EFFECT OF 12 WEEKS SPEED ENDURANCE TRAINING ON MENSTRUAL CYCLE OF ATHLETE TIRUNESH DIBABA ATHLETICS TRAINING CENTRE FEMALE MIDDLE DISTANCE RUNNER

BY: GESIT KEBEDE

JIMMA UNIVERSITY

COLLEGE OF NATURAL SCIENCES

DEPARTEMENT OF SPORT SCIENCE

A THESIS SUBMMITED TO THE SCHOOL OF GRADUATE STUDIES OF JIMMA UNIVERSITY DEPARTMENT OF SPORT SCIENCE IN PARTIAL FULFILLMENT OF THE REQUIREMENTS FOR THE DEGREE OF MASTER OF SCIENCE IN SPORT SCIENCE SPECIALIZED IN COACHING ATHLETICS

JULY, 2020

JIMMA, ETHIOPA

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BY: GESIT KEBEDE

ADVISOR: SAMSON WONDIRAD (Ass.Prof.)
CO-ADVISOR: ESHETU GIRMA (MSc.)

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DECLARATION

By my signature below, I declare and affirm that this thesis is my own work. I have followed all ethical and technical principle of scholar ship in the preparation, data collection, data analysis and compilation of this thesis. Any scholarly matter that is included in the thesis has been given recognition through citation.

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As member of the examiner Board of the final MSC. OPEN Defense, we certify that we have read and evaluated the thesis prepared By Gesit Kebede In titled effects of 12 weeks speed endurance training on menstrual dysfunction of athlete Tirunesh Dibaba athletics training centre female middle distance runner was commented that it could be accepted as fulfilling the thesis requirement for the degree of Master of science in coaching Athletics specialization

Name of Major Adviser: Samson wondirad (asst.prof) Signature _____ Date _____

Name of co Advisor: Eshetu Girma (MSc.) Signature _____ Date _____

As member of the examiner Board of the final MSC. OPEN Defense, we certify that we have read and evaluated the thesis prepared By Gesit Kebede and examine the candidate were commented that the thesis by accepted as fulfilling the thesis requirement for the degree of Master of Science in coaching athletics specialization.

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Acronym

PMS: Premenstrual Syndrome

$VO_{2max:}$ Maximum oxygen consumption

Abbreviations

ATDATC: Athlete Tirunesh Dibaba Athletics Training Centre

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ABSTRACT

Excessive physical activity is one factor that can cause menstrual disorders. Disorders that can occur include the absence of menstruation (amenorrhea), bone thinning (osteoporosis), irregular menstruation or intermenstrual bleeding, abnormal growth of the uterine lining, and infertility (Asmarani, 2010). Wiarto (2013)explains that in sports discussed about menstruation is an irregular menstrual cycle (oligomenorrhea or reduced menstrual frequency) or menstruation stops beyond 90 days (amenorrhea or absence of menstrual cycle).The purpose of this study was to assess the effect training on menstrual dysfunction of Athlete Tirunesh Dibaba Athletics Training Centre Female Middle Distance Runner. Quasi-experimental design was employed and participants (N = 8) were purposively taken from the academy. Method of data analysis includes frequency, percentages, histogram, mean, standard deviation and Wilcoxon Signed Rank test. The result of this study shows athletes height (1.61± .027 meter), weight (51.88 ± 4.05Kg), BMI (19.88 ± 1.39), variation of menstruation period occurrence was between 5- 23 day, athletes show moderate premenstrual Syndrome symptom and the posttest ranks of PSM symptoms median score were significantly higher than PSM symptoms median score at Z = -2.714, p = 0.05. The finding of this study concludes that 12 weeks middle distance training increase the severity level of PSM symptom from pretest to posttest of experimental group. The study suggests that menstrual dysfunction due to high-intensity training recommended that menstrual function returned to normal by decreasing the training intensity or stopping the training for a while.

Keywords: amenorrhea, menstrual dysfunction, oligomenorrhea and PSM symptoms

CHAPTER ONE

1. INTRODUCTION

1.1. Background of the study

The world is becoming one village due to the effect of globalization among the things that make the world globalized, sport takes the line share. Sport has so much effect on the world, because one of the objectives of international sport is to create friendship and good relationship among nations in the world. Sports such as football and running are the leading sports and running are the leading sport that communicates the world in the best way So, the international community have developed a positives outlook for sports individuals and governments are greatly participating in sport activates in varies occasions such as Olympic games, hence the world society has so much expectation from sport sectors(Ethiopian Athletics Federation, 2019).

The earliest record of formal international athletic competition in Ethiopia dates from 1956 in Melbourne Olympic. The first amateur athletics clubs in Ethiopia was formed in 1950's. Over the past 50 years Ethiopia has produced many athletics champions. At the first in 1960 Rome Olympic, AbebeBikila won the first marathon –Ethiopia's Olympic gold medal. Since then the sport has provided many famous for female athlete names including: Derartu Tulu, Fatuma Roba, Gete Wami, Birhane Adare, Tirunesh Dibaba, Mesere tDefar, Genzebe Dibaba, Almaz Ayana and others. Athletics academy aims to provide better facilities and training environment for the athlete's, by providing the best coaching staff, facilities and resources in psychology, physical therapy, nutrition, performance analysis, skill acquisition, strength and conditioning and athlete career education support. However all athletics training academy in Ethiopia will not offer all the mentioned facilities (Ethiopian Athletics Federation, 2019).

In under control Ethiopian federal sport commission there are two athletics academy among these, Athlete Tiruneshe Dibaba Athletics Training Centre and Ethiopian youth sport academy. Currently Athlete Tirunesh Dibaba Athletics training centre the first top academy to contributing so money number of female athlete's achievement on international and national competitions. For example:-Tigest Begashaw(1500M),Kokeb Tesfaye(800M),

Meskerem Seyfu(300M), Sofiya Shemsu (800M)and others. These academy have different organizational structure, for instance Athlete Tirunesh Dibaba Athletics Training centre have a camp where their athletes are living. This academy provides better facilities and training environment for the athlete's. The facility include: dormitory, balance nutrition, regular academy, health centre, sport wear and equipments, controlled training, meeting rooms, pocket money and Administration facilities (Athlete Tirunesh Dibaba Athletics Training Centre, 2020).

This study will be conducted in Athlete Tirunesh Dibaba Athletics Training center. It is founded in Oromia regional state Arsi zone Asella town and established by the former Ministry of youth and sport on October 2010 recruiting 280 athletes from all regions according to their talent to provide scientific and modern training in order produces elite representatives to provide support to Ethiopia Athletic status (Athlete Tirunesh Dibaba Athletics Training Centre, 2020).

Menstrual dysfunction in the female athlete includes a wide spectrum of disorders. The most commonly discussed is amenorrhea, or absence of menstrual cycle, that can be divided into primary and secondary. Primary amenorrhea, or delayed menarche, may be present in female athletes who begin training before puberty, and is defined in an athlete with absence of menstruation by the age of 15. Secondary amenorrhea occurs in post menarchal athletes who lack three or more consecutive cycles after menarche, and is not pregnant (Brunet, 2005). In female athletes is also frequent the occurrence of irregular cycles or oligomenorrhea (six or fewer cycles per year) as noted by Nazem & Ackerman (2012). On the other hand, age of menarche for Hungarian athletes has been found to be little affected by athletic competition (Fox et al., 1988). Although average menarche age of Belgium gymnasts is 15.6 ± 2.1 years, the average menarche age of girls in the general population is 13.2 ± 1.2 years (Claessens et al., 1992).The group that attained menarche latest was the teak-wondo athletes; the earliest were the judokas. It was determined that high-intensity training delayed menarche age (Dusek, 2001). Intense exercise had been reported to delay menarche when the sports activity was begun before puberty (Kin et al., 2000, Broso & Subrizi, 1996). This research was aimed to assess the effect 10 weeks training on menstrual dysfunction of Athlete Tirunesh Dibaba Athletics Training Centre Female Middle Distance Runners

1.2. Statement of the problem

The female reproductive hormones which rise and fall throughout the menstrual cycle, are known to affect numerous cardiovascular, respiratory, thermoregulatory and metabolic parameters, which in turn, may have implications on exercise physiology (Ross, Anne, Hugh & Tim, 2017). Many experts now contend that the female sex steroid hormones estrogen and progesterone have potential effects on exercise capacity and performance through numerous mechanisms, such as substrate metabolism, cardiorespiratory function, thermoregulation, psychological factors, and injuries. Consequently, hormone level changes may theoretically lead to either improved or decreased performance at various times throughout the menstrual cycle (Naama, Gal & Connie, 2005).

Several authors suggested that the cyclic increases in endogenous female steroid hormones of an ovulatory menstrual cycle may have a slight, deleterious influence on aerobic capacity, with potential implications for individual athletes. Nevertheless, the cycle phase did not impact significantly on the majority of the other performance tests and cardio respiratory variables measured in this study (Constance et al, 1995).

The most well-known reported prevalence of disordered eating and menstrual disorders in female university athletes varies and depends on a number of factors, including type of sport, level of participation, and type of questionnaire used to screen for disordered eating (Nattiv et al, 1882). Although a number of studies have reported a higher prevalence of disordered eating and menstrual disorders in female university athletes compared with non-athletes, particularly in elite female athletes competing in aesthetic, weight class and endurance sports where leanness is emphasized (Sundgot-Borgen, 2004).

Few previous researchers have addressed that while some of investigations have used moderately trained women, relatively few (Connie, Jerilynn, Don & Jack, 1995) have studied more highly trained athletes, who are the individuals most likely to be affected by changes in a performance. The complex metabolic actions of the female steroid hormones may alter various components of sports performance in different ways during the course of an ovulary menstrual cycle.

When the effects of menstrual cycle on performance was examined some researchers found negative effects (Wilson et al., 1991) but some researchers did not find negative effects on

performance (Quadagno et al., 1991 as sighted on Kishali et al (2006). However, Olympic medal–winning performances have taken place during all portions of the menstrual cycle (Fox et al., 1988; Fleck et al., 1990). 37% of the athletes who participated in the 1964 Olympic Games said that they thought their performances were not negatively affected by their menstrual cycle (Kin et al.,2000). Lebrun et al. (1995) examined the effects of menstrual cycle phase on four selected indices of athletic performance; aerobic capacity, anaerobic capacity, isokinetic strength and high-intensity endurance. They found the cycle phase did not impact significantly on the majority of the performance tests and cardio respiratory variables (Lebrun et al., 1995). Kin et al. (2000) asked athletes the effect of menstrual cycle on performance and 50.49% of the athletes answered that their performance was not affected, 49.51% of the athletes answered their performance was affected. 70% of the athletes had same or better performance, 30% of the athletes performed worse (Reer, 1994 as sighted on Kishali et al (2006).

The researcher was a coach who was working as coaching staff and most of the researcher female runners faces menstrual dysfuction problem due this athletes were absent from the training. This was the reason why the researcher motivated to conduct this research topic. At present, there is no conclusive evidence that participation in exercise affects menstruation and is equivocal and unclear whether menstruation affects athletic performance. An attempt has therefore been made to discuss the effects of 12 weeks speed endurance on female athletes menstrual cycle.

Thus, the researcher attempted to answer the following research questions. These are:

- ✓ What is menstrual dysfunction level of Athlete Tirunesh Dibaba Athletics Training Centre female middle distance runners?
- ✓ What is current premenstrual Syndrome symptoms level of Athlete Tirunesh Dibaba Athletics Training Centre female middle distance runners?
- ✓ What is effect of speed endurance training on premenstrual syndrom symptoms of Athlete Tirunesh Dibaba Athletics Training Centre female middle distance runners?
- ✓ What is the most significant difference between pretest and posttest of premenstrual Syndrome symptom Experimental group of Athlete Tirunesh Dibaba Athletics Training Centre female middle distance runners?

1.3. Objective of the study

1.3.1. General objective

This research was aimed to effect speed endurance training on menstrual dysfunction of Athlete Tirunesh Dibaba Athletics Training Centre Female Middle Distance Runner.

1.3.2. Specific objectives

- ✓ To assess menstrual dysfunction level of Athlete Tirunesh Dibaba Athletics Training Centre female middle distance runners
- ✓ To identify premenstrual Syndrome symptoms prevalence level of Athlete Tirunesh Dibaba Athletics Training Centre female middle distance runners
- ✓ To investigate the effect of middle distance runners performance on PMS symptoms of Athlete Tirunesh Dibaba Athletics Training Centre female middle distance runners
- ✓ To evaluate the significant difference between premenstrual Syndrome symptom pretest and posttest of Experimental group of Athlete Tirunesh Dibaba Athletics Training Centre female middle distance runners

1.4. Delimitations

This study was delimited to assess effect training on menstrual dysfunction of Athlete Tirunesh Dibaba Athletics Training Centre Female Middle Distance Runner. Moreover, delimited to eight (n = 8) female middle distance runners in the year 2019/20, Asella, Ethiopia. the study also delimited to variable including independent variables such as body mass index, menstrual dysfunction and premenstrual Syndrome symptoms and independent variables 12 weeks speed endurance training.

