Nutritional Status, Dietary Habits, Practises and Knowledge and Their Relationship with Performance Among Young Athletes in The United Arab Emirates

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NUTRITIONAL STATUS, DIETARY HABITS, PRACTISES AND KNOWLEDGE AND THEIR RELATIONSHIP WITH PERFORMANCE AMONG YOUNG ATHLETES IN THE UNITED ARAB EMIRATES

BY
Seham Mohammed Al Reesh
A thesis
Submitted to
United Arab Emirates University
In partial fulfillment of the requirements
For the Degree of M.Sc. in Environmental Sciences

May 2014
United Arab Emirates University
College of Science
M.Sc. Program in Environmental Science

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Supervisor

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May 2014
Declar ation of Original Work

I, <Seham Mohammad Sulamin Al Reesh>, the undersigned, a graduate student at the United Arab Emirates University (UAEU) and the author of the thesis titled “Nutritional status, dietary habits, practices and knowledge and their relationship with performance among young Athletes in the United Arab Emirates”, hereby solemnly declare that this thesis is an original work done and prepared by me under the guidance of Dr. Platat Carine in the College of Science at UAEU. This work has not been previously formed as the basis for the award of any degree, diploma or similar title at this or any other university. The materials borrowed from other sources and included in my thesis have been properly acknowledged.

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ABSTRACT

Objectives: The goals of this project are 1) To assess the nutritional status, 2) To describe the nutritional knowledge, 3) To describe Nutritional Practices, Dietary Habits for Athletic individual in the United Arab Emirates, Then to investigate the relations of both Nutritional status and Knowledge with Performance.

Methodology: A cross-sectional study was done to conducted in a sample of 59 Athletes recruited from Al Jazeera Academic sports clubs in the UAE in which, Nutrition Knowledge, Practices and Habits was evaluated by questionnaire, different components of the nutritional status (Weight, Body Composition, Skin Fold Thickness, Biochemical Parameters) and the Physical Performance was assessed. SPSS software v.20 was used to perform statistical analyses.

Results: Food frequency consumption separated the frequency of consumption of different food per week. Food were separated into the six main food groups: 1) Cereals, legumes, nuts and grains(14.11±4.56), 2) Milk, dairy products(10.00±3.32), 3) Meat, Fish(5.93±2.28), 4) Fruits and Vegetables,(11.11±4.55), 5) Snack food (7.91±3.23) Beverages(8.25±2.55) by the athletes. The significant relationship was found between Mothers education level and Milk Group (P-value<0.01). The significant relationship was found between Snack group and Weight(kg) (P-value<0.03), there was found significant relationship for athletes consumed Snack group and Skin Fold Sub-scapular (P-value=0.04) and for the rest of athletes there was relationship between Milk Group and Bone Mineral Content (g) (P-value=0.04). There were significant relation between Cereal Group and Hemoglobin (mg/dl) (P-
value=0.01), the significant relationship was found between Snack group and Mean Platelet volume (Hectoliters) (P-value=0.02). Knowledge score was (80.73±8.81), score for Self Efficiency (18.88±3.66) and Attitude (21.30±1.88). Knowledge score was (80.73±8.81), score for Self Efficiency (18.88±3.66) and Attitude (21.30±1.88).

Conclusions: The majority of the adolescent Soccer players considered in this study fell into the normal Weight category and all are of a normal Height according to the Anthropometric data. The implication of this finding is that the athletes are considered to have an excess of body fat stores, Anemia, low blood results and less Skin Fold then it is desirable, which is not desirable for Soccer players. A quite good Dietary Knowledge but limited healthy Dietary Practices and limited ability to change were observed, with a significant influence of the family environment. A high prevalence of anemia and a low cardio respiratory fitness were also demonstrated.
Acknowledgement

This dissertation and thesis is dedicated to my family and my best friend. Next I would like to thank Mr. Jarrar Amjad, who helped me collect data along and the management of Al Jazeera Football Academy who allowed me to gather information which was critical for my report on their academic premise.
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List of Abbreviations

%FM : Percentage of fat mass
%BF : Percentage body fat
BMD : Bone Mineral Density
BMI : Body mass index
BMI-for-age : Body mass index-for-age
CBC : Complete Blood Count
CHO : Carbohydrates
DEXA : Dual Energy X-Ray Absorptiometry
FM : Fat mass
Hb or Hgb : Hemoglobin (Hb or Hgb) is a protein that carries oxygen in the blood
Hematocrit : Hct is the amount of space in the blood
HRCE : Health Research Ethics Committee
MCH : Mean corpuscle hemoglobin which is the average amount of Hb in each RBC.
MCHC : Mean corpuscle hemoglobin concentration which is the average amount of Hb in the RBCs compared to the average size of the RBCs
MCV : The mean corpuscle volume which is the average size of the RBCs
MPV : Mean platelet volume which is the average size of the platelets
NCHS : National Center for Health Statistic
PAL : Physical activity level
Platelet : Platelet count (Plt) Platelets is sticky cells that help to form blood clots
RBC Count : Red blood cells its aim to help of hemoglobin for working as carry oxygen
RDA : Recommended dietary intake
RDW : Red cell which is the distribution width amount of variation in size
SA : South Africa
SD : Stander deviation
UAE : United Arab Emirates
WBC Count: mean white blood cells
WHO: World Health Organization
YRBS: Youth risk behavior survey
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CHAPTER 1: LITERATURE REVIEW AND STATEMENT OF THE RESEARCH QUESTION

1.1 Introduction

The study of nutrition dates back to over 200 years. Nutrition can be defined as food or nourishment needed to keep an organism growing, healthy and viable. It is also referred to the process of providing or receiving food or other life-supporting substances. Hence, the study of nutrition covers the types of food needed to keep an organism thriving and the means by which the organism derives nourishment by the digestive process. Every living thing needs proper nutrition to survive. Nutrition has obviously a critical role in health and well being at every stage of life.

Food provides energy, nutrients and other substances needed for health. The adequate between the quality and the quantity of the food consumed and the body needs determine the nutritional status of an individual. Indeed, an optimal nutritional status is needed to maintain bodily functions, to reduce stress and enhance immune system. By contrast, a poor nutrition can lead to the development of many chronic diseases such as diabetes, obesity, cancer or cardiovascular diseases and thus to an unfavourable nutritional status. More commonly nutrition is associated with the consumption of food from which the body will take the needed components, named nutrients and including carbohydrates, protein, fat, vitamin, mineral and water, to stay healthy. Hence, appropriate food choices are an important aspect of nutrition and can influence the nutritional status.
1.2 The Nutritional Demands Of Adolescent Athletes

Like any other individual, athletes have to cover their needs by consuming adequate food. Nonetheless, athletic individuals represent a particular population because they are characterized by a regular practice of intense physical activity, the participation in competitions, and most often a high level of stress to reach the highest level of performance. Their body has to find in food the necessary nutrients to cover not only the basic functions of the body but also the needs related to the practice of physical activity. By consequence, in athletes, appropriate food consumption is a key for health, performance making of nutrition an essential component of optimum bodily functions and increasing the chance of performance. Nutrition can thus be considered as a very good tool to maximize all bodily functions, contributing to obtain adequate nutrition to optimize health fitness and to increase sports performance (Berning, 2000; Jonnalagadda et al., 2001).

Over the past 20 years, researchers have documented the benefits of nutrition related to exercise performance. In a joint position statement, the American College of Sports Medicine, American Dietetic Association, and Dietitians of Canada reported that “physical activity, athletic performance, and recovery from exercise are enhanced by optimal nutrition.” Following these guidelines might improve an athlete's training, recovery, and performance. Optimal nutrition can reduce fatigue, allowing an athlete to train and compete longer or recover faster between training sessions (Ruud, 1996). It is well-established that regardless of the level at which athletes compete at, good
nutrition is critical for them to perform at their optimum while trainings and competition (Paugh, 2005; Beals & Manore, 1998).

