

# Effectiveness Of Moderate Intensity Aerobic-Based Interventions Targeting Obesity Among University Students—A Case Of BUIITEMS

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## Abstract

This study was focused to determine the effects of moderate-intensity aerobic trainings upon obese students. A sample of n=30 was equally divided into two groups control group (CG)=15 and experimental group (EG)=15 was included in the study. Pre and Post-test research design was applied to conduct the study. The collected data were properly analyzed with the help of appropriate statistical tests such as independent sample t-test and paired sample t-test. Results indicated a significant reduction in weight (8.4lb), Serum cholesterol level (16.7mg/dl), BMI (1.3lb/inch<sup>2</sup>) WHR (0.027). additionally, findings reveled an improvement in the upper and lower body strength of the participant. (6.1kg). Based on this finding it has been concluded that moderate intensity aerobic exercises have significant role in the reduction of obesity. Hence, it is suggested that the aerobic exercises intervention used in the study may be used among the health practitioners and other health related communities for the betterment of health.

**Keywords;** Obesity, Body Mass Index, Moderate Intensity Aerobic Exercises, Untrained Students

## Introduction

Obesity is defined as abnormal or excessive fat accumulation that presents a risk to health. A body mass index (BMI) over 25 is considered overweight, and over 30 is obese. There is a difference in between overweight and obesity. Overweight denotes the occurrence of the excess of body weight. Obesity denotes the presence of high amount of body fat. All obese people are overweight, but all overweight persons are not inevitably obese in excess. A fat cell is an

endocrine cell and adipose tissue is endocrine organ. As such, adipose tissue secretes some products, like metabolites, cytokines, lipids and coagulation factors. Significantly, excess adiposity or obesity causes the increased level of circulating fatty acids and inflammation.

Fats or lipids are the third main group of the macronutrients needed in human nutrition. The lipids are found primarily in meat and dairy food, at least, these are the most visible sources, but of our diet, and at least a minimum intake is

essential. However, many problems are associated with excessive intake of dietary fat, including obesity, cardiovascular disease, and some forms of cancer. An important component of lipids is the fatty acids. Levels of fat intake are highly correlated with weight. High consumption of dietary fat is associated with both increased body fat and obesity.

Fats are the most concentrated source of food energy, supplying nine calories per gram, more than doubles the calorie content of the protein and carbohydrates. Besides getting fatter, we are also developing more metabolic disorders, such as type 2 diabetes, which is marked by hormonal abnormalities in the processing and storage of nutrient and is far more common in obese individuals than in lean ones. Genetic factors also have a strong influence on obesity and are associated with body mass index (BMI).

Obesity poses a major public health challenge. Each year, obesity contributes to an estimated 112,000 preventable deaths. Obese adults are at increased risk for many serious health conditions, including high blood pressure, high cholesterol, type 2 diabetes and its complications, coronary heart disease, stroke, gallbladder disease, osteoarthritis, sleep apnea, and respiratory problems, as well as endometrial, breast, prostate, and colon cancers. Children with a high body mass index (BMI), an indicator of excess body weight, are more likely than those with a normal BMI to have insulin resistance (which can lead to diabetes), high blood pressure, and unhealthy levels of fats and other lipids. Furthermore, obese children often become obese adults; some studies have found that even 2- to 5-year-olds with a high BMI are likely to become obese adults. Besides suffering from physical illnesses, obese adults and children also may experience social stigmatization and discrimination, as well as psychological problems.

The constant development of economic level and corresponding changes of life style, we are facing gradually increasing weight, with younger-age

trend. As a common metabolic disease in modern society, obesity is mostly caused by unreasonable lifestyle and eating habits. Obesity affects people's health greatly in figures and images as well as diseases including high blood pressure, diabetes, and various cardiovascular diseases. Obesity is associated with a higher risk for serious diseases, such as type 2 diabetes, heart disease, and cancer.

Due to the large prevalence, overweight and obesity are declared as a global epidemic by World Health Organization (WHO). The worldwide prevalence of obesity nearly tripled from 1975 to 2016. More than 1.9 billion adults aged 18 years and older were overweight in 2016. Of these, over 650 million adults were obese. 39% of adults aged 18 years and over (39% of men and 40% of women) were overweight in 2016. Overall, about 13% of the Global adult population (11% of men and 15% of women) was obese in 2016. Over 340 million children and Adolescents aged 5-19 were overweight or obese in 2016.