1.5. Significance of the study

- ✓ The present study will help athletes to be aware of the effect of middle distance runners training on menstrual health
- ✓ This study will bring player, coaches, parents and specialists with new insights about the effect of middle distance runners on physiology of females
- ✓ The findings of this study will enable players to know and improve their current physiological levels

- ✓ It can help coaches and sport scientists to design more effective training programs and science-based strategies for the further improvement of players' health, and positive image of the sport
- ✓ It will help specialists and researchers to conduct further studies on the area

1.6. Operational definition of terms

Amenorrhea: Absence of menstrual cycles for three consecutive months (90 days) or more. (Waldrop, 2005; Nattiv *et al,.;* Thompson, 2007)

Disordered eating: a collection of abnormal eating behaviors such as restrictive eating, skipping meals and purging. These behaviors can be present without reaching a clinically significant level. (Nattiv *et al.*, 2007)

Eating disorder: a clinical mental disorder characterized by abnormal eating behaviors, an irrational fear of gaining weight, and false beliefs about eating, weight, and shape. (American Psychiatric Association working group, 2000)

Eumenorrhea: the presence of menstrual cycles occurring in intervals of 21-35 days.(Nattiv *et al.*, 2005 and Thompson, 2007).

Female athlete triad: The Triad is a medical condition often observed in physically active girls and women, and involves any 1 of the 3 components: (1) low energy availability (EA) with or without disordered eating (DE), (2) menstrual dysfunction, and (3) low bone mineral density (BMD) (ACSM, 2007)

Menarche: the onset of menstrual cycles in a sexually maturing female (Nattiv et al., 2005).

Menstrual cycle: a series of carefully coordinated events that prepares the woman's body for pregnancy (Lugos, 2019).

Menstruation: is the shedding of the lining of the uterus (Lugos, 2019).

Oligomenorrhea: the presence of menstrual cycles is noted but at intervals greater than 35 days. (Nattiv *et al.*, 2007)

Premenstrual syndrome (PMS)is an array of predictable physical, cognitive, affective and behavioral symptoms that occur cyclically during the luteal phase of the menstrual cycle (Lugos, 2019).

Primary amenorrhea: absence of menarche past the age of 15. (Nattiv *et al.*, 2007)

Secondary amenorrhea: amenorrhea beginning after a female has reached menarche. (Nattiv et al., 2007)

CHAPTER TWO

2. REVIEW OF RELATED LITERATURE

2.1. Athletics in Ethiopia

The dominance of East-African women and men in marathon running is well known (Hamilton 2000). Athletes from both Ethiopia and Kenya dominate marathon running for a long time (www.iaaf.org). In the top list of the International Association of Athletics Federations (IAAF) for male marathoners, the first best 37 marathon race times were achieved by athletes from Ethiopia and Kenya (www.iaaf.org/records/toplists/road-running/marathon/outdoor /men/senior).

In women, however, the three fastest marathon race times were achieved by an athlete from Great Britain followed by two female marathoners from Kenya .In the 'World Marathon Majors' with the largest city marathons worldwide, female and male champions are exclusively from East African particularly from Ethiopia and Kenya (www.worldmarathonmajors. Com /champions /current-champions).

The reasons for the dominance of East-African runners in long and middle distance running events such as marathons included environmental conditions such as a specific geographic background (Onywera et al. 2006). The dominance of East-African distance runners is primarily a Kenyan phenomenon, with majority of the Kenyan runners originating from the Kalenjin tribe in general and the Nandi sub-tribe in particular. Similar to Kenyan runners, elite Ethiopian runners are also of a distinct environmental background where marathoners mainly originate from the altitudinous regions of Arsi and Shewa (Scott et al. 2003).

Tirunesh Dibaba Sports Academy is the first Ethiopian athletic training center established in 2010. It is located near Asella town, Arsi Zone, Oromia Regional State. Its establishment originates from Ethiopian athletes' accomplishments in the Beijing 2008 Summer Olympics, and the resultant commitment to accelerate and multiply athletic success. Hence, the academy was named after one of the most prominent female athletes, Tirunesh Dibaba, who won double golds in 5000 m and 10,000 m at the Beijing 2008 Summer Olympics.

This academy provides an opportunity for selected male and female youth athletes specializing in athletics and football major fields. Ethiopian Youth Sports Academy (EYSA)

is the other sports academy established in 2013 with the intent to expand the landscape of sporting success, and is in the capital Addis Ababa, Ethiopia. This sports academy is comprehensive, and hosts selected male and female youth athletes across nine major fields, including athletics, football, volleyball, handball, basketball, boxing, tennis table, taekwondo, and swimming.

2.2. Menstrual Health

2.2.1. Physiology of Menstrual cycle

The menstrual cycle describes the monthly rhythm in the function of the uterine endometrial, while the term "ovarian cycle" describes the cyclic change in ovarian function over the same time. These two terms are used interchangeably and therefore the generic term "menstrual cycle" is used to include both. Menstruation is the shedding of the lining of the uterus. The lining of the uterus, called the endometrial, increases approximately three times in thickness throughout the monthly cycle due to an increase in blood supply and micronutrients. This thickening is to prepare a home for a fertilized egg, or ova. If pregnancy does not occur, the uterus cleans itself of the cells with the monthly cycle of bleeding. This process is achieved through a very delicate balance between hormones and their target organs. The menstrual cycle includes the activities of the hormones of the hypothalamus, the anterior pituitary gland and the ovaries, and the resulting changes in the ovaries, uterus, cervix, and basal body temperature (BBT). The menstrual cycle is divided into 3 phases (Buckley and Fox, 2002). They are follicular phase, ovulatory phase and luteal phase.

The onset of menstrual cycles (menarche) is generally at about 12.7 years of age, with the development of breasts and pubic hair (secondary sex characteristics) usually occurring one or two years earlier. Normal menstrual cycles take place at intervals between 21 and 35 days, with the average being about 28 days.

Menstrual flow generally lasts about three to five days. The first day of menstrual bleeding marks the onset of the follicular phase. During the early part of this phase, blood levels of the female hormones estrogen and progesterone are both low. Toward the latter part of the follicular phase, estrogen secretion rises to a peak, just prior to ovulation. Ovulation usually occurs around mid-cycle (between days 13 and 15), although stress and a variety of other factors could cause ovulation to be delayed or missed. The luteal phase lasts from ovulation until the onset of the next menses, normally about 14 days. This phase can also be affected by

external factors. Estrogen levels remain high-although not as high as immediately before ovulation-and progesterone also increases. These reproductive hormones can cause some physiological and psychological symptoms, described later. If implantation of a fertilized ovum does not occur, falling hormone levels will lead to shedding of the uterine lining (the endometrium) as menstrual flow, and the cycle begins again.

In terms of the menstrual cycle, there is scientific consensus that in most cases athletic performance shows little change over the different phases of the cycle, except in the small percentage of women that experience strong pre-menstrual discomfort or painfulness. Nevertheless, there are scarce scientific reports specific to female football players in this area. Some authors have shown that the injury risk in female football players may be perhaps higher in certain phases of the menstrual cycle than in others. However, there is still inconsistency in the results of this type of studies, and thus, further research is warranted.

The use of contraceptive pills seems to alleviate some pre-menstrual symptoms such as irritability, discomfort, or pain in the breasts and abdomen and to reduce the risk of musculoskeletal injuries, although they may also cause some unwanted side effects. In some cases players who travel, train, and compete regularly at a high-level may also want to delay their menstruation for better comfort and convenience during these activities by using long-acting contraceptive pills. Nonetheless, the long-term consequences on players' health and fertility of such permanent practice are still unknown, and therefore, it is currently not recommended."Regular" ovulatory menstrual cycles can result only if the regulated feedback systems involving the hypothalamus, the anterior pituitary gland and the ovaries are functioning as they should. In addition, the uterus and the reproductive organs must be intact (ACSM, 2007)

2.3. Premenstrual syndromes

Premenstrual syndrome is a combination of recurring physical and emotional symptoms that occur in premenopausal women one to two weeks prior to menstruation.1 The symptoms of premenstrual Syndrome may include acne, anxiety, backache, bloating, breast swelling and tenderness, cramps, cravings, fatigue, headaches, irritability, tension, and changes in mood. premenstrual Syndrome affects women of all ages. Symptoms may first appear shortly after a

young woman reaches menarche or later in adulthood, continuing until menopause. (American Medical Association, 1989)

The luteal phase can last up to fourteen days, and it is during this phase that the first signs of premenstrual Syndrome emerge. During the luteal phase, there are fluctuations in estrogen, progesterone, aldosterone, and prolactin. These hormonal changes strongly influence the emotional and physical symptoms of premenstrual Syndrome including fluid retention, breast tenderness, mood swings, etc. Once menstruation begins, hormone levels drop, which would explain why many women report that symptoms cease or gradually diminish once their period begins.

What causes premenstrual Syndrome? Physicians and medical researchers aren't exactly sure. Several theories about the cause or etiology of premenstrual Syndrome have been proposed. One theory holds that premenstrual Syndrome is caused by imbalanced levels of progesterone and estrogen (American Medical Association 1989); another theory asserts it may be due to the deregulations of serotonin, a substance found in the human brain that regulates mood (Lugos, 2019)

In recent years, one theory that is gaining increased recognition and credibility is the role of diet and nutrition. Dr. Guy Abraham, a researcher and retired obstetrician and gynecologist, has stated that "Nutrition is the single most important factor whether or not a woman will have premenstrual Syndrome (Gale, 2001).

2.3.1. PMS Subgroups

Premenstrual Syndrome -A: This is the most common category. The symptoms include anxiety, irritability, mood swings, and nervous tension. Symptoms seem to relate to an oestrogen excess and progesterone deficiency during the luteal phase. Oestrogen appears to affect the oxidation of biogenic amines such as noradrenaline, adrenaline, dopamine and serotonin all of which have profound effects on mood and behavior. Oestrogen is known to increase prolactin secretion; an increase in prolactin levels is known to produce symptoms similar to premenstrual Syndrome -A and premenstrual Syndrome -H. (Abraham, 1983)

Premenstrual Syndrome -C: Symptoms include increased appetite (sugar/salt craving), headaches, fatigue, dizziness, and palpitations. It is observed that many of the symptoms observed are related to glucose intolerance, most likely during the late luteal phase. It is postulated that an increased cellular capacity to bind insulin may be the cause. Abraham notes that these patients often have low red blood cell magnesium. (Abraham GE 1983)

Premenstrual Syndrome -D: This is the least common subgroup. Symptoms include depression, crying spells, confusion, lack of concentration, insomnia. Symptoms are attributed to a decrease in oestrogen out-put in the luteal phase with an increase in adrenal androgens and/or progesteroneIn ten premenstrual Syndrome -D patients, Abraham states that mean blood estrogen levels were lower, and mean blood progesterone levels were higher than normal during the mid-luteal phase in women with premenstrual Syndrome -D.

Premenstrual Syndrome -H: premenstrual Syndrome -H is the second most common subtype. Symptoms include fluid retention, weight gain, abdominal bloating, breast swelling and tenderness. The symptoms are due to an increase in levels of aldo-sterone during the late luteal phase. This may result as a response to stress, oestrogen excess or dopamine deficiency. Abraham states that the severe form of premenstrual Syndrome -H is linked with elevated levels of aldosterone, which is a hormone secreted by a part of the adrenal gland. Fluid retention—a common complaint in premenstrual Syndrome — can be caused by high levels of aldosterone. Aldosterone regulates electrolyte levels in the body, specifically sodium and potassium. Aldosterone influences fluid retention in that sodium that would otherwise be excreted in urine is, instead, replaced with potassium, resulting in a loss of potassium but retention of sodium (American Medical Association, 1989). The result is that the body retains extra sodium, which, in turn, causes excess fluids to be retained.

In addition to conventional treatments, many physicians and professional medical associations recommend supplementation with certain nutrients (accompanied by diet and lifestyle changes) as a viable treatment option for premenstrual Syndrome. In April 2000, the American College of Obstetricians and Gynecologists revised its recommendations to include the use of nutritional supplements including magnesium, calcium, and vitamin E, combined with aerobic exercise and a complex carbohydrate diet to resolve premenstrual Syndrome symptoms, The American College of Obstetricians and Gynecologists(2003).

