

**JIMMA UNIVERSITY**

**SPORT ACADEMY**

**DEPARTMENT OF SPORT SCIENCE**



**EFFECT OF 12 WEEKS AEROBIC TRAINING ON BODY WEIGHT MANAGEMENT IN  
CASE OF MALE DEJA GERESU DUKI PREPARATORY SCHOOL 12<sup>TH</sup>A IN SOUTH WEST  
SHOA**

**BY: TEKALIGN ABEBE MULETA**

**A THESIS SUBMITTED TO THE DEPARTMENT OF SPORT SCIENCE PRESENTED IN  
THE PARTIAL FULFILLMENT OF THE REQUIREMENTS FOR THE MASTER DEGREE  
IN SPORT SCIENCE**

**SEPTEMBER, 2021 G.C**

**JIMMA, ETHIOPIA**

EFFECT OF 12 WEEKS AEROBIC TRAINING ON BODY WEIGHT MANAGEMENT IN  
CASE OF MALE DEJA GERESU DUKI PREPARATORT SCHOOL<sup>12<sup>TH</sup></sup>A IN SOUTH WEST  
SHOA

BY: TEKALIGN ABEBE MULETA

A THESIS SUBMITTED TO THE DEPARTMENT OF SPORT SCIENCE PRESENTED IN  
PARTIAL FULLFILMENT FO THE REQUIREMENTS FOR THE MASTER OF DEGREE  
IN SPORT SCIENCE

ADVISOR: - TEFAYE DENEMA (Ass Prof)

CO- ADVISOR: - ZEWGE HAILU (Msc)

**SEPTEMBER, 2021, G.C**

**JIMMA, UNIVERSITY**

**JIMMA UNIVERSITY**  
**SPORT ACADEMY**  
**DEPARTMENT OF SPORT SCIENCE**

**DECLARATION OF THE AUTHOR**

I, the under signed declare that this thesis is my original work and has not been presented for a degree in any other university and that all sources of materials used for the thesis and sited have been duly acknowledged.

Name of the author: - Tekalign Abebe Muleta

Signature\_\_\_\_\_

Date of submission: \_\_\_\_\_

This thesis has been submitted for examination with my approval as University Advisor

Name: \_\_\_\_\_

Signature: \_\_\_\_\_

Date:-\_\_\_\_\_

This is certifying that the thesis prepared by Tekalign Abebe Muleta with topic: Effect of aerobic training on body weight management in the case of male Deja Geresu Duki Preparatory school 12<sup>TH</sup>A In South West Shoa” and submitted to in partial fulfillment of the requirements for Master of Degree in physical educations complies with the regulation of the university and meets the accepted standards with respect to originality and quality.

**Signed by the Examining Committee:**

Internal Examiner: Mekoya Mengesh (Msc)      Signature \_\_\_\_\_ Date \_\_\_\_\_

External Examiner: Behazeh Wlode (PHD)      Signature \_\_\_\_\_ Date \_\_\_\_\_

Advisor: Tesfaye Damena (Ass Prof)      Signature \_\_\_\_\_ Date \_\_\_\_\_

CO-Advisor: - Zewge Hailu (Msc)      Signature \_\_\_\_\_ Date \_\_\_\_\_

Chair Person \_\_\_\_\_      Signature \_\_\_\_\_ Date \_\_\_\_\_

---

Chair of Department or Graduate Program Coordinator



## **DEDICATION**

I dedicate this thesis manuscript to my adviser and my Sweet mothers Zinash Bekele, my Wife Hana Deneje and my son Monenus Tekalign and my brother and sister for their constant physical emotional moral and financial support throughout my educational career and life. As well as the researcher extended his dedication to peoples who contribute even a piece of advice throughout in my life to reach in this stage.

## **BIOGRAPHICAL SKETCH**

The author was born on October 1982 E.C in south west shoa part of Ethiopia specific place Dilella. He attended his primary and junior school at Dilella and Woliso schools. He attended secondary school in Deja Geresu Duki high school and. On 2000 he joined Mettu Teacher College in dipploma 2002 graduated after two years in jobs of Jimma zone he joined Jimma University and graduated with Bsc degree in sport sciences in 2004-2008 E.C Then he served for the last 8 years in south west Shoa woliso town high schools bing physical education teacher & Ambo University Woliso Campus and Rift valley University Woliso campus part timers Instructor.

Finally in July 2008 E.c he joined Jimma university sport academy post graduate program to pursue his MED in the field of physical education.

## **ACKNOWLEDGEMENT**

First, I would like to express my heart-felt thanks to my Advisor: - Tesfaye Damena (Ass Prof) and Co-advisor Zewge Hailu (Msc) for the unreserved, critical and constructive comments gave me that contributed to the overall accomplishment of this thesis. Certainly, had it not been for his sustainable encouragement, this thesis would not have been a success. I am grateful to Jimma University for giving me such a huge opportunity to be building myself through learning and develop my knowledge by conducting this study.

I would also like to express my thanks to the following individuals who played a substantial role in the successful accomplishment of my study by providing technical as well as moral support starting from the initial to the end of this research work:- my dearest friends Muleta kabbaa all families . My thanks also goes to Hana Deneje, for editing and providing me a constructive comment on the whole research work.

My special gratitude goes to Woliso Town and Educational Office and schools experts and all secondary school leaders and teachers for their willingness to give necessary information through moral support during to make the study successful.

Finally, I would like to express my deepest gratitude for my family, Tekalign Abebe all my Sisters and Brothers for their overall encouragement and support. Lastly but not list I would like to express my deepest gratitude to my any times My sweet mother Zinash Bekele for her spiritual support and encouragement for me during my university stay in summer and to all other whose names are not mentioned here .



## ACRONYMS AND ABBREVIATIONS

|      |   |
|------|---|
| AE   | Aerobic exercise                                    |
| AECT | Aerobic exercise and circuit training               |
| BWCT | Body weight circuit training                        |
| BMI  | Body mass index                                     |
| CVD  | Cardio vascular disease                             |
| CT   | circuit training                                    |
| CHD  | Coronary heart disease                              |
| DEXA | Dual-energy x-ray absorption-trey                   |
| EPHA | Ethiopian public health association                 |
| IBW  | Ideal body weight                                   |
| PE   | Physical exercise                                   |
| PF   | Physical fitness                                    |
| PRT  | pre test  |
| PT   | post test   |
| SPSS | statistical package of software for social sciences |
| WHO  | world health organization                           |

## TABEL OF CONTENT

| CONTENT                                     | PAGE |
|---|------|
| ACKNOWLEDGEMENT .....                       | I    |
| ACRONYMS AND ABBREVIATIONS .....            | II   |
| LIST OF TABLE .....                         | VI   |
| LIST OF FIGURESFIGURE .....                 | VII  |
| ABSTRACT .....                              | VIII |
| CHAPTER ONE .....                           | 1    |
| 1. INTRODUCTION .....                       | 1    |
| 1.1 BACKGROUND OF THE STUDY .....           | 1    |
| 1.2 STATEMENT OF THE PROBLEM .....          | 3    |
| 1.3 .RESEARCH HYPOTHESIS .....              | 4    |
| 1.4. OBJECTIVE OF THE STUDY .....           | 5    |
| 1.4.1 GENERAL OBJECTIVE .....               | 5    |
| 1.4.2. SPECIFIC OBJECTIVE .....             | 5    |
| 1.5. SIGNIFICANCE OF THE STUDY .....        | 5    |
| 1.6. DELIMITATIONS OF THE STUDY .....       | 6    |
| 1.7.LIMITATIONS OF THE STUDY .....          | 6    |
| 1.8. OPERATIONAL DEFINITION OF TERMS .....  | 7    |
| 1.9. ORGANIZATION OF THE STUDY .....        | 8    |
| CHAPER TWO.....                             | 9    |
| 2. LITERATURE REVIEW .....                  | 9    |
| 2.1 CONCEPT OF BODY WEIGHT MANAGEMENT ..... | 9    |
| 2.1.1 BODY WEIGHT .....                     | 10   |
| 2.2 BODY TYPE OR SOMATOTYPES .....          | 11   |
| 2.2.1ECTOMORPHS.....                        | 11   |
| 2.2.2MESOMORPHS .....                       | 11   |
| 2.2.3ENDOMORPHS .....                       | 11   |
| 2.3 BODY COMPOSITION .....                  | 12   |
| 2.4 BODY COMPOSITION MEASUREMENT.....       | 14   |
| 2.4.1BODY MAX INDEX (BMI) .....             | 15   |
| 2.4.2WAIST MEASUREMENT.....                 | 16   |
| 2.4.3 SKIN FOLD MEASUREMENT .....           | 16   |
| 2.4.4 UNDER WATER WEIGHING.....             | 16   |
| 2.4.5 DEXA.....                             | 16   |
| 2.5. CLASSIFICATION OF BODY WEIGHT .....    | 16   |
| 2.5.1. OPTIMAL BODY WEIGHT .....            | 16   |
| 2.5.2. UNDER WEIGHT .....                   | 17   |
| 2.5.3. DEFINING EXCESS WEIGHT .....         | 17   |

|  |    |
|--|----|
| 2.6. TYPES OF OBESITY.....   | 17 |
| 2.6.1. ANDROID (APPLE TYPE).....                                   | 17 |
| 2.6.2. GYNOID (PEAR TYPE) .....                                    | 18 |
| 2.6.3. THE THIRD TYPE.....   | 18 |
| 2.7. DETERMINANT FACTORS OF BODY WEIGHT.....                       | 19 |
| 2.7.1. GENETICS.....   | 19 |
| 2.7.2. METABOLIC RATE .....  | 20 |
| 2.7.3. EATING PATTERNS.....  | 20 |
| 2.7.4. LIFE STYLE.....   | 21 |
| 2.7.5. ENVIRONMENT .....   | 22 |
| 2.7.6. OTHER FACTORS.....  | 22 |
| 2.8. CONSEQUENCES AND RISK OF OVERWEIGHT AND OBESITY .....         | 23 |
| 2.8.1. PHYSICAL.....   | 23 |
| 2.8.2. PSYCHOLOGICAL.....  | 23 |
| 2.8.3. <i>Social</i> .....   | 24 |
| 2.9 PREVENTIVE AND TREATMENT METHOD OF OVERWEIGHT AND OBESITY..... | 24 |
| 2.9.1. EXERCISE .....  | 24 |
| 2.9.1.1. AEROBIC EXERCISE .....                                    | 25 |
| 2.9.1.2. BODY WEIGHT CIRCUIT TRAINING .....                        | 25 |
| 2.9.2. ENERGY BALANCE.....   | 26 |
| 2.9.3. LIFE STYLE MODIFICATION.....                                | 27 |
| CAPHER THREE.....  | 28 |
| 3. RESEARCH METHODOLOGY.....                                       | 28 |
| 3.1 THE STUDY AREA .....   | 28 |
| 3.2. THE STUDY DESIGN .....  | 30 |
| 3.3. POPULATION OF THE STUDY .....                                 | 32 |
| 3.4. SAMPLE SIZE AND SAMPLING TECHNIQUES.....                      | 32 |
| 3.5. SOURCE OF DATA.....   | 33 |
| 3.6. INCLUSIVE AND EXCLUSIVE CRITERIA .....                        | 33 |
| 3.6.1. INSTRUMENTATION .....                                       | 33 |
| 3.7. METHODS AND PROCEDURES OF DATA COLLECTION .....               | 34 |
| 3.7.1 .EXPERIMENTAL MEASUREMENTS.....                              | 34 |
| 3.7.2. HEIGHT MEASUREMENT .....                                    | 34 |
| 3.7.3. BODY WEIGHT MEASUREMENT .....                               | 34 |
| 3.7.4. BODY MASS INDEX (BMI) .....                                 | 34 |
| 3.7.5. WAIST CIRCUMFERENCE (WC).....                               | 35 |
| 3.7.5.1.HIP CIRCUMFERENCE (HC) .....                               | 35 |
| 3.7.5.2.WAIST HIP RATIO (WHR %) .....                              | 35 |
| 3.7.5.3. MIXED EXERCISE PROTOCOL .....                             | 35 |
| 3.8. METHOD OF DATA ANALYSIS .....                                 | 35 |

|  |    |
|--|----|
| 3.9. ETHICAL CONSIDERATION.....  | 36 |
| CHAPETR FOUR.....  | 37 |
| 4. RESULT AND DISCUSION .....  | 37 |
| 4.1. BODY WEIGHT (KG) .....  | 37 |
| 4.2. BMI (KG/M2).....  | 38 |
| 4.3. WAIST CIRCUMFERENCE (WC).....                                     | 38 |
| 4.4. HIP CIRCUMFERENCE (HC).....                                       | 39 |
| 4.5. WAIST HIP RATIO (W/H) .....                                       | 40 |
| 4.6. COMPARISON OF ANTHROPOMETRIC RESULT (BW, BMI, WC.HP, W/H %) ..... | 41 |
| 4.7. DISCUSSION .....  | 42 |
| CHAPETR FIVE .....   | 44 |
| 5. SUMMARY, CONCLUSIONS AND RECOMMENDATION.....                        | 44 |
| 5.1. SUMMARY.....  | 44 |
| 5.2 CONCLUSION.....  | 45 |
| 5.3RECOMMENDATION .....  | 46 |
| REFERENCE.....   | 47 |
| APPENDIX A.....  | 50 |
| APPENDIX B .....   | 51 |
| APPENDIX C .....   | 54 |
| APPENDIX D.....  | 55 |
| APPENDIX E .....   | 56 |
| APPENDIX F.....  | 57 |
| APPENDIX G.....  | 58 |
| APPENDIX H.....  | 59 |

## LIST OF TABLE

| <b>Table</b>  | <b>Page</b> |
|---|-------------|
| TABLE 1. AVERAGE WEIGHT AROUND THE WORLD.....   | 10          |
| TABLE 2. THE STUDY DESIGN LAYOUT.....   | 30          |
| TABLE 3. THE MEAN VALUES OF BODY WEIGHT FOR TG AND CG INVOLVED IN AEROBIC EXERCISE<br>COMBINED WITH CIRCUIT TRAINING FOR TWELVE WEEK OF EXPERIMENTAL PERIOD. .... | 37          |
| TABLE 4: THE MEAN VALUES OF BODY BMI FOR TG AND CG INVOLVED IN AEROBIC EXERCISE<br>COMBINED WITH CIRCUIT TRAINING FOR TWELVE WEEK OF EXPERIMENTAL PERIOD. ....    | 38          |
| TABLE 5: THE MEAN VALUES OF WC FOR TG AND CG INVOLVED IN AEROBIC EXERCISE<br>COMBINED WITH CIRCUIT TRAINING FOR TWELVE WEEKS OF EXPERIMENTAL PERIOD. ....         | 38          |
| TABLE 6. THE MEAN VALUES OF BODY HC FOR TG AND CG INVOLVED IN AEROBIC EXERCISE<br>COMBINED WITH CIRCUIT TRAINING FOR TWELVE WEEK OF EXPERIMENTAL PERIOD. ....     | 39          |
| TABLE 7. THE MEAN VALUES OF BODY W/H% FOR TG AND CG INVOLVED IN AEROBIC EXERCISE<br>COMBINED WITH CIRCUIT TRAINING FOR TWELVE WEEK OF EXPERIMENTAL PERIOD. ....   | 40          |
| TABLE 8 CHANGES IN THE ANTHROPOMETRIC MEASUREMENT CHARACTERISTICS TREATMENT<br>AND CONTROL GROUPS.....  | 41          |

## list of figures

| <b>Figure</b>   | <b>PAGE</b> |
|---|-------------|
| <a href="#">FIGURE 1. MAP OF THE STUDY AREA</a> .....   | 29          |
| <a href="#">Figure 3.Body max index chart</a> .....     | 15          |
| <a href="#">Figure 2.Healthy body composition</a> ..... | 14          |