### 1.3 The Nutritional Habits of Adolescents Athletes

Nutrition in athletes, or sports nutrition, is relatively a new discipline where various nutritional principles are applied to enhance the performance of athletes (Clark, 2008). Besides, nutrition in athletes' population is most often not very well used, inappropriate and sometimes even risky dietary practices being frequent. In addition, institutional athletes might encounter numerous barriers that hinder healthy eating, including lack nutrition knowledge, vegetarian or restricted dietary intake, or participation in excessive exercise (Cotugna et al., 2005).

There are many reasons why nutritional advice is not followed. It may be due to the lack of knowledge or information, and interest of making a change in one's diet, or certain perceived or encountered barriers that may prevent people from eating healthier diets such as the lack of money (cost), lack of time (too busy with work) or taste (Kearney & McElhone, 1999). Athletes may often rely on coaches for nutrition guidance in certain sports. Therefore, when coaches are misinformed about nutrition, this becomes a potential problem for athletes also (Cotugna et al., 2005). Nutrition training can be conveyed to the individuals through regular and wide educational programs as well as the individual training himself on his own settings. Various studies focused on the necessity of nutrition training (Rosenbloom et al., 2002; Zawila et al., 2003; Rastmanesh et al., 2007).
Besides, competing at top levels causes athletes to risk their health by pushing their physical and mental limits, both in training and competition. Difficulties may arise in managing potential health risks such as overtraining, malnutrition, drug abuse and playing hurt. In competitive sports, good health is the necessary foundation for developing peak athletic performance. This phenomenon of protecting and risking the athletes' health challenges the development of health promotion and protection strategies, especially for young athletes (Mountjoy et al., 2008; Thiel et al., 2010).

Since young athletes are in period of growth, nutrition should ensure not only health but also body building and contribute to performance. During these years, the nutrition choices people make will affect not only their current health, but their future health as well (Stang et al., 1995) The physical changes of adolescence have a direct influence on a person's nutritional needs, especially in case of adolescents who need additional calories, protein, calcium, and iron. Poor or inadequate nutrition can put adolescents at a higher risk of suffering from obesity, obesity-related diseases, and other eating disorders.

Because adolescent athletes have the pressure to perform at a certain level, some of them may be tempted to adopt unhealthy behaviours such as crash dieting, taking supplements, or eating unhealthy foods to fulfil their vigorous appetites. A balanced nutritional outlook is important for good health and athletic performance (Kulesza et al., 2009)

The American Dietetic Association and the American College of Sports Medicine suggested a simple breakdown equation of balanced nutrition as anything that
contains 40% carbohydrates, 30% fat and 30% proteins which are consumed over an entire day's meal. But, eating habits of athletes most of the time do not match these recommendations. Hinton et al. (2004) found in his study that generally, athletes' diet contains lower proteins and carbohydrate and higher fat compared to what is recommended for them.

1.4 Dietary Supplement Intake in Adolescent Athletes

It was widely s

consumption varying between 59% and 88% (Heikkinen et al., 2011). There are various reasons which can be attributed to the popularity of dietary supplements among athletes. One major reason is the intensity of effort required to conduct a sport activity. Reports indicate that adults who engage in physical or athletic activities consume supplements in increasing amount, instead of food, and this consumption varies depending on factors like type of sports, age, gender and culture (Alves & Lima, 2009; Heikkinen et al., 2011) An estimated $46 billion had been invested by the dietary supplement industry in 2001 for developing and broadcasting advertisements worldwide in an attempt to convince potential consumer for buying their products (Alves & Lima, 2009).

But, so far, there is no scientific evidence of the beneficial effect of the use of dietary supplements by athletes. Even, some negative health effects have been reported (Christine et al., 2000)

For example, dietary supplements that contain ephedra alkaloids (also known as ma huang) and guarana-derived caffeine are widely consumed for purposes of weight
reduction and energy enhancement. A number of reports of different reactions to dietary supplements that contain ephedra alkaloids, some of which resulted in permanent injury or death, have appeared in the medical literature. (Christine et al., 2000)

1.5 The Influence of Nutrition on Athletes Performance of Health

This frequent inappropriate nutrition in young athletes can be attributed to the specificities of this period of adolescence, misinformation, and lack of knowledge. Indeed, adolescence is a time of growing up physically but also socially. Adolescents are usually hardly concerned with their health but at the same time they have to cope with substantial physical, psychological and social developments. Adolescence represents a very sensitive phase of development during which adolescents can be more easily influenced. They are exposed to wide nutritional information through social networks, media, internet, magazines. (Tian et al., 2009). But despite the fact that nutritional information is increasingly available now, it is often not reliable. In addition, basically, young athletes do not understand the relationship and role of nutrition and athletic performance, athletes being generally not aware of their nutritional needs, importance of meeting them and how they can fulfill them. (Paugh, 2005; Morse & Driskell, 2009). It has been found that trainers had more influence on the attitude, behaviors and intention of adolescent athletes regarding supplement use compared to their parents and that media has a major role by publicizing ideal body myths and successfully manipulating the minds of adolescent people which would do anything to meet their goals. Unfortunately, most athletic trainers, strength staff, coaches have a weak nutritional knowledge and offer limited sports nutrition
information (Grete et al., 2011) leading to uninformed or misinformed athletes regarding nutritional practices. (Morse & Driskell, 2009)

So far, few have been done to overcome these barriers. Some studies indicated that a short-term nutritional education program can significantly improve supplementations knowledge (Jazayeri & Amani, 2004). Many authors suggested that implementing a systematic nutritional awareness and education program can modify an athlete's nutritional and dietary awareness. However, (Wallinga, 2012), most of the studies showed that even when nutritional knowledge and education were acceptable, inappropriate eating habits were observed among athletes. (Barker et al., 2007). Too often, athletes don't have enough time to meet their nutritional needs: they just take the easiest on the go food. (Paugh, 2005). Nutrient intake was found to be possibly influenced by lack of time, hectic training and the increased emphasis on physical leanness and body image as mentioned in a study by (Ziegler, 2002). This emphasizes the fact that the challenge for athletes is double. Athletes, especially male athletes, need to be not only educated regarding nutrition, the relationship between nutrition, health and performance but also to be taught on how to use this knowledge to develop and adopt healthy and optimum eating habits.

Most studies concerning the young athletes' health conducted previously deal with sports specific injuries and illnesses (Cassas & Wayhs, 2006) (Adirim & Cheng, 2003) and health-related behaviors such as eating disorders (Pernick et al., 2006), (recreational) drug use (Laure et al., 2004) and dietary supplement use (Braun et al., 2009; Petróczi et al., 2008). Additionally some of these studies examine the athletes' attitudes towards specific behaviors like doping and drug abuse (Gabriel et al., 2007).
However, the nutritional habits of young athletes, their nutritional awareness and the impact of their knowledge on performance have not been studied in a one single study yet. There are a lot of representative studies dealing with the state of health and risky health behavior in adolescents (Hölling et al., 2008) (Wille et al., 2008) but a comparison between values of young athletes has not possible.

A recent research for measuring physical fitness in children who are 5 to 12 years old has been made. The overall results of the test battery consist of a compound motor activity that recruits various combinations of endurance, strength (force – generating capacity, agility, balance and motor co – ordination. Standing broad jump, jumping a distance of 7m on 2 feet, jumping a distance of 7m on one foot, throwing a tennis ball with one hand, pushing a medicine ball with 2 hands, climbing wall bars, performing a 10X5 m shuttle run, running 20 m as far as possible and performing a reduced cooper test (6 minutes). The test battery was administrated to 193 children (aged 5 – 12) years from 4 schools and kindergartens in Norway (Fjortoft et al., 2011).

The result was that the children in each group were able to perform all of the test items, establishing the suitability of the test battery for children as young as 5 years of age, total scores improved linearly confirming that that it’s easy to measure physical fitness in children (Fjortoft et al., 2011).

This gap in terms of data related to dietary knowledge and practices in young athletes and the potential repercussions on health and performance has to be filled urgently since inaccurate perception of nutritional awareness and poor nutrition can disrupt an
athlete's physical development and also reduce an athlete's ability to perform well
during training and competition.