An examination of the study in this regard shows benefits of physical activity in women's health including the reduction or elimination of many premenstrual Syndrome symptoms (Zeinab, et al., 2013).

A cross-sectional study among systematically selected female students of Mekelle University College of Health Sciences, Mekelle town, northern Ethiopia from March to April 2013. From the total population size of 608; a sample size of 258 was drawn. Age of the study participants ranged from 18 to 25 years, with mean age of 20.86 ± 1.913 years. Among the participants, 144(83.2%) have had at least one premenstrual Syndrome symptoms with their menstrual period their study revealed a high prevalence and negative impact of premenstrual Syndrome on students of Mekelle University (FikruWakjira and MebratuLegesse, 2013).

Mulugeta Woldu(2014) also studied the prevalence and severity of premenstrual syndrome and functional disability associated among female students of Addis Ketema preparatory school. Cross-sectional study was conducted to determine the prevalence and severity of premenstrual syndrome and associated functional disability among female students. A total of 210 sampled female students were included in the study. The information for the study was collected by a pre-designed self-administered questionnaire by reviewing literatures. One hundred eighty female students completed questionnaire making a response rate of 85.7%. one hundred fifty five(86.1%) reported to have experienced premenstrual syndrome, out of which 71 (41.3%) had mild, moderate 47(27.3%), severe 29 (26.9%) and extremely severe (3.5%) forms of premenstrual syndrome. premenstrual syndrome for most of them started at their age of menarche (45.9%). 73% reported that the symptoms have interfered and decreased their daily activity. Eighty nine (49.4%) reported to have changed their diet (10.5%) used analgesics and exercise (3.9%) as coping mechanism to relive the symptoms.

Another study was also conducted by Addis Tenkir (2002); the main aim of the study was to determine the prevalence of PMS and its effect on the academic and social performances of students of Jimma University (JU). A cross-sectional survey was conducted among 242 randomly selected female students of JU in Jan. 2002. The age of participants ranged from 17 to 38 years, with mean & median age of 20.3 & 20years, respectively. Almost all (99.6%) had at least one premenstrual (premenstrual Syndrome) symptom in many of the menstrual cycles in the last 12 months. The prevalence of premenstrual Syndrome or premenstrual

dysphoric disorder was 27%.They concluded that their study revealed a high prevalence and negative impact of PMS on students of Jimma University.

More than 300 different treatments for premenstrual Syndrome symptoms have been suggested. Treatments include: medication, surgery, non-drug treatments and the alternative and ultimately physical exercise and sports have been proposed. Considering their side effects, medical and surgical therapies are used only in severe cases of premenstrual Syndrome and in the case of no response to other therapeutic treatments. Hence, non-drug therapies and exercise have received more attention by researchers and afflicted women.

2.4.2. Effect of High Intensity Exercise on hormones and premenstrual Syndrome Symptoms

premenstrual Syndrome can often be physically painful for women. Premenstrual pain causes women to involuntarily contract their muscles; with this involuntary contraction breathing tends to become shallow and rapid. Shallow breathing and tight muscles can decrease the amount of blood flow and oxygenation to the tissues. Fluid retention can cause aches in the ankles, feet, and pelvis.

There is an increasing amount of research to indicate that exercise is beneficial to women who suffer from premenstrual Syndrome. There are several physiological reasons why this may be. The vigorous pumping action of the muscles during exercise moves blood and other fluids from the congested organs and lower extremities. By strengthening the lower back and abdominal muscles, low back pain can be reduced or prevented. Women who exercise regularly often report that their periods are shorter and they bleed less. Exercise can offer psychological benefits as well. Endorphins, responsible for the legendary "runners high", can reduce depression and anxiety; after exercise women often experience a sense of peace and relaxation. Exercise is a perfect outlet for the stress induced "fight or flight" hormones that can accumulate and cause anxiety and tense muscles. Exercise can also improve posture: Poor posture can cause pain in the upper and lower back (Zeinab, et al., 2013).

Maximum fluctuation in hormones occurs during the premenstrual/menstrual phases. Israel found a raised renal threshold for estrogens in patients with premenstrual Syndrome and suggests that the cause was not high level of oestradiol in the blood but due to lack of progesterone to act as antagonist (Lebrun et al., 1995).

It is not only ovarian hormones which fluctuate, but that those of adrenal cortex (Aldosterone) also exhibit cyclical activity, which is increased in the week preceding menstruation. Aldosterone causes water and sodium retention, potassium depletion (electrolyte imbalance) and hypertension because of insufficient progesterone to act as aldosterone antagonists (Kishali et al., 2006).

Aerobic exercise training acutely raises serum progesterone levels, a response prevented by prolonged fasting before exercise. Such increase in progesterone may be insufficient to substantially alter the menstrual cycle, but may provide positive benefit to alter mood and decrease stress via neurotransmitter systems (e.g., GABA, Serotonin) modulated by sex steroids. The efficacy of aerobic exercise on pain may be related to release of endorphin, counteracting possible declines in endorphin levels in the luteal phase. Raised endorphin levels have been associated with significant reductions in depression. The disturbed ratio between mineral ocorticoiddesoxycorticosterone, aldosterone, water and electrolyte balance) and estrogen on the one hand and progesterone and glucocorticoids (related to stress, anti-allergic, anti-inflammatory and carbohydrate metabolism) on the other hand would go a long way toward explaining the totality of the syndrome (Vishnupriya and Rajarajeswaram, 2011).

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Table 2.1The effects of exercise on hormonal secretions

Host gland	Hormone	Exercise effects on hormone selection
Anterior pituitary	Endorphins, growth hormone GH	Increase with increasing exercise
Posterior pituitary	Vasopressin (ADH) Oxytocin	Increase with increasing exercise Increase with heavy exercise only
Adrenal cortex	Cortisolcorticosterone exercise effect on hormone aldosterone	Increase with increasing exercise
Adrenal medulla	Epinephrine norepinephrine	Increase with increasing exercise
Thyroid	Thyroxin triiodothyronine	Increase with increasing exercise
Pancreas	Insulin glucagon	Insulin decrease with exercise increase with exercise
Pancreas	Insulin glucagon	Decrease with exercise increase with exercise
Ovaries	Estrogen progesterone	Estrogen increase with exercise
Kidney	Rennin	Increase with increasing exercise

Regular exercise activity has been repeatedly been shown to have many health benefits in woman. According to Barbara and Sheila (2011)study which was aimed to determine the influence of regular exercise on premenstrual symptoms in premenopausal woman, cross sectional study included a total of 100 healthy premenopausal women was divided into two groups which included the exercising group and the non-exercising group. The exercising group included 50 women who were selected from the health and fitness centres in Mangalore. The exercise program consisted of a 5 min warm up, followed by a 45 min limb and trunk fast exercise session and a 10 min cool down. Movements such as lunges, squats, staircase step, jumping jacks, and push-ups are conducted so as to raise the heart rate. The total exercise time duration was for one hour, three times a week for six months. The control group included 50 healthy non exercising women selected from the general population. In the present study, the psychological, behavioral and physical symptoms were significantly lower ($P<0.001$) in the exercising group than the non-exercising group. Further, it was observed that skin changes were significantly less ($P<0.01$) in the exercisers than the non-exercisers. In conclusion, regular exercise as a part of life style modification decreases the premenstrual symptoms.

About 3% to 8% of women have symptoms that are severe enough to disrupt their home and society responsibilities. Varied therapeutic treatment has been studied. The study was aimed to determine two different intensity of regular aerobic training on clinical symptoms of PMS. This study was a kind of semi experimental study, after the announcement and call for research based on questionnaires about symptoms of premenstrual Syndrome (negative mood, discomfort and edema), 90 women with mean age (27.1±10.96) who are eligible to participate in this study were selected. All subjects with premenstrual syndrome and had no history of any disease. These subjects were divided into three groups. High-intensity exercise group (n=30), moderate-intensity exercise group and the control group (n=30), which did not participate in any sporting activity. After three months and three physical activity sessions per week, symptoms were evaluated again in 3 groups. The symptoms after three months of regular aerobic exercise, in the two experimental groups decreased and the amount of the reduction in the two groups did not differ. BMI does not influence on incidence rate of pms ($p=0.0001$). Recent research shows that regular aerobic exercise is effective in reducing premenstrual Syndrome symptoms(Zahra*et al.,* 2017).

The potential benefits of aerobic exercises at different intensities in the management of premenstrual syndrome.The study design was quasi-experimental; sixty one female subjects were randomly allocated into three groups, Group A (mild intensity), Group B (moderate intensity) and Group C (severe intensity) and the intervention were given for 6 weeks. The study setting was general community settings. The outcome measures were menstrual symptom questionnaire, VO2 max, forced vital capacity (FVC), maximum voluntary ventilation (MVV) and lipid profile. The results showed that there was significant decrease in menstrual symptoms in both Groups B and C. However, Group C improved with increased rate of perceived exertion. LDL levels did not change significantly but HDL, TGL, VO2 max, FVC, and MVV improved significantly in Groups B and C, but remains significantly unchanged in Group A (Vishnupriya and Rajarajeswaram, 2011).

The effect of moderate aerobic exercise on mood states and menstrual cycle syndromes in two groups of exercising (n=97) and non-exercising (n=154) women [14]. The results showed a principal role of regular exercising in decreasing negative feelings such as anger, sin, disgust and pain. Participation in regular physical activity increases mental and physical health, which bears practical benefits for women. Regular physical activity can reduce psychological morbidity and anxiety can be relieved through exercise. The positive effect of exercise on psycho emotional symptoms of premenstrual Syndrome including depression and anxiety. An examination of the studies in this regard show benefits of physical activity in women's health including the reduction or elimination of many PMS symptoms (Scully *et al.*, 1998)

2.5. Menstrual dysfunction

During the past few decades, increasing numbers of women of all ages have been participating in sports, at both recreational and competitive levels. Most girls and women derive significant health benefits from regular physical activity. They can achieve the same training effects as do men, such as decreased blood pressure, lowered heart rate, and improved aerobic capacity, as well as decreased percent body fat. These changes help protect against atherosclerosis and heart disease. In addition, weight-bearing exercise promotes strong and healthy bones. Earlier myths regarding detrimental effects of excessive exercise on the female reproductive system have been largely dispelled. However, athletes, parents, coaches and physicians should be aware that exercising women could potentially be subject to menstrual cycle dysfunction (ACSM 2007)

Menstrual dysfunction is classified as primary amenorrhea, secondary amenorrhea, or oligomenorrhea. Irregular menses and an ovulation is found more often in athletes compared to none athletes with those involved in running sports experiencing infrequent menses more often than those not involved in running sports. Research has also found athletes involved at the Olympic level to experience menstrual dysfunction more often than those involved at the collegiate level (Thompson, 2007).

Furthermore, menstrual irregularities (i.e., infrequent or absent menses) in female football players may be linked to excessive energy expenditure due to intensive training combined with inadequate nutritional intake, competitive and personal stress, and low body fat, which may result in increased risk of low bone density or osteoporosis, stress fractures due to suppressed estrogen levels, reduced performance, and impaired fertility. Thus, the absence of menses should not be perceived as a pleasant convenience, especially if the player has already experienced several months of missed periods without being pregnant. This should represent a red flag and the affected player should seek immediate medical help to avoid irreversible damage in her bone health and fertility(Ibid, 2007).

2.5.1. Definitions

The monthly menstrual cycle is the result of a complex interaction between the endocrine and reproductive systems. External stimuli affect the system through hormonal signals to the hypothalamus. The cessation of menses coincident with physical training has long been recognized. Eumenorrhea describes a normal menstrual pattern of 10–13 menses per year Menstrual dysfunction seen in athletes is characterized by a significant decrease in reproductive hormones, especially oestrogen, and disruption of the normal menstrual cycle. In the Norwegian study mentioned above, primary amenorrhea, secondary amenorrhea, oligomenorrhea and short luteal phase were all defined as menstrual dysfunction (Torstveit 2005).

2.5.2. Prevalence

Exercise induced or athletic menstrual dysfunction is common in active women and can significantly affect health and sports performance. It has been reported that menstrual dysfunction occurs in 6–79% of women engaged in athletic activity. Prevalence depends on the definition of menstrual dysfunction, the sport and the competitive level of the athletes

investigated. In the questionnaire (part I) of the study on elite Norwegian athletes (n = 669) referred to above, a similar percentage of athletes (17%) and controls (15%) reported current menstrual dysfunction (Torstveit 2005).