## ABSTRACT

*The study was conducted to investigate the effects of aerobic training combined with circuit training on body weight management. In this study, a total Population of 40 male were recruited as one experimental group and their age ranges 18-22 years .All subjects participated They were divided randomly into two groups equal in number exercise group (n=20) and control group (n=20) out of 40 subjects 2subjects from TG2subjects from CG with draw training only 36 were able to accomplish the study .The first group (TG) included 20 males treated with BWCT 12weeks. The second group (CG) included 20 males no treatment was given. The subject ages ranged from 18-22 years old, and over weighted with  $>25$  BMI kg/m<sup>2</sup> participated in this study. Participants joined sessions for 45-60 min per day, at 55-69% of (MHR); 3 days per week. Duration of the study was 3 months from. Body weight, BMI, waist circumference and waist to hip ratio were evaluated before and after the program for both groups. The general objective of the study was to examine the effects of aerobic exercises with circuit training on body weight management. Research design is true experimental design. Instruments study calibrate balance beam scale the total body weight & height ,tape meters to measure WHC,Stop watch Whistle & first aid The obtained results showed there was a statistically significant difference in between pre test and post test the post treatment values of the Major finding mean difference was ,BW(3,4%), BMI (0.97%), WC (7.67) HC ( 2.4%)and WHR(6%) on TG .a statistically no significant difference between pre test and post test in BW, BMI, WC ,HC WHR among CG participants. Accordingly, it could be concluded that the aerobic exercise combined is effective in body weight management. Recommendation develop habits of participation aerobics combined with circuit training program as parts of life at least three day per week for 30 minute In consequences, regular combined mode of exercises can contribute great role for body weight management.*

**Key Words:** Aerobic training, Bodyweight management, Bodyweight Exercise,

# CHAPTER ONE

## 1. INTRODUCTION

### 1.1 Background of the Study

Aim for a healthy body weight Health and longevity threatened when a person is either overweight or underweight. Excess body weight and fatness pose a threat to both the quality and quantity of one's life. In today's society, leanness is often equated with health, fitness, self-control, beauty, success. Obesity on other hand it is considered undesirable for reasons that are often more related body appearance concern than to actual or potential medical complication (lauren1997). Healthy weight is vital to a healthy and longer life. One will learn about weight control principles and practices, as well as guidelines for designing exercise programs for weight loss, weight gain and body composition change. Individuals with body fat levels falling at or near the extremes of the body fat continuum are likely to have serious health problems that reduce life expectancy and threaten their quality of life. (Heyward, 2002)

The overall average prevalence of obesity in adults for the year2000 was 8.2% of the global population. The prevalence of obesity progressively increases with the degree of development of countries, as seen in the data for undeveloped countries (1.8%), developing countries (4.8%), countries in transition (17.1%), and developed countries (20.4%) (WHO, 2001). In 2014, more than 1.9 billion adults 18 years and older over weight of these over 600million were obese. Each year, it is estimated at least 2.8 million people die as result of being overweight or obese (WHO).Therefore obese individuals have shorter life expectancy and greater risks of increase one's risk of developing serious CVD, CHD, hypercholesterolemia, hypertension, and diabetes mellitus, certain cancers, osteoarthritis, musculoskeletal and reproductive disorders, and psychosocial problems such as, depression, low self-esteem, body dissatisfaction prejudice and discrimination. (World Health Organization, 2010).

Over weight and Obesity multi factorial; however the fundamental cause of age, genetic, environment, eating pattern, sedentary life lifestyle, metabolic rate and other factors medications (anti-depressant) psychological problems, diseases, social issues are mentioned.



Multiple methods for estimations of body fatness have been developed. Anthropometric measurements provide approximate estimates of fatness and have the advantages of being quick, cheap and readily available. The most common methods used in clinical and epidemiological settings include BMI, WC, WHR and skin fold caliper. For more precise measures of total body fat, dual energy x-ray absorptiometry (DXA) is often used. (Vendees *et al.*, 2007).

Body fat distribution varies. Some people may be apple-shaped (Android) and other people may be pear-shaped (Gynoid). The terms android obesity and Gynoid obesity refer to the localization of excess body fat, mainly in the upper or lower body. Android obesity (apple shaped) is more typical of males; gynoids obesity (pear shaped) is more characteristics of females. However, some men may have Gynoid obesity, and some women have android obesity. Other terms are also used to describe types of obesity and regional fat distribution. Android obesity is frequently simply called upper-body obesity, and Gynoid obesity is often described as lower-body obesity. (Heyward, 2002) .contrast over weight and obesity kills more people than underweight.

The incidence of obesity is increasing rapidly. Research efforts for effective treatment strategies still focus on diet and exercise. Physical activity play an important role in combating this major health problem by encouraging a physically active lifestyle and by planning exercise programs and scientifically sound diets for one's. Restricting caloric intake and increasing caloric expenditure through physical activity and exercise are effective ways of reducing body weight and fatness while normalizing blood pressure and blood lipid profiles. (Morrow, et al., 2005)

Exercise is associated with an increase in energy expenditure, thus promoting changes in body composition and bodyweight while keeping dietary intake constant. (Stigler and Conifer, 2006) Most people know the benefits of regular physical exercises. However most adults and many children still lead a relative sedentary life style are not active enough to achieve many health benefits. Worldwide it is estimated that 60 percent of adults are simply not active enough to benefit their health (WHO, 2003b).the overall physical inactivity or sedentary trend is worse poor in urban areas most of the world's population live in countries. It is well known that physical exercise is perquisite for healthy life beyond reduction excess fat. (Sullen *et al.*, 2012).

Over weight and obesity is increasing at an alarming rate in our country and the problem appears to be increasing at remarkable rate in adults as well as children .Overweight and obesity relatively common and prevalent urban than rural populations .the present study was concerned with examining the problem of overweight in woliso more specifically the problem under investigation was to determine the effects of aerobic exercise and body weight circuit training on body weight management among male adults in Deja Geresu Duki Preparatory School

## **1.2 Statement of the Problem**

The world prevalence of overweight and obesity more than doubled between 1980 and 2014 (WHO, 2014).A report compiled by the EPHA in 2012 indicated that high prevalence of overweight, obesity and associated problems blood pressure, type2 diabetes, CHD ,some cancer were widely prevalent in Ethiopia . This shows that overweight, obesity is becoming a growing problem globally as well as in our country.

The fundamental cause of overweight and obesity is an energy imbalance between calories consumed and calories expended there has been an increased intake of energy dense foods that are high in fat and an increase in physical inactivity due to increasingly sedentary nature of many forms of work changing modes of transportation and increasing urbanization.

Obesity a major risk factor for no communicable diseases such as: cardiovascular diseases (mainly heart disease and stroke), diabetes, musculoskeletal disorders (especially osteoarthritis – a highly disabling degenerative disease of the joints), some cancers (including endometrial, breast, ovarian, prostate, liver, gallbladder, kidney, and colon).Overweight and obesity, as well as their related no communicable and diseases, are largely preventable by making the choice of healthier foods and regular physical activity and obesity. Physical fitness training is mandatory for every individual to maintain Many research studies said that physical exercise was important for the development of all physical fitness and to Keep ideal body weight. Now days because of sedentary life a lot of peoples were attacked by chronic disease as a result of overweight and obesity. Coronary heart disease, hypertension. (Gianni *et al.*, 2015).

Diabetes and some other upcoming diseases are caused by overweight problems. According to many research studies finding physical inactivity is one of the causes for development of chronic disease and poor fitness. Similarly, people were living sedentary lifestyle due to poor culture of having regular physical exercise.

Good health and to prevent body weight. Aerobic exercises is more vital to burn out extra calories that stored in human's body. So aerobic exercise is very important to improve excess weight of body, aerobic capacity (cardiovascular endurance) as well as reduce the chance of being exposed to chronic diseases. However the main emphasis is on this issue with this in mind the research is conducted to find out the "Effects of 12 weeks of aerobic training exercises program on weight loss of sedentary overweight

The purpose of the present study to find out the effect of aerobic exercises and body weight circuit training on body weight management of male adults. The researcher's personal experience, observations and different documents witnessed with existence of problem in case of woliso town particularly Male Deja Geresu Duki preparatory School 12A the findings it is necessary to create an enabling environment and opportunities to promote physically active life style and develop lifelong positive attitudes towards PE among community in order to maintain healthy weight. The researcher has gone through various related research studies completed on this area based on the available, literature, keeping the above logical concepts, the following hypotheses has been formulated. It would be hypothesized that;

### **1.3 .Research Hypothesis**

- ❖ There would be significant differences due to the intervention of aerobic training with body weight management of overweight adults.
- ❖ There are no significant differences due to intervention of aerobic training combined with on body weight management.
- ❖ What is the effect of aerobics exercise on improvement of waist circumference for overweight body management?

## **1.4. Objective of the Study**

### **1.4.1 General Objective**

The general objective of this study was to examine the effects of aerobic exercise combined with circuit training (AECT) on body weight management over weight male adults after 12 weeks training program .to achieve this general objective ,the following specific objective has been set.

### **1.4.2. Specific Objective**

The specific objectives of the study are:

- ❖ To find out the effects of AECT on body weight (BW).
- ❖ To assess the effects of AECT on waist hip ratio (W/H %).
- ❖ To investigate impact of aerobic AECT on body max index (BMI).

## **1.5. Significance of the Study**

Currently, enhancement of body weight management efficiency is designed upon critical study of human physiology, modern way of feeding and scientific way of training based upon a new findings and principles of investigation. This study is highly concentrated on the effects of 12weeks aerobics exercise programs in improving body weight management and waist circumference overweight. The findings would help communities to maintain healthy body weight trough physical exercise. To making appropriate choice of life Style and helps to increase participation in physical activities Deja Geresu Duki preparatory school. Further these studies have the following significance

- ❖ Is there significant difference between the BW of treatment and control group in Deja Geresu duki preparatory school
- ❖ Is there significance difference between the W/H of treatment and control group in Deja Geresu Duki preparatory school
- ❖ Does 12- Weeks of AECT training significantly affect BMI of the treatment group in Deja Geresu Duki preparatory school
- ❖ Does 12- Weeks of AECT training significantly affect the anthropometry of the treatment group in Deja Geresu Duki preparatory school

## **1.6. Delimitations of the Study**

These are set by the researchers or authors themselves the boundaries or scope set by the authors to meet study objectives and goals this means that these are in the control or researcher are mainly associated with study experimental or conceptual framework ,research questions or hypotheses. The study was focused on examining effects of aerobic exercise combined with body weight circuit training body weight management in the case of selected male volunteers participating in Deja Geresu Duki Preparatory school., Which is located in Oromia regional state, south west show zone .To setup the study in manageable manner and also it is impossible to cover all the population under the experimental study due to will selected Deja Geresu Duki Preparatory School from members 40 male adults who are BMI >25 and volunteers and the age of 18-22 to be participant of the study.

## **1.7. Limitations of the study**

- Metrological variations such as air temperature, atmospheric pressures, relative humidity etc. during testing periods may not be control and their possibility will influence on the result. Inadequacy of available relevant research materials, sufficient books.
- The researcher had not include other physical fitness variables since it is wide, to study all aerobic training variables, it would require relevant materials, Sufficient economy laboratory measurement protocol and conducive environment.
- The researcher was not control the players Lifestyle (diet, sleep, nutrition, and time management), Mental Psychological preparation, ability to cope under pressure and socioeconomic status. Since they are living with their own parents house
- These can be associated with the research design sampling strategies, time and certain other factors
- Limitation can impact study findings conclusions and generalizations of the study these should be clearly stated in your study so that the results may not be misinterpreted.
- Outcome of this study would be very interesting to conduct the study on selected aerobic training on the body weight management of students however .Study was Limited is one preparatory school.
- The experimental research was complex and considering usually as private domain. As a result data collection materials and man power was very difficult to carry but the study.

## 1.8. Operational Definition of terms

- ❖ **Anthropometry:** is defined as measurement of human body.
- ❖ **Body weight management:** Overweight and obesity results from an energy imbalance between calories consumed and calories expended measurement of body mass index (BMI) (Gerry Carr, 1992).
- ❖ **Aerobic Exercise:** Exercise is different movements which involve rotating joints in specific patterns to challenge muscles in different ways ( Len Hoy ,1980)
- ❖ **Body Mass Index (BMI):** BMI is a number that is based on a person's weight and height. It can be used to identify people at risk for some health problem. (Gerry Carr,1992 )
- ❖ **Physical activity:** is the performance of some of the activity in order to develop or maintain physical fitness and overall health while directed toward the skill or performance. (Gerry Carr, 1992).
- ❖ **Obese:** abnormal accumulation of body fat usually, 20% or more over an individual's ideal body weight. (Brian Mac, 2000).
- ❖ **Overweight:** is abnormal or excessive fat accumulation that may impair health.
- ❖ **Circuit training:** is an excellent way to increase mobility strength and stamina.
- ❖ **Pre-test:** is a preliminary test administered to determine performance of students before training (Brian Mac, 2000).
- ❖ **Post-test:** post-test is an achievement test administered after training.( Davis ,2000 )
- ❖ **Physical:** a medical is relating to the body as opposed to the mind ( Lewis, 2003
- ❖ **Repetition:** The Respite number of exercises done in one set (cooper, 1968).
- ❖ **Experimental:** Based on new ideas, forms or methods that are used to find out what effect they have :( Ritchie and Lewis, 2003)
- ❖ **Training :** Training is pedagogical process of upgrading or improving performance (Gerry Carr,1992 )

## **1.9. Organization of the study**

This thesis is organized in five chapters. The first chapter of this research discusses the Introduction part. Background, statement of the problem, objective of the study and hypothesis, significance of the study, delimitation and limitation and Operational definition of terms in the second chapter review of related literature from difference sources was stated. In this chapter ,based on the Literature review conceptual frame work is designed on components of aerobic training variables comparing body weight management chapter three deals with all methodology used for this research .In this part , description of the study area source of data collection research design study population and sampling size techniques Instrumentation ,Inclusion and exclusion criteria ,method and procedure of data collection ,exercises training protocol data quality control , method of data analysis ethical issues and code of conduct on chapter four the overall collected data were analyzed and presented using tabulation and explicit explanation Last chapter presents summary of the results , and decision , conclusions and recommendations based on research findings.

## CHAPTER TWO

### 2. LITERATURE REVIEW

#### 2.1 Concept of body weight management

Weight management means keeping body weight at a healthy level. The subject of weight management is a complex and controversial public health issue for all individuals. Most people agree that overweight and obesity have risen and that poor nutrition and physical activity habits play an important role. However, not everyone agrees on how to reverse this trend. Some researchers and clinicians argue that the health risks for overweight and obese individuals are so great that the only way to decrease the risk is weight loss. Others point to study results indicating that overweight/obese individuals can reduce their health risks by becoming physically fit through exercise and healthy food choices, but not necessarily losing weight. Tamie Dehay, 2012.

Reaching and maintaining a healthy weight is important for overall health and can help you prevent and control many diseases and conditions. If you are overweight or obese, you are at higher risk of developing serious health problems, including heart disease, high blood pressure, type 2 diabetes, gallstones, breathing problems, and certain cancers. This might indicate the incidence of disease, eating disorders or under-nourishment (Goon *et al.*, 2006:23).

Body composition has been known to be one of the major health-related components of physical fitness (PF) that is affected by body weight and interconnected with muscles, fat, bone, and other important body tissues. Sometimes though, this element of a larger whole is reduced to fat and fat-free mass, and assessed as a body fat percentage and total body weight (in kilograms) (Lindsay *et al.*, 2013:2). An individual with an excessive percentage of body fat may be at risk of diseases such as cardiac disorders, musculoskeletal injuries and degradation, and reproductive disorders, whereas body fat percentage that is lower than 6-10% to 12-15% in boys and girls respectively, could lead to negative effects gain; The general goals of weight loss and management are: (1) at a minimum, to prevent further weight gain; That is why maintaining a healthy weight is so important: It helps lower risk for developing these problems, help, and gives more energy to enjoy life (2) to reduce body weight; and (3) to maintain a lower body weight over the long term.



### 2.1.1 Body Weight

The term human body weight is used colloquially and in the biological and medical sciences to refer to a person's mass or weight. Body weight is measured in kilograms, a measure of mass, throughout the world; although in some countries such as the United States it is measured in pounds, or as in the United Kingdom, stones and pounds. Excess or reduced body weight is regarded as an indicator of determining a person's health, with body volume measurement providing an extra dimension by calculating the distribution of body weight. (Roberts, Ian e. 2012.”