In the Middle East, data are very sparse but confirmed the frequent practice of
inappropriate nutrition. In 1994, in a study conducted in Bahrain, it has been shown
that 28% of the athletes skipped breakfast, and that the food they consumed prior to
any competition was almost similar to the one consumed by the rest of their family
members. This highlighted the fact that they had no specific diet plan, adapted to their
athletes' status. The study also showed that half of the athletes only drank water in
breaks or halftime of the match. The study also indicated that the athletes received
more than 50% of their nutrition knowledge from Mass Media and another 20% from
their coaches. (Musaiger & Ragheb, 1994)

1.6 Research Done to Athletes in UAE

In the United Arab Emirates (UAE), even less data are available regarding
nutritional knowledge, practices of athletes and the relationships and potential impact
of these eating habits on health and performance are missing. But a similar situation
than this one described in the neighbor country, Bahrain, can be expected. The few
studies available reported inappropriate nutritional knowledge and practices even
though many efforts are done to increase nutrition awareness among athletes. Such as
the study conducted in Al Ain city, UAE, to determine how gym user's relation to
Anabolic Steroids, which showed that more than half of the sample study knew little
of the effects that Anabolic Steroids has (Al-Falasi et al., 2008). Athletes need to
ensure they get the proper balance of nutrients, especially they ensure proper
hydration due to the climate in the country.
The holy month of Ramadan is of great importance to Muslims all around the world and hence in the UAE. During this time, there is a trend for the majority of Muslims to eat foods that are specific to Ramadan. These foods tend to be higher in fats, animal protein, and sugars than the typical diet outside of Ramadan (Chaouachi et al., 2009).

Since the crucial role of nutrition for young athletes' health, growth and performance, are lack of available data and the frequently reported inappropriate and risky dietary practices, it is urgent to better understand the nutrition in young athletes, in the UAE, to be able to influence their practices by offering adapted actions and interact with the social environment of the players.

1.7 Statement of the Research Question

With the ever-increasing professionalism of football, the pressure placed on aspiring young athletes to perform has never been greater. However, many of the players in the UAE setting (and other developing countries) come from communities where there a high incidence of childhood and adolescent malnutrition (Reddy et al., 2010; Reddy et al., 2003; Department of Health, Medical Research Council, Orc Macro. 2007).

Those adolescents should be educated about nutrition at an early age with the goal of improving their nutritional intake and thus their nutritional status as they get older (Roshnbaum CA et al., 2006). Thus , adopting this approach would address both issues of nutrition knowledge and performance.
Limited data currently exist on nutritional intake and status of youth athletes, and youth soccer players in particular. Information regarding nutritional status as well as training and competition nutrition practices will assist clinicians and dietitians in implementing intervention strategies aimed at optimizing nutritional status of these athletes. This will ultimately support them in realizing their athletic potential as well as ensuring optimal development during this critical growth phase, which already has increased nutritional demands. It is important to understand the nutritional needs of these athletes to enable the development of effective programs that will improve the athlete’s dietary intakes and thus improve their performance.
CHAPTER 2: METHODOLOGY

2.1 Aim

The aim of this study was to assess the level of nutritional knowledge among adolescent athletes and to assess the impact of this knowledge on their sports performance.

2.2 Objectives

1) To assess the nutritional status
2) To describe the nutritional knowledge
3) To describe dietary habits in athletic individual in the United Arab Emirates, then to investigate the relations of both nutritional status and knowledge with performance.

2.3 Study Design

The study design was a descriptive, observational study an analytical component cross-sectional study by using SPSS V.20 for Anora. (Fig. 1)
2.4 Study Population

Participants were recruited in the Football Academy of the Al Jazeera Sports Club, in Abu Dhabi, UAE. Participation to this study was open to the one hundred 13-18 years old athletes registered in this Academy.

2.5 Inclusion Criteria

Any athlete, registered in the Academy involved in serious training for not less than a year and who were regular at the Al Jazeera training club was included (Appendix I).

2.6 Exclusion Criteria

Any athlete with eating disorders, endocrinal disorders (Thyroid disorders etc.), or consuming cortisone containing drugs was excluded from the sample population.
According to the screening test (Appendix 1), and by using the medical data available in the medical file of each athlete at the Academy, fifty nine participants were finally included in the study.

2.7 Data Collection

Ethical approval was obtained prior to conducting any assessment from the Al Ain Medical District Ethical Committee, protocol number 12/83, on November the 28th 2012. Each participant which was included in the research study was given complete information about the research study before their inclusion as part of the research sample. They were open to ask research assistants any question or information regarding the study for them to be comfortable being part of this research. The participants and their respective legal tutors were asked to sign an informed consent forum (Appendix 2) where they acknowledged that they had received complete information to their satisfaction about the research study.

An identification number was randomly assigned to each athlete. This number was used on the record file of the athlete and on any result sheet added to his record file for the project. All results, sheets or electronic files related to this project and to the participant were kept and stored anonymously in a locked cupboard, in a locked room at the Human Nutrition laboratory.

The assessments, including both Arabic (Appendix 3) and English (Appendix 4) questionnaire administration for dietary habits, knowledge evaluation, and sociodemographic data (Appendix 5), anthropometry (Appendix 6) and bone mineral density measurement were conducted in the Laboratory of Human
Nutrition of the Department of Nutrition and Health, College of Food and Agriculture, UAE University, in December 2012.

Assessment was performed by a group of 5 trained students under the supervision of the Principal Investigator of the research project and a trained instructor from the Department of Nutrition and Health, College of Food and Agriculture, UAE University.

Data collection was organized in four different sessions in the Laboratory of Human Nutrition as mentioned above. During each session, data were collected in a group of 20-30 athletes.

At their arrival to the laboratory, athletes were split into smaller groups for better handling. Each group was following the same assessment plan: questionnaire administration or anthropometric assessment, finally bone mineral density assessment.

Cardio respiratory fitness or ability was measured by conducting a shuttle run test at the Academy (Appendix 7).

Biochemical data were obtained from the medical file of each participant at the Academy, as part of the regular medical follow-up of the athlete, which is usually performed in the medical center chosen by the athlete’s family.
2.7.1 Demographic and Socio economic, Dietary habits, Knowledge and Attitude

All included athletes were asked to fill out a questionnaire in order to assess their dietary habits, knowledge. The questionnaire was constructed based on available validated questionnaires found in the literature (Sakamaki et al., 2005; Paugh, 2005; Barker et al., 2007) and used in a similar population in previous research projects.

The questionnaire was developed in both Arabic and English versions for catering to convenience of all participants. The questionnaire was administered by trained students in small groups.

The questionnaire was divided into different parts covering demographic and socio economic data, dietary habits, nutritional knowledge, attitude and self-efficacy. The parts related to dietary habits are in Food Frequency Questionnaire.

The whole questionnaire is provided in Appendix in thirteen pages which include many questions such as open/close of questions, tables, choosing and yes or no questions in total of 36 various questions.

Demographic and socio economic data such as gender, age, father’s and mother’s education level, athlete’s grade at school and both parents’ Occupation was assessed.

Dietary habits were assessed by using a food frequency questionnaire according to the dietary habits on a regular week spent at the Academy. Food were separated into the six main food groups: 1) Cereals, legumes, nuts and grains, 2) Milk, dairy
products. 3) Meat, Fish, 4) Fruits and vegetables, 5) Snack food and 6) Beverages. A list of items culturally adapted was prepared for each of these food groups.

Different options were proposed for the answers: Never, 1-2 times per week, 3-4 times per week, 5-6 times per week and daily, and every answer have specific score that end up with total average for each part of the questionnaire and then converted to mean ± standard deviation.

Some dietary habits and practices were also assessed, including the frequency and place of meals taken outside home, frequency and type of snack consumed, consumption of dietary supplements, types and times of meals taken before and after training and competition.