2.5.4. Factors associated with menstrual dysfunction

A number of factors, such as energy balance, DE behaviors, exercise intensity and training practices, bodyweight and body composition, and physical and emotional stress, pregnancy, thyroid disease, disordered eating behaviors may contribute to the development of athletic menstrual dysfunction. There also appears to be a high degree of individual variation regarding the susceptibility of the reproductive axis to exercise and diet related stresses. The percentage of football players reported to have current menstrual dysfunction is low compared to other sports and could indicate that football players are less affected by the well-known risk factors for menstrual dysfunction compared to athletes engaged in other sports(Torstveit 2005). .

2.5.5. Dysmenorrhea

Menstrual cramping, painful menses or dysmenorrhea, may occur with ovulatory cycles. Some women may experience cramping throughout their reproductive lives, some only intermittently, and others experience cramping rarely or never. Uterine cramping is caused by prostaglandins released when the lining of the uterus sheds. These prostaglandins cause uterine muscle to contract and smooth muscle contractions in the digestive tract cause other symptoms such as nausea and diarrhea (ACOG Technical Bulletin 1999 No. 166).

Primary dysmenorrhea is one of the most common complains and gynecological problem worldwide among young females. Findings claimed that exercise may positively affect this problem.

The study made by with purpose to examine the effect of 8 weeks physical activity on primary dysmenorrhea of female students. Based on McGill's questionnaire 50 students having moderate to severe primary dysmenorrhea took part in this study and randomly were divided into experimental (N=25) and control (N=25) groups. The experimental group participated in a physical activity program for 8 weeks, 3 sessions a week and 90 minutes per session. The results revealed that performing a regular physical activity significantly reduced

type of drugs consumed (p# 0.08), number of drugs consumed (p# 0.01), volume of bleeding (p# 0.002), rate of bleeding (p# 0.005), length of menstruation pain (p# 0.001) and total and present pain intensity (p# 0.01, p#0.05) in experimental group when comparing with control group or when comparing pre and post-test findings of experimental group.

A comparative study to determine the frequency of menstrual disorders (amenorrhea, oligomenorrhea, dysmenorrheal, and PMS) between Tabriz athletes and non-athletes University female students. 360 university girls student (180 athletes [21.37±4.34 yrs] and180 non-athletes [20.57±2.12 yrs] were selected purposefully and completed the menstrual history questionnaire, sport questionnaire and Dickerson questionnaire.

Data were analyzed by descriptive statistics and inferential (Chi-Square test). Results did not support a statistically significant differences in frequency of menorrhea athletes 10.55%, non-athletes 8.88%), oligomenoorhea (18.33% in athletes and 15.55% in non-athletes) and PMS (55.88% in athletes and 66.11% in non-athletes). 2.5.6. Amenorrhea and oligomenorrhea

In 1997, the Task Force on Women's Issues published the first Triad position stand which described a syndrome of 3 distinct but interrelated conditions: DE, amenorrhea, and osteoporosis. American College of Sports Medicine revised position stand on the Triad published in 2007. The Triad is a medical condition often observed in physically active girls and women, and involves any 1 of the 3 components: (1) low energy availability with or without disordered eating, (2) menstrual dysfunction, and (3) low bone mineral density (BMD). The most recognizable sign of the female athlete triad is amenorrhea (Nattiv*et al.*, 2007).

Amenorrhea is defined as an absence of menstrual cycles for three to six consecutive months in those that have begun menstruating or no menstrual cycle by age 16. Some of the causes of amenorrhea may include: exercise, pregnancy, thyroid disease, an occult prolactinoma, and polycystic ovary syndrome. Some other factors that may contribute to menstrual dysfunction include: energy balance, exercise intensity and training practices, body weight and composition, disordered eating.This absence of a menstrual cycle is categorized as primary or secondary amenorrhea. Primary amenorrhea occurs when no menstrual cycle has occurred by the age of sixteen. Secondary amenorrhea is an absence of at least three to six consecutive menstrual cycles in women who have begun menstruating (Golden,2002).Amenorrhea is

defined as the absence of menstrual cycles lasting more than three months. Amenorrhea beginning after menarche is called secondary amenorrhea. Primary amenorrhea refers to a delay in the age of menarche. Because menarche is occurring earlier, the defining age for primary amenorrhea was recently reduced from 16 to 15 yr (American Society of Reproductive Medicine Practice Committee, 2004).

Low estrogen levels are often a result of menstrual dysfunction and, this can lead to a decrease in bone acquisition during adolescent years. These factors can cause osteopenia, scoliosis, and stress fractures. Low body weight and body fat was thought to cause amenorrhea in the 1970's. It is now thought that exercise stress and energy availability "dietary energy intake minus exercise energy expenditure" (ACSM, 1997), are possible cause.It has been speculated that athletes may have a tendency of having a menstrual dysfunction.

Most female football players are healthy. However, recent findings from studies on Norwegian female elite athletes also showed that football players are dieting and experiencing eating disorders, menstrual dysfunction and stress fractures. Sixty-four percent of female soccer players aged 10 to 14 hadn't experienced menarche, researchers reported at an American Academy of Orthopaedic Surgeons meeting. The study found that 19%, 18% and 20% of those aged 15 to 17, collegiate players and professional players, respectively, had irregular and/or absence of menstrual cycles. The study found 14.3% of the athletes had a history of stress fractures (Sundgotet al.2004).

American Academy of Orthopedic Surgeons (2012) reported that competitive soccer linked to increased injuries and menstrual dysfunction in girls. In the U.S., there are nearly three million youth soccer players, and half of them are female. New research presented February 7 at the 2012 Annual Meeting of the American Academy of Orthopedic Surgeons (AAOS) found that despite reporting appropriate body perception and attitudes toward eating, elite youth soccer athletes (club level or higher) face an increased risk for delayed or irregular menstruation .To determine the prevalence of the female triad among soccer players, investigators recruited 220 athletes, median age 16.4, from an elite youth soccer club, an NCAA Division I university team, and a women's professional team. The participating athletes completed questionnaires regarding age of menarche (first menstruation), menstrual history, and history of musculoskeletal injuries including stress fractures.

The Eating Attitudes Test was used to assess each athlete's body image, and attitudes toward eating. The average age of menarche was 13 years of age among the participants. Irregular menstruation cycles, or absence of menstruation, were reported by 19 percent of the participants in the 15-17 age group, 18 percent of the college-age players, and 20 percent of the professional athletes. A history of stress fractures was reported in 14 percent of the players, with a majority of the injuries in the ankle and foot. "Elite female soccer athletes are at risk for delayed onset of menarche, menstrual dysfunction and stress fractures, which may be due to an imbalance of energy intake and output," said Robert H. Brophy, MD, co-investigator and assistant professor of orthopedic surgery at Washington University School of Medicine in St. Louis, Mo. "The risk for soccer athletes appears to be lower than for female athletes in aesthetic (gymnastics, dancing, etc.) and endurance sports. More research is needed to identify the underlying causes, and potential remedies, for these findings in elite female soccer athletes, and whether these findings translate to female athletes participating in other team sports(Nattiv et al., 2007).

In a study of 80 varsity athletes and 80sedentary controls at an all girls' private high school, researchers sought to determine the prevalence of the female athlete triad.All subjects were between the ages of 13 and 18 years. Data were collected through the use of several methods. The subjects recorded 3-day dietary recalls after receiving instruction from a registered dietitian, completed validated questionnaires related to medical history including menstrual status, provided blood samples, and were measured by DXA scans. Amongst the 80 high school varsity athletes, 36% were identified as having low energy availability, 54% had amenorrhea or oligomenorrhea, and 13% were found to have low bone mineral density. In the sedentary control group, 39% had low energy availability, 21% were found to have amenorrhea or oligomenorrhea, and 20% were classified as having low bone mineral density. Only one athlete and one control were found to have all three parts of the female athlete triad. The researchers found that the female high school athletes and controls had a high prevalence of one but not all of the components of the triad(Hoch et al., 2009).

Other studies have focused on one part of the female athlete triad and found high prevalence rates as well. In Norway, researchers found that elite female athletes in sports where leanness is important for performance were more likely to have a clinical eating disorder. From a sample of 186 athletes and 145 controls, 46.7% of leanness sports athletes, 19.8% of non-leanness sports athletes, and 21.4% of controls were found to have eating disorders. A small

study of 15 Greek and 30 Canada elite female gymnasts identified that 78% reported menstrual dysfunction in the form of oligomenorrhea or secondary menarche (Torstveit, 2005).

In a large study of 788 Iranian female elite athletes from various sports, researchers reported that 71 or 9.0% had amenorrhea or oligomenorrhea, with 11 of those 71 athletes having polycystic ovary syndrome as the known cause. The evidence on the female athlete triad shows that its components can be prevalent in female athletes from various age groups and competition levels. Knowing this prevalence can help in the promotion of increased attentiveness to accurately measuring the body composition of female athletes(Dadgostar, Razi, Aleyasin, Alenabi, &Dahaghin, 2009).

According to a study conducted on 91 female competitive runners running at least 40 miles per week during their peak training. These females were given a questionnaire to assess their menstrual history. They found 26% of the participants were oligomenorrheic and 10% were amenorrheic. Oligomenorrheic was defined as having four to nine menstrual cycles per year and amenorrheic was defined as having fewer than four menstrual cycles in the past year. The oligomenorrheic females were reported to have 45% fewer menstrual cycles in their lifetime than the eumenorrheic females. They also ran 18% more miles per week compared to the eumenorrheic females. Concluded from their study disordered eating is related to menstrual irregularity quite strongly, low bone mineral density (BMD) is associated with irregular menstrual cycles, and disordered eating is associated with low BMD when irregular menstrual cycles are absent(Cobb et *al.*, 2003).

According surveyed 139 athletes in grade 7-12 who had experienced menses for at least a year. Five reported secondary amenorrhea, 19 reported oligomenorrhea, 50 reported 7 to 9 menses in the past year and 65 reported 10 or more menses in the previous year. Athletes who participated in running sports were found to experience infrequent menses compared to athletes not involved in running sports (57.1%, 15.4%) (Paula, 2003).

Based on survey made, 119 female recreational and collegiate athletes at Stanford University on disordered eating habits and their menstrual cycle history. Within the collegiate athletes 42.9% had irregular menstrual cycles and 14.3% were amenorrheic. Of the recreational

athletes 13.4% had irregular periods and 2.9% were amenorrheic (Hopkinson and Lock, 2004).

A study mentioned earlier by Thompson (2007) with 37 Division I athletes and 18 college females found women who had reported an eating disorder started menstruation at an older age than those who did not report having an eating disorder. Of the collegiate athletes 5.7% reported both menstrual dysfunction and an eating disorder. They also found that 2.8% of the collegiate athletes were amenorrheic while none of the non-athletes were amenorrheic. Oligomenorrhea was found in 30.6% of the collegiate athletes and 16.7% of non-collegiate athletes. This was determined by a questionnaire about their current menstrual status, asking whether they had a menstrual cycle in the last six months, in the last six weeks, or every 25-35 days.

Carla, S. (2008), surveyed 425 collegiate athletes from seven universities about their menstrual history. They found 3 (1%) had no menstrual cycle, 35 (11.9%) reported less than or equal to six cycles in the past year, and 25 (8.4) reported more than 12 cycles in the past year. also found 113 (26.7%) of the 425 female collegiate athletes surveyed were using OC to help regulate their menstrual cycles. Of the athletes that reported irregular menstrual cycles 95 (31%) were not using OC to help regulate their menstrual cycle.

Robert (2018), a study was performed on 50 nationally or higher ranked British middle or long distance female runners' ages 17 to 35 years old. A questionnaire was administered to the 50 females about their menstrual history. Gibson and colleagues reported 24 to experience amenorrhea (0-3 menstrual cycles per year), 9 to experience oligomenorrhea (4-9 menstrual cycles per year), and 17 to be eumenorrhea (10-13 menstrual cycles per year).
Sixty-three elite female athletes, competing at a regional level, were given questionnaires to determine their menstrual status Of the 44.4% in the sample who reported having a menstrual dysfunction, amenorrhea was found in 57% with oligomenorrhea in 25% and short cycle in 18%. Amenorrhea was defined as having three or less menstrual cycles in a year, oligomenorrhea was defined as having four to nine menstrual cycles in a year, and short cycle was having 13 or more cycles in a year. Menstrual dysfunction occurred in 61% of the participants after they became an athlete. A study mentioned previously by Torstveit and Sundgot-Borgen (2005) surveyed 669 athletes and 597 controls to determine if elite athletes

are at an increased risk of developing the female athlete triad. Athletes involved in leanness sports had a higher percentage of menstrual dysfunction (42%) compared to nonleanness athletes (25.8%) and controls (24.5%). This study defined menstrual dysfunction as having amenorrhea (no menstrual cycle by age 16 or absence of three or more consecutive menstrual cycles after menarche), oligomenorrhea (35 days or more between cycles), and short menstrual cycle (less than 22 days between cycles) (Torstveit & Sundgot-Borgen, 2005).