**Table 1. Average weight around the world**

| Region                         | Adult population<br>(millions) | Average weight     | Overweight population<br>total population |
|--------------------------------|--------------------------------|--------------------|---|
| Africa                         | 535                            | 60.7 kg(133.8 lb)  | 28.9%                                     |
| Asia                           | 2,815                          | 57.7 kg (127.2 lb) | 24.2%                                     |
| Europe                         | 606                            | 70.8 kg (156.1 lb) | 55.6%                                     |
| Latin America and<br>Caribbean | 386                            | 67.9 kg (149.7 lb) | 57.9%                                     |
| North America                  | 263                            | 80.7 kg (177.9 lb) | 73.9%                                     |
| Oceania                        | 24                             | 74.1 kg (163.4 lb) | 63.3%                                     |
| World                          | 4,630                          | 62.0 kg (136.7 lb) | 34.7%                                     |

Source: [https://en.wikipedia.org/wiki/Human\\_body\\_weight](https://en.wikipedia.org/wiki/Human_body_weight)

## **2.2 Body Type or Somatotypes**

Each one of us in her it's a unique body type. Even though the media would have us think otherwise, there are really many healthy and normal body types. For ease of reference, body types have been categorized into three main types, and those types have been further categorized as blends of the three main types. Each body type has advantages over the others for certain activities, but a person with any body type can be healthy and fit and look great. .Swinburne. 2012

### **2.2.1 Ectomorphs**

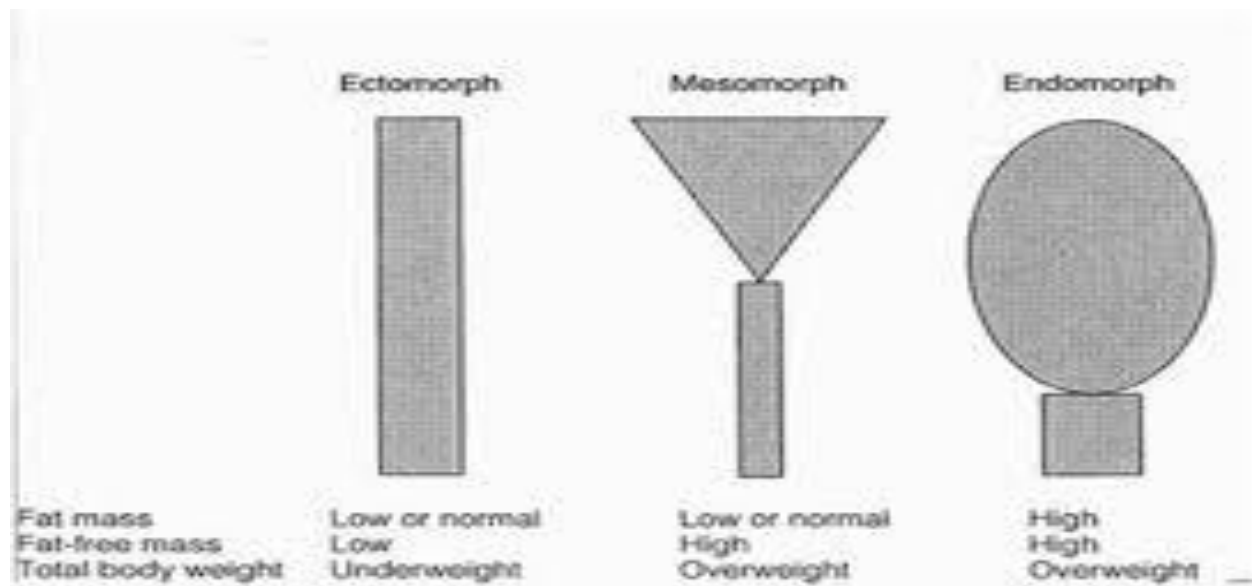
Are generally tall and thin and have long arms and legs. These people have difficulty gaining weight and muscle no matter how much they eat or how hard they weight train. They have the body type tend to see in ballet dancers, runway models, long-distance runners, and some basketball players. A very small proportion of the population has this type of body. Boyd A .Swinburne. 2012

### **2.2.2 Mesomorphs**

Are generally muscular, shorter, and have stocky arms and legs. These people are strong and tend to gain muscle mass when they do strength training. They may find it difficult to lose weight. They excel in power sports like soccer, softball, vaulting in gymnastics, and sprinting events in track and field. Boyd A .Swinburne. 2012

### **2.2.3 Endomorphs**

Are generally shaped like apples or pears and carry more body fat. Their bodies resist losing weight and body fat no matter how restrictive they are with their eating. In fact, the more they “diet,” the more their metabolisms slow down to resist weight loss. These people are better able to handle long periods of starvation and famine (which was a benefit to our ancestors). Sports they excel at are distance swimming, field events, and weight lifting.P, Mathieu P, Larose E.2008



Source;<https://www.google.com.et/search>

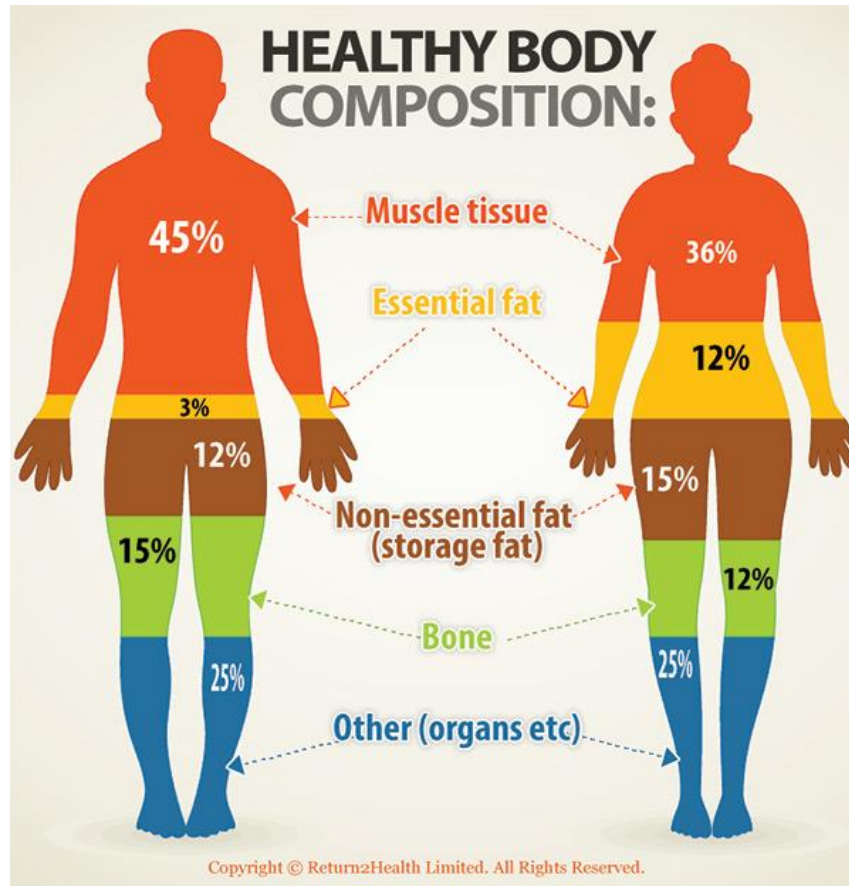
Figure 1. Somatotypes

### 2.3 Body Composition

The body is composed of water, protein, minerals, and fat. A two-component model of body composition divides the body into a fat component and fat-free component. Body fat is the most variable constituent of the body. The total amount of body fat consists of essential fat and storage fat. Fat in the marrow of bones, in the heart, lungs, liver, spleen, kidneys, intestines, muscles, and lipid-rich tissues throughout the central nervous system is called essential fat, whereas fat that accumulates in adipose tissue is called storage fat. Essential fat is necessary for normal bodily functioning. Sinning, WE. 1996.

The essential fat of women is higher than that of men because it includes sex-characteristic fat related to child-bearing. Storage fat is located around internal organs (internal storage fat) and directly beneath the skin (subcutaneous storage fat). It provides bodily protection and serves as an insulator to conserve body heat. The relationship between subcutaneous fat and internal fat may not be the same for all individuals and may fluctuate during the life cycle. Lean body mass represents the weight of your muscles, bones, ligaments, tendons, and internal organs. Lean body mass differs from fat-free mass. Since there is some essential fat in the marrow of your bones and internal organs, the lean body mass includes a small percentage of essential fat. However, with the two-component model of body composition, these sources of

essential fat are estimated and subtracted from total body weight to obtain the fat-free mass. Practical methods of assessing body composition such as skin folds, bioelectrical impedance analysis (BIA), and hydrostatic weighing are based on the two-component (fat and fat-free mass) model of body composition. Our bodies require essential fat because it serves as an important metabolic fuel for energy production and other normal bodily functions. Normal body functions may be disrupted if body fat falls below the minimum level recommended for men (5%) and women (15%). The body fat ranges for optimal health (18%-30%) for women and (10%-25%) for men are based on several epidemiological studies of the general population. Body fat percentages for optimal fitness and for athletes tend to be lower than optimal health values because excess fat may hinder physical performance and activity. When prescribing ideal body fat for a client, you should use a range of values rather than a single value to account for individual differences. After age 20, you should expect at least 1-3% fat gain per decade up to the age of 60; thereafter fatness declines gradually. In addition, there is approximately a 2% loss of bone mass per decade in older populations. As a result of these changes, men and women who weigh the same at age 60 as they did at age 20 may actually have double the amount of body fat unless they have been physically active throughout their life (Wilmore et al 1986) Body composition is a key component of an individual's health and physical fitness profile. Obesity is a serious health problem that reduces life expectancy by increasing one's risk of developing coronary artery diseases, etc. Too little body fat also poses a health risk because functions. Essential lipids, such as phospholipids, are needed for cell membrane formation: nonessential lipids, like triglycerides found in adipose tissue, provide thermal insulation and store metabolic fuel. In addition, lipids are involved in the transport and storage of fat-soluble vitamins (A, D, E and K) and in the functioning of the nervous system and the reproductive system, as well as in growth and maturation during pubescence. (Morrow, et al., 2005) Knowledge of the typical body composition of athletes in a sport is helpful in determining suitable target weights and in evaluating the effects of training programs. Unfortunately, the ideal weight and fat content of an athlete for optimum performance are not known precisely. Extensive data are available on wrestlers due to research on weight reduction and the need to establish minimum weight. Adolescent wrestlers are especially of concern because of potential effects of extreme weight loss on health and growth (Sinning, 1996)



Source; <https://www.google.com.et/search>

**Figure 2. Healthy body composition**

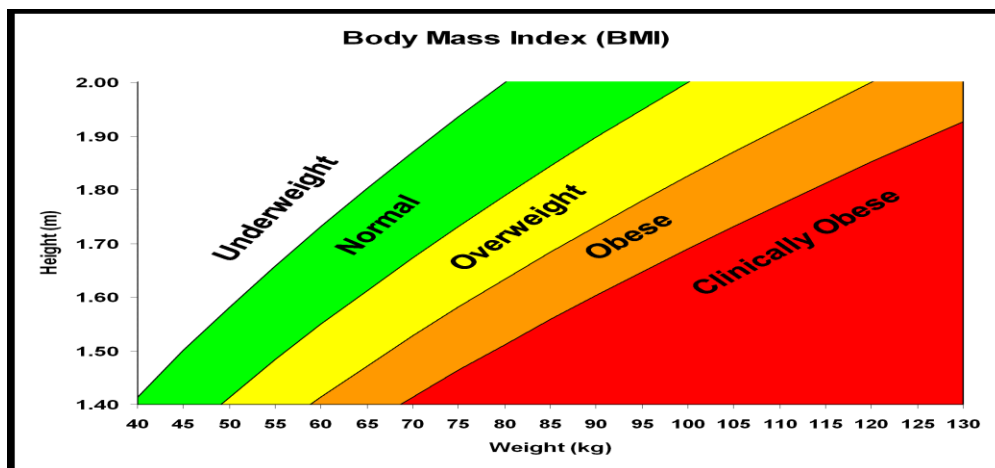
## 2.4 Body Composition Measurement

Body composition can be estimated through various techniques from Field-based tests requiring only a calculator or tape measure to advanced tests conducted in clinical or laboratory setting performed by trained technician. The most Common and accessible methods of exploring the levels of adiposity include body mass index (BMI), waist circumference, skin folds and the other sophisticated measurement bioelectrical impedance analysis, dual–energ x-raabsorphtiom-etry(DEXA) under water weighing .according to David Naviman 2011 some of them elaborated as follows; Why measure body composition? (WHO, 2012).

- ❖ Baseline assessment prior to exercise program and or diet plan
- ❖ To help athletes determine the best body composition for performance.
- ❖ To monitor fat and fat free weight in patients with diseases.
- ❖ To track long-term changes that occur in body fat and fat free mass with ageing.
- ❖ To assess underweight or anorexic individuals
- ❖ Accurately assess lean and fat mass in overweight individuals
- ❖ To assess the decrease in body fat weight that occurs in response to a weight management program.

### 2.4.1 Body mass index (BMI)

Body mass index (BMI) was invented by a Belgian mathematician, Adolphe Quetelet, who was born in 1796. A calculation of body weight and height indices for determining degree of obesity the most common formula for body mass index is body weight in kilograms divided by height in meters squared, and is also the Quetelet index. It has been seen as a useful guideline for approximating a healthy weight and for carrying out surveys of populations. (Boride, 1988).



Source; <https://www.google.com.et/search>

Figure 3. Body mass index chart

### **2.4.2 Waist measurement**

Waist circumference is a simple check to see if you are carrying excess body fat around middle. Waist circumference is positively correlated with abdominal fat content. Carrying excess body fat around middle is more of a health risk than if weight is on hips and thighs. Regardless of height, for most adults a waist measurement of greater than 94 cm for men and 80 cm for women is an indicator of the level of internal fat deposits which coat the heart, kidneys, liver, digestive organs and pancreas. This can increase the risk of heart disease and stroke. Waist measurement helps to assess risk by measuring the amount of fat carried around middle. It provides a clinically acceptable measurement for assessing a patient's abdominal fat content before and during weight loss treatment. Heyward, Vivian H. 2002.

### **2.4.3 Skin fold measurement**

The most widely used method for determine body fat percent calipers of a double fold of skin at various sites .when considering validity, reliability, economy, and good norms skin fold tests are probably most practical and useful with proper training and practice testers can learn to assess body composition quickly accurately. However, careful selection and observation of rules for measuring are important. Lohman, T, G 1986.

### **2.4.4 under water weighing**

Method of determine body composition by weighing the individual under water. In this procedure whole body density is calculated from body volume and then body density is converted to percent body fat through use of equations. Wilmore JH.1969.

### **2.4.5 DEXA**

The acronym for dual energy x-ray absorption–etry ,which is a method for estimating body composition .it uses low radiation to measure bone minerals , fat mass ,non bone fat free mass (a three component model) Laforgia J, Heymsfield SB1999

## **2.5. Classification of Body Weight**

### **2.5.1. Optimal body weight**

The healthiest body weight taking account fat-free mass and fat mass. Calculated by dividing the fat –free mass by 100%desired percent body fat.

### **2.5.2. Under weight**

Underweight is a term describing a person whose body weight is considered too low to be healthy. The definition usually refers to people with a body mass index (BMI) of under 18.5 or a weight 15% to 20% below that normal for their age and height group. (NASMHP,2008)

### **2.5.3. Defining excess weight**

In reviewing weight issues and potential interventions, it is important to first define excess weight. In adults, there is general consensus that excess weight is measured using standard categories of Body Mass Index (BMI). BMI is a direct calculation using height and weight, and is a practical indicator for adults of body fat. In the U.S., adults whose BMI measures 25.0-29.9 kg/m<sup>2</sup> are categorized as overweight, 30.0-34.9 kg/m<sup>2</sup> as mildly obese, 35.0-39.9 kg/m<sup>2</sup> as moderately obese, and >40.0 kg/m<sup>2</sup> as extremely obese (NASMHP,2008)

## **2.6. Types of obesity**

Background: In general obesity can be categorized as upper truncal obesity and lower truncal obesity also known as ‘apple type of obesity’ and ‘pear type of obesity’, respectively. The third type besides android and gynoid, there is one more type of obesity. On the basis of distribution of excess body fat obesity is broadly divided into following three categories. NASMHPD. 2008.