Pakistan has been facing a twofold challenge of having both underweight and excess body weight populations. The burden of overweight and obesity in Pakistan has increased several-fold. According to global disease, Pakistan stands at number eight among the 10 countries hosting half of the 693 million obese individuals in the world in 2014. According to a list of the world's "fattest countries" published on Forbes, out of 194 countries, Pakistan is ranked 165 in terms of its overweight population, with 22.2% of individuals over the age of 15 crossing the threshold of obesity. This ratio roughly corresponds with other studies, which reveal that one-in-four Pakistani adults as being obese.

It becomes essential to look at this health problem for a particular population, when considering the severe health hazards associated with overweight and obesity. Various population-based

epidemiological studies have been conducted on investigating the obesity issue in adults as public health unease. On the other hand, in Pakistan, limited data exist showing the nationwide prevalence of obesity among adults. For instance, Jaffar et al. used the data from National Health Survey of Pakistan (NHSP; 1990–1994) and reported that 25.0% of adults were either obese or overweight. These estimates based on NHSP data are now outdated and need to be recomputed. Furthermore, considerable changes in dietary intake patterns and an increasingly sedentary lifestyle differentiate normal weight adults from those that are obese or overweight. The facts also suggest that the overweight and obesity approximations of adults should be updated. So, we designed the present research.

### Problem Statement

Obesity in Baluchistan is a health issue that has now a common phenomenon in the province. Urbanization and an unhealthy, energy-dense diet (the high presence of oil and fats in Baloch and Pashtoon Foods), as well as changing lifestyles, are among the root causes contributing to obesity in the province. Students in universities in Baluchistan are more exposed to the risks of obesity. As in universities, consumption of unhealthy diet like fast food and soft drink is more common. Along with diet socio-demographic factors are also associated with overweight and obesity.

### Research Objectives

The main objective of the study is;

1. To identify the effects of moderate intensity aerobic exercises upon the selected parameters of obesity;

i. Weight

ii. WHR

iii. BMI

iv. Serum cholesterol level

### Hypotheses

**H<sub>A1</sub>:** There is a significant effect of moderate intensity aerobic training on Weight

**H<sub>A2</sub>:** There is a significant effect of moderate intensity aerobic training on WHR (Waist-Hip Ratio)

**H<sub>A3</sub>:** There is a significant effect of moderate intensity aerobic training on BMI (Body Mass Index)

**H<sub>A4</sub>:** There is a significant effect of moderate intensity aerobic training on Serum cholesterol level.

### Literature Review

There is a proliferation of empirical evidences in assessing the issue of Obesity in Pakistan as well as in the rest of the world.

Khalafi et al, (2020) compares the effect of two types of exercise training, i.e., moderate-intensity continuous training (MICT) or high-intensity interval training (HIIT) on the browning of subcutaneous white adipose tissue (scWAT) in obese male rats. And findings indicate that prolonged exercise training promotes the browning of white adiposities, possibly through suppression of adiposeness together with white to beige trans-differentiation and is dependent on the intensity of exercise. Marcos, Jones and Morey (2020) assessed the effects of 6-weeks of high-intensity interval training (HIIT) or moderate-intensity continuous training (MICT) on aerobic fitness and body composition in males with overweight or obesity. Twenty-eight participants (18–45 years; BMI: 25–35 kg/m<sup>2</sup>) performed stationary cycling 3 times per week for 6 weeks. The effects of HIIT or MICT on body composition outcomes were negligible to small across whole-body and all regional-specific sites (all effect sizes ES = –0.19 to 0.38) and did not

differ significantly between the groups (all  $p > 0.21$ ). Short-term (6-weeks) cycling training did not improve body composition in males with overweight or obesity.

Edwin, Christopher and Stephen (2018) compared the effects of different frequencies of HIIT with those of moderate-intensity continuous training (MICT) on body composition in overweight or obese adults. The results that performing HIIT once weekly, even with a lower weekly volume of exercise, improved cardio respiratory fitness, body composition, and blood pressure in overweight/obese adults. Anduaga, Corres and Betolaza (2018) conducted a study to determine the effectiveness of different 16-week aerobic exercise programmes with hypocaloric diet on blood pressure, body composition, cardio respiratory fitness and pharmacological treatment. The study found that the combination of hypocaloric diet with supervised aerobic exercise 2 days/week offers an optimal non-pharmacological tool in the management of blood pressure, cardio respiratory fitness and body composition in overweight/obese and sedentary individuals with hypertension. High-volume HIIT seems to be better for reducing body mass compared with low-volume HIIT. The exercise-induced improvement in cardio respiratory fitness is intensity dependent with low-volume HIIT as a time-efficient method in this population.