Some studies have not found a link between athletes and controls for example:found no significant difference in menstrual dysfunction between athletes (n = 84) and non-athletes (n = 62). In this study, each participant was an undergraduate at a Division I university. The participants completed a questionnaire on their menstrual history. Reinking and Alexander found 21% of all their subjects had oligomenorrhea or amenorrhea(Mark and Laura, 2005).

Menstrual dysfunction is classified as primary amenorrhea, secondary amenorrhea, or oligomenorrhea. Irregular menses and an ovulation is found more often in athletes compared to none athletes with those involved in running sports experiencing infrequent menses more often than those not involved in running sports. Research has also found athletes involved at the Olympic level to experience menstrual dysfunction more often than those involved at the collegiate level (Golden, 2002).

2.6. Body composition

Chih-Hui*et al.* (2017), studied on the effects of training in female collegiate soccer players is currently limited. The purpose of this study was to determine the effects of a typical 12-week off-season resistance training and conditioning program on body composition and selected performance measures in female collegiate soccer players. Twenty one members of a Division I women's soccer team completed body composition testing (DEXA), power and endurance performance testing (VO_{2max}, Wingate testing, vertical jump), and 3-day food records. Average baseline body mass was 63.3 ± 6.4 kg. Fat mass and body fat percentage significantly decreased and lean body mass significantly increased from baseline to post-test. Performance measures of VO_{2max}, mean wattage (Wingate testing), anaerobic capacity, and fatigue index significantly improved from baseline. Change in fat mass was shown to have a significant correlation to the changes in VO_{2max}, fatigue index, and peak watts.

Throughout the competitive season, one of the main ways to track an athlete's training progress and health is through body composition measurements. While athletes often record this information on their own, trainers and sports nutritionists often help with documentation and analysis. Total body mass is an easy measurement to track and provides a quick indication of any rapid changes. For some sports, body mass must be used as part of grouping players for competition, whereas in other sports, weight is not a determinant. Regardless of whether total body mass is critical to the sport, it does not indicate the muscle mass or fat mass of an athlete, which are measurements that can signify training progress and health, respectively. Another method of examining body composition involves using the body weight in conjunction with the height of the athlete to allow the calculation of density via the body mass index (BMI) formula.

A large study that took place in Spain from 2000 to 2004 was conducted with the aim of determining the correlation between BMI and fat, muscle, and bone percentages in athletes The subjects of the study were 3,971 Caucasian competitive-level athletes who had participated in National, European, World, or Olympic competitions. There were 1230 females and 2741 males from the sports of soccer, basketball, handball, badminton, tennis, volleyball, swimming, rowing, cross country, gymnastics, judo, alpinism, triathlon, and others. The body compositions of these athletes were calculated using skin-fold thickness measures. The authors concluded that BMI is not an adequate method to determine body fatness in the elite athlete population (Adrienne, 2012).

At Michigan State University, a study was conducted with the main purpose of describing the relationship between body mass index (BMI) and percent body fat and the secondary purpose of determining the accuracy of BMI as a measure of percent body fat in college athletes. Participants for this study included 226 collegiate athletes and 213 college-aged non-athletes. Percent body fat was measured by use of the Bod Pod. The researchers found that BMI was not an accurate measure of fatness of college athletes and non-athletes (Ode *et al.*,2007).

2.7. Conceptual framework

Previous study indicated that participating in physical activity program is likely an approach to reduce the detrimental effect of primary dysmenorrhea symptoms in young females (Dersehet *al.*,2017). Similar finding reported that low incidence of premenstrual Syndrome between two groups, it is necessary to have more attention to exercise in other university fields among female university students (Laden *et al.*, 2012). Considering this, the researcher aimed to assess the effect of 12 weeks speed endurance on middle distance runners' menstrual dysfunction as illustrated below.

Figure 2. 1 Conceptual framework of the study

Figure 2.1 indicates that 12 weeks of speed endurance training protocol affect athletes' menstrual dysfunction. Therefore, the researcher hypothesized those 12 weeks of speed endurance training protocol significant athletes' menstrual dysfunction of Athlete Tirunesh Dibaba Athletics Training Centre female middle distance runners

CHAPTER THREE

3. METHODOLOGY

3.1. Research Design

Quasi-experimental research involves the manipulation of an independent variable without the random assignment of participants to conditions or orders of conditions. Among the important types are nonequivalent groups' designs, pretest-posttest, and interrupted time-series designs (Kothari, 2004).

This research study constitutes quasi-experimental design in which eight middle distance runner experimental groups were involved with no control group because of small number of participant. Before-and-after without control design in such a design a single test group or area was selected and the dependent variable was measured before the introduction of the treatment. The treatment was then introduced and the dependent variable is measured again after the treatment has been introduced. The effect of the treatment would be equal to the level of the phenomenon after the treatment minus the level of the phenomenon before the treatment.

3.2. Population of the study

Athlete Tirunesh Dibaba Athletics Training Centre female middle distance runners population were (N = 8). By the virtue of opportunity all of the population of of the study was included in the study. In this case, the total population of the study was considered as target population of the study. The subject of this study consists of selected eight female middle distance runners who were regular member of Athlete Tirunesh Dibaba Athletics Training Centre in the year 19/20. Purposive sampling technique was used to select middle distance runners because of the nature of the event.

3.3. Sample and sampling procedures

As it was discussed in the population section of the study the total population of the study which was considered as target population of the study was (N = 8). In this study, the population of the study was (n =8). Since the population of the study was small in number the population of the study was considered as the population and target population then considered as sample of the study.

3.4. Inclusion criteria

1. Those who were not married and not pregnant
2. Not using regular oral contraceptives
3. physically and mentally healthy, without chronic disease

3.5. Selection of Variables

The training was focused on speed endurance training protocol, since the middle distance runners quality demands sped endurance that does not mean that other training programs were insignificant. Before the onset of the training the first two weeks familiarization test and training program was introduced. Then after 12 weeks speed endurance was undertaken. Finally, posttest was conducted to female middle distance runners found in the training center.

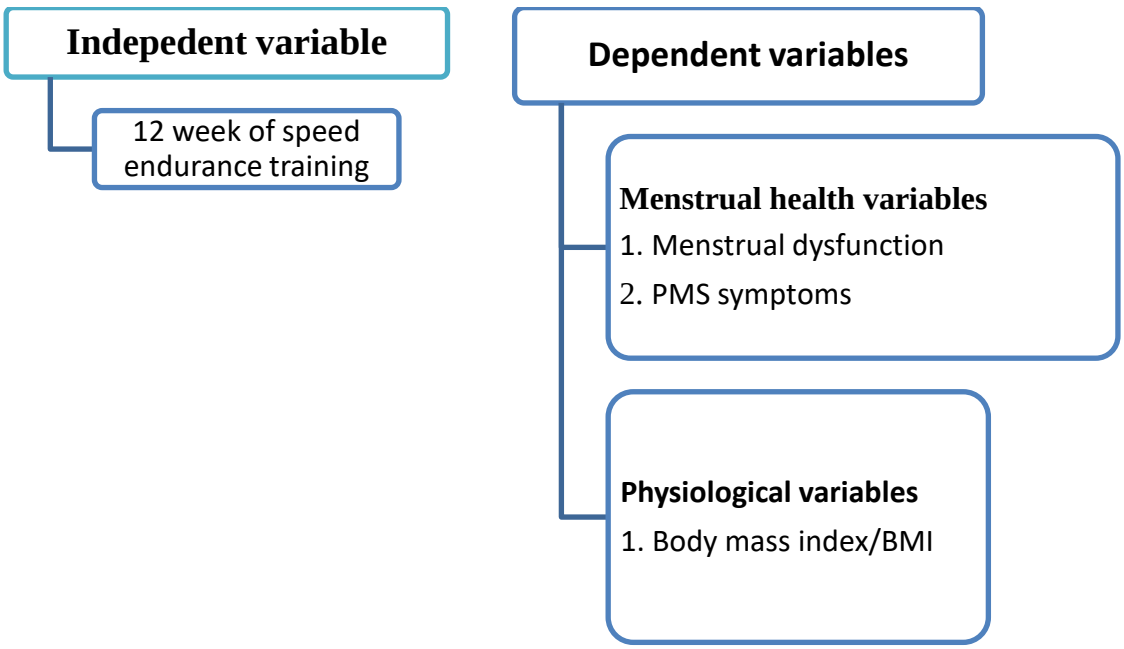

Figure 3.1.Selection of variables

3.6. Data collection instruments

Table.3. 1 Data collection instruments

S.n	Variables	Tests/tools administrated	Instruments	Criterion measure/ Units
1.	Body mass index	Weight in Kg and height in m^2	Weight machine & stadio-meter	Kg/m^2
2.	Menstrual dysfunction	Menstrual cycle self-track sheet	Calendar	Frequency
3.	premenstrual Syndrome symptoms	premenstrual Syndrome symptoms questionnaire	questionnaire	Severity and prevalence of menstrual cycle

From the above table one can understand that in order to assess of athletes Body Mass. Weight was measured using weight machine Kg. The subjects were weighted wearing shorts and a tee shirt, and without shoes. Height was measured using a portable stadio-meter (sensitivity ± 0.25 cm). The subjects were measured distributed to both feet and head positioned on Horizontal plane. The body mass index (BMI) was calculated by the formula BMI = weight (kg)/height2 (m). Menstrual dysfunction of athletes was assessed using menstrual cycle self-track sheet from monthly calendar. Premenstrual syndrome symptoms questionnaire consisting of 24 questions items was assessed Severity and prevalence of menstrual cycle.

3.7. Procedure of data collection and testing protocols

3.7.1. Procedure of data collection

First the researcher was submitting letter of permission to Athlete Tirunesh Dibaba Athletics Training Centre, Research Directorate Director Office. After getting permission from the coordinating office, the researcher was handover official letter to the middle distance department then after the final permission from the center coach the researcher was carried out the data collection. Finally, consent agreement was signed by women athletes after the purpose of the study was briefly explained to them. One woman, who was experienced reproductive health expert from Athlete Tirunesh Dibaba Athletics Training Centre clinic, was collect data regarding menstrual health.

3.7.2. Testing protocol

First in the familiarization phase of two weeks athletes were given 2 hours seminar concerning menstrual health and how to complete menstrual health questionnaires and diaries of premenstrual symptoms and how to use the calendar. At the same time but in other program the researcher introduced and demonstrated procedures of tests and measurements which were conducted in 3 months of the study. At the beginning of each month, after collecting the questionnaire papers and diary sheets of the previous menstrual cycle data collectors submitted to the researcher.

In order to gather the necessary data concerning the physiological variables, all participants in the study was oriented and the written informed consent (the Amharic version) (ACSM 2002) were administered and completed by the participants. Baseline test in the selected physiological variables were conducted for experimental. At the end of each month of middle distance training, the same test was conducted and raw data were collected. Finally, post-test was taken at 3rd month.

3.8. Validity of the test

In this thesis, both content and criterion validity test was employed. In the case of content validity, premenstrual Syndrome symptoms variable of middle distance runners were measured by premenstrual Syndrome symptoms questionnaire as well as menstrual dysfunction of an athlete was measured by menstrual cycle self-track sheet. Whereas, criterion validity test include body mass index of middle distance runners were measure in weight (Kg) and athletes' height was measured meter.

3.9. Reliability

3.9.1. Reliability of data

Instrument reliability, tester's competency and testing condition affect data reliability. Therefore, to get consistent result: testing personnel, testing period, place and instruments were the same for all participants.

3.9.2. Reliability of instrument

To ensure reliability of instruments which was used in this study like weighing scale and stadio-meter to measure athletes body mass index.

3.9.3. Reliability of test

Test retest ensures reliability of the test. The subjects from both groups for the selected physiological variables were measured or tested twice and their average was taken.

3.9.4. Testers' competency

All physiological tests and measures were conducted by the health expert with help of sport science professionals. Different data collectors were selected and trained on their study area. Expertise were train the data collectors on their site regarding training on testing and measurements on menstrual health.