### **2.6.1. Android (apple type)**

Android type of obesity is likened to the shape of an apple. The shoulders, face, arms, neck, chest and upper portion of the abdomen are bloated. The stomach gives a stiff appearance. So, also arms, shoulders and breast. The back seems to be erect but the neck is compressed and there will be protruding chest because of the bulk in the stomach. The lower portion of the body, the hips, thighs and legs are thinner beyond proportion in comparison with the upper part. In these persons, the vital organs affected will be mostly the heart, liver, kidneys and lungs. Though this type of obesity is found more in males it is common in females too. Those females, who are under hormone treatment for their menstrual abnormalities or after childbirth, are more prone to this type of obesity. It occurs in females around menopause too due to thyroid glands functional disturbance. Android type of obesity is a major risk for heart damage and heart disease due to high cholesterol. Indian journal of clinical Practice. 2013.



### **2.6.2. Gynoid (pear type)**

In this type the lower part of the body has the extra flesh. This type of obesity is also common to both sexes though females are more affected. Gynoid type of obesity is similar to pears. The flesh is somewhat flabby in the abdomen, thighs, buttocks and legs. The face and neck mostly give a normal appearance. In some persons, the cheeks may be drawn too. As these persons grow old the whole figure assumes a stooping posture and the spine is never erect due to the heavy hips and thighs. The vital organs affected mostly are the kidneys, uterus, intestines, bladder and bowels. In this type of obesity, exercises or dieting will not help appreciably in reducing weight. Indian Journal of Clinical Practice .2013.

### **2.6.3. The third type**

Besides android and gynoid, there is one more type of obesity. Some people do not belong to any of the above type of obesity. Their whole body from head to toe looks like a barrel. Their gait is more like rolling rather than walking. The fat tissues in their body hinder the movement of all the internal organs and consequently affect their brisk functioning. For them any exercise is difficult due to the enormous size of the body. So such persons should follow a strict diet and do plenty of exercise. Obesity and overweight are best defined using the body mass index (BMI). This index is determined by dividing body weight in kilograms by the square of the height in meters:  $BMI = W/H^2$ . The normal rate for BMI is 18.5-25. A BMI between 25 and 30 kg/m<sup>2</sup> is defined as overweight and a BMI above 30 kg/m<sup>2</sup> is defined as obesity. Visceral fat can be used as an index of central adiposity. An increase in visceral fat reflects central obesity and increases health risks. The waist circumference (WC) is used to assess the amount of visceral obesity. A WC in men 94 cm or more, and in women 80 cm or more, is the threshold for high health risk but desirable abdominal girth level should be <80 cm. WHO .2000

## **2.7. Determinant Factors of Body Weight**

Over weight and obesity is multi factorial. The major cause of overweight and obesity are genetics, metabolic rate, eating patterns, lifestyle, and environment as well as other factors described as follows. Kevin D Hall. 2012

### **2.7.1. Genetics**

The term “genetics” refers to the molecular codes that exist in all human beings. Genes are expressed to carry out a variety of functions throughout the body. Research is emerging on how gene expression can be altered by factors outside of the body (epigenetic). For example, a woman’s nutritional habits in pregnancy may be able to alter the genes expressed in her fetus. Some studies show that children who have parents who are obese or overweight are at a higher risk of becoming obese or overweight themselves, even if they are not living in the same home. Some genes have been identified that may affect appetite or metabolic rate.6-8 these genes exist in various combinations in humans because they probably offered survival advantage. During periods of food availability, these genes may have increased the efficiency of fat deposition so an individual can survive longer during periods of food insecurity. (Challis et al., 2000).

The interplay between genetics and environmental causes for overweight and obesity can be confusing. Families may share genetics and behaviors. Despite the presence of some genetic factors, it is unlikely that genetics are responsible for the obesity epidemic, which correlates with changing lifestyle patterns. Genetics take generations to change (although changes in gene expression are being studied). Even for those who feel they are genetically predisposed; genes do not supersede all other factors in terms of achieving a healthier weight. (Zheng, Lenard, Shin, &Berthoud, 2009)

Genetics play a role in obesity and overweight, though the extent which genetics affects weight is still unclear. Five genetic mutations that cause human obesity have been identified, as well as additional genetic risk factors (Challis et al., 2000). Predisposition to obesity appears to be caused by an interaction between at least 250 obesity-associated genes and prenatal factors (Eggerling, Pawlak, & Ludwig, 2002). Overall, although genetic markers have been associated with obesity, genetic causes account for less than 5% of obese individuals (Speiser et al., 2005). Impaired brain function may also contribute to difficulties with weight management. Signaling pathways in the brain tell the body when to eat and when to stop eating (Zheng, Lenard, Shin, &Berthoud, 2009). Even the slightest chemical imbalance in the brain can disrupt

healthy signaling and result in significant weight gain. For example, the hormone leptin regulates energy intake and energy expenditure by telling the brain when the body has reached satiation. Defects in the receptor for leptin produces severe obesity syndrome. Also persons prescribed medications which after station signal path ways .often leading to weight gain. (www.bhwellness.org)

### **2.7.2. Metabolic rate**

Apart from genetics, people's metabolic rates are largely determined by how active they are. We are told that for every ten years beyond our early to mid-twenties our metabolism slows about 10%. While a reduction in metabolism is observable as we age, such a reduction may be more due to a sedentary lifestyle than to mere aging. Muscle tissue is metabolically active compared to fat, and thus our metabolic level at any moment is in large part due to the state of our muscle mass. Inactivity accelerates loss of muscle tissue over time which decreases metabolism, making it all but certain that weight will be gained. Activity, on the other hand, reduces muscle loss, or even increases muscle mass, with the effect of increasing metabolism and making it easier to lose weight. . (Challis et al., 2000).

### **2.7.3. Eating patterns**

People's food related habits and cultural expectations are also important determinants of their weight, influencing the types and amounts of foods consumed. For instance, families favoring high-fat, high calorie food (such as lasagna) served 'family style' (so that anyone can take as much as they like) are at greater risk for eating too much food and gaining weight than are families serving smaller portions of lean meats, steamed vegetables and brown rice. Similarly, families who push members to eat, or who keep high fat snacks and deserts handy are at greater risk for weight problems than are families that promote sensible portion sizes and save treats for special occasions. The speed at which people learn to eat and the consciousness with which they do so are important too. People who eat quickly tend to eat more than people who eat slowly as it takes a few minutes for your stomach to tell your brain it is full. Fast eaters sometimes finish their plates before getting the stomach's fullness message. . (Challis et al., 2000).

#### **2.7.4. Life style**

A sedentary lifestyle is a type of lifestyle with no or irregular physical activity. A person who lives a sedentary lifestyle may colloquially be known as a couch potato. It is commonly found in both the developed and developing world. Sedentary activities include sitting, reading, socializing, watching television, playing video games, and computer use for much of the day with little or no vigorous physical exercise. A sedentary lifestyle can contribute to many preventable causes of death. Screen time is the amount of time a person spends watching a screen such as a television, computer monitor, or mobile device. Excessive screen time is linked to negative health consequences. Physical inactivity a leading cause of disease and disability, warns WHO.

April 2002 - Physical inactivity can have serious implications for people's health, said the World Health Organization on the occasion of World Health Day. Approximately 2 million deaths per year are attributed to physical inactivity, prompting WHO to issue a warning that a sedentary lifestyle could very well be among the 10 leading causes of death and disability in the world.

Sedentary lifestyles increase all causes of mortality, double the risk of cardiovascular diseases, diabetes, and obesity, and increase the risks of colon cancer, high blood pressure, osteoporosis, lipid disorders, depression and anxiety. According to WHO, 60 to 85% of people in the world from both developed and developing countries lead sedentary lifestyles, making it one of the more serious yet insufficiently addressed public health problems of our time. It is estimated that nearly two-thirds of children are also insufficiently active, with serious implications for their future health.

Physical inactivity, along increasing tobacco use and poor diet and nutrition, are increasingly becoming part of today's lifestyle leading to the rapid rise of diseases such as cardiovascular diseases, diabetes, or obesity. (WHO)

### **2.7.5. Environment**

The environment is a major determinant of overweight and obesity. Environmental influences on overweight and obesity are primarily related to food intake and physical activity behaviors. In countries like the United States, there is an overall abundance of palatable, calorie-dense food. In addition, aggressive and sophisticated food marketing in the mass media, supermarkets, and restaurants, and the large portions of food served outside the home, promote high calorie consumption. Many of our socio cultural traditions promote overeating and the preferential consumption of high calorie foods. (WHO. 2003)

For many people, even when caloric intake not above the recommended level, the number of calories expended in physical activity is insufficient to offset consumption. Mechanization limits the necessity of physical activity required to function in society. Many people are entrenched in sedentary daily routines consisting of sitting at work, sitting in traffic, and sitting in front of a television or a computer monitor for most of their waking hours (NIH,1998)

### **2.7.6. Other factors**

Medications; Medications associated with weight gain include certain antidepressants (medications used in treating depression), anticonvulsants (medications used in controlling seizures such as carbamazepine [Tegretol, Tegretol XR , Equetro, Carbatrol] and valproate [Depacon, Depakene]), some diabetes medications (medications used in lowering blood sugar such as insulin, sulfonylureas, and thiazolidinediones), certain hormones such as oral contraceptives, and most corticosteroids such as prednisone. Weight gain may also be seen with some high blood pressure medications and antihistamines. The reason for the weight gain with the medications differs for each medication. If this is a concern for you, you should discuss your medications with your physician rather than discontinuing the medication, as this could have serious effects. Psychological factors for some people, emotions influence eating habits. Many people eat excessively in response to emotions such as boredom, sadness, stress, or anger. While most overweight people have no more psychological disturbances than normal weight people, about 30% of the people who seek treatment for serious weight problems have difficulties with binge eating.

Diseases such as hypothyroidism, insulin resistance, polycystic ovary syndrome, and Cushing's syndrome are also contributors to obesity. Social issues:

A link between social issues and obesity has been established. Lack of money to purchase healthy foods or lack of safe places to walk or exercise can increase the risk of obesity.  
[http://www.medicinenet.com/obesity\\_weight\\_loss/page3.htm](http://www.medicinenet.com/obesity_weight_loss/page3.htm)

## **2.8. Consequences and Risk of Overweight and Obesity**

The consequences of obesity can be split into three groups, physical, psychological and social.

### **2.8.1. Physical**

In our looks-obsessed society, lots of people think that being overweight is an appearance issue. But being overweight is actually a medical concern because it can seriously affect a person's health. Excess weight, especially obesity, diminishes almost every aspect of health, from reproductive and respiratory function to memory and mood. Obesity increases the risk of several debilitating, and deadly disease. People who are overweight have an increased risk of:

- ❖ cardiovascular disease
- ❖ High blood pressure
- ❖ Strokes
- ❖ Type 2 diabetes
- ❖ Some cancers

In addition to the above, obesity can reduce life expectancy by up to 9 years. Being overweight can also put extra pressure on joints and limbs, making activity quite difficult and sometimes any movement at all can be painful.

### **2.8.2. Psychological**

Many people can also develop psychological problems because of being overweight or obese. For example: low self-esteem; poor self-image (not liking how you look); low confidence; feelings of isolation. These feelings may affect relationships with family members and friends and, if they become severe, may lead to depression. Studies have shown that obesity can lead to psychological problems such as: (Ebbeling, Pawlak, & Ludwig, 2002).

- ❖ Depression
- ❖ Anxiety
- ❖ Low quality of life
- ❖ Low self-esteem
- ❖ Body dissatisfaction

### **2.8.3. Social**

The social consequences of being overweight and obese are serious and pervasive. Some of them are listed below:

- ❖ More likely to suffer from prejudice and discrimination in some situations (for example Employment, travel, schooling, healthcare, retail etc)
- ❖ Fewer friends
- ❖ Lower educational attainment
- ❖ Lower employment
- ❖ less likely to marry
- ❖ more likely to divorce

## **2.9 Preventive and treatment method of overweight and obesity**

### **2.9.1. Exercise**

Exercise is an essential component of a healthy weight management program. Where a person's genetics are more or less set at conception, the amount of energy a person expends in physical activity is under voluntary control. People can choose to be more active, and becoming more active will help people to lose weight. Exercise builds lean muscle mass and burns up fat reserves. Muscles are very metabolically active. Adding muscle mass through strength training raises metabolism (the rate at which the body burns calories) which makes it easier to lose weight. A significant loss of muscle mass, on the other hand, which is what happens when people are sedentary, reduces resting metabolic rate and makes it harder to lose weight. Adding muscle mass helps people to look firmer and slimmer because muscle takes up less space than fat. Careful strength training reduces the risk of accidental injury, improves bone density, helps with digestion and assists in lowering blood pressure, cholesterol and triglyceride levels (all

predictors of disease when elevated. It is recommended that all adults should aim for 150 minutes of exercise a week. One way to do this is to do 30 minutes of moderate-intensity exercise in bouts of 10 minutes for five days of the week. Another method is to do 75 minutes of vigorous-intensity activity spread throughout the week or a combination of moderate and vigorous activity. It is estimated that just to stay the same weight, if diet is not altered, most people need to do 45-60 minutes of moderately-intensive exercise every single day. (<https://www.mentalhelp.net/articles/dynamics-of-weight-loss>)

### **2.9.1.1. Aerobic exercise**

Aerobic exercise any activity involving large muscles, done for an extended period of time. Aerobic exercise is done primarily for cardiovascular fitness and weight loss. Aerobic-type training is commonly undertaken to promote weight loss since it can potentially increase energy expenditure with-out changing energy intake (Ballor, 1996) Aerobic exercise is rhythmic activity that can be maintained continuously and employs the body's largest muscle groups (i.e. the legs).

Aerobic literally means "with oxygen". The continuous rhythmic nature of aerobic activity drives the heart and lungs to bring fresh oxygen to the working muscles. Since fat only burns when oxygen is present, it is important that some form of aerobic exercise be included in a fat loss program. In addition, aerobic exercise at threshold levels encourages muscle growth as it builds cardiopulmonary endurance. To be of maximum benefit, aerobic exercise should be performed 3 to 5 times a week for at least 20 minutes per session.

([http://www.biodyncorp.com/knowledgebase/310/managing\\_weight\\_loss.html](http://www.biodyncorp.com/knowledgebase/310/managing_weight_loss.html))

### **2.9.1.2. Body weight circuit training**

Elements of circuit-style training programs were present early on in history. The modern form of circuit training was developed by R.E. Morgan and G.T. Anderson in 1953 at the University of Leeds in England. It was initially examined as a 9 to 12 exercise protocol where participants performed exercises at a moderate intensity (about 40% to 60% of 1 RM values) for a specified number of repetitions or amount of time. Once the repetitions were performed or time expired, the participant would move to the next exercise station with very little rest. Improvements in muscle strength and endurance were observed, as well as components of aerobic fitness.



People usually cite reasons like a lack of time, no gym membership or not knowing how to use weight machines properly as obstacles to strength training, here's an idea: Simply do bodyweight exercises instead. Bodyweight exercises are a simple, effective way to improve balance, flexibility, and strength without machinery or extra equipment. From legs and shoulders to chest and abs, we've covered every part of the body that can get stronger with body resistance alone.