Wewege, Ward and Keech (2017) analyse the comparative effects of high-intensity interval training (HIIT) and moderate-intensity continuous training (MICT) for improvements in body composition in overweight and obese adults. Trials comparing HIIT and MICT in overweight or obese participants aged 18–45 years were included. The study found that short-term moderate-intensity to high-intensity exercise training can induce modest body composition improvements in overweight and obese individuals without accompanying body-weight changes. HIIT and MICT show similar

effectiveness across all body composition measures suggesting that HIIT may be a time-efficient component of weight management programs.

Rahimi (2014) studied the effects of 12 weeks of high intensity versus moderate intensity weight training of equal work output on body composition in overweight men. The study concluded that 12 weeks of HI weight training may be more effective in improving body composition than MI weight training in overweight young men with physical characteristics similar to the ones found in the present study. Marra C, Bottaro M, Oliveira RJ, Novaes JS. (2005) studied the effect of moderate and high intensity aerobic exercise on the body composition of overweight men. The study concluded that 14 wks of HI aerobic exercise may be more effective in improving body composition than MI aerobic exercise in overweight young military men with physical characteristics similar to the present study.

Volek et al, (2002) studied the effects of an 8-week weight-loss program on cardiovascular disease risk factors and regional body composition. The results indicated that short-term weight loss resulting from reducing percentage energy from fat, increasing physical activity and vitamin/mineral supplements including folic acid has a favorable effect on regional body composition and total and LDL cholesterol with minimal effects on HDL cholesterol, triacylglycerols, homocysteine and insulin and the effects are greater in men compared to women. Andersen, Bartlett and Verde (1999) analysed the short- and long-term changes in weight, body composition, and cardiovascular risk profiles produced by diet combined with either structured aerobic exercise or moderate-intensity lifestyle activity. The study found that a program of diet plus lifestyle activity may offer similar health benefits and be a suitable alternative to diet plus structured aerobic activity for obese women.

The above literature shows that different studies have concluded different results regarding the impacts of aerobic exercises on obesity. Therefore, a case study for each area is required better analyses the impact of moderate intensity aerobic exercises on obesity.

## Methodology

### Study design

Study comprises pre & post-test nature of the experimental research design.

### ➤ Dependent Variable:

#### a) Weight (lb)

The weight is measured by machine and converted into pounds.

#### b) Body Mass Index (BMI)

BMI determine the height weight ratio to find the value which define the body shape. Body Mass Index (BMI) formula is weight (lb.) divided by height (inches)<sup>2</sup> multiply by 703.the standard values of range of BMI iss following below.

**Table 1: WHO Standard BMI Chart**

BMI	Weight status
Below 18.5	Under weight
18.5—24.9	Normal weight
25—29.9	Over weight
30 and above	Obese

#### c) Waist-Hip Ratio (WHR)

WHR determine the fat % of abdominal area with the help of waist measurement below to chest narrow area and measurement of maximum wide region of hip area.

#### d) Serum Cholesterol

Serum cholesterol was taken through blood testing in unit of milligram per deciliters (mg/dL).

### Independent Variable:

#### 1. Moderate Intensity Aerobic Training (MIAT)

The study aerobic straight-line method to target the zone for fat burning in human body through intensity of maximum heart rate (MHR). The intensity is moderate aerobic exercise between 60% to 70 %.

### Sample size and Data source

A total number of 30 male students were recruited and participated conveniently assigned to

treatment group moderate intensity aerobic training (Treatment group) (n=15) or control group (n=15). Convenient sampling was used to select 30 obese students. Convenient sampling is a type of no probability sampling method adopted by researchers where they collect data from a conveniently available pool of respondents. It is the most commonly used sampling technique.

Data for the study comprises primary data collected from male obese students of Baluchistan University of engineering and management sciences (BUIITEMS). The data was collected through Health History Questionnaire (HHQ).

### Data analysis

- All statistical analysis was calculated by using the statistical package for the social sciences (SPSS), version 23.
- Statistical significance was kept at an alpha level less than or equal to 0.05.