3.8.5. Pilot test

In this case, reliability test was conducted because it helps the questionnaire to adopt according to Ethiopian context. Accordingly, cronbach's alpha reliability coefficient normally ranges between 0 and 1. However, there was actually no lower limit to the coefficient. The closer Cronbach's alpha coefficient was to 1.0 the greater the internal consistency of the items in the scale. Based upon the formula _ = rk / [1 + (k -1)r] where k is the number of items considered and r is the mean of the inter-item correlations the size of alpha is determined by both the number of items in the scale and the mean inter-item correlations. George and Mallery (2003 p. 321) provide the following rules of thumb: "_ > .9 – Excellent, _ > .8 – Good, _ > .7 – Acceptable, _ > .6 – Questionable, _ > .5 – Poor and _ < .5 – Unacceptable". Accordingly, the questionnaire was first administered to Adama Athletics club middle distance runners which were found in Asella, Ethiopia.

Table.3. 2 pilot test result of Adam Athletics club athletes

S.n	Variable	α-level
1.	PSM symptoms questionnaire	0.83

Table.3. 2, indicates that the PSM symptoms questionnaire (α = 0.83). The results of cronbatch alpha level indicate that the questionnaire was good with the major modification of grammars, spelling and general instructions of the questionnaire.

3.9.6. Administration of the Test

The researcher informed the nature of the study and created awareness. Then written informed consent the Amharic version obtained prior to the start of the study. The (ACSM 2002) were used to screen the interested female for eligibility before athletes came to the Physiological variables test and training. All of the tests and measures were conducted based on their standards.

3.10. Statistical technique

The collected data were processed using statistical package of social sciences (SPSS) version 25.Mean and standard deviation was used to analyze the demographic characteristics of an athlete. Frequency, percentages and histogram was used to analyze menstrual dysfunction level and PMS symptoms level of runners. Logistics regression was used to analyze to what extent middle distance runners performance affects PMS symptoms of ATDATC female middle distance runners. Wilcoxon Signed Rank test was used to test the significant difference of PSM symptom between pretest and posttest of Experimental group.

CHAPTER FOUR

4. RESULTS AND DISCUSSION

This study involves female middle distance runner aged 16-18 years at the time of pretest 8 females in total were assessed for training. Eight (8) respondents were selected in which 8 of them were allocated to the experimental group. All subjects were completed a pre- and post-test along with 36 training sessions. All 8 respondents of experimental group members were finished the training program. The number of sessions attended on average was 36 for an attendance rate of 100%. No subjects were eliminated from the study due to the corrective exercises that were set-up to be performed in the warm-up and cool-down. This implies that all of the participants were attended the sessions of the training. Thus, there were no injuries. But, participant completed all post testing. Furthermore, the exercises were adjusted in the case of day-to-day ailments.

4.1. Descriptive Statistics of athletes Demographic variables

Table.4. 1 Descriptive Statistics of athletes Demographic variables

S.n	Demographic variables	N	Mean	Std. Deviation
1.	Height	8	1.61	.027
2.	Weight	8	51.88	4.05
3.	Body mass index	8	19.88	1.39

The height of ATDATC female middle distance runners was (1.61± .027 meter) high. The weight of ATDATC female middle distance runners was (51.88 ± 4.05Kg). A body mass index (BMI) ATDATC female middle distance runner was (19.88 ± 1.39).

This shows that height ATDATC female middle distance runners swing from 1.58 - 1.63m high. Runners' weight ranges from 47.83 – 55.85kg.The body mass index of runners were from 18.49 -21.27 BMI. This implies that middle distance runners were shorter, slightly lighter weighter and had normal body appearance. ATDATC female middle distance runners

had similar demographic variables. From the very beginning of talent identification by Athlete Tirunesh Dibaba Athletics Training Centre almost equivalent demographic variables of athletes were similar. Thus, female middle distance runners in Athlete Tirunesh Dibaba Athletics Training Centre had similar demographic characteristics

4.2. Menstrual dysfunction level of ATDATC female middle distance runners

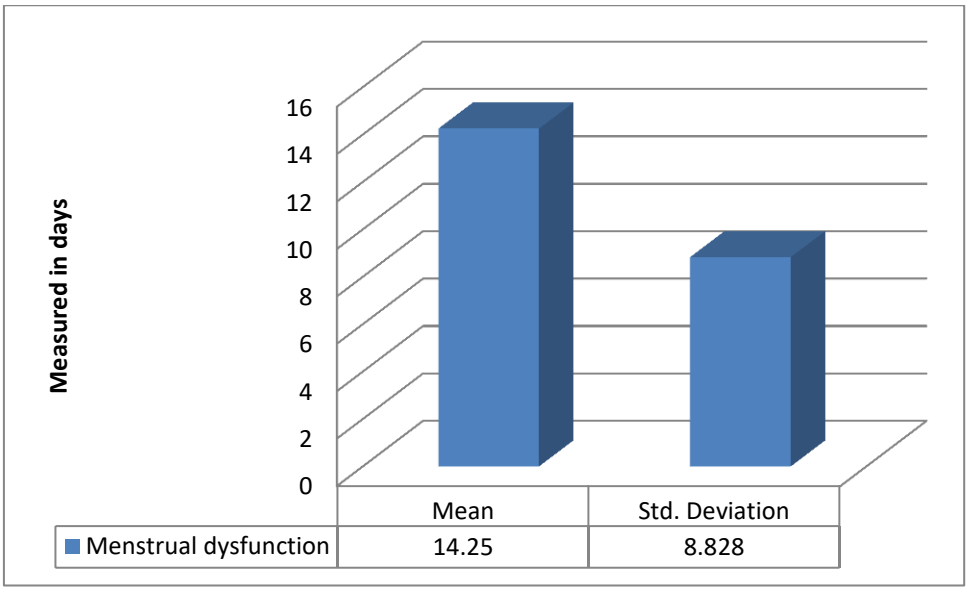

Figure 4.1 Menstrual dysfunction level of middle distance runners

The figure shows that menstrual dysfunction level of ATDATC female middle distance runners (14.25 ± 8.828 days). The frequency level of menstruation period occurrence collected from calendar ranges from 5- 23 day and athletes stay with their menstruation symptom from 3-5 days. From this, one can understand that mass or collective middle distance training without consideration of athletes menstruation period is difficult for both athletes and coaches because ultimately affects athlete's performance and their health of ATDATC female middle distance runners' experimental group.

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4.3. The Current Status of PMS symptoms of ATDATC female middle distance runners

Table.4. 3. The current status PMS symptoms of ATDATC female middle distance runners

S.n	PSM items	Alternative response									
		No symptom		Mild		Moderate		Severe		Very Severe	
		Fr.	%	Fr.	%	Fr.	%	Fr.	%	Fr.	%
1	Headaches	4	50	2	25	1	13	1	12.5		
2	Feel bloated in abdomen	4	50			3	38	1	12.5		
3	Change in bowel habit	4	50			2	25	2	25		
4	Feel depressed	2	25			1	13	3	37.5	2	25
5	Get angry for no good reason	2	25	1	12.5	1	13	1	12.5	3	37.5
6	Periodic type of pain	3	37.5	2	25	1	13	1	12.5	1	12.5
7	Easily upset	5	62.5							3	37.5
8	Cravings for sweet foods and change in appetite	2	25			4	50			2	25
9	Poor concentration or memory			1	12.5	2	25	2	25	3	37.5
10	Irritability	3	37.5	4	50	1	13				
11	Tender breasts	5	62.5			2	25			1	12.5
12	General ache & pain	2	25			2	25	3	37.5	1	12.5
13	Feeling tense			1	12.5			3	37.5	4	50
14	Nausea and sickness	2	25	2	25	1	13			3	37.5
15	Difficulty in sleeping	1	12.5			2	25	2	25	3	37.5
16	Violent feelings	1	12.5	1	12.5	1	13	2	25	3	37.5
17	Water retention	3	37.5					1	12.5	4	50
18	Mood swings	1	12.5			1	13	3	37.5	3	37.5
19	Hot flashes/hot sweat	1	12.5	1	12.5	1	13	2	25	2	25
20	Feel bad about your self					2	25	2	25	4	50
21	Clumsiness and lethargy	1	12.5			1	13	2	25	4	50
22	Bach ache	1	12.5			2	25			5	62.5
23	Spot eg. acne			1	12.5	2	25	3	37.5	2	25
24	Tired/fatigue					1	13	3	37.5	4	50
25	Overall result	-	-	1	12.5	5	62.5	1	12.5	1	12.5

The above table shows that ATDATC female middle distance runners during menstruation time athletes got a headaches 4(50%), 2(25%), 1(13%) and 1(12.5%) reported as no symptom, mild, moderate, severe and very severe respectively. Feel bloated in abdomen 4(50%), 3(38%) and 1(12.5%) replied as no symptom, moderate and severe respectively. Change in bowel habit 4(50%), 2(25%) and 2(25%) replied as no symptom, moderate and

severe respectively. Feel depressed 2(25%), 1(13%), 3(37.5%) and 2(25%) responded as no symptom, moderate, severe and very severe respectively. Get angry for no good reason 2(25%), 1(12.5%), 1(13%), 1(12.5%) and 3(37.5%) responded as no symptom, mild moderate, severe and very severe respectively. Periodic type of pain 3(37.5%), 2 (25%), 1(13%), 1(12.5%) and 1(12.5%) replied as no symptom, mild, moderate, severe and very severe respectively.

In the same manner, ATDATC female middle distance runners during menstruation time athletes feel easily upset 5(62.5%) and 3(37.5%)%) responded as no symptom and very severe respectively. Cravings for sweet foods and change in appetite 2(25%), 4(50%) and 2(25%) replied as no symptom, moderate and very severe respectively. Poor concentration or memory 1(12.5%), 2(25%), 2(25%) and 3(37.5%) replied as mild, moderate, severe and very severe respectively. Irritability 3(37.5%), 4(50%) and 1(13%) responded as no symptom, mild and moderate respectively. Tender breasts 5(62.5%), 2(25%) and 1(12.5%) replied as no symptom, moderate and very severe respectively. General ache & pain 2(25%), 2(25%), 3(37.5%) and 1(12.5%) replied as no symptom, moderate, severe and very severe respectively. Feeling tense 1(12.5%), 3(37.5%) and 4(50%) replied as moderate, severe and very severe respectively.

Nausea and sickness 2(25%), 2(25%), 1(13%) 3(37.5%) replied as no symptom, mild, moderate and very severe respectively. Difficulty in sleeping 1(12.5%), 2(25%), 2(25%) and 3(37.5%) replied as no symptom, moderate, severe and very severe respectively.

Violent feelings 1(12.5%), 1(12.5%), 1(13%), 2(25%) and 3(37.5%) replied as no symptom, mild, moderate, severe and very severe respectively. Water retention 3(37.5%), 1(12.5%) and 4(50%) replied as no symptom severe and very severe respectively. Mood swings 1(12.5%), 1(13%), 3(37.5%) and 3(37.5%) replied as no symptom, mild, moderate, severe and very severe respectively. Hot flashes/hot sweat 1(12.5%), 1(12.5%), 1(13%), 2(25%) and 2(25%) replied as no symptom, mild, moderate, severe and very severe respectively.

Feel bad about yourself 2(25%), 2(25%) and 4(50%) replied as no moderate, severe and very severe respectively. Clumsiness and lethargy1(12.5%), 1(13%), 2(25%) and 4(50%) replied as no symptom, mild, severe and very severe respectively. Bach ache 1(12.5%), 2(25%) and 5(62.5%) replied as no symptom, moderate and very severe respectively. Spot acne 1(12.5%), 2(25%), 3(37.5%) and 2(25%) replied as mild, moderate, severe and very severe respectively. Tired and fatigue 1(13%), 3(37.5%) and 4(50%) replied as moderate, severe and very severe

respectively. Overall PSM result shows majority of athletes 5(62.5%) had shown PMS symptoms moderately.

From the above analysis ATDATC female middle distance runners reveals that athletes did not shown PSM symptom of getting easily upset and tender breasts. Moreover, ATDATC female middle distance runners had mild irritability, periodic type of pain, headaches, feel bloated in abdomen and change in bowel habit during menstruation. Furthermore, ATDATC female middle distance runners show moderate cravings for sweet foods and change in appetite and nausea and sickness during menstruation. This indicates that currently the middle distance runners were suffering with high intensity training.

In the worst scenario, ATDATC female middle distance runners show severe depression, get angry for no good reason, poor concentration or memory, general ache & pain, difficulty in sleeping, violent feelings, mood swings, hot flashes/hot sweat, feel bad about yourself, clumsiness and lethargy, spot acne and tired or fatigue. Moreover, ATDATC female middle distance runners had shown very severe water retention and backache. Generally, ATDATC female middle distance runners shown moderate PSM symptom response during menstruation time.