Bodyweight can provide an adequate training load as long as it results in sufficient aerobic and resistance training intensities. Bodyweight exercises do not require free weights or resistance training equipment. The exercises included can be performed anywhere, at any time, with limited physical space and with no equipment. The BTS is a bodyweight exercise program that combines functional training, core exercises, and aerobic workouts to enhance endurance, strength, flexibility as well as to burn fat. ([www.cphysd.ca](http://www.cphysd.ca))

### **2.9.2. Energy balance.**

Body weight is dependent on the first and second laws of thermodynamics. Weight gain is inevitable when total energy intake exceeds total energy expenditure. Contrariwise, when total energy expenditure exceeds total energy intake, body weight will decrease. Thus, the energy balance equation (i.e., weight change = energy intake minus energy expenditure) governs to change in weight (Basllor, 1996)

If there is a positive energy balance, with intake greater than expenditure, there will be a gain in body weight. Conversely, when energy expenditure is in excess of energy intake, body weight will become less. It is interesting to examine the actual amounts of energy represented by these weight changes. The weight which is added to or lost from the body does not consist only of fat itself but is mostly adipose tissue which is a complex mixture of fat (lipid), connective tissue, and fluid. One kilogram of lipid has an energy equivalent of about 9000 kcal. The energy content of the connective tissue and fluid is comparatively low, but these form 10–30% of the total mass of adipose tissue, which therefore has a lower energy equivalent than pure lipid: about 7000 kcal/kg. When the body is losing weight, each kilogram of adipose tissue which is being consumed has therefore provided 7000 kcal of energy. The body energy stores by about 7000 kcal opposite circumstance, when the body is gaining weight, each kilogram of added adipose tissue increases. An energy imbalance in the body results in a weight gain or loss. There is an energy balance when the caloric intake equals the caloric expenditure. A positive energy balance

is created when the input (food intake) exceeds the expenditure (resting metabolism plus activity level). For every 3500 Kcal of excess accumulated, 1Lb (0.45kg) of fat is stored in the body. A negative energy balance is produced when the energy expenditure exceeds the energy input. This can be accomplished by reducing the food intake or increasing the physical activity level. A caloric deficit of approximately 3500 Kcal produces a loss of 1 Lb of fat. Proper nutrition and daily physical activity are key components of a weight management program. The basic principle underlying safe and effective weight loss programs are that weight can be lost only through a negative energy balance, which is produced when the caloric expenditure exceeds the caloric intake. The most effective way of creating a caloric deficit is through a combination of diet (restricting caloric intake and exercise (increasing caloric expenditure) (Heyward, 2002)

### **2.9.3. Life style modification**

Expert panels sponsored by both the World Health Organization and the National Institutes of Health have recommended that obese adults (i.e., body mass index  $\geq 30$  kg/m<sup>2</sup>), as well as those who are overweight (body mass index of 25–29.9 kg/m<sup>2</sup>) and have co morbid conditions, lose 10% of their initial weight. A comprehensive program of lifestyle modification is considered the first option for achieving this goal. Lifestyle modification, also referred to as behavioral weight control, includes primary components: diet, exercise, and behavior therapy. Obesity is mostly preventable through a combination of social changes and personal choices

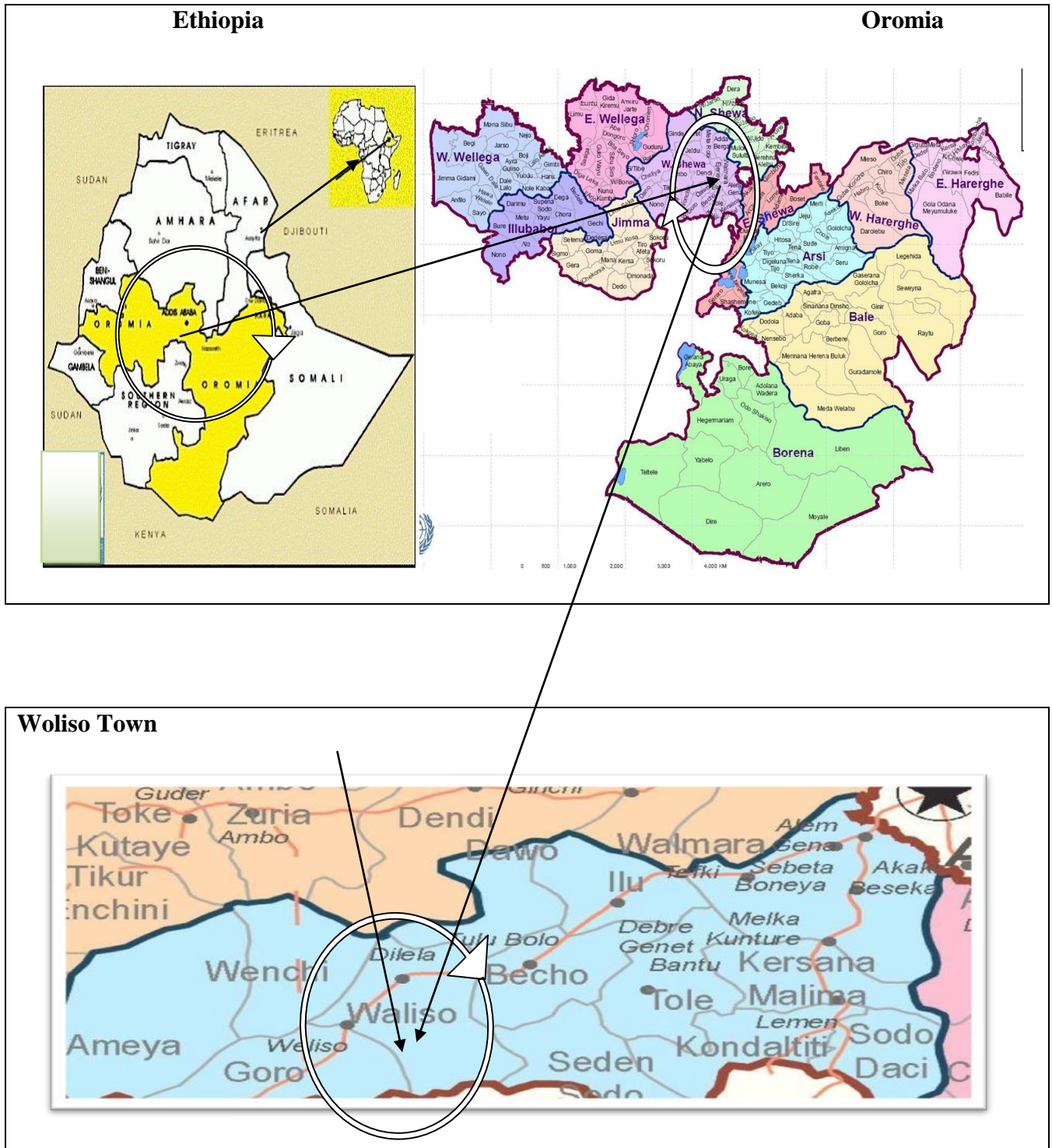
## **CAPTER THREE**

### **3. RESEARCH METHODOLOGY & MATERIALS**

#### **3.1 The Study Area**

The study was conducted at woliso which is located 114 km far from Addis Ababa, the capital city of Ethiopia. It has a latitude and longitude of 8°32'N 37°58'E with an elevation of 2063 meters above sea level with annual rain fall of 1200mL and temperature of 18-27 0c. Woliso was founded in 1927. Since then the town has passed through different social, economic and political reforms. At the moment the town of Woliso has area coverage of 2,225.25 hectare and a population 100,000. Ethnically the population is composed of almost every nation and nationalities of Ethiopia, Woliso. The town is well known by kitfo and kocho which are special food of the people. Currently the town is serving as being the capital city of south west shoa zone of Oromia region. The specific area the study takes place woliso stadium on of the former stadium in the town. Source; <https://www.google.com.et/>

**Figure 1. Map of the study area**



Source ; <https://www.google.com.et/search?q=google+map+ethiopia+picture>

### 3.2. The Study Design

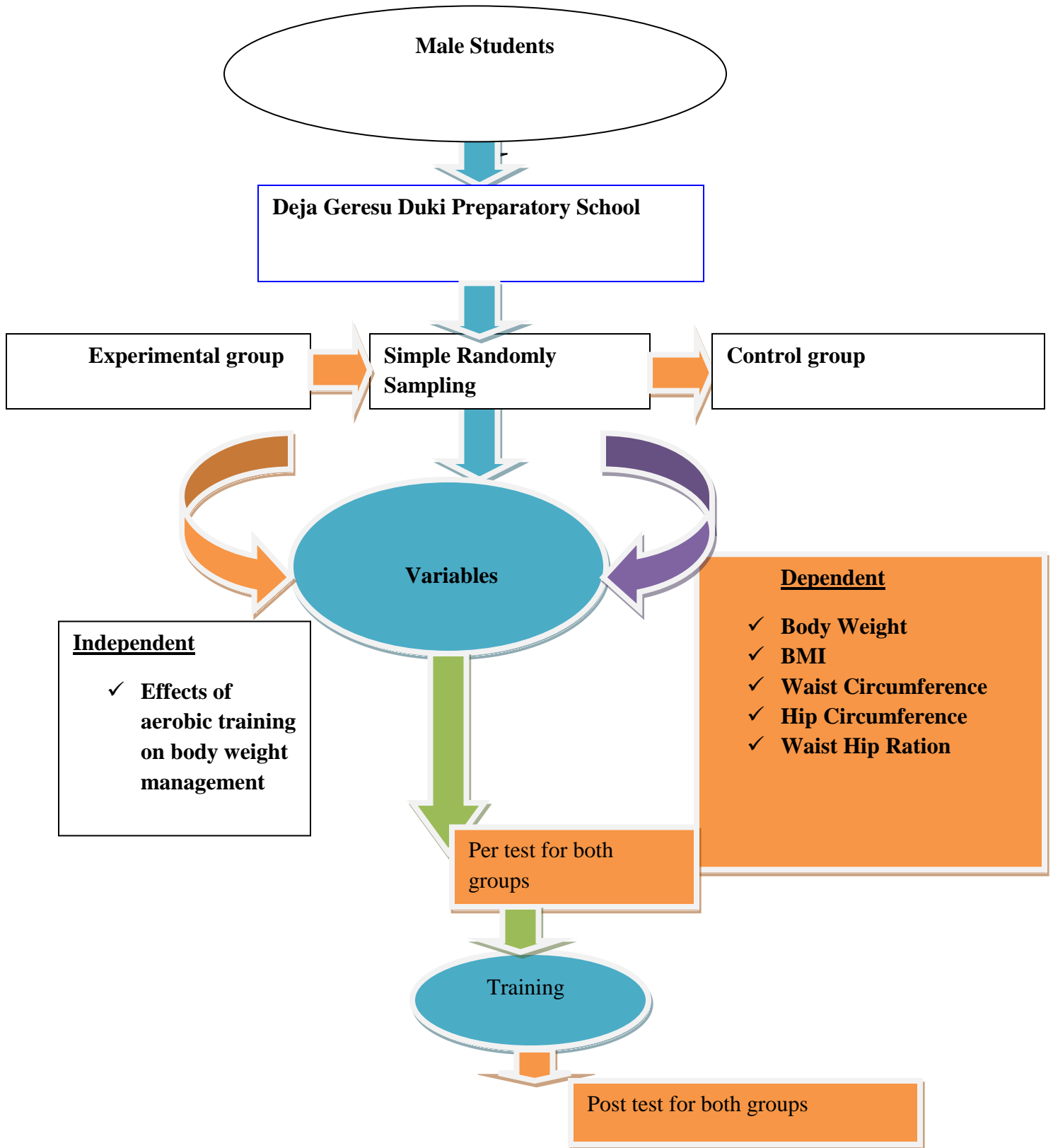
This research was taken informal True experimental design was applied in the true experimental must have a control group which is a group of research participants that resemble the EG but do not receive TG one control group and one Experimental group. (i.e. for pre test and posttest without control ) this study 40 male volunteer with the age of 18-22 years old would be selected as subjects from Daja Gerasu Dhuki School participants by using physical activity readiness questionnaires. The layout for this study as Follows:

**Table2. The study design layout**

| Treatment         | Aerobic exercise and BWCT program |
|-------------------|-----------------------------------|
| Frequency         | 3days /week                       |
| Total duration    | 12 weeks                          |
| Duration /session | 45-60 minutes                     |
| Intensity         | Moderate (55-69HR max)            |
| Exercise days     | Monday, Wednesday ,and Friday     |
| Time of training  | Morning                           |

The pre, during and post tests on selected anthropometric measurement such as BMI ,skin fold thickness ,waist circumference ,waist hip ratio generally body Compositions test result were administered for selected subject. The participant were engaged in designed Program of twelve weeks aerobic exercise and circuit training(AECT) such as rope jumping, jogging, jumping jack, mountain climber And jogging, including warming up ,stretching and cooling down exercise with moderate Intensity, for three days per week (Monday and Wednesday, Friday ), for 45-60 minute per day .

**DIAGRAM 1: DIAGRAM OF EXPERIMENTAL DESIGN**



### **3.3. Population of the study**

A study population is the entire group of people to which a researcher intends the results of a study to apply (Aron and Coups,2008).The target population of this study was grade 12A high school students of Deja Geresu duki preparatory school Among are selected through randomly sampling size techniques such as in the school and their respective teachers the study contains the total population of 40 male students in the school it is to conduct a research on the above total mentioned school population it is Important to determine and select the sample population of the study.

### **3.4. Sample Size and Sampling Techniques**

The randomly sampling method was used to select the sample with pre determined criteria of the study. Based on parameters the subjects among Deja Geresu Dhuki preparatory school participants' selected 40 overweight volunteers by using prepared physical activity readiness questionnaires (PARQ).

The subjects were overweight aged 18-22 years, who had body fat>25%. They did not exercise regularly, and had not been previously diagnosed hypertension, diabetes other health problems. Total sample size consisting of 40 subjects to factor in the subjects who would be dropped from the analysis. The subjects were randomly classified into 2groups: treatment (n = 20) and control (n = 20) groups. The subjects were instructed to follow, training program from initial to the end. However, 2 subjects from the exercise group (TG) were excluded because of health problem and 2 from the control group were excluded because did not participate in the test conducted at during and post test of the study due to personal case. Thus, 18 subjects from the exercise group and 18 from the control group completed the pre- and post-study assessments.

### **3.5. Source of Data**

Data was obtained from primary data sources. The primary sources of data were those obtained from field test which was through pre test, during and post test. There are some things which provide information regarding individuals' ability, knowledge, performance and achievement (Ritchie et al., 2000)

The reason for the investigator was used field test to administer a group of individuals (time effective) less precise than laboratory test of the same characteristics. Additionally, relevant literatures would consult for the availability of data.

### **3.6. Inclusive and Exclusive Criteria**

Investigators must include in their protocols a thorough description of the study population. The first priority is that the subject population have the attributes that will make it possible to accomplish the purpose of the research. Investigators must specify inclusion and exclusion criteria for participation in a study. Inclusion criteria are characteristics that the prospective subjects must have if they are to be included in the study, factors such as age, gender, type and stages of disease, the subject's previous treatment history and the presence or absence, as in the case of the healthy or control group, of other medical, psychosocial or emotional conditions. Healthy or control subjects may be defined as those individuals who would be free of certain specified attributes of non-health. An example of inclusion criteria for a study of BW, BMI, HC, WRC, male between the ages of 18-22 who have been diagnosed with the health statuses of the subject were assessed by physical activity readiness.

#### **3.6.1. Instrumentation**

The following materials were used through the study: calibrated balance beam scale, the total body weight and height, flexible tape meters to measure waist and hip circumferences, skin fold calipers to measure the amount of fat under the skin, other equipment such as stop watch, whistle, first aid kit.



### **3.7. Methods and Procedures of Data Collection**

Based on the objectives of the research, the physical activity readiness questionnaire (PARQ) distributing for Deja Geresu dhuki preparatory School l2A .then filter 36 from total population by considering (PARQ) as an inclusion and exclusion criteria. Selected subject were at the age of 18-22and they were actively participates in aerobics exercise and circuit training health related exercise training program which result losing weight for three months (12weeks) and 45-60 minutes per session .Anthropometric measurement pre, during, posttest seriously administered.

