modification group.

The adjusted post-test mean values of experimental and control groups on mean arterial pressure and peak exploratory flow rate is graphically represented in the figure II.

Figure II: Bar Graph Showing the Adjusted Post Test Mean Values on Mean Arterial Pressure and Peak Exploratory Flow Rate of Experimental and Control Groups



Discussion:

The findings of this study showed 12 week physical activities with lifestyle modification training caused reduce in mean arterial pressure and increase in peak exploratory flow rate than physical activities and lifestyle modification training. The nature of the physical activities involves exercise that stimulates heart and lungs activity to produce changes in the body. The nature of lifestyle modification involves diet plan, mediation and food habits, behaviour to produced changes in the functioning of the body, which help the subjects in reducing mean arterial pressure and increasing peak exploratory flow rate.

Statistical findings of the study showed that 12 weeks of physical activities, lifestyle modification and physical activities with lifestyle modification trainings caused a significance

improvement in mean arterial pressure and peak exploratory flow rate when performing brisk walking, jumping jack, high knee, half burpee, sit-up, diet plan and meditation. The cause can be noted as sufficient and training specific to the body functioning or the sufficiency in the severity of the training. These findings similar to Bora et al., (2017), Lee et al., (2006), Wadden et al., (2012) also found changes in mean arterial pressure and peak performance due to physical activities and lifestyle modification training.

Sarkar et al., (2009) reported differences in cardiovascular parameters like heart rate, blood pressure, respiratory rate in men and women and the cardiovascular fitness of healthy men and healthy women ranging in age 40 to 50 years. They suggest that these differences are indicative of the need to use these differences to individualize the exercise protocols for males and females and also to highlight the importance of regular exercise. Goodpaster et al.,(2010). Reached other conclusion, among patients with severe obesity, a lifestyle intervention involving diet combined with initial or delayed initiation of physical activity resulted in clinically significant weight loss and favourable changes in cardio metabolic risk factors.

Thiyagarajan et al.,(2015) reported High BP is one of the most important and common risk factors for atherosclerotic cardiovascular disease and renal disease. The contemporary approach to the epidemic of elevated BP and its complications involves pharmacologic treatment of hypertensive individuals and "lifestyle modification," which is beneficial for both nonhypertensive and hypertensive persons. A substantial body of evidence strongly supports the concept that lifestyle modification can have powerful effects on BP. Increased physical activity, a reduced salt intake, weight loss, moderation of alcohol intake, increased potassium intake, and an overall healthy dietary pattern, termed the Dietary Approaches to Stop Hypertension (DASH) diet, effectively lower BP. The DASH diet emphasizes fruits, vegetables, and low-fat dairy products and is reduced in fat and cholesterol. Other dietary factors, such as a greater intake of protein or monounsaturated fatty acids, may also reduce BP but available evidence is inconsistent.

Conclusion

From the results of the study and discussion, the following conclusion are drawn.

1. Due to effect of physical activities, lifestyle modification and combined physical activities with lifestyle modification training, the mean arterial pressure of the obese individuals was significantly reduced.
2. Due to effect of physical activities, lifestyle modification and combined physical activities with lifestyle modification training, the peak exploratory flow rate of the obese individuals was significantly increased.
3. Combined physical activities with lifestyle modification group was better than isolated physical activities and lifestyle modification groups in reducing MAP among obese individuals, whereas insignificant differences were found between physical activities and lifestyle modification training.
4. Combined physical activities with lifestyle modification group and isolated lifestyle modification group were better than isolated physical activities group in increasing PEFR of obese individuals. However, insignificant difference were found between combined physical activities with lifestyle modification group and lifestyle modification group.

We can conclude that combined physical activities with lifestyle modification can be implemented among obese individuals in order to improve their physiological capacities.

Reference:

1. Berlin DA, Bakker J. (2015). Starling curves and central venous pressure. Crit Care.19:55.
2. Bora, G., Sudhir, G. K., & Swamy, K. N. (2017). Impact of exercise training on peak expiratory flow rate in relation to body mass index–An Indian perspective, *Indian Journal of Clinical Anatomy and Physiology*, 4(1): 34-39.
3. Goodpaster, B. H., DeLany, J. P., Otto, A. D., Kuller, L., Vockley, J., South-Paul, J. E., & Jakicic, J. M. (2010). Effects of diet and physical activity interventions on weight loss and cardiometabolic risk factors in severely obese adults: A randomized trial. *Jama*, 304(16): 1795-1802.
4. Gundogdu Z, Eryilmaz N. (2011). Correlation between peak flow and body mass index in obese and non-obese children in Kocaeli, Turkey. *Prim Care Respir J*, 20:403-6.
5. Jain SK, Kumar R, Sharma DA. (1983). Factors influencing peak expiratory flow rate (PEFR) in normal subjects. *Lung India*, 3:92-7.
6. Lee, M., Entzminger, L., Lohsoonthorn, V., & Williams, M. A. (2006). Risk factors of hypertension and correlates of blood pressure and mean arterial pressure among patients receiving health exams at the Preventive Medicine Clinic, King Chulalongkorn Memorial Hospital, Thailand. *J Med Assoc Thai*., 89(8): 1213-21.
7. Madhavan S, Ooi WL, Cohen H, Alderman MH (1994). Relation of pulse pressure and blood pressure reduction to the incidence of myocardial infarction, *Hypertension*, 23:395–401.
8. Srinivas P, Chia YC, Poi PJ, Ebrahim S.(1999). Peak expiratory flow rate in elderly Malaysians, *Med J Malaysia*.54:11-21.
9. Standardization of Spirometry, (1995). American Thoracic Society. *Am J Respir Crit Care Med*., 152:1107-36.
10. Sundland, G. B., Jansson, A., Saartok, T., Renstrom, P., Engstrom, L. M. (2008). Selfrated pain and perceived health in relation to stress and physical activity among school students: a 3-year follow up. *Pain*, 136: 239-23.
11. Thiyagarajan, R., Pal, P., Pal, G. K., Subramanian, S. K., Trakroo, M., Bobby, Z., & Das, A. K. (2015). Additional benefit of yoga to standard lifestyle modification on blood pressure in prehypertensive subjects: a randomized controlled study, *Hypertension Research*, 38(1): 48-55.
12. Tuomilehto, J., Lindstrom, J., Eriksson, J. G., *et al* (2001). Finnish Diabetes Prevention Study Group: prevention of type 2 diabetes mellitus by changes in lifestyle among subjects with impaired glucose tolerance, *N Engl J Med.*, 344: 1343–50.
13. Wadden, T. A., Butryn, ML. (2003). Behavioral treatment of obesity. *Endocrinol Metab Clin North Am*., 32: 981–1003.
14. Wadden, T. A., Webb, V. L., Moran, C. H., & Bailer, B. A. (2012). Lifestyle modification for obesity: new developments in diet, physical activity, and behavior therapy. *Circulation*, 125(9): 1157-1170.
15. World Health Organization (2000). Obesity: preventing and managing the global epidemic. Report of a WHO Consultation. *WHO Technical Report Series*, 894.
16. Wright BM, McKerrow CB. (1959). Maximum forced expiratory flow rate as a measure of ventilatory capacity: With a description of a new portable instrument for measuring it. *Br Med J*., 2:1041-6.