4.4. The effect of speed endurance training on PMS symptoms of ATDATC runners

Table.4. 2. Ordinal logistic regression model summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.420[a]	.176	.039	9.057
a. Predictors: (Constant), Performance				

The standard approach for describing the relationships in this problem is linear regression. The most common measure of how well a regression model fits the data is R^2. This statistic represents how much of the variance in the response is explained by the weighted of predictors. The closer R^2 is to 1, the better the model fits. Regressing preference on the Menstrual dysfunction results in an R^2 of .176, indicating that approximately 17.6% of the variance in the Menstrual dysfunction is explained by the middle distance runner running performance in the linear regression. The remaining 82.4% variation of menstrual dysfunction explained by excluded variables. Excluded variables were variables which affects

the premenstrual syndrome other than 12 weeks speed endurance training such type of nutrition taken individually, individual difference, experience of training and previous life style of athletes any much more confounding variables.

Table.4. 3 The effect of middle distance runners' performance on PMS symptoms of ATDATC runners

S.n	Model	Unstandardized Coefficients		Standardized Coefficients	LRM	Sig.
		B	Std. Error	Beta		
1.	(Constant)	83.709	61.382		1.364	.222
2.	Performance	-.004	.003	-.420	-1.133	.300
Dependent Variable: Menstrual dysfunction						

The standardized coefficients are shown in the table. The sign of the coefficient indicates whether the predicted response increases or decreases when the predictor increases, all other predictors being constant.

The value of the coefficient reflects the amount of change in the predicted preference ranking. Using standardized coefficients, interpretations are based on the standard deviations of the variables. Each coefficient indicates the number of standard deviations that the predicted response changes for a one standard deviation change in a predictor, all other predictors remaining constant. In this case, since alpha value is greater than the level of significance p = .300. The null hypothesis was accepted that the regression model is insignificant. Since the model is inadequate that the regression model is useless for inferential purpose.

4.5. Comparison of PSM symptom pretest and posttest

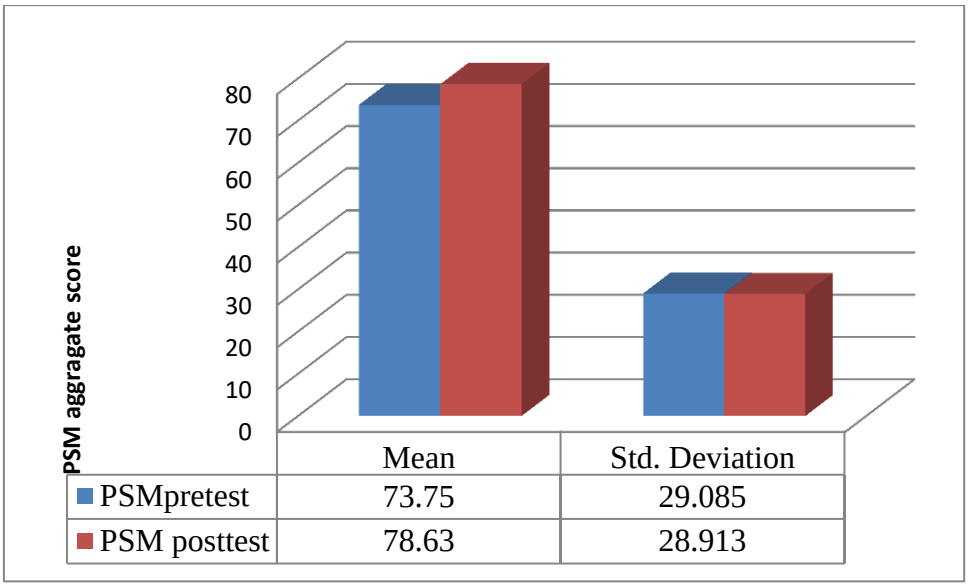

Figure 4.2 Comparison of PSM pretest and posttest

The figure reveals that PSM pretest (73.75 ± 29.085 score) and posttest (78.63 ± 28.913 score) respectively. From this one can understand that there was mean difference between pretest and posttest PSM Experimental group of ATDATC female middle distance runners. One can describe that 12 weeks speed endurance middle distance training was made a difference between PSM pretest and post result ATDATC female middle distance runners.

Table.4. 4 Comparison of PSM symptom pretest and posttest of Experimental group

S.n	Variable	Pretest Median	Posttest Median	Z	Sign.
1.	PSM symptoms	76	81	-2.714	.007

A Wilcoxon Signed Rank test indicated that posttest ranks of PSM symptoms score median were statistically significantly higher than PSM symptoms score median at Z = -2.714, p = 0.05. Since the p-value is less than $p < 0.05$, the null hypothesis was rejected and concluded that there is significant median difference between pretest and posttest PSM symptoms score of ATDATC female middle distance runners. Thus, 12 weeks middle distance training has shown increase of PSM symptom from pretest to posttest. This indicates that 12 weeks middle distance training increase the severity level of PSM symptom from pretest to posttest of experimental group.

4.6. Discussion

The finding of the study shows 12 weeks speed endurance training affects the menstrual dysfunction of middle distance runners. Other similar study suggests that irregular menstruation was common among girls and significant association was found with place of residence. Dysmenorrhea was present in three-fourth of adolescent girls still majority of them have never used analgesics. Daily routine was affected in more than 80% of girls during menstruation (Neha, 2018).

Menstrual cyclist is influenced by prior and concomitant exercise intensity and duration in long-distance runners, gymnasts, ballet dancers, fencers, and rowers. Oligomenorrhea and amenorrhea develop more in athletes than non-athletes but the doctors could not show any reason. These dysfunctions could happen as a result of hormonal and body function changes during high-intensity training (Shangold, 1990; Wierrani, 2000) as sighted on Kishali et al (2006). Excessive loss of body weight and body fat ratio causes the irregular menstrual cycle and amenorrhea. Training and competition stress also cause these dysfunctions. The athletes that participated in the present study said their menstrual cycle was affected a little from high-intensity training. Although 14.5% of the athletes have menstrual disorders in a normal time, this ratio increased to 20.7% during the intensive training. According to the present results it was seen that menstrual disorder increased with high-intensity training.

Delay of menarche and longer frequency of menstrual disorders, found among athletes, turned out to be directly proportional to the amount of time devoted to training and to the kind of performed sports (Trivelli et al., 1995). In one study menstrual function was assessed comparatively in different categories of 155 Nigerian athletes, aged 13–19 years, and 135 non-athletes, aged 12–18 years, who answered questionnaires and were interviewed. Menstruation was more regular and normal in the non-athletes (44%) than the athletes (21%) (Triola, 1988). Kin et al. (2000) assessed menstrual function of 103 athletes and 99 non-athletes aged 12–25 years. 54.37% of athletes and 72.73% of non-athletes have a regular menstrual cycle.

Kishali et al.(2006) found that 17% of athletes have an irregular ¨menstrual cycle. In the present study 51.5% of athletes had a regular menstrual cycle, 14.5% an irregular menstrual cycle, and 34% a sometimes irregular menstrual cycle. In this study ratio of regular menstruation was lower than the Kin et al. (2000) study but the results were almost similar.

Other study suggests that excessive exercise, among others, seen from exercise frequency and duration of exercise leads to dysfunction in the hypothalamus which causes impairment in GnRHpulsatility that may inhibit FSH secretion. Such conditions may lead to delayed menarche, amenorrhea and menstrual cycle disruption (Asmarani, 2010). This is in accordance with the study of Homai et al (2014) which states that the nature and severity of menstrual symptoms depends on several things such as type of exercise, intensity, duration of exercise, and also the rate of development of the coach program

Similar study found that 68.6% athletes did not have a pain, 31.4% of athletes had painful menstruation. Kin and et al. (2000) found 70.87% of the athletes had painful menstruation and 29.3% athletes did not have pain. In the study 36.9% of the athletes had painful menstruation, 17.4% did not have pain and 45.6% of the athletes sometimes had pain. In the present study ratio of the athletes that did not have the pain during menstruation was lower from Kin et al. (2000) study. The source of this difference could be the number of the answer alternatives.

Female athletes reporting poorer performance during menstruation, a large percentage were endurance athletes (e.g., tennis players and rowers). Performances for volleyball and basketball players and swimmers and gymnasts were better than the endurance athletes, but were still below normal. Performances by track-and-field athletes, especially sprinters were not affected nearly so much by menstruation as were the performances by other athletes (Fox et al., 1988).

Athletes in lightweight sports (distance running, gymnastics, lightweight rowing) are at high risk, although the syndrome can arise in relation to any sport. The energy deficit is usually related to eating disorders and is partly influenced by peer pressure. Genetic, neurochemical, and psych-developmental factors may also contribute, along with the physical and psychological effects of training and competition. The long term effects tend to be greatest in young athletes who start intense exercise before menarche. These athletes have an increased chance of delayed menarche, impairment of growth and pubertal progression, subsequent menstrual dysfunction, and suboptimal bone health (Thompson, 2007)

In the present study, the PMS expression rate was higher in non-athlete cohort in comparison to the athlete cohort and it was statistically significant which is consistent with the results obtained by Kroll (2014). PMS was lower in women who had more physical activities (2007) and the relationship is significant. But, the results obtained by the present study are not

consistent with the results obtained in the study conducted by Qanbari et al (2008) which was performed on 210 individuals. As it is seen, the obtained results from various sources and articles in different countries are indicative of distinct discrepancies and part of these discrepancies relate to the cultural differences and having exerted constraints in the women's reaction to menstruation in different communities and societies (2005).

The risk of athletic injury is higher in women with Pre Menstrual Syndrome (PMS). The most important symptoms associated with athletic injuries are irritability, breast swelling and abdominal congestion. Any woman who experiences PMS or dysmenorrheal will likely not perform as well while she is experiencing symptoms. For these women, some degree of control over their menstrual cycle is possible through the use of low dose oral contraceptives (Wilmore and Costill, 1994).

CHAPTER FIVE

5. SUMMARY, CONCLUSION AND RECOMMENDATIONS

5.1. Summary

The purpose of this study was to assess the effect 12 weeks speed endurance training on menstrual dysfunction of Athlete Tirunesh Dibaba Athletics Training Centre Female Middle Distance Runner. From this, the following research questions were emanated to be answered. This includes To what extent menstrual dysfunction level was observed among ATDATC female middle distance runners? What was the current PMS symptoms level of ATDATC female middle distance runners? To what extent speed endurance training affects PMS symptoms of ATDATC female middle distance runners? Was there significant difference between pretest and posttest of PSM symptom Experimental group? Quasi-experimental design was employed and participants (N = 8) were purposively taken from the academy. Descriptive statistics including frequency, percentages, histogram, mean and standard deviation as well as inferential statistics which (Wilcoxon Signed Rank test) was employed as a method of data analysis.

The result of this study shows middle distance runners of ATDATC were shorter, slightly heavier and had normal body appearance. Thus, female middle distance runners had similar demographic variables.

The finding of this study suggests that mass or collective middle distance training without consideration of athletes menstruation period is difficult for both athletes and coaches because ultimately affects athlete's performance and their health of ATDATC female middle distance runners' of experimental group.

The finding of this study reveals that ATDATC female middle distance runners PSM manifestation includes severe depression, get angry for no good reason, poor concentration or memory, general ache & pain, difficulty in sleeping, violent feelings, mood swings, hot flashes/hot sweat, feel bad about yourself, clumsiness and lethargy, spot acne and tired or fatigue. Moreover, runners had shown very severe water retention and backache. Aggregate result suggests that runners shown moderate PSM symptom response during menstruation

time. The finding of this study confirms that 12 weeks middle distance training increase the severity level of PSM symptom from pretest to posttest of experimental group.

5.2. Conclusion

The finding of this study indicates that middle distance runners of Athlete Tirunesh Dibaba Athletics Training Centre were shorter, slightly heavier and had normal BMI. Hence, female middle distance runner's demographic variable permits athletes to be middle distance runners in their future carrier.

The finding of this study confirms 12 weeks speed endurance training affects athletes' menstrual dysfunction; this was resulted with female athletes shown moderate painful menstruation which has to be noticed by athletes and coaches. Large percentages were Tirunesh Dibaba Athletics Training Centre middle distance runners' increases the level of training intensity, diversify type of exercise and increase the time of training then middle distance runners reported poorer performance during menstruation.