#### **3.7.1 .Experimental Measurements**

The experimental test measurements including body height, weight, waist circumference, hip circumference, waist to hip ratio, BMI, skin fold thickness test were taken before aerobic physical training in terms of pretest ,during training test and finally after 12 weeks of training or Post training

#### **3.7.2. Height measurement**

The calibrated height and weight digital balance beam scale in meters was used to measure the total body height participant were asked to stand was barefooted.

#### **3.7.3. Body weight measurement**

This is measurement take total body mass of an individual the calibrated digital balanced beam scale in kilogram (kg).subjects weighted in light clothing with bare footed. Strictly speaking, body weight is the measurement of weight without items located on the person, without shoes or heavy accessories such as mobile phones and wallets.

#### **3.7.4. Body mass index (BMI)**

This measurement was taken properly to calculate the percentage of total body weight and ratio .it is indirect measurement of body fat and can be calculated as subject weight in kg divided by the square of height in meters.

### **3.7.5. Waist circumference (WC)**

For this waist circumference test the subject were asked to stand cloths .the waist circumference is measuring at the level midway between the lower rib margin and the iliac crest with the participation breathing out gently .this technique is using to measure the fat accumulation around the abdomen using flexible tape meters and the unit of measurement is in centimeters (cm)

#### **3.7.5.1 Hip circumference (HC)**

Hip measurement was used to measure maximum circumference over the buttocks by using flexible tape meter and the unit of measurement is centimeter

#### **3.7.5.2. Waist hip ratio (WHR %)**

Waist-hip ratio, or WHR, looks at the ratio of waist circumference to hip circumference. This tests by take the above waist circumference and hip circumference results calculating waist circumference divided by hip circumference ( $WHR=WC/HC$ )

#### **3.7.5.3. Mixed Exercise Protocol**

This exercise protocol comprised of both aerobic as well as circuit training. The aerobic and the circuit training were using combined during the twelve weeks period. By combined, it is meant aerobic exercise with body Wight circuit training would give in every session. Frequency of exercise program is kept three days/week. The subjects performed warm up and cool down exercises in the same manner as described for other exercise program.

### **3.8. Method of Data Analysis**

The data collected through tests were analyzed interpreted and tabulated into a meaningful idea using manually and in a computer in order to evaluate the changes observed among participants that underwent the physical trainings. Data analyzing using computerized statistical package software (SPSS).The paired T-test will used to compare the pre training and post training data and the level of significance  $<0.05\%$ .

### **3.9. Ethical Consideration**

This study went in line with ethical issues. The privacy of the participant could be protected. Generally, this research has been conducted as pre rules, policies and research ethics of Jimma University.

## CHAPETR FOUR

### 4. RESULT AND DISCUSION

#### 4.1 Body Weight (kg)

**Table 3.the mean values of body weight for TG and CG involved in aerobic exercise combined with circuit training for twelve week of experimental period.**

|           | PARAMEER  |           |
|-----------|-----------|-----------|
|           | BW        |           |
|           | TG(n=18)  | CG(n=18)  |
| Variables | Mean±SD   | Mean ± SD |
| PR        | 89.6±3.47 | 88.9±2.85 |
| DT        | 88.3±3.42 | 88.3±2.90 |
| POT       | 86.2±3.39 | 88.4±2.93 |
|           |           |           |

*BW=body weight, TG=treatment group, CG=control group, PR=pretest, DT=duringtest, POT=posttest, values are mean ± SD*

Table 3 indicates that there were significant changes in the reduction of body weight in treatment group .body weight reduced post test from 89.6 to 86.2 kg (3.4%)and

Similarly table also indicated that body weights no significant changes from among CG Participants.

The data showed there is change of body weight in group of AECT participants' given relatively compare with CG .the use of the physical exercise has been one of the most employed procedures for the overweight obesity treatment. There is a significant inverse relation between physical activity and body fat.

Studies have verified the effectiveness of the exercise for the increase on the fat burn and decrease on the body weight the results are also in line with the previous literature that found improvements in health related Parameters of overweight participants as a result of regular exercise participation (leslie h.*et, al2019*).

## 4.2 BMI (Kg/m<sup>2</sup>)

**Table 4: The mean values of body BMI for TG and CG involved in aerobic exercise combined with circuit training for twelve week of experimental period.**

|           | PARAMEER    |            |
|-----------|-------------|------------|
|           | BMI         |            |
|           | TG(n=18)    | CG(n=18)   |
| Variables | Mean ± SD   | Mean ± SD  |
| PR        | 26.16±0.40  | 25.96±0.53 |
| DT        | 25.79±0.47  | 26.08±0.57 |
| POT       | 25.19± 0.54 | 26.08±0.55 |

*BMI=body max index, TG=treatment group, CG=control group, PR=pretest, DT= during test, POT=posttest, values are mean ± SD*

The data showed that there were significant changes in the reduction of BMI in TG of participants .This was due to the training they were engaged in the AECT .the mean value of BMI reduced from 26.16kg/m<sup>2</sup> to 25.19 kg/m<sup>2</sup> (0.97%) for TG recorded and table also indicated that there was no reduction from among CG but additional BMI gain due to no action taken in order t to manage their body weight within twelve weeks experimental period.

## 4.3 Waist Circumference (WC)

**Table 5: the mean values of WC for TG and CG involved in aerobic exercise combined with circuit training for twelve weeks of experimental period.**

|           | PARAMEER    |             |
|-----------|-------------|-------------|
|           | WC          |             |
|           | TG(n=18)    | CG(n=18)    |
| Variables | Mean ± SD   | Mean ± SD   |
| PR        | 104.39±2.76 | 103.94±2.87 |
| DR        | 101.22±2.12 | 104.28±2.67 |
| POT       | 96.72±1.93  | 104.33±2.70 |

*WC=Waist circumference, TG=treatment group, CG=control group, PR=pretest, DT= during test, POT=posttest, values are mean ± SD*

The data indicated table that the waist circumferences of treatment group were progressively changed from pre test to post test of experimental period. The TG waist circumference mean value was reduced from 104.39 pretest core to 96.72(7.3%) post test.

#### 4.4 Hip Circumference (HC)

**Table 6. The mean values of body HCfor TG and CG involved in aerobic Exercise combined with circuit training for twelve week of experimental period.**

|           | PARAMEER    |             |
|-----------|-------------|-------------|
|           | HC          |             |
|           | TG(n=18)    | CG(n=18)    |
| Variables | Mean ± SD   | Mean ± SD   |
| PR        | 101.83±2.43 | 101.50±2.85 |
| DR        | 100.56±1.9  | 101.61±2.81 |
| POT       | 99.44±1.72  | 101.56±2.79 |

*HC=Hip circumference, TG=treatment group, CG=control group, PR=pretest, DT= during test, POT=posttest, values are mean ± SD*

The data in table 5 revealed that the mean value of hip circumference in TG was changed from 101.83 to 99.44 (2.3%) value of the TG decreased at the end of the experimental period. As table shows the CG hip circumferences the pre test to post test result was the same throughout the study period this means there is no significance change.

#### 4.5 Waist Hip Ratio (W/H)

**Table 7. The mean values of body W/H% for TG and CG involved in aerobic exercise combined with circuit training for twelve week of experimental period.**

|           | PARAMETR        |                 |
|-----------|-----------------|-----------------|
|           | W/H%            |                 |
|           | TG(n=18)        | CG(n=18)        |
| Variables | Mean $\pm$ SD   | Mean $\pm$ SD   |
| PR        | 1.02 $\pm$ 0.01 | 1.01 $\pm$ 0.01 |
| DR        | 1.00 $\pm$ 0.01 | 1.02 $\pm$ 0.01 |
| POT       | 0.96 $\pm$ 0.01 | 1.02 $\pm$ 0.01 |

*W/H=Waist hip ratio, TG=treatment group, CG=control group, PR=pretest, DT= during test, POT=posttest, values are mean  $\pm$  SD*

As indicated in table 5 (W/H) the mean value of TG waist hip ratios before training (pretest) was 1.02 and after they engaged in AECT the mean value of decreased to 0.96 (6%) .The improvement rate of this data was indicator of the effects of AECT

As indicated table waist to hip ratio mean value of CG pre test result was 1.01 post tests was 1.01. The result showed that the CG was same throughout study .which indicates no significance difference was observed on CG of participants.

#### 4.6. Comparison of Anthropometric Result (BW, BMI, WC,HP, W/H %)

**Table. 8. Changes in the Anthropometric measurement characteristics treatment and control groups**

| PARAMETER                |                |            |                |            |
|--------------------------|----------------|------------|----------------|------------|
|                          | TG             |            | CG             |            |
|                          | PR ±SD POT ±SD |            | PR ±SD POT ±SD |            |
| BW(kg)                   | 89.6±3.47      | 86.2±3.39  | 88.9±2.85      | 88.4±2.93  |
| BMI (kg/m <sup>2</sup> ) | 26.16±0.40     | 25.19±0.54 | 25.96±0.53     | 26.08±0.55 |
| WC(CM)                   | 104.39±2.76    | 96.72±1.93 | 103.94±2.87    | 104.3±2.7  |
| HC(CM)                   | 101.83±2.43    | 99.44±1.72 | 101.50±2.85    | 101.56±2.7 |
| W/H (%)                  | 1.02±0.01      | 0.96±0.01  | 1.01±0.01      | 1.02±0.01  |

*PR=Pretest, POT=Posttest, BW=Body weight, BMI=Body mass index, WC=Waist circumference, HC=Hip circumference, W//H=Waist hip ratio%*

The data (6) the above table showed that TG there was significance difference in between the pre to post test score of all anthropometric measurement was due to AECT in which they were engaged in .the mean score value of BW pre test before training result was (89.6) and post test after training mean score values was (86.2.) the mean value score of pre test with mean score values of 12 weeks AECT mean difference value decreased by (3.4).

As indicated the tables mean value of BMI from pre test 26.16 decreased to 25.19 post test. BMI score of pre test to post test mean difference value of TG decreased (0.97) recorded.

The mean value of WC from pre test 104.39 decreased to 96.72 post test.WC score of pre testpost test mean to post test mean difference value of TG decreased (7.6) recorded.

The mean value of HC also reduced from pre test 101.83 to 99.44 post tests .HC score of pre test mean to post mean difference value of TG reduced (2.4) recorded. The mean value of waist



hip ratio (W/H) from pre test 1.02 decreased to 0.96 post test. Waist hip ratio/H score of pre test mean to post test mean difference value of decreased (0.06) recorded.

When we compare the pre test and post test of mean difference value score in each parameters of 12 weeks AECT intervention treatment groups the first Better change observed on W.C=7.67%, second on W/H =6% third on BW=3.4%, fourth BMI=0.97%, lowest score of mean difference value was HC=2.4%. The improvement rate of this data was one indicator of the

Since all score of mean difference value had been reduced from pre test to post test it clearly showed that body weight management were progressively well improved from pre training to post training in TG. The result also showed that the CG was the same throughout the study which indicates no significance difference was observed on CG of participants.

#### **4.7. Discussion**

The purpose of this study is to find out the effect of 12 weeks aerobic training on body weight management In the case of male Deja Geresu Duki Preparatory school. To achieve the purpose of this study 40 overweight Volunteers and grouped into experimental and control group equally to compare the effects of the given exercise.

Both groups were selected from which age ranges 18-22 years old. The exercise program was designed for 12 weeks, three times per week with 45-60 min per day duration and moderate intensity.

Each session was divided again in to warming up, main part (aerobic training stretching) and cooling down phase. The data collected from the study was analyzed using SPSS version 20 software. The paired sample t-test was used for this study.

The mean values of participants there were significant changes in the reduction of body weight for control group and experimental group respectively. The mean values of participants body weight reduced post test from 89.6 to 86.2 kg (3.4%) and similarly also indicated that body weights no significant changes from among control group participants.

The data showed there is change of body weight in group of AECT participants given relatively compare with control group the use of the physical exercises has been one of the most employed

procedures for the overweight obesity treatment. There is a significant inverse relation between physical activity and body fat

Studies have verified the effectiveness of the exercise for the increase on the fat burn and decrease on the body weight the results are also in line with the previous literature that found improvements in health related Parameters of overweight participants as a result of regular exercise participation (Leslie *h.et, al2019*).

The mean value of BMI ( $\text{kg}/\text{m}^2$ ) the data showed there were significant in the reduction of BMI in treatment group of participants this was due to the training they were engaged in the AECT the mean valve of BMI reduced from  $26.16 \text{ kg}/\text{m}^2$  to  $25.19 \text{ kg}/\text{m}^2$  (0.97) for TG recorded and table also indicated that there was no reduction from among CG but additional BMI gain due to no action taken in order to manage their body weight within twelve weeks experimental period.

The data indicated that the waist circumferences of treatment group were progressively changed from per test to post test of True experimental period. The TG waist circumference mean valve was reduced from 104.39 pretest core to 96.72 (7.6) post test after training for experimental.

The mean valve of Hip circumferences from per test also reduced from test pre test 101 .83 to 99.44 post test. HC Showed of per test mean to post mean difference valve of treatment group reduced (2.4) recorded .The mean valve of Waist hip ratio from pre test 1.02 decreased to 0.96 post test. Waist hip ratio/ Hip score of per test mean to post test mean difference valve of decreased (0.06) recorded

When we compare the per test and post test of mean difference valve score in each parameters of 12 weeks aerobic exercises circuit training intervention treatment groups the first better change observed on W.C = 7.67% , Second W/H =6% thired on BW = 3.4% forth BMI 0.97 ,lowest score of mean difference valve was HC =2.4 % .The improvement rate of this data was one indicator of the

Since all score of mean difference value had been reduced from pre test to post test it clearly showed that body weight management were progressively well improved from pre training to post training in TG. The result also showed that the CG was the same throughout the study which indicates no significance difference was observed on CG of participants.

## CHAPETR FIVE

### 5. SUMMARY, CONCLUSIONS AND RECOMMENDATION

#### 5.1. Summary

The vast majority of scientific evidence supports a beneficial role of exercise on achieving body weight stability and overall health. The goal is to find ways to motivate people to exercise and adopt healthy lifestyles. In order to achieve this objective, we must be innovative and creative in finding ways to fight against the modern way of living that drives excess energy intake relative to expenditure. This was the reason the researcher had selected the aerobics exercise combined with circuit training program for this study. Based on this the study with objectives of investigate the effect of aerobic exercise combined with circuit training on the body weight management among participants of Deja Geresu Dhuki Preparatory School had been and well conducted.

Thirty six over weighted subjects sex only male their age range from twenty up to twenty two years and their body max index (BMI) between  $>25.0\text{kg/m}^2$ - $27.\text{kgm}^2$ were participated in this study, purposive sampling was used to select participant .The selected participant were assigned The exercise were done for three consecutive months three days per week 45-60 min for TG only with aerobic exercise combined with circuit training .pre, during test were taken analyzed.

The training program consisted of moderate intensity (60-65HRMax) including proper warming up , dynamic searching, cooling down /static starching performed in each training session .the test measurement used to collect the result were including body eight ,body max index, waist circumference ,hip circumference ,waist hip ratio .

The data was analyzed by SPSS statistical software package version 20.00 paired tests was used to identify or to see the significance between the training program result on the changes of body weight .The level of significance was set at 0.05%. The statistical results of each test were analyzed and discussed based on parameters separately.

The result and analysis of the study between the pre and post test data from both groups (TG and CG) clearly showed that there was significance difference in each of the test measurements including body weight, body max index waist circumference hip circumference waist hip ratio. As the study finding indicated that TG with aerobics exercise combined with circuit training Program had positive effect on body weight management inversely CG participant

## 5.2. CONCLUSION

Based on the obtained results of the study, the following points are stated as conclusions.