- To note whether there were differences in student's body composition and aerobic fitness level in response to the training program ANOVA was employed. In addition, to examine the pre -post training effect of training program paired t-test was employed.

## 1. EMPIRICAL FINDINGS AND DISCUSSION

### 1.1. Results.

#### 1.1.1. Pre and Post Analysis of Weight

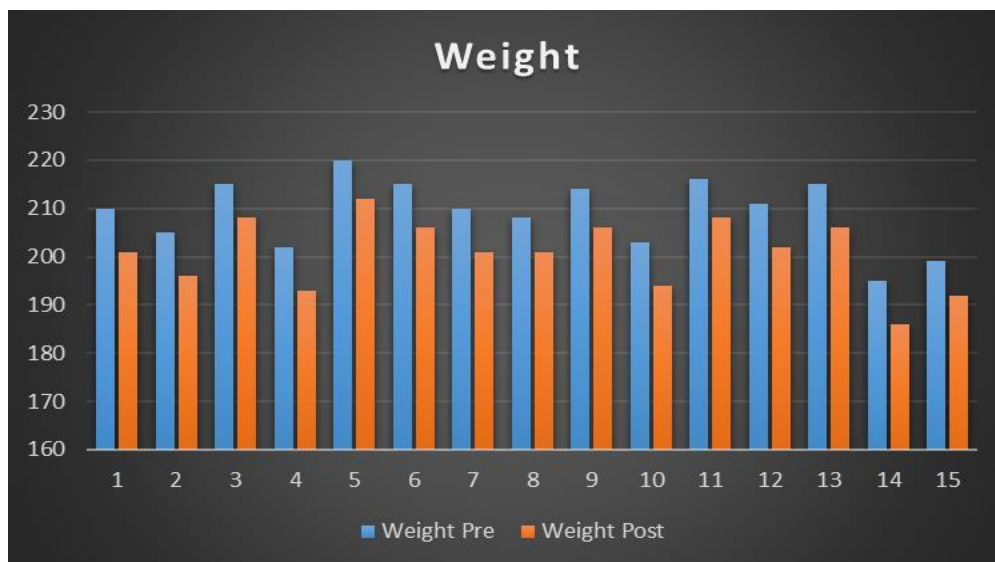


Figure 1: Analysis of weight

#### 1.1.2. Pre and post analysis of serum cholesterol

Figure showed the pre and post analysis of serum cholesterol of the treatment group. Serum cholesterol was taken pre or post through blood testing in unit of milligram per deciliters (mg/dL).

Figure 1 depicts the pre and post analysis of Weight of participants in the treatment group. The weight is measured by machine and converted into pounds. There are 15 participants in the treatment group and their pre and post analysis are showed in the graph. The blue line shows the pre-treatment weight and yellows showed the post analysis of the students. From the graph it is cleared that the Moderate intensity aerobic exercises with intensity of 60% to 70% of MHR worked to weight loss of each member of treatment group.

The blue generated line shows the pre-treatment serum cholesterol level and yellows show the post analysis of the treatment group. Moderate intensity aerobic exercises with intensity of 60% to 70% clearly showed the reduction of cholesterol level of each member of treatment group.