2.7.2 Anthropometric Measurements

Since nutrition is a major factor of health, it generally requires collection of survey data in order to study the relationship between diet, health and nutritional status. Anthropometry is the study of the human body dimensions which measures simple physical aspects of the body like height, weight, waist, skin fold thickness, fat mass, Body Mass Index (BMI), bone density, muscle mass.
The Measurements Were Done As The Following:

1. Height
   It was measured by using a stadiometer at the 0.1 nearest cm, and then comparing to the age according to the WHO guidelines (Appendix 8).

2. Weight
   It was measured using a TANITA scale based on impedance. All athletes were asked to take their shoes off and wear the light clothes to get the most accurate reading. Total weight was obtained at the 0.1 nearest kg and then comparing to the age according to the WHO guidelines. Percentage of fat was also provided by the machine.
   BMI (kg/m²) was calculated by using the formula: \( \text{Weight (kg)/Height (m)}^2 \) (Lee, et al. 1996) and then comparing to the age according to the WHO guidelines (Appendix 9).

3. Waist and hip circumferences
   They were measured by using a simple measurement tape at the 0.2 nearest cm, in the standing position, according to the WHO guidelines.

4. Subcutaneous fat measurements were taken with SKYNDEX skin fold caliper at the 0.1 nearest mm. Biceps, triceps, sub-scapular and supra-iliac skin folds were measured according to the WHO guidelines (Appendix 10& Appendix 11).
The skin folds thickness at the triceps and sub scapular skin fold site was measured as it is the most common approach used to assess body composition for young people (Lohman, 1989). These specific sites are advantageous because it is highly comparable to other measures assessing body fatness, measurements taken are more reliable and objective than other sites and there are international norms to interpret the measurements (Lohman, 1989).

Assumptions made when using skin fold thickness include the fact that skin folds predict non-subcutaneous fat and more than 50% of the body's fat is subcutaneous, the thickness of skin is considered negligible, the compressibility of fat between subjects is similar and the selected sites represent the average thickness of all subcutaneous fat (Lee, 2010).

2.7.3 Bone Mineral Density

Bone mineral density was done for each participant using the Dual Energy X-Ray Absorptiometry (or DEXA) machine. Bone mass is the actual weight of the skeleton while bone density is the ratio of weight to the area or volume of the bones. As a thumb rule, the heavier the bones, the stronger they are. In order to measure and understand Mineral Density (BMD) factor like age, height and degree of physical maturity play an important role in determining the bone health of a person.

The most commonly used method for measuring bone mass is the Dual Energy X-Ray Absorptiometry (or DEXA). The DEXA instrument requires the person being observed to hold still for approximately 60 seconds. For measuring the bone mass
with a DEXA machine, the person has to lie down on a flat padded table and remain still while the "arm" of the DEXA machine passes over the entire body or the selected areas being measured. A beam of low-dose x-rays from below the table passes through the area of the body which needs to be measured. These x-rays are detected by a device in the instrument's arm and the machine converts the information received by the detector into an image of the skeleton and analyzes the quantity of bone in the skeleton. The results are presented as bone mineral density (BMD) which is the amount of bone per unit of skeletal area. The time required to perform each measurement is less than a minute.

2.7.4 Biochemical Parameters

The biochemical test was taken from the Aljazeera sport academic club for all athletes by asking them to bring the blood test for the athletes and they ask the athletes family to do it but they do it in various laboratories clinic that is needed for the research to show the relation between many indicators such, the biochemical parameters used for this study.

This laboratory test are useful for the project as its show two main health problems related to our research which is anemia and dehydration. Also, this test are important because from the complete blood count we can detect many health problems that related to long term training or playing such as A high RBC or Hematocrit that due to dehydration. also there are some disease can affect the soccer performance such as A low Red Blood Cells or Hematocrit is a sign of anemia, and from this point also we can detect if the athletes consume good diet or no this can be shown also if individual have low hemoglobin values this may
be due to on the other hand the test show a platelet count which is a test to measure how many platelets in blood. Platelets help the blood clot. Any abnormal result in this test could be referring for Vitamin K deficiency and anemia.

A complete blood count (CBC) is used in this experiment for all athletes to detect many different health conditions such as:

1. Diagnose allergies to any kind of medicine or food and to know if they have any kind of infections
2. Investigate if there is any blood clotting problems or blood disorders such as anemia
3. Evaluate red blood cell production or destruction for the athletes
4. Provide basic information about health
5. Detect a health condition before they have any symptoms
6. Confirm that a health condition exists
7. Identify the causes of health symptoms
8. Rule out a disease
9. Establish a baseline that can be used for comparison with future test results

**Glucose:**

The blood test Glucose, the glucose is the primary energy source for all body tissues. The sugars and carbohydrates consumed are directly consumed to glucose, which used as energy or stored in the liver or as fat throughout the body.

A low glucose level and high glucose level lead to symptoms such as weakness, nausea, sweating and difficulty thinking clearly.

- The range for a fasting glucose is 60 - 109 mg/dl
The other blood test was CBC include: WBC, RBC, HgB, Hct, MCV, MCH, MCHC, Platelet, RDW and MPV.

**Hemoglobin:**

Hemoglobin (Hb or Hgb) is a protein that carries oxygen in the blood. The low level means there is anemia, bleeding, malnutrition or cirrhosis, while the high level mean dehydration or polycythemia.

- Male: 13.8 to 17.2 gm/dL.

**WBC count:**

WBCs mean White blood cells its help with fight infection in the body the disorder in it refer to Infection or leukemia.

- 4,500 to 10,000 cells/mcL.

**RBC count:**

RBCs= Red blood cells its aim is to help of hemoglobin for working as carry oxygen throughout the body. The low level of hemoglobin mean the individual may suffer from anemia, bleeding, malnutrition or kidney disease and if there is increase in the level of it in blood this is mean the individual may have Polycythemia, heart and lung disease or dehydration.

- Male: 4.7 to 6.1 million cells/mcL.

**Hematocrit:**

Hct is the amount of space in the blood that is occupied by RBCs. The high level mean anemia, bleeding, malnutrition, cirrhosis or cancer the low level refer to dehydration, polycythemia or hemochromatosis.

- Male: 40.7 to 50.3%
MCV:  
The mean corpuscle volume which is the average size of the RBCs. It's related to anemia, thalassemia and malnutrition.  
- 80 to 95 femtoliter

MCH:  
Mean corpuscle hemoglobin which is the average amount of Hb in each RBC. It's related to anemia, thalassemia and malnutrition.  
- 27 to 31 pg/cell

MCHC:  
Mean corpuscle hemoglobin concentration which is the average amount of Hb in the RBCs compared to the average size of the RBCs. Any disorder in the normal level means the individual have anemia, thalassemia or malnutrition.  
- 32 to 36 gm/dL

Platelet:  
Platelet count (Plt) Platelets is sticky cells that help to form blood clots. Any abnormal level lead to bleeding and clotting disorders.  
- 150,000 - 400,000 platelets per micro liter (mCL)

RDW:  
Red cell which is the distribution width. Amount of variation in size of the RBCs the abnormal level refers to anemia, thalassemia and malnutrition.  
- 11% to 15%
Mean platelet volume which is the average size of the platelets can lead to bleeding and clotting disorders.

- 7.5 to 11.5 femtoliters

Note:

- cells/mcL = cells per micro liter
- gm/dL = grams per deciliter
- pg/cell = picograms per cell

(AH, 2008; Goldman L. S. A., 2011)

2.7.5 **Cardio respiratory Fitness**

Cardio respiratory fitness is a measure of how well your body is able to transport oxygen to your muscles during prolonged exercise, and also of how well your muscles are able to absorb and use the oxygen, once it has been delivered essentially, your cardio respiratory fitness level is a measure of the strength of your aerobic energy system.