- ✓ Almost in all parameters, clearly showed that the better test results were recorded in post training than pre and during training. This indicates that aerobics exercise combined with circuit training program were effective for the reduction of overweight.
- ✓ Continuing participating in aerobic exercise combined with circuit training program had the potential to maintain healthy weight.
- ✓ In general, this finding clearly noted that aerobic exercise combined with circuit training program has significant effect on the body weight management.
- ✓ The vast majority of scientific evidence supports a beneficial role of exercise on achieving body weight stability and overall health. The goal is to find ways to motivate people to exercise and adopt healthy lifestyles. In order to achieve this objective, we must be innovative and creative in finding ways to fight against the modern way of living that drives excess energy intake relative to expenditure.
- ✓ In general, this findings clearly noted that moderate intensity aerobics exercise training program has a significant effect on the reduction of body weight, waist circumference and body mass index that resulted following the accumulation of excessive fat in the body. Aerobic exercises and strength exercises are interlinked.
- ✓ Continuing participating in moderate intensity aerobics physical training program had the ability to reduce body weight, waist circumference and body mass index hip circumference.

### **5.3. RECOMMENDATION**

- ✓ Develop habits of participation in aerobics combined with circuit training program as parts of life at least three day per week for 30 minute.
- ✓ Continuing participation through combined exercise program with well-balanced dietary intake .this important because to prevent weight regain after substantial weight loss program.
- ✓ Some limitation were faced while conducting this research, this due to the availability of inadequate materials, therefore, further findings may be proceed and conducted by fulfilling the above challenges.
- ✓ It is highly expected from professional of physical education and sports and related fields to guide and educate on the importance and benefited aerobic exercise combined with circuit training program on the reduction of body weight. Future research will be needed to give a better insight into the many issues impacting physical activity levels of people, including the barriers to healthy active living.
- ✓ Individuals need to participate in regular physical activities to promote health related fitness. This can help to reduce the possibility of obesity, overweight and improves cardiovascular endurance, muscular strength/endurance and flexibility
- ✓ The government should create a forum for seminar and workshop on various aerobic exercise programs and their importance and benefit to health. Since aerobic exercise require no equipment or minimal equipment. Male aerobic training community may be encouraged to underage this type of exercise training regularly for physical fitness improvement.

## REFERENCE

American, Heart Association. 2001. The New American Heart Association Cookbook. New York, NY: Clarkson Potter Publisher.

Ana Cláudia Fernandez, Marco Túlio de Mello, SérgioTufik, Paula Morcelli de Castro and MauroFisberg.2004 .Influence of the aerobic and anaerobic training on the body fat mass in obese adolescent.

Cole SA, Butte NF, Voruganti VS. 2010.Evidence that multiple genetic variants of MC4R play a functional role in the regulation of energy expenditure and appetite in Hispanic children.Am J ClinNutr.Jan ;91(1):191-199.

David nieman.2011.exercise testing and prescription health related approach 7<sup>th</sup> edition.

Després JP, Lemieux I, Bergeron J,Pibarot P, Mathieu P, Larose E. 2008. Abdominal obesity and the metabolic syndrome.Contribution to global cardio metabolic risk.ArteriosclerThrombVasc Biol;28(6):1039-49. 4

Ellis KJ. Human body composition: in vivo methods. Physiol Rev. 2000. 80:649-680.

Fields DA, Goran MI. Body composition techniques and the four-compartment model in children. J ApplPhysiol. 2000. 89:613-620.

Goon, D.T. Toriola, A.L. and Shaw, B.S. 2006.Gender differences in aerobic fitness of pre-adolescent school children in Makurdi, Nigeria.African journal for physical, health education, recreation and dance, 12(4):356-368.

Heyward, V. H. 1991. Advanced fitness assessment and exercise prescription. Champaign: Human KineticsPublishers.

Heyward, Vivian H. 2002.Advanced Fitness Assessment and Exercise Prescription, 4ED, Champaign Illinois: Human Kinetics Publishers Inc.

[http://www.biodyncorp.com/knowledgebase/310/managing\\_weight\\_loss.html](http://www.biodyncorp.com/knowledgebase/310/managing_weight_loss.html).

[http://www.cdc.gov/healthyweight/assessing/bmi/childrens\\_bmi/about\\_childrens\\_bmi.html](http://www.cdc.gov/healthyweight/assessing/bmi/childrens_bmi/about_childrens_bmi.html),2013

<http://www.cdc.gov/mmwr/pdf/ss/ss6104.pdf><http://www.livestrong.com/article/378022-how-to-calculate-body-fat-from-caliper-measurements>.

Indian Journal of Clinical Practice. 2013. Cardiology, Higher Prevalence Rate of CHD in ‘Apple Type of Obesity ‘Cases as Compared to ‘Pear Type Obesity’ Cases Vol. 23, No. 12,

Kevin D Hall, Gary Sacks, Steven L Gortmaker, Boyd A .Swinburn. 2012. Quantification of the effect of energy imbalance on bodyweight.

Lea andFebiger ,Segal, K.R. Gutin, B.Presta, E.Wang, J. and Van Itallie, T.B. 1985. Estimation of human body composition by electrical impedance methods: A comparative study. *Journal of Applied Physiology*, 58, 1565-15

Lindsay, A.R. Hongu, N. Spears, K. Idris, R. Dyrek, A. andManore, M.M. 2013. Field assessments for obesity prevention in children and adults: physical activity, fitness, and body composition. *Journal of nutrition education and behavior*, 45:6.

McArdle, W. D. Katch, F. I. and Katch, V. L. 1991. Exercise physiology: Energy, nutrition, and human performance 3rd ed. Philadelphia.

Michelle Cormier, CEP Geoffrey Drover, CEP, CSCS Mary-Beth McGinn, CEP, CPT-CC, Todd Stride, CEP, CSCS .2015.bodyweight training system.

Morrow, James R.2005.Measurement and Evaluation in Human Performance, 3ED, Champaign Illinois: Human Kinetics Publishers Inc., Padmanathan.V and Jhonjoseph.K,

National Association of State Mental Health Program Directors NASMHPD. 2008. Obesity reduction & prevention strategies for individuals with serious mental illness. Retrieved from [http://www.nasmhpd.org/general\\_files/Obesity%2010-8-08](http://www.nasmhpd.org/general_files/Obesity%2010-8-08)

National Institute of Health.2011.Overweight and obesity statistics. Retrieved from <http://win.niddk.nih.gov/statistics/index.htm>pdf

Neumark-Sztainer D, Story M, Harris T.1999.Beliefs and attitudes about obesity among teachers and school health care providers working with adolescents.J Nutr Education.

Neumark-Sztainer D, Story M., Faibisch L. Perceived stigmatization among overweight African-American and Caucasian adolescent girls. J Adolesc Health. 1998; 23: 264-270

NHI 1998.clinical guidelines on the identification, evaluation, and treatment of overweight and obesity in adults The Evidence Report.

Sinning, WE. 1996. "Body Composition in Athletes", As Cited in Roche, AF. Heymsfield, SB. and Lohman TG.Human Body Composition, Champaign Illinois: Human Kinetics Publishers Inc. pp.257-258.

Tackling Obesity Department of Health.2011. Start Active, Stay Active A report on physical activity for health from the four home countries' Chief Medical Officers

Tamie DeHay, Ph.D 2012. Weight Management Strategies for Adults and Youth With.

Walpole, Sarah C,Prieto-Merino, David, Edwards, Phil, Cleland, John, Stevens, Gretchen Roberts, Ian e. 2012."The weight of nations: an estimation of adult human biomass" BMC Public.

Wilmore JH .1969. The use of actual, predicted and constant residual volumes in the assessment of body composition by underwater weighing. Med Sci Sports Exerc ;1:87-90.

Wilmore, J. H.Buskirk, E. R. DiGirolamo, M. and Lohman, T. G. 1986.Body composition a round table. The Physician and Sports medicine, Guide to Skin folds Caliper 14, 3, 144-162.

Withers RT, Laforgia J, Heymsfield SB1999. Critical appraisal of the estimation of body composition via two-, three-, and four-compartment models. Am J Hum Biol ;11:175-185.

World Health Organization .2000.The Asia-Pacific Perspective Redefining Obesity and its Treatment.World Health Organization Geneva, Switzerland.





## **APPENDIX B**

### **Participant's information sheet and informed consent form**

**Research Title:** Effect of aerobic exercise combined with on body weight management the case of selected male participant in Deja Geresu Dhuki School south west Shoa, Oromia regional state, Ethiopia.

**Investigator name:** Tekalign Abebe (BSC in Sport Sciences)

#### **1. purpose of the study**

The purpose of this study to investigate the effect of aerobic exercise combined with body weight on body weight management on overweight adults. The findings of this study can be very much contribution who are overweight and obese as well as the community in order to combating the problem over weight and obese, next this study is to write research for partial fulfillment of master program in Med.

#### **2. procedure and duration**

The experiment of the study period will take 3 months .this study will be involves 40 subjects from Deja Geresu Dhuki School. Subjects involve in aerobic exercise combined with body weight circuit training under the researcher monitoring.

Training duration in the study will not more than 60 minutes per session .subject also participate in body composition test in three phase at the initial and during and final at the end of 12 week training.

### **3. Risk and benefits**

The risk of this study is small. While testing procedure and during session you may face numbness, muscle soreness, muscle cramp, muscle strain and fatigue but not major injury, in case of you injury or pain the researcher will be provide first aid to you, but not no financial compensation will be given .if it is sever the researcher will be covering every cost for u until rehabilitation period .you feel Pain, abnormal heart rate, to fast or to slow breathing rate, coughing any type of discomfort immediately describe before for risk minimizing.

There may be no personal benefit for participating in this study ,however it is hoped that in the future of study by understanding the effect of aerobic exercise combined body weight circuit training on body weight management and you will learn how to measure body weight at your home using BMI or waist hip ratio to know your progress .

### **4. Confidentiality**

Your test result and other related personal information will kept confidential. Her e will be no information that will identify you in particular. the findings of the study will be general for the study community and will not reflect any thing particular of individual person .the data or test results will be coded to exclude showing names no reference will be made oral or written reports the could link participant s to the research.

### **5. Rights**

Participation for this study is fully voluntary .you have the right to with draw from the study at any time and this will not label you for any loss of benefits which you otherwise entitled .but it is not advisable

**6. Contact address.**

If there is any questions or enquires any time about the study or the procedures, please contact;

|   |  |
|---|--|
| Tekalign Abebe                            | +251910030911  |
| Email                                     | tekalignabebe2019@gmail.com                                    |
| Tesfaye demane (Ass prof) (Major Advisor) | + 251913893850   |
| Email                                     | Tesfaye <a href="mailto:demane@gmail.com">demane@gmail.com</a> |
| Zewge Bekele ( msc) (Co- Advisor          | <a href="mailto:Zewge86@gmail.com">Zewge86@gmail.com</a>       |
| Email                                     | +251913358589  |

**7. Declaration informed voluntary consent**

I read the participant information .I have clearly understood the purpose of the research, the procedure the risk and benefits .issues of confidentiality, the right of participating and the contact address for any queries .I will informed that I have the right to withdraw from the study at any time .therefore I declare my voluntary consent to participate in this study with my signature as indicated as follows.

Participant code no \_\_\_\_\_ Name of investigator\_\_\_\_\_

Signature\_\_\_\_\_Signature\_\_\_\_\_

Date\_\_\_\_\_

Date\_\_\_\_\_

## APPENDIX C

**Appendix Table 1. Anthropometric test data records sheet**

Participant code no \_\_\_\_\_ age \_\_\_\_\_

Sex \_\_\_\_\_ weight \_\_\_\_\_

height \_\_\_\_\_

| No | Types of anthropometric test | Units             | Major variables to measured            | Data collected during experimental period |             |           |
|----|------------------------------|-------------------|--|---|-------------|-----------|
|    |                              |                   |  | pre test                                  | during test | post test |
| 1  | Height                       | M                 | Total body height                      |   |             |           |
| 2  | Weight                       | Kg                | Total body weight                      |   |             |           |
| 3  | Body mass index              | Kg/m <sup>2</sup> | Height weight ratio                    |   |             |           |
| 4  | Waist circumference          | Cm                | Amount of fat around the abdomen       |   |             |           |
| 5  | Hip circumference            | Cm                | Amount of fat around the hip           |   |             |           |
| 6  | Waist to hip ratio           | %                 | Amount of fat in hip and waist         |   |             |           |
| 7  | Skin fold thickness          | %                 | Fat amounts in the subcutaneous tissue |   |             |           |

## APPENDIX D

### Training description

Training plan is a working document and guide line for desired outcomes .however it should be flexible enough to meet the participant need. The training plan will outline where and when will deliver the training, purpose and goals, equipment need, with considering training principles (FITT).Basically training plan is essential ‘road map ‘ to reach desired destination .

**Aerobic exercise;** Aerobic refers to how body uses oxygen to sufficiently meet energy demands during exercise. That makes sweat, causes to breathe harder, and gets heart beating faster than at rest. It strengthens heart and lungs and trains cardiovascular system to manage and deliver oxygen more quickly and efficiently throughout body .Cardiovascular system is made up of heart and blood vessels e.g., arteries, veins, and capillaries that transports blood throughout the body. Aerobic exercise uses large muscle groups. Every practical session implement according to training principles and keeping safety procedure as well as protocols in order to minimize injury maximizing the benefit from the exercises.

**Circuit:** A method of physical conditioning in which one moves from one exercises to another, usually in a series of different stations. This workout combines strength training and aerobic/anaerobic training all in one. Various circuits offered including a full body circuit, a lower body circuit, core circuit, upper body circuit, etc. By doing the exercises consecutively, heart rate stays in the aerobic zone, at the same time developing lean muscle tissue. Circuits are great for all levels, beginners up to advanced and burns more calories in less time than a typical strength training workout. Only body weight exercise component of the circuit training under the investigation, (i.e. no need of equipment) all physical exercises takes place out door.

The exercise protocol comprised of both aerobic as well as body weight circuit training. The aerobic and the body weight circuit training were using combined during the twelve weeks period. Frequency of exercise program is kept three days/week(Monday Wednesday ,Friday) at morning time (12:00-1:00oclock) gradually increase duration 45 to 60 minute and with moderate intensity (55-69HRmax) .The subjects performed warm up and cool down exercises in the same manner as described for other exercise program.