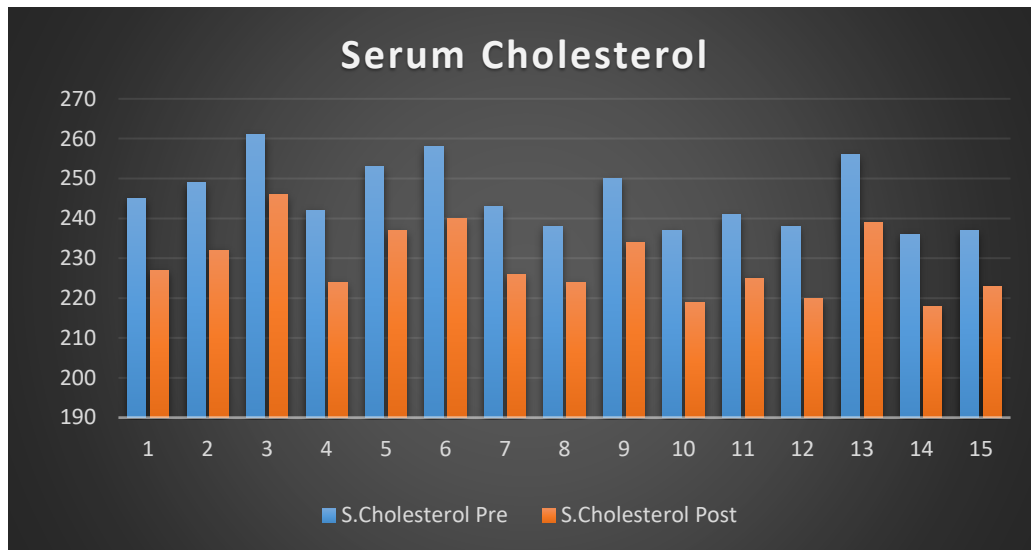


Figure 2: Analysis of serum cholesterol

### 1.1.3. Pre and post analysis of Body Mass Index (BMI)

Body Mass Ratio (BMI) of treatment group are showed in the figure. BMI was taken pre or post

height-weight ratio. The weight was taken in pounds and height in inch square [inches]<sup>2</sup>. Moderate intensity aerobic exercises clearly shows the reduction in BMI values of each member of treatment group.

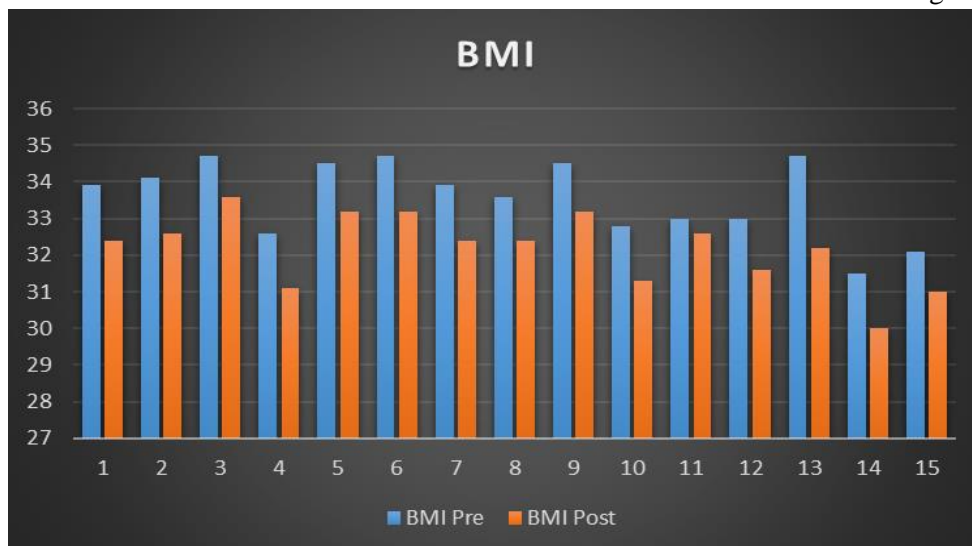


Figure 3: Analysis of BMI

### 1.1.4. Pre and post analysis of Waist-Hip Ratio (WHR)

Figure showed the pre and post analysis of Waist-Hip ratio (WHR). WHR measurement was taken pre or post by the help inch tape. The waist measurement was taken narrow area below chest

and hip measurement was taken from the widest round of hip. The blue generated line shows the pre-treatment WHR and yellows show the post analysis of the treated students WHR. Moderate intensity 60% to 70% aerobic exercises with slightly changes showed reduction in WHR values of each member of treatment group.