Athletes in lightweight sports such as middle distance running are at high risk, although the syndrome can arise in relation to 12 weeks speed endurance middle distance training increase the severity level of PSM symptom manifestation includes severe depression, get angry for no good reason, poor concentration or memory, general ache & pain, difficulty in sleeping, violent feelings, mood swings, hot flashes/hot sweat, feel bad about yourself, clumsiness and lethargy, spot acne and tired or fatigue. Moreover, runners had shown very severe water retention and backache.

5.3. Recommendation

- ✓ The researcher recommends athletes to include the use of nutritional supplements including magnesium, calcium, and vitamin E, combined with aerobic exercise and a complex carbohydrate diet to resolve premenstrual syndrome symptoms, because non-drug therapies and exercise (The American College of Obstetricians and Gynecologists 2003)
- ✓ The researcher recommends athletes and coaches for their menstrual cycle disturbances such as oligomenorrhea or amenorrhoea may recover and return to normal by stopping or reducing exercise intensity and appropriate nutrition during strenuous exercise (Homai et al, 2014).
- ✓ The weakness in this study is that researchers do not have control over psychological and nutritional factors that can affect the menstrual cycle. Detailed experimental design will be necessary.
- ✓ The researcher recommends the athletes experiencing menstrual irregularities and disturbances should seek medical consultation and management before further training and competition.
- ✓ The researcher recommends athletes and coaches for menstrual dysfunction due to high-intensity training recommended that menstrual function returned to normal by decreasing the training intensity or stopping the training for a while (Uysal, 1996) as sighted on Kishali et al (2006).
- ✓ The researcher recommends athletes and coaches that doing regular physical exercises and continuous sport can be effective in preventing PMS (Sadegh et al., 2016).

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APPENDIX-A

MENSTRUAL CYCLE SELF-TRACKING SHEET

Code Number: _____

Directions: Starting with this month, please circle the days that you have your period for the next 3 consecutive months.

February

Mo	Tue	We	Thu	Fri	Sat	Sun
						1
2	3	4	5	6	7	8
9	10	11	12	13	14	15
16	17	18	19	20	21	22
23	24	25	26	27	28	29
30						

March

Mo	Tue	We	Thu	Fri	Sat	sun
	1	2	3	4	5	6
7	8	9	10	11	12	13
14	15	16	17	18	19	20
21	22	23	24	25	26	27
28	29	30				

April

Mo	Tue	We	Thu	Fri	Sat	sun
			1	2	3	4
5	6	7	8	9	10	11
12	13	14	15	16	17	18
19	20	21	22	23	24	25
26	27	28	29	30		

MENSTRUAL CYCLE SELF-TRACKING SHEET (Amharic version)

የግል የወር አበባ ዑደት መቁጠሪያና መከታተያ ቅጽ

የምስጢር ቁጥር _____ ዕድሜ _____

ትዕዛዝ፡- ከዚህ ወር ጀምሮ ለሦስት ተከታታይ ወራት የወር አበባ ያየሽባቸዉን ቀናት ከታች ባለዉ የቀን መቁጠሪያ ላይ በትክክል አክብቢ። ቀናቱና ወራቱ እንደ ኢትዮጵያ ዘመን አቆጣጠር የ2012 ዓ.ም ነዉ።

የካቲት

ሰኞ	ማክሰኞ	ረቡዕ	ሀሙስ	አርብ	ቅዳሜ	ዕሁድ
						1
2	3	4	5	6	7	8
9	10	11	12	13	14	15
16	17	18	19	20	21	22
23	24	25	26	27	28	29
30						

መጋቢት

ሰኞ	ማክሰኞ	ረቡዕ	ሀሙስ	አርብ	ቅዳሜ	ዕሁድ
	1	2	3	4	5	6
7	8	9	10	11	12	13
14	15	16	17	18	19	20
21	22	23	24	25	26	27
28	29	30				

ሚያዝያ

ሰኞ	ማክሰኞ	ረቡዕ	ሀሙስ	አርብ	ቅዳሜ	ዕሁድ
			1	2	3	4
5	6	7	8	9	10	11
12	13	14	15	16	17	18
19	20	21	22	23	24	25
26	27	28	29	30		

APPENDIX-B

Menstrual Cycle History

Code_____ Date and month _____

Instruction: Please write /underline your response.

1. Age you started your period: **_____**

2. Date of most recent menstrual period: _____

3. Your menstrual cycle is:

A. Regular (comes consistently every month) B. Irregular

4. Frequency of Menstrual Cycle:

A. <21 days B. 21-28 days C. 28-35 days D. >35 days

5. Your menstrual bleeding lasts for how many days

A. 1-2 B. 3-5 C. 6-7 D. >7

6. Intensity of pain during menstrual flow (on average):

A. Very light B. LightMedium C. Heavy D. Very Heavy

7. Are you on birth control or any other medication that would affect your menstrual cycle?

A. YES B. NO

Menstrual Cycle History (Amharic version)

የወር አበባ ዑደት ታሪክ

የምስጢር ቁጥር _____ዕድሜ _____

መመሪያ፡እባክሽን የራስሽ የሆነዉን መልስ ብቻ ጻፈ/ ከስሩ አስምሪ።

1. መጀመሪያ የወር አበባ ያየሽዉ በ ----------አመትሽ/ዕድሜሽ ነዉ?

2. ይህን መጠይቅ ከመሙላትሽ በፊት የነበረሽ የቅርብ ጊዜ የወር አበባ የመጣበት ቀንና ወር ----------/-------- 2012ዓ.ምነዉ።
3. የወር አበባሽ በየወሩ ሲመጣ
   ሀ/ መደበኛ ነዉ/ ወሩን ጠብቆ ይመጣል ለ/ መደበኛ አይደለም/ ይዛባል
4. የወር አበባሽ የሚመጣበት ጊዜ
   ሀ/ ከ21 ቀናት ባነሰ ለ/ ከ21-28 ቀናት
   ሐ/ ከ28-35 ቀናት መ/ ከ35 ቀናት በላይ
5. የወር አበባሽ ሲፈስ ለምን ያህል ቀናት ይቆያል?
   ሀ/ 1-2 ለ/ 3-5 ሐ/ 6-7 መ/ ከ7 ቀናት በላይ
6. የወር አበባሽ ሲፈስ ያለዉ ህመም
   ሀ/ የለም ለ/ ቀላል ሐ/ መካከለኛ መ/ ከባድ ሠ/ በጣምከባድ
7. ባለፈዉ ወር የእርግዝና መከላከያ መድሐኒት ወይም የወር አበባሽን ጊዜ ሊለዉጥ የሚችል መድሐኒት ተጠቅመሻል?
   ሀ/ አዎ! /ተጠቅሚያለሁ ለ/ አይ! /አልተጠቀምኩም

APPENDIX-C

The Menstrual Health Questionnaire

Code _____

Date_____

The following is a list of symptoms which women sometimes experience. For each symptom choose the descriptive category listed below which best describes your experience of that symptom during the week before period. Circle the number of the category which you choose. Even if none of the categories is exactly correct, choose the one that best describes your experience. Please be sure to circle one number for each symptom. Please also remember to put your name and the date in the blank spaces at the top of this page.

Descriptive Categories:

Degree of symptoms	0	1	2	3	4
Description	No symptom	Mild (hardly noticeable)	Moderate (noticeable but not restricting)	Sever (so noticeable as restricting daily activities)	Very sever (unable to carry out day today activities)

No	Symptoms	No symptom(0)	Mild (1)	Moderate (2)	Sever (3)	Very sever (4)
1	Headaches					
2	Feel bloated in abdomen					
3	Change in bowel habit					
4	Feel depressed					
5	Get angry for no good reason					
6	Periodic type of pain					
7	Easily upset					
8	Cravings for sweet foods and change in appetite					
9	Poor concentration or memory					
10	Irritability					
11	Tender breasts					
12	General ache & pain					
13	Feeling tense					
14	Nausea/sickness					
15	Difficulty in sleeping					
16	Violent feelings					
17	Water retention					
18	Mood swings					
19	Hot flashes/hot sweat					
20	Feel bad about your self					
21	Clumsiness/lethargy					
22	Bach ache					
23	Spot eg.ache					
24	Tired/fatigue					
Total score						

APPENDIX-D

The Menstrual Health Questionnaire (Amharic version)

የወር አበባ ጤንነት መጠይቅ

የምስጢር ቁጥር _____ ዕድሜ _____ ቀን_____

ከዚህ በታች የተዘረዘሩት ምልክቶች፣ሕመሞችና ስሜቶች አንዳንድ ጊዜ ሴቶች የወር አበባ ሊመጣ ሲል ከሚያጋጥሟቸዉ ዋና ዋናዎቹ ናቸዉ፡፡ የወር አበባ ከሚፈስበት የመጀመሪያ ቀን በፊት ባሉት ሰባት ቀናት ዉስጥ የሚታዩሽን ምልክቶች፣ሕመሞችና ስሜቶች ቀጥሎ በተሰጠዉ የክብደት ደረጃ ምድብ መሠረት ትይዩ√ ምልክት አድርጊ፡፡

ከአራቱ ምድቦች ውስጥ የሚሰማሽን/የሚታይብሽን ምልክት፣ሕመምና ስሜት ክብደቱን በትክክል ባይገልጽልሽም እንኳን ከሌሎቹ በተሻለ መልኩ ይገልጽልኛል የምትይዉን ምረጭና √ ምልክትአድርጊ፡፡

እባክሽን ለእያንዳንዱ ጥያቄ ከአራቱ አንዱን ቁጥር ማለትም ለምልክቱ የሰጠሽዉን ክብደት ምረጭና √ ምልክት ማድረግሽን፤የምስጢር ቁጥር፣ዕድሜ እና መጠይቁን የሞላሽበትን ቀን መጻፍ አትርሺ፡፡

የክብደቱደረጃ	0	1	2	3	4
የመለኪያው ማብራሪያ	የህመሙ ስሜት /መጠን	መጠነኛ ሆኖ ምልክቱን ህመም/ ወይም ስሜቱን በቀላሉ መለየት የሚከብድ	መካከለኛ ሆኖ ግን የእለት እንቅስቃሴን የማያስተጓጉል	ከባድ ሆኖ የእለት እንቅስቃሴን የሚያስተጓጉል	በጣም ከባድ ሆኖ ሙሉ ለሙሉ የእለት እንቅስቃሴን የሚያስተጓጉል

ተ.ቁ	ምልክቱ፣ህመሙ	የለም/0	መጠነኛ/1	መካከለኛ 2	ከባድ 3	በጣምከባድ 4
1	የራስምታት					
2	የሆድመነፋትና የቁርጠት ስሜት					
3	መጨነቅ					
4	የሆድመላወስ/መረበሽ					
5	ያለአንዳች ምክንያት መናደድ					
6	በሰአታት/ጊዜያትልዩነትየሚከሰትህመም					
7	በቀላሉመናደድ/ማልቀስ					
8	ለጣፋጭምግቦችመጓጓት					
9	ትኩረት ማጣትና አለማስታወስ					
10	የተቆጣ/ያበጠጡትወይምየጡትህመም					
11	ትዕግስት ማጣትና የመቁነጥነጥ ስሜት					
12	ሙሉየሰዉነትህመም					
13	ዉጥረት(የአዕምሮ፣የሰዉነትወይምየስሜት)					
14	እንቅልፍ ለማንቀላፋት መቸገር					
15	ማቅለሽለሽ ወይም ማስታወክ					
16	ቁጡናየሀይለኛነትስሜት					
17	ሰዉነት ብዙ ዉሃ በመያዝ ያበጠ መምሰል					
18	ተለዋዋጭስሜት					
19	ቅጽበታዊ ሙቀት ወይም ወበቅ					
20	ስለራስሽ መጥፎ ስሜት መሰማት					
21	ቀርፋፋናዘገምተኛመሆን					
22	የጀርባ ህመም/ቁርማት					
23	ምልክት መዉጣት ለምሳሌ ቡጉር					
24	ድካም/የሰዉነትመዛል					
	አጠቃላይድምር					

ምሳሌ:- የምስጢርቁጥሯምሳሌ፡- **code-105** የሆነች ወጣት መካከለኛ የሆነ የራስ ምታት የሚሰማት ቢሆን ከታች እንደምትመለከተዉ የራስ ምታት በሚለዉ ትይዩ መካከለኛ ከሚለዉ ስር √ ምልክት ታደርጋለች፡፡

APPENDIX-E

Middle distance runners' performance

S.n	Codes	Best time
1	Code-105	04:32:62
2	Code-205	04:36: 57
3	Code-305	04:45:05
4	Code-405	04:43:48
5	Code-505	05:01:29
6	Code-605	04:51:13
7	Code-705	05:14:23
8	Code-805	05:19:17