Cardio respiratory fitness is measured through VO2 Max testing. VO2 Max is essentially a measurement of the Maximum amount of oxygen that your body is capable of consuming to generate energy that can be used at the cellular level. In this research, we used because it was suitable for athletes time and also there is many research confirm, this test is suitable for adolescent to check their performance (Fjortoft, 2011). The Bruce protocol was followed the reason and this protocol are accrued comparing this method between practice shuttle running test
tread mill shuttle running test was better because although both methods are
accrued (Fjortoft, 2011) but tread mill we have to do it and UAE University and
this consuming more time from athletes and conflict with their training session and
competition time and other hand shuttle running test was done in the Al Jazeera
Academic Club in short time comparing to the treadmill test.

Shuttle Running Test

Protocol

It was initially planned to perform the measurement of the cardio respiratory
fitness in the participants in the Human Nutrition laboratory of the Department of
Nutrition and Health, by following the Bruce treadmill protocol and by measuring
gas exchange with indirect calorimetry. Nonetheless, for practical reasons related
to the competitions’ schedule of the athletes, the number of visits and the duration
of each visit which were allowed by the administration of the Football Academy,
the protocol had to be revised.

In order to fit the restrictions listed above and to measure accurately the cardio
respiratory fitness it was decided to perform this measurement directly at the
Football Academy.

Because it allows to assess cardio respiratory fitness in a group of participants in
the same time, because it has been demonstrated as a valid tool to estimate
Maximal cardio respiratory fitness of young athletes (Res, 2011). The shuttle run
test of Leger was selected (Mahar et al., 2011). This test requires first to measure a
20 meters distance, and mark it at both ends with a line or funnels, then the
participants should go from one end to the next when they hear the sound of the peep. The sounds get closer and closer after every level, so participants start with slow walking equivalent to a speed of then gradually increase their speed. Frequency of the sound signals is increased 0.5 km h⁻¹ each minute from a starting speed of 8.5 km h⁻¹. When the subject can no longer follow the pace, the last stage number announced is used to predict Maximal oxygen uptake (VO₂ Max) (Y, ml kg⁻¹ min⁻¹) from the speed (X, km h⁻¹) corresponding to that stage (speed = 8 + 0.5 stage no.) (Léger L.A., 2011). The equation established by (Mahar et al., 2011) was used to estimate Maximum volume of dioxygen (VO₂ Max) of the athletes. (Res, 2011)

$$\text{VO}_2 \text{ Max} = 41.76799 + (0.49261 \times \text{PACER}) - (0.00290 \times \text{PACER}^2) - (0.61613 \times \text{BMI}) + (0.34787 \times \text{gender} \times \text{age})$$

[R=0.75, R²=0.56, SEE=6.17 ml/kg/min], where PACER is the number of laps completed; for gender, 1 = boy and 0 = girl; and age is in years.

Standardized regression coefficients demonstrated that PACER performance contributed more to the prediction than other variables in the mode (Mahar et al., 2011)
The references which were used for VO2 Max are:

One-Mile Run / 20m PACER / MALE

<table>
<thead>
<tr>
<th>VO2 Max</th>
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<tr>
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</table>

<table>
<thead>
<tr>
<th>Age</th>
<th>NI – Health Risk</th>
<th>NI</th>
<th>HFZ</th>
</tr>
</thead>
<tbody>
<tr>
<td>13</td>
<td>≤ 38.6</td>
<td>38.7 – 41.0</td>
<td>≥ 41.1</td>
</tr>
<tr>
<td>14</td>
<td>≤ 39.6</td>
<td>39.7 – 42.4</td>
<td>≥ 42.5</td>
</tr>
<tr>
<td>15</td>
<td>≤ 40.6</td>
<td>40.7 – 43.5</td>
<td>≥ 43.6</td>
</tr>
<tr>
<td>16</td>
<td>≥ 38.9</td>
<td>41.1 – 44.0</td>
<td>≥ 44.1</td>
</tr>
<tr>
<td>17</td>
<td>≥ 38.8</td>
<td>41.3 – 44.1</td>
<td>≥ 44.2</td>
</tr>
<tr>
<td>17+</td>
<td>≥ 38.6</td>
<td>41.3 – 44.2</td>
<td>≥ 44.3</td>
</tr>
</tbody>
</table>

* (Appendix 7)
The three zones are:

1. Healthy Fitness Zone (HFZ)

2. Needs Improvement (NI)
   
The area where the student's score between HFZ and NIH, and if the students increase their physical activities they will improve performance in the designated fitness area to achieve the HFZ.

3. Needs Improvement – Health Risk (NIH)

   NI – Health Risk mean increasing the health risk issue that related in some way to the fitness area.

2.8 Data Analysis

A database was created in the software SPSS version 20 in which athletes were identified by using their number only. Data were entered and then checked in order to detect abnormal values or data entry mistakes. In case of abnormal value, the original data was checked in the study file of the concerned athlete. Correction was done if the data entered was different to the data in the study file of the athlete. Otherwise, when applicable and possible, it was asked to assess again the variable at the academy.

2.8.1 Socio-demographic Information

This data included data of birth, age, mother and father education level, mother and father work status.
2.8.2 Anthropometric Measurements

Height for Age was plotted on the WHO anthropometric growth charts for boys aged (2-19) (Appendix 8) where the height-for-age and BMI-for-age percentiles was calculated (Appendix 9). The cut-off values for the various anthropometric indices were followed. Skin fold measurements included triceps and sub scapular skin folds. The percentiles for both were determined using the NHANES 1999-2002 and NHANES 2008 reference (Appendix 10 and Appendix 11). The percentage body fat (%BF) was determined TANITA machine.

2.8.3 Dietary Supplement Intake

Players were provided with two questions about consuming protein or vitamin supplement during the last year. Athletes indicated whether or not a particular supplement was used during the last year.

2.8.4 Training Nutrition

The frequency of meals before and after training and time of consumed this meal before or after training and competition.
2.8.5 Variables that will be examined

Anthropometric Measurements

Weight (kg), Height (cm), Waist Circumference (cm), Hip circumference (cm), Skin fold Thickness (Triceps, Biceps, sub-scapular and supra-iliac) (mm) Fat mass (\% and kg), BMI (kg/m^2) and Bone Mineral Density (DEXA) g/cm^2 or kg/m^2 BMD

Biochemistry

Fasting Blood Glucose (mg/dl), WBC (cells/\text{mcL}), RBC (cells/\text{mcL}), Hgb (gm/dl.), Hct (\%), MCV (\text{femtoliter}), MCH (pg/\text{cell}), MCHC (gm/dl.), Platelet platelets per micro liter (\text{mcL}), RDW (\%) and MPV (\text{femtoliter}).

2.8.6 Determining Dietary Habits, Knowledge and Attitude

In order to summarize all the dietary data which were collected through questionnaire, scores were created for every question and then calculated for each part, and then the mean ± standard deviation was calculated.

Data obtained from the food frequency questionnaire were considered either independently for some specific questions, if relevant, or considered as the frequency of the consumption of a food group 1) Cereals, legumes, nuts and grains, 2) Milk, dairy products, 3) Meat, Fish, 4) Fruits and vegetables, 5) Snack food and 6) Beverages)
In each food group and for each item in the considered food group, a value varying from 0 to 4 was assigned to the frequencies “never”, “1-2 times/week”, “3-4 times/week”, “5-6 times/week” and “daily”, respectively. Then all values were added for each group providing a score reflecting the frequency of consumption of each given group; consequently, frequency of consumption of 1) Cereals, legumes, nuts and grains group, 2) Milk, Dairy products, 3) Meat and fish, 4) Fruits and Vegetables, 5) Snack food and Beverages. French Fries were excluded from the group 4 and considered separately.

Dietary knowledge was evaluated with 15 questions. For each question, a value of 0 was assigned to the answer “do not know” and a value from “1 to 3”, was assigned, following a “healthy” scale (3 corresponding to the right answer or the healthier answer, “2 and 1” corresponding to the less healthy answers) to the other possible answers. Questions “1, 4 and 5” were presented as tables containing different items. An answer was asked for each item. In this case, a value was assigned for each item following the same rules as those described above and all values were then added.

For the section “Dietary Knowledge”, the score varies finally between (5 and 100).