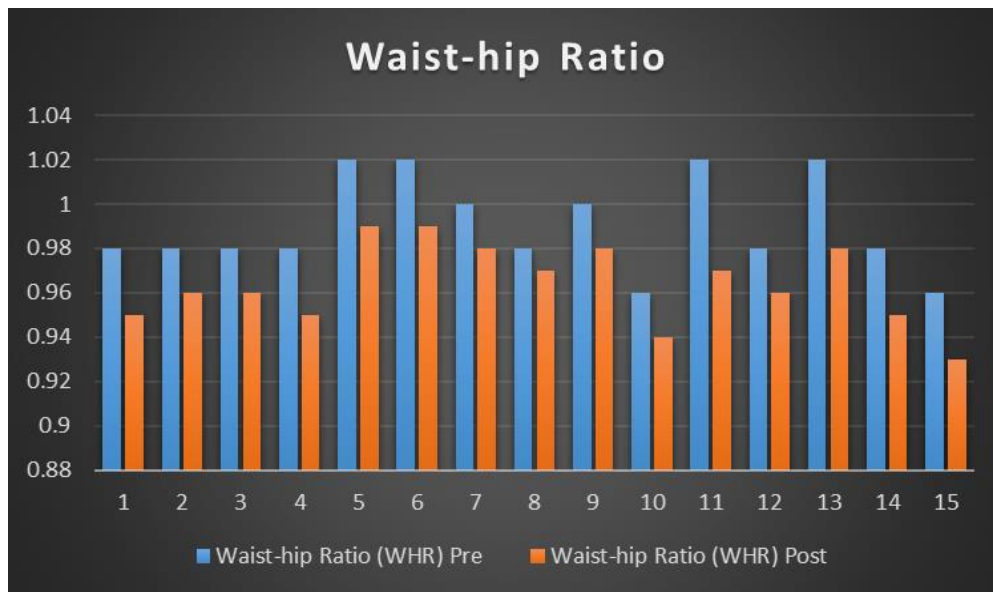


Figure 4: Analysis of WHR



**Table 2: Descriptive statistics with margin of error**

	N	Mean	Std. Error of Mean	Std. Deviation	Minimum	Maximum	Shapiro-Wilk Sig.	Margin of error ( $\bar{x} \pm \delta$ )
Weight Pre-Analysis	15	209.20	1.83	7.10	195.00	220.00	.540	209.20±7.10
Weight Post Analysis	15	200.80	1.88	7.26	186.00	212.00	.555	200.80±7.26
Body Mass Index Pre-Analysis	15	33.57	0.26	1.02	31.50	34.70	.155	33.57±1.02
Body Mass Index Post Analysis	15	32.19	0.26	1.00	30.00	33.60	.365	32.19±1.00
Waist-Hip Ratio Pre-Analysis	15	0.99	0.01	0.02	0.96	1.02	.077	0.99±0.02
Waist-Hip Ratio Post Analysis	15	0.96	0.00	0.02	0.93	0.99	.577	0.96±0.02

**Paired Samples Test of weight Table (1)**

		Paired Differences					t	Sig. (2-tailed)
		Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference Lower	Upper		
Pair 1	WEIGHT PRE-ANALYSIS - WEIGHT POST ANALYSIS	8.400	0.82808	.21381	7.94143	8.85857	39.28	.000

In the above statistics table,  $t(15) = 39.287$ ,  $p < 0.000$ . Due to the means of the two weights in pounds and the direction of the t-value, we can conclude that there was a statistically

significant improvement in weight pounds following the training program from  $200.90 \pm 0.828$  m ( $p < 0.000$ ); an improvement are, 8.4000.

**Paired Samples Test of cholesterol level Table (2)**

	Paired Differences					t	Sig. (2-tailed)
	Mean	Std. Deviation	Std. Error Mean	95% Interval of the Difference Lower	Confidence of the Upper		
Pair 2 S. CHOLESTEROL PRE-ANALYSIS S. CHOLESTEROL POST-ANALYSIS	16.666	1.44749	.37374	15.8650	17.46826	44.59	.000

In the above statistics table,  $t(15) = 44.594$ ,  $p < 0.000$ . Due to the means of the two cholesterol and the direction of the t-value, we can conclude that there was a statistically

significant improvement in reduction cholesterol level following the training program from  $245.23 \pm 1.447$  m ( $p < 0.000$ ); it shows an improvement 16.66667.

**Paired Samples Test of BMI Table (3)**

	Paired Differences					t	Sig. (2-tailed)
	Mean	Std. Deviation	Std. Error Mean	95% Interval of the Difference Lower	Confidence of the Upper		
Pair 3 BODY MASS INDEX PRE-ANALYSIS - BODY MASS INDEX POST ANALYSIS	1.3866	0.42404	0.10949	1.15184	1.62149	12.66	.000

In the above statistics table,  $t(15) = 12.665$ ,  $p < 0.000$ . Due to the means of the two BMI and the direction of the t-value, we can conclude that there was a statistically significant improvement in BMI following the training program from  $33.57 \pm 0.424$  m ( $p < 0.000$ ); it shows an improvement 1.38667.