## APPENDIX E

**Appendix Table 2. Plan for twelve weeks (three months of experimental study)**

Intensity of exercise: moderate(55-69HRmax)      Frequency: 3days/week

Duration: 45min      Month: October, 2020

Objective:to create physiological adaptation for physical exercise.

| Day<br>s  | duration | Types of exercise                   | 1-4weeks |                          |                         |
|-----------|----------|-------------------------------------|----------|--------------------------|-------------------------|
|           |          |                                     | Set      | Restb/n set<br>(station) | Minute/exer<br>cise set |
| Monday    | 45       | Warming up and dynamic stretching   | 1        | 1x30s                    | 1x10                    |
|           |          | Aerobic exercise/5lap jogging       | 1        | 1x30s                    | 1x10                    |
|           |          | Circuit training(7station)full body | 2        | 2x30s                    | 2x7                     |
|           |          | Push up                             | 2        |                          | 1x2                     |
|           |          | Leg raises                          | 2        |                          | 1x2                     |
|           |          | Mountain climber                    | 2        |                          | 1x2                     |
|           |          | Step up                             | 2        |                          | 1x2                     |
|           |          | Triceps dips                        | 2        |                          | 1x2                     |
|           |          | Skipping ropes                      | 2        |                          | 1x2                     |
|           |          | Crunches                            | 2        |                          | 1x2                     |
|           |          | Cooling down/static stretching      | 1        |                          | 1x9                     |
| Wednesday | 45       | Warming up and dynamic stretching   | 1        | 1x30s                    | 1x10                    |
|           |          | Aerobic exercise/5lap jogging       | 1        | 1x30s                    | 1x10                    |
|           |          | Circuit training(7station)full body | 2        | 2x30s                    | 2x7                     |
|           |          | Push up                             | 2        |                          | 1x2                     |
|           |          | Leg raises                          | 2        |                          | 1x2                     |
|           |          | Mountain climber                    | 2        |                          | 1x2                     |
|           |          | Step up                             | 2        |                          | 1x2                     |
|           |          | Triceps dips                        | 2        |                          | 1x2                     |
|           |          | Skipping ropes                      | 2        |                          | 1x2                     |
|           |          | Crunches                            | 2        |                          | 1x2                     |
|           |          | Cooling down/static stretching      | 1        |                          | 1x9                     |
| Friday    | 45       | Warming up and dynamic stretching   | 1        | 1x30s                    | 1x10                    |
|           |          | Aerobic exercise/5lap jogging       | 1        | 1x30s                    | 1x10                    |
|           |          | Circuit training(7station)full body | 2        | 2x30s                    | 2x7                     |
|           |          | Push up                             | 2        |                          | 1x2                     |
|           |          | Leg raises                          | 2        |                          | 1x2                     |
|           |          | Mountain climber                    | 2        |                          | 1x2                     |
|           |          | Step up                             | 2        |                          | 1x2                     |
|           |          | Triceps dips                        | 2        |                          | 1x2                     |
|           |          | Skipping ropes                      | 2        |                          | 1x2                     |
|           |          | Crunches                            | 2        |                          | 1x2                     |
|           |          | Cooling down/static stretching      | 1        |                          | 1x9                     |

## APPENDIX F

**Appendix Table 3. Plan for twelve weeks (three months of experimental study)**

Intensity of exercise: moderate (55-69HRmax) Frequency: 3days/week

Duration: 50 minute Month: November, 2020

Objective: to loss of excess fat through physical exercise.

| days                                | duration | Types of exercise                   | 1-4weeks |                                   |                     |
|-------------------------------------|----------|-------------------------------------|----------|-----------------------------------|---------------------|
|                                     |          |                                     | Set      | Rest b/n set (station)            | Minute/exercise Set |
| Monday                              | 50       | Warming up and dynamic stretching   | 1        | 1x30s                             | 1x10                |
|                                     |          | Aerobic exercise/5lap jogging       | 1        | 1x30s                             | 1x10                |
|                                     |          | Circuit training(7station)full body | 3        | 3x30s                             | 3x7                 |
|                                     |          | Push up                             | 3        |                                   | 1x3                 |
|                                     |          | Leg raises                          | 3        |                                   | 1x3                 |
|                                     |          | Mountain climber                    | 3        |                                   | 1x3                 |
|                                     |          | Step up                             | 3        |                                   | 1x3                 |
|                                     |          | Triceps dips                        | 3        |                                   | 1x3                 |
|                                     |          | Skipping ropes                      | 3        |                                   | 1x3                 |
|                                     |          | Crunches                            | 3        |                                   | 1x3                 |
|                                     |          | Cooling down/static stretching      | 1        |                                   | 1x9                 |
|                                     |          | Wednesday                           | 50       | Warming up and dynamic stretching | 1                   |
| Aerobic exercise/5lap jogging       | 1        |                                     |          | 1x30s                             | 1x10                |
| Circuit training(7station)full body | 3        |                                     |          | 3x30s                             | 3x7                 |
| Push up                             | 3        |                                     |          |                                   | 1x3                 |
| Leg raises                          | 3        |                                     |          |                                   | 1x3                 |
| Mountain climber                    | 3        |                                     |          |                                   | 1x3                 |
| Step up                             | 3        |                                     |          |                                   | 1x3                 |
| Triceps dips                        | 3        |                                     |          |                                   | 1x3                 |
| Skipping ropes                      | 3        |                                     |          |                                   | 1x3                 |
| Crunches                            | 3        |                                     |          |                                   | 1x3                 |
| Cooling down/static stretching      | 1        |                                     |          |                                   | 1x9                 |
| Friday                              | 50       |                                     |          | Warming up and dynamic stretching | 1                   |
|                                     |          | Aerobic exercise/5lap jogging       | 1        | 1x30s                             | 1x10                |
|                                     |          | Circuit training(7station)full body | 3        | 3x30s                             | 3x7                 |
|                                     |          | Push up                             | 3        |                                   | 1x3                 |
|                                     |          | Leg raises                          | 3        |                                   | 1x3                 |
|                                     |          | Mountain climber                    | 3        |                                   | 1x3                 |
|                                     |          | Step up                             | 3        |                                   | 1x3                 |
|                                     |          | Triceps dips                        | 3        |                                   | 1x3                 |
|                                     |          | Skipping ropes                      | 3        |                                   | 1x3                 |
|                                     |          | Crunches                            | 3        |                                   | 1x3                 |
|                                     |          | Cooling down/static stretching      | 1        |                                   | 1x9                 |



## APPENDIX G

**Appendix Table 4. Plan for twelve weeks (three months of experimental study)**

Intensity of exercise: moderate (55-69HRmax) Frequency: 3days/week

Duration: 60minute

Month: December, 2020

Objective: to maintain healthy body weight through physical exercise.

| days                                | duration | Types of exercise                   | 1-4weeks |                                   |                     |
|-------------------------------------|----------|-------------------------------------|----------|-----------------------------------|---------------------|
|                                     |          |                                     | Set      | Rest b/n set (station)            | Minute/exercise Set |
| Monday                              | 60       | Warming up and dynamic stretching   | 1        | 1x30s                             | 1x10                |
|                                     |          | Aerobic exercise/5lap jogging       | 1        | 1x30s                             | 1x10                |
|                                     |          | Circuit training(7station)full body | 4        | 4x30s                             | 4x7                 |
|                                     |          | Push up                             | 4        |                                   | 1x4                 |
|                                     |          | Leg raises                          | 4        |                                   | 1x4                 |
|                                     |          | Mountain climber                    | 4        |                                   | 1x4                 |
|                                     |          | Step up                             | 4        |                                   | 1x4                 |
|                                     |          | Triceps dips                        | 4        |                                   | 1x4                 |
|                                     |          | Skipping ropes                      | 4        |                                   | 1x4                 |
|                                     |          | Crunches                            | 4        |                                   | 1x4                 |
|                                     |          | Cooling down/static stretching      | 1        |                                   | 1x9                 |
|                                     |          | Wednesday                           | 60       | Warming up and dynamic stretching | 1                   |
| Aerobic exercise/5lap jogging       | 1        |                                     |          | 1x30s                             | 1x10                |
| Circuit training(7station)full body | 4        |                                     |          | 4x30s                             | 4x7                 |
| Push up                             | 4        |                                     |          |                                   | 1x4                 |
| Leg raises                          | 4        |                                     |          |                                   | 1x4                 |
| Mountain climber                    | 4        |                                     |          |                                   | 1x4                 |
| Step up                             | 4        |                                     |          |                                   | 1x4                 |
| Triceps dips                        | 4        |                                     |          |                                   | 1x4                 |
| Skipping ropes                      | 4        |                                     |          |                                   | 1x4                 |
| Crunches                            | 4        |                                     |          |                                   | 1x4                 |
| Cooling down/static stretching      | 1        |                                     |          |                                   | 1x9                 |
| Friday                              | 60       |                                     |          | Warming up and dynamic stretching | 1                   |
|                                     |          | Aerobic exercise/5lap jogging       | 1        | 1x30s                             | 1x10                |
|                                     |          | Circuit training(7station)full body | 4        | 4x30s                             | 4x7                 |
|                                     |          | Push up                             | 4        |                                   | 1x4                 |
|                                     |          | Leg raises                          | 4        |                                   | 1x4                 |
|                                     |          | Mountain climber                    | 4        |                                   | 1x4                 |
|                                     |          | Step up                             | 4        |                                   | 1x4                 |
|                                     |          | Triceps dips                        | 4        |                                   | 1x4                 |
|                                     |          | Skipping ropes                      | 4        |                                   | 1x4                 |
|                                     |          | Crunches                            | 4        |                                   | 1x4                 |
|                                     |          | Cooling down/static stretching      | 1        |                                   | 1x9                 |

## APPENDIX H

**Appendix Table 3. Norms of waist hip ratio**

| Sex    | Acceptable |           | Unacceptable |           |         |
|--------|------------|-----------|--------------|-----------|---------|
|        | Excellent  | Good      | Average      | High      | Extreme |
| Male   | <0.85      | 0.85-0.90 | 0.90-0.95    | 0.95-1.00 | >1.00   |
| Female | <0.75      | 0.75-0.80 | 0.80-0.85    | 0.85-0.90 | >0.90   |

Source; <http://www.topendsports.com/testing/tests>

**Appendix Table 4. Norms of body composition (BMI)**

| classification      | BMI (kg/m <sup>2</sup> ) | sub-classification | BMI (kg/m <sup>2</sup> ) |               |
|---------------------|--------------------------|--------------------|--------------------------|---------------|
| <b>underweight</b>  | < 18.50                  | Severe thinness    | < 16.00                  |               |
|                     |                          | Moderate thinness  | 16.00 - 16.99            |               |
|                     |                          | Mild thinness      | 17.00 - 18.49            |               |
| <b>normal range</b> | 18.5 - 24.99             | Normal             | 18.5 - 24.99             |               |
| <b>overweight</b>   | ≥ 25.00                  | pre-obese          | 25.00 - 29.99            |               |
|                     |                          | Obese<br>(≥ 30.00) | obese class I            | 30.00 - 34.99 |
|                     |                          |                    | obese class II           | 35.00 - 39.99 |
|                     |                          |                    | obese class II           | ≥ 40.00       |

Source: World Health Organization

**Source: WHO, 2012**

| Norm for waist circumference in adults |                          |                           |
|--|--------------------------|---------------------------|
| Waist circumferences                   |                          |                           |
| Risk category                          | Females                  | Males                     |
| Very low                               | <27.5 in ( < 70cm)       | <31.5 in (< 80cm)         |
| Low                                    | 27.5-35.0 in( 70-89cm)   | 31.5- 39.0 in (80-99cm)   |
| High                                   | 35.5- 43.0 in (90-109cm) | 39.5- 47.0 in (100-120cm) |
| Very high                              | >43.5 in ( > 110 cm)     | >47.0 in (>120 cm)        |

**Source: Bray (2004).**

## Appendix. I. Raw Data Test Recording Sheet

Group I

| Control Group |     |     |      |      |     |     |     |     |       |       |
|---------------|-----|-----|------|------|-----|-----|-----|-----|-------|-------|
|               | B/w |     | Ht   |      | w/c |     | Age |     | BMI   |       |
|               | Pt  | Pot | PT   | Pot  | Pt  | Pot | Pt  | Pot | Pt    | Pot   |
| S 1           | 74  | 75  | 1.65 | 1.65 | 90  | 91  | 18  | 18  | 27.18 | 27.54 |
| S 2           | 71  | 73  | 1.63 | 1.63 | 92  | 94  | 21  | 21  | 26.72 | 27.47 |
| S 3           | 73  | 74  | 1.65 | 1.65 | 91  | 91  | 19  | 19  | 26.81 | 27.18 |
| S 4           | 69  | 70  | 1.65 | 1.65 | 89  | 90  | 18  | 18  | 25.34 | 25.71 |
| S 5           | 71  | 73  | 1.67 | 1.67 | 93  | 95  | 21  | 21  | 25.45 | 26.17 |
| S 6           | 75  | 77  | 1.66 | 1.66 | 90  | 92  | 22  | 22  | 27.21 | 27.94 |
| S 7           | 69  | 69  | 1.65 | 1.65 | 89  | 90  | 18  | 18  | 25.34 | 25.34 |
| S 8           | 70  | 68  | 1.61 | 1.61 | 89  | 90  | 19  | 19  | 27.00 | 26.23 |
| S 9           | 75  | 77  | 1.65 | 1.65 | 90  | 91  | 18  | 18  | 27.54 | 28.28 |
| S 10          | 74  | 75  | 1.67 | 1.67 | 89  | 90  | 18  | 18  | 26.53 | 26.89 |
| S 11          | 71  | 70  | 1.65 | 1.65 | 89  | 89  | 18  | 18  | 26.07 | 25.71 |
| S 12          | 74  | 77  | 1.63 | 1.63 | 92  | 91  | 18  | 18  | 27.85 | 28.98 |
| S 13          | 73  | 73  | 1.69 | 1.69 | 93  | 93  | 18  | 18  | 25.55 | 25.55 |
| S 14          | 72  | 74  | 1.66 | 1.66 | 94  | 95  | 19  | 19  | 26.12 | 26.85 |
| S 15          | 74  | 76  | 1.67 | 1.67 | 90  | 91  | 18  | 18  | 26.53 | 27.25 |

|      |    |    |      |      |    |    |    |    |       |       |
|------|----|----|------|------|----|----|----|----|-------|-------|
| S 16 | 73 | 75 | 1.68 | 1.68 | 93 | 94 | 19 | 19 | 25.86 | 26.57 |
| S 17 | 72 | 73 | 1.65 | 1.65 | 89 | 90 | 18 | 18 | 26.44 | 26.81 |
| S 18 | 72 | 74 | 1.66 | 1.66 | 91 | 93 | 18 | 18 | 26.12 | 26.85 |
| S 19 | 70 | 70 | 1.60 | 1.60 | 91 | 92 | 22 | 22 | 27.34 | 27.34 |
| S 20 | 71 | 72 | 1.61 | 1.61 | 92 | 93 | 22 | 22 | 27.39 | 27.77 |

Group II

| Experimental Group |     |     |      |      |     |     |         |     |       |       |
|--------------------|-----|-----|------|------|-----|-----|---------|-----|-------|-------|
| Students           | B/w |     | Ht   |      | w/c |     | Sex Age |     | BMI   |       |
|                    | Pt  | Pot | Pt   | Pot  | Pt  | Pot | Pt      | Pot | Pt    | Pot   |
| 001                | 70  | 66  | 1.63 | 1.63 | 92  | 85  | 18      | 18  | 26.34 | 24.84 |
| 002                | 73  | 70  | 1.64 | 1.64 | 90  | 81  | 22      | 22  | 27.14 | 26.02 |
| 003                | 70  | 66  | 1.65 | 1.65 | 93  | 83  | 19      | 19  | 25.71 | 24.24 |
| 004                | 69  | 65  | 1.63 | 1.63 | 89  | 81  | 18      | 18  | 25.97 | 24.46 |
| 005                | 74  | 70  | 1.68 | 1.68 | 93  | 85  | 18      | 18  | 26.21 | 24.80 |
| 006                | 71  | 67  | 1.66 | 1.66 | 90  | 80  | 18      | 18  | 25.76 | 24.46 |
| 007                | 70  | 65  | 1.63 | 1.63 | 94  | 83  | 19      | 19  | 26.34 | 24.46 |
| 008                | 72  | 68  | 1.68 | 1.68 | 91  | 85  | 18      | 18  | 25.51 | 24.09 |
| 009                | 72  | 67  | 1.67 | 1.67 | 92  | 84  | 19      | 19  | 25.81 | 24.02 |
| 010                | 70  | 66  | 1.65 | 1.65 | 92  | 86  | 18      | 18  | 25.71 | 24.24 |

|     |    |    |      |      |    |    |    |    |       |       |
|-----|----|----|------|------|----|----|----|----|-------|-------|
| 011 | 69 | 64 | 1.60 | 1.60 | 93 | 81 | 18 | 18 | 26.95 | 25    |
| 012 | 70 | 67 | 1.62 | 1.62 | 89 | 83 | 18 | 18 | 26.67 | 25.52 |
| 013 | 70 | 65 | 1.63 | 1.63 | 94 | 83 | 19 | 19 | 26.34 | 24.46 |
| 014 | 73 | 69 | 1.67 | 1.67 | 92 | 82 | 18 | 18 | 26.17 | 24.74 |
| 015 | 70 | 67 | 1.60 | 1.60 | 89 | 80 | 22 | 22 | 27.34 | 26.17 |
| 016 | 73 | 68 | 1.68 | 1.68 | 93 | 82 | 19 | 19 | 25.86 | 24.09 |
| 017 | 73 | 68 | 1.67 | 1.67 | 92 | 90 | 18 | 18 | 26.17 | 24.38 |
| 018 | 69 | 66 | 1.60 | 1.60 | 91 | 83 | 19 | 19 | 26.95 | 25.78 |
| 019 | 74 | 70 | 1.70 | 1.70 | 91 | 80 | 18 | 18 | 25.60 | 24.22 |
| 020 | 72 | 69 | 1.66 | 1.66 | 89 | 81 | 18 | 18 | 26.12 | 25.03 |

Pt= pre training, pot= post training, BW = body weight, WC= waist circumference,

HT =height, Ag= age, BMI= Body mass index