Dietary Attitude was evaluated with 12 questions, the goal being to reach the highest score, example:
Do you think these foods are high or low in salt?

<table>
<thead>
<tr>
<th></th>
<th>High</th>
<th>Low</th>
<th>Don’t know</th>
</tr>
</thead>
<tbody>
<tr>
<td>Labna</td>
<td>2</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>Cheese Cheddar</td>
<td>2</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>Sausage</td>
<td>2</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>Pasta or rice</td>
<td>1</td>
<td>2</td>
<td>0</td>
</tr>
<tr>
<td>Red meat</td>
<td>1</td>
<td>2</td>
<td>0</td>
</tr>
<tr>
<td>Vegetables</td>
<td>1</td>
<td>2</td>
<td>0</td>
</tr>
</tbody>
</table>

Dietary Attitude was evaluated with 12 questions, the goal being to reach the highest score. The Questions were aimed to find out how the athletes behave in certain situations. For instance, “Which would be the best choice for a healthy snack?”. Different choices were proposed as answers. A value was attributed to each answer following a “healthy” scale as it has been previously described for the Dietary knowledge score. The score varies finally between (12 – 36).

Examples:

Which would be the best choice for a healthy snack?

Potato chips □ 0
Chocolate bar □ 0
Donut □ 0
Cereal bar □ 1
Which would you do?

Eat corn without butter  □  1
Eat corn with butter      □  0

Dietary Self Efficacy was evaluated with 9 Questions. Following a “How sure are you” scale, for each question, a value of 1 was assigned to the answer “I know I can’t”, a value of 2 was assigned to the answer “I am not sure I can”, a value of 3 was assigned to the answer “I think I can” and a value of 4 was assigned to the answer “I know I can”. The score varies finally between (9 and 36).

2.8.7 Data Statistical Analysis

The software SPSS version 20 was used to conduct all data analysis.

The data was described as mean ± s.d. or percentage (%) as appropriate.

In order to study the relationship between (1) nutritional knowledge, practices, attitudes and health parameters (2) nutritional knowledge, practice, attitudes and performance and (3) health parameters and performance, univariate analysis were first performed by using ANOVA or Chi-square as appropriate.
Chapter 3: RESULT

3.1 Socio-demographic Data

Table I refer to the sample for this study consisted of 59 adolescent athletes who were attended at the Al Jazeera Academic sport club. The age of the athletes was from 13 to 18 years of age, with a mean of 15.15±1.11 years. Socio-demographic characteristics of the sample can be found in Table I.

Most of the fathers were employed (60.70%). By contrast, half of the mothers were student (48.30%) and almost 30% were employed. Almost 25.80% of the mothers and 41.10% of the fathers had at least a university level of education. Most frequently, mothers and fathers reached high school level of education 34.50% and 39.3% for mothers and fathers, respectively, whereas less than 6% reached university levels in both mothers and fathers cases. 3.4% of fathers reached university level and 5.40% of mothers reached university level.

3.2 Anthropometry Data

Table II, III, IV, V describe anthropometry data in the sample of young athletes. The mean weight was 59.20±9.59 kg. The mean height was 169.27±8.14 cm. Based on their BMI-for-age, most of the athletes (91.50%, n=55) are classified as normal weight, While 1.69%, n=1 of the athletes are classified as underweight and 6.7 %, n=4 of the athletes are classified as overweight. The mean BMI is (20.66±2.16) kg/m².
The mean WH ratio was (0.80±0.02). The average for BMD was (1.17±0.15) g/cm² and BMC was (2247.64±401.76) (g).

Most of the athletes fell into the average classification for triceps and sub scapular skin fold measurements. Skin fold thickness results were taken from skin fold triceps (7.44±2.58), skin fold biceps (4.66±2.20) finally skin fold sub scapular (8.17±2.00). The fat mass percentage(16.46±3.28) which was higher than the recommended range of (7.6-12.1%).

While (3.6%=N)<5th percentile, (69.6%.N=39) 5th -25th percentiles and 5th percentiles waist ratio (26.8%).N=15).
Table I: Sociodemographic characteristics of the sample (n=59).

<table>
<thead>
<tr>
<th></th>
<th>Total sample (n=59)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Age (years)</strong></td>
<td>15.15±1.10</td>
</tr>
<tr>
<td><strong>Mother educational level (%)</strong></td>
<td></td>
</tr>
<tr>
<td>Illiterate</td>
<td>8.60</td>
</tr>
<tr>
<td>Primary education</td>
<td>31.00</td>
</tr>
<tr>
<td>High School</td>
<td>34.50</td>
</tr>
<tr>
<td>University</td>
<td>3.40</td>
</tr>
<tr>
<td>Other (higher study, specialize certificate, etc.)</td>
<td>22.40</td>
</tr>
<tr>
<td><strong>Father educational level (%)</strong></td>
<td></td>
</tr>
<tr>
<td>Illiterate</td>
<td>3.60</td>
</tr>
<tr>
<td>Primary education</td>
<td>16.00</td>
</tr>
<tr>
<td>High School</td>
<td>39.30</td>
</tr>
<tr>
<td>University</td>
<td>5.40</td>
</tr>
<tr>
<td>Other (higher study, specialize certificate, etc.)</td>
<td>35.70</td>
</tr>
<tr>
<td><strong>Mother’s work status (%)</strong></td>
<td></td>
</tr>
<tr>
<td>Unemployed</td>
<td>20.70</td>
</tr>
<tr>
<td>Student</td>
<td>48.30</td>
</tr>
<tr>
<td>House wife</td>
<td>1.70</td>
</tr>
<tr>
<td>Employed</td>
<td>29.30</td>
</tr>
<tr>
<td><strong>Father’s work status (%)</strong></td>
<td></td>
</tr>
<tr>
<td>Unemployed</td>
<td>5.40</td>
</tr>
<tr>
<td>Student</td>
<td>21.40</td>
</tr>
<tr>
<td>Retired</td>
<td>3.60</td>
</tr>
<tr>
<td>Employed</td>
<td>60.70</td>
</tr>
<tr>
<td>Other (dead or having private business)</td>
<td>8.90</td>
</tr>
</tbody>
</table>
Table II: Anthropometric characteristics of the sample (n=59).

<table>
<thead>
<tr>
<th>Metric</th>
<th>Total sample (n=59)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Weight (kg)</td>
<td>59.20±9.59</td>
</tr>
<tr>
<td>Height (cm)</td>
<td>169.27±8.14</td>
</tr>
<tr>
<td>BMI (kg/m²)</td>
<td>20.66±2.16</td>
</tr>
<tr>
<td>WH Ratio</td>
<td>0.80±0.02</td>
</tr>
<tr>
<td>Waist circumference (cm)</td>
<td>73.71±6.28</td>
</tr>
<tr>
<td>Hip (cm)</td>
<td>91.65±6.97</td>
</tr>
<tr>
<td>Skin fold Biceps (mm)</td>
<td>4.66±2.20</td>
</tr>
<tr>
<td>Skin fold Triceps (mm)</td>
<td>7.44±2.58</td>
</tr>
<tr>
<td>Skin fold Supra iliac (mm)</td>
<td>7.55±2.94</td>
</tr>
<tr>
<td>Skin fold Sub scapular (mm)</td>
<td>8.17±2.00</td>
</tr>
<tr>
<td>Fat Mass (%)</td>
<td>16.46±3.28</td>
</tr>
</tbody>
</table>

Table III: BMI-Age measurement percentile category for athletes (n=27).

<table>
<thead>
<tr>
<th>Category</th>
<th>&lt; 5th percentile*</th>
<th>5th to 85th percentile*</th>
<th>85th - 95th percentile*</th>
<th>&gt;95th percentile*</th>
</tr>
</thead>
<tbody>
<tr>
<td>%</td>
<td>1.69%, N=1</td>
<td>91.50%, N=55</td>
<td>6.7%, N=3</td>
<td>0%</td>
</tr>
</tbody>
</table>

*Age and gender dependent percentiles as built by WHO were used. WHO growth charts for boys (5-19) years old (WHO, 2006)
Table IV: Skin fold measurement (Triceps and Subscapular) percentile category for athletes (n=59).