Table 3: Mean difference of pre and post analysis

S.NO		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	Mean Difference
Weight	Pre	210	205	215	202	220	215	210	208	214	203	216	211	215	195	199	8.4
	Post	201	196	208	193	212	206	201	201	206	194	208	202	206	186	192	
	difference	9	9	7	9	8	9	9	9	7	8	9	8	9	9	9	
S.Cholesterol	Pre	245	249	261	242	253	258	243	238	250	237	241	238	256	236	237	16.667
	Post	227	232	246	224	237	240	226	224	234	219	225	220	239	218	223	
	difference	18	17	15	18	16	18	17	14	16	18	16	18	17	18	14	
BMI	Pre	33.9	34.1	34.7	32.6	34.5	34.7	33.9	33.6	34.5	32.8	33	33	34.7	31.5	32.1	1.387
	Post	32.4	32.6	33.6	31.1	33.2	33.2	32.4	32.4	33.2	31.3	32.6	31.6	32.2	30	31	
	difference	1.5	1.5	1.1	1.5	1.3	1.5	1.5	1.2	1.3	1.5	0.4	1.4	2.5	1.5	1.1	
Waist-hip Ratio (WHR)	Pre	0.98	0.98	0.98	0.98	1.02	1.02	1	0.98	1	0.96	1.02	0.98	1.02	0.98	0.96	0.027
	Post	0.95	0.96	0.96	0.95	0.99	0.99	0.98	0.97	0.98	0.94	0.97	0.96	0.98	0.95	0.93	
	difference	0.03	0.02	0.02	0.03	0.03	0.03	0.02	0.01	0.02	0.02	0.05	0.02	0.04	0.03	0.03	

The above table shows the mean difference of all pre tested variables and post-test variables.

## 2. CONCLUSIONS AND RECOMMENDATIONS

### 2.1. CONCLUSIONS

The study explores the impact of moderate intensity aerobic exercises to control obesity in university students. The study also explores the socio-demographic factors that are link with obesity. For this purpose, two groups were selected; treatment group, and control group. Pre and post data were collected for each group. The sample of 15 students (treatment group) has been selected for treatment of moderate intensity aerobic exercises. The experiment planned for 08 weeks, 05 sessions per week with two-day rest. The experiment has been divided into two phases on the bases of training and timing of sessions. The session contains two types of training, Aerobic endurance exercise including warm-up and cool down. After 56 days of training the post data were collected from blood and with instruments. The data shows the impact of independent variable (moderate intensity aerobic exercises) on depended variables (Weight, waist hip ratio, Body Mass Index, Serum Cholesterol). The mean reduction in the independent variables after aerobic exercises are; Weight (8.4lb), Waist Hip Ratio (0.027). BMI (1.3lb/inch<sup>2</sup>), Serum Cholesterol level (16.6mmgg/Dl).

The investigation additionally found that socio-demographic factors positively affect obesity in Baluchistan. Socio-demographic factor (Age, marital status, economy, schooling, culture diet) hereditary variables, digestion, endocrine capacity change, inordinate fat, way of life and dietary patterns and utilization of medications incited corpulence and intestinal issues. Simple obesity accounts for 95% in all. Normally, the consumption of fats, sugar and diets containing high calories were the part of daily intake of people of Baluchistan. Especially, local people of Baluchistan take high load fat diet like Landhi

meal (cultural diet) which intake continues about 10 months per year and the education level at family has also positive effect on obesity because they are not educated and unable to know the importance of proper diet and exercise. Simultaneously, people of Baluchistan drink the ample amount of alcohol which provide excessive energy and leads to obesity. The effect of obesity was quite high on university students. This is mainly due to consumption of unhealthy food and irregular patterns of eating. The obese university students damage their figure and mental strength which greatly affect their job hunting after completing their studies.

The study concluded that although the results of aerobic exercises are slow but it has no side effects. The use of drugs to avoid exercise and overcome obesity damages the physical and mental health of the students. Aerobic exercises not only help to utilize the idle fats of the body responsible for the obesity but also provide mental calmness to the students. Therefore, aerobic exercises are more fruitful for the male university students to overcome obesity.

### 2.2. RECOMMENDATIONS

- Students must give awareness about the importance of physical exercises through workshops and programs.
- At primary and secondary level schooling aerobic exercise must be made part of their routine.
- Awareness campaign must be design in order to information about the importance of healthy food.
- Drugs related to weight loss and those who claimed as resistant to obesity must be ban by government.

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