<table>
<thead>
<tr>
<th>Percentile categories</th>
<th>Lean</th>
<th>Below average</th>
<th>Average</th>
<th>Above average</th>
<th>Excess fat</th>
</tr>
</thead>
<tbody>
<tr>
<td>Triceps * %</td>
<td>18.64%</td>
<td>25.41%</td>
<td>55.91%</td>
<td>0 %</td>
<td>0 %</td>
</tr>
<tr>
<td>(N=11)</td>
<td>(N=15)</td>
<td>(N=33)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Subscapular * %</td>
<td>3.38%</td>
<td>23.72%</td>
<td>72.85%</td>
<td>0 %</td>
<td>0 %</td>
</tr>
<tr>
<td>(N=2)</td>
<td>(N=14)</td>
<td>(N=43)</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*Skin fold measurement (Triceps and Subscapular) dependent percentiles as built by (NHANES2007-2010) were used.

Table V: Waist Circumference classification according to NCHS waist percentiles

<table>
<thead>
<tr>
<th>&lt;5th percentile*</th>
<th>5th - 25th percentile*</th>
<th>50th percentile*</th>
<th>&gt;50th Percentile*</th>
</tr>
</thead>
<tbody>
<tr>
<td>%</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3.60%, n=2</td>
<td>69.60%, n=39</td>
<td>26.80%, n=15</td>
<td>0%, n=0</td>
</tr>
</tbody>
</table>

*Age and gender dependent percentiles as built by NCHS (2007-2010) were used.
3.3 Biochemistry data

Table VI, VII, VIII, IX refers to all biochemistry data including fasting glucose level, WBC, RBC, Hb, Hct, MCV, MCHC, PLATELET, RDW and MPV. From the table below it is observed that there were nine anemic athletes and two athletes record blood glucose level less than 60.00 (mg/dL). There was significant positive relationship between Hb and anemia (p-value=0.00) and between anemia with HCT (p-value = 0.00) which mean with decreasing of Hb level and hct level in the blood sample of athletes that’s lead more anemia issue.

Even though the mean of the parameters related to red blood cell count (RDW and RBC), Hb and Hematocrit are within the normal range, the standard deviation suggests that some may be out of this range. Indeed, a detailed observation of the values within the sample shows that a great number of the athletes have values below the lower limit of the normal range.

3.4 Food frequency consumption

Table X represents the frequency of consumption of different food per week. Food were separated into the six main food groups: 1) Cereals, legumes, nuts and grains(14.11±4.56), 2) Milk, dairy products(10.00±3.32), 3) Meat, Fish(5.931±2.28), 4) Fruits and vegetables, 5) Snack food (7.91±3.23) and 6) Beverages(11.11±2.55) consumed by the athletes.
3.5 Sport related dietary habits

Table XI refer the vitamin and mineral intake Table XI indicates that half of the players reported to have taken vitamin supplements over the past year. A great majority reported to have not taken any protein supplement.

The frequency of consumption of specified meals or snacks by athletes Table XI shows that more than half of the athletes didn’t eat meal before training. Half of them eat a meal after training and in majority within the 30 minutes following the training. However almost all the athletes take a meal before the competition, and all of them consume a meal after competition.
Table VI: The Frequency and percentage of Anemia category and glucose blood level.

<table>
<thead>
<tr>
<th>Anemia *</th>
<th>Frequency</th>
<th>%</th>
<th>Normal range</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>9</td>
<td>33.30</td>
<td>14.00 - 18.00 (gm/dL)</td>
</tr>
<tr>
<td>1</td>
<td>18</td>
<td>18.00</td>
<td>14.00 - 18.00 (gm/dL)</td>
</tr>
</tbody>
</table>

Glucose blood level**

<table>
<thead>
<tr>
<th></th>
<th>Frequency</th>
<th>%</th>
<th>Normal range</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>2</td>
<td>7.4</td>
<td>60.00 - 109.00 (mg/dL)</td>
</tr>
<tr>
<td>1</td>
<td>25</td>
<td>92.6</td>
<td>60.00 - 109.00 (mg/dL)</td>
</tr>
</tbody>
</table>

*Anemia, 0: <14.00, 1: ≥14.00

**Glucose blood level, 0: <60.00, 1: ≥60

Table VII: BMC and BMD characteristics of the sample (n=59).

<table>
<thead>
<tr>
<th>Total sample (n=59)</th>
</tr>
</thead>
<tbody>
<tr>
<td>BMC(g)</td>
</tr>
<tr>
<td>2247.64±401.76</td>
</tr>
<tr>
<td>BMD(g/cm²)</td>
</tr>
<tr>
<td>1.17±0.15</td>
</tr>
<tr>
<td>Upper Range for BMD (%)</td>
</tr>
<tr>
<td>100.00</td>
</tr>
</tbody>
</table>
Table VIII: The relationship between anemia, Hgb (Hemoglobin) and Hct (Hematocrit)

<table>
<thead>
<tr>
<th>Sample</th>
<th>Mean ±s.d</th>
<th>P-value*</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hgb*</td>
<td></td>
<td></td>
</tr>
<tr>
<td>0</td>
<td>13.30±5.50</td>
<td>0.00</td>
</tr>
<tr>
<td>1</td>
<td>14.9±7.39</td>
<td></td>
</tr>
<tr>
<td>Hct**</td>
<td></td>
<td></td>
</tr>
<tr>
<td>0</td>
<td>0.40±0.17</td>
<td>0.00</td>
</tr>
<tr>
<td>1</td>
<td>0.44±0.01</td>
<td></td>
</tr>
</tbody>
</table>

* Hgb, 0: <14.00, 1:≥14.00

** Hct, 0: <40.70 (%), 1:≥50.30 (%)
<table>
<thead>
<tr>
<th>Parameter</th>
<th>Total sample (n=27)</th>
<th>Normal Range</th>
</tr>
</thead>
<tbody>
<tr>
<td>Glucose (mg/dL)</td>
<td>80.46±10.62</td>
<td>60.00 – 109.00</td>
</tr>
<tr>
<td></td>
<td>(57.60-100.80)</td>
<td></td>
</tr>
<tr>
<td>≥109 mg/dl (%)</td>
<td>0.00</td>
<td></td>
</tr>
<tr>
<td>&lt;60 mg/dl (%)</td>
<td>22.20</td>
<td></td>
</tr>
<tr>
<td>WBC (cells/mcl.)</td>
<td>5530.00±133.00</td>
<td>4000.00 – 11000.00</td>
</tr>
<tr>
<td></td>
<td>(2.24-8.53)</td>
<td></td>
</tr>
<tr>
<td>≥4000.00 cells/mcl. (%)</td>
<td>11.11</td>
<td></td>
</tr>
<tr>
<td>&lt;11000.00 cells/mcl. (%)</td>
<td>0.00</td>
<td></td>
</tr>
<tr>
<td>HgB (gm/dL)</td>
<td>14.39±1.03</td>
<td>14.00 – 18.00</td>
</tr>
<tr>
<td></td>
<td>(12.20-16.30)</td>
<td></td>
</tr>
<tr>
<td>≥18.00 gm/dL (%)</td>
<td>0.00</td>
<td></td>
</tr>
<tr>
<td>&lt;14.00 gm/dL (%)</td>
<td>33.33</td>
<td></td>
</tr>
<tr>
<td>Parameter</td>
<td>Total sample (n=27)</td>
<td>Normal Range</td>
</tr>
<tr>
<td>-----------------------------------</td>
<td>---------------------</td>
<td>-----------------------------------</td>
</tr>
<tr>
<td>Hct %</td>
<td>43.00±2.00</td>
<td>40.70 - 50.30</td>
</tr>
<tr>
<td></td>
<td>(0.37-0.49)</td>
<td></td>
</tr>
<tr>
<td>&gt;50.30 (%)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>&lt;40.70 (%)</td>
<td>0.00</td>
<td></td>
</tr>
<tr>
<td></td>
<td>3.70</td>
<td></td>
</tr>
<tr>
<td>MCV(Hct / RBC) (femtoliter)</td>
<td>81.80±4.40</td>
<td>80.00 - 95.00</td>
</tr>
<tr>
<td></td>
<td>(70.70-89.90)</td>
<td></td>
</tr>
<tr>
<td>&gt;95.00 femtoliter (%)</td>
<td>0.00</td>
<td></td>
</tr>
<tr>
<td>&lt;80.00 femtoliter (%)</td>
<td>13.33</td>
<td></td>
</tr>
<tr>
<td>MCHC(MCH / MCV) (gm/dL)</td>
<td>33.30±0.10</td>
<td>32.00 to 36.00</td>
</tr>
<tr>
<td></td>
<td>(31.30-35.80)</td>
<td></td>
</tr>
<tr>
<td>&gt;36.00 gm/dL (%)</td>
<td>0.00</td>
<td></td>
</tr>
<tr>
<td>&lt;32.00 gm/dL (%)</td>
<td>11.11</td>
<td></td>
</tr>
</tbody>
</table>
Table X: Usual consumption of the different food groups in the sample (n=59).

<table>
<thead>
<tr>
<th>Food Group</th>
<th>Mean ± s.d or %</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cereals Group</td>
<td>14.11±4.56</td>
</tr>
<tr>
<td>(3-10 servings per week)</td>
<td>25.50</td>
</tr>
<tr>
<td>(11-17 servings per week)</td>
<td>21.60</td>
</tr>
<tr>
<td>(18-25 servings per week)</td>
<td>52.90</td>
</tr>
<tr>
<td>Meat Group</td>
<td>5.931±2.28</td>
</tr>
<tr>
<td>(1-3 servings per week)</td>
<td>25.90</td>
</tr>
<tr>
<td>(4-7 servings per week)</td>
<td>37.90</td>
</tr>
<tr>
<td>(8-11 servings per week)</td>
<td>36.2</td>
</tr>
<tr>
<td>Fruits and vegetables Group</td>
<td>11.11±2.55</td>
</tr>
<tr>
<td>(0-21 servings per week)</td>
<td>35.80</td>
</tr>
<tr>
<td>(9-13 servings per week)</td>
<td>26.40</td>
</tr>
<tr>
<td>(14-21 servings per week)</td>
<td>37.70</td>
</tr>
<tr>
<td>Dairy products Group</td>
<td>10.00±3.32</td>
</tr>
<tr>
<td>(3-19 servings per week)</td>
<td>16.70</td>
</tr>
<tr>
<td>(7-11 servings per week)</td>
<td>50.00</td>
</tr>
<tr>
<td>(12-19 servings per week)</td>
<td>33.33</td>
</tr>
</tbody>
</table>
Table X: Usual consumption of the different food groups in the sample (n=59).

<table>
<thead>
<tr>
<th>Food Group</th>
<th>Mean ± s.d. or %</th>
</tr>
</thead>
<tbody>
<tr>
<td>Beverages Group</td>
<td>8.25±3.23</td>
</tr>
<tr>
<td>(0-5 servings per week)</td>
<td>27.10</td>
</tr>
<tr>
<td>(6-9 servings per week)</td>
<td>23.70</td>
</tr>
<tr>
<td>(10-17 servings per week)</td>
<td>49.20</td>
</tr>
<tr>
<td>Snack Group</td>
<td>7.91±3.23</td>
</tr>
<tr>
<td>(3-6 servings per week)</td>
<td>42.10</td>
</tr>
<tr>
<td>(7-10 servings per week)</td>
<td>43.90</td>
</tr>
<tr>
<td>(3-20 servings per week)</td>
<td>14.00</td>
</tr>
</tbody>
</table>

Table XI: Sport-related dietary habits of the sample (n=59) (%)

<table>
<thead>
<tr>
<th>Dietary Habit</th>
<th>Total sample (n=59)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Consumption of vitamin supplements</td>
<td>57.60</td>
</tr>
<tr>
<td>during the year (%)</td>
<td></td>
</tr>
<tr>
<td>Consumption of protein supplements</td>
<td>91.50</td>
</tr>
<tr>
<td>during the year (%)</td>
<td></td>
</tr>
</tbody>
</table>
Table XI: Sport-related dietary habits of the sample (n=59) (%)

<table>
<thead>
<tr>
<th>Consumption of meal before training</th>
<th>Total sample (n=59)</th>
</tr>
</thead>
<tbody>
<tr>
<td>No (%)</td>
<td>65.50</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>The time of meal before training time</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>0-30 (min)</td>
<td>17.60</td>
</tr>
<tr>
<td>30-1(min)</td>
<td>82.40</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Consumption of meal after training</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>No (%)</td>
<td>50.00</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>The time of meal after training time</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>0-30 (min)</td>
<td>96.60</td>
</tr>
<tr>
<td>30-1(min)</td>
<td>3.40</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>The time of meal before competition time</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>0-30 (min)</td>
<td>89.70</td>
</tr>
<tr>
<td>30-1(min)</td>
<td>10.30</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Consumption of meal after competition time</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>No (%)</td>
<td>0.00</td>
</tr>
</tbody>
</table>
3.6 Dietary Knowledge, Attitude and Self-Efficacy

Table XII refer to dietary knowledge was evaluated by 15 questions addressing the main nutritional issues for an appropriate nutrition for adolescents and athletes like water and fruits consumption. The score can vary between 5 and 100. The mean score in our sample was 80.73±8.81.

Attitude was assessed in a “What would you do?” section including 12 questions related to food choices for snack or meals with a total score of between12 and 36. The mean score in our sample was 21.30±1.88.

Self-efficacy was evaluated in a “How sure are you?” section including 9 situations in which the athlete was asked to answer which behavior he thinks he would be able to adopt from “I know I can”, “I think I can”, “I am not sure I can”, and “I know I cannot”. The score varies finally between 9 and 36. The mean score in our sample was 18.88±3.66.

3.7 Cardio respiratory fitness

Table XIII refer to illustrates VO2Max in the sample. The mean was 38.60±1.39 (ml/(kg.min)). According to the categories of cardio respiratory fitness based on VO2 Max, it appears that for most of the athletes, their cardio respiratory fitness needs to be improved. No one was having a healthy cardio respiratory fitness.
3.8 The Exploration of Possible Associations between Usual Consumption of the Different Food Group and Sociodemographic

Table XIV refer to the significant relationship between athletes mother education level and Meat group (P-value<0.01) where when the mothers education level increase the meat and meat consumption for the athletes' increase.
Table XII: Knowledge, Attitude and Self-efficacy dietary scores in the sample (n=42).

<table>
<thead>
<tr>
<th></th>
<th>Total sample (n=42)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Score Nutritional knowledge</td>
<td>80.73±8.81</td>
</tr>
<tr>
<td>Range (5.00-100)</td>
<td></td>
</tr>
<tr>
<td>Score Nutritional attitude</td>
<td>21.30±1.88</td>
</tr>
<tr>
<td>Range (12.00-36.00)</td>
<td></td>
</tr>
<tr>
<td>Score Nutritional self- efficiency</td>
<td>18.88±3.66</td>
</tr>
<tr>
<td>Range (9.00-36.00)</td>
<td></td>
</tr>
</tbody>
</table>

Table XIII: Cardiorespiratory fitness (VO2 Max) in the sample (n=29).

<table>
<thead>
<tr>
<th></th>
<th>Total sample (n=29)</th>
</tr>
</thead>
<tbody>
<tr>
<td>VO2 Max *(ml/(kg.min))</td>
<td>38.60±1.39</td>
</tr>
<tr>
<td>Healthy Fitness Zone (%)</td>
<td>0.00</td>
</tr>
<tr>
<td>Needs Improvement (%)</td>
<td>84.60</td>
</tr>
<tr>
<td>Needs Improvement – Health Risk (%)</td>
<td>15.40</td>
</tr>
</tbody>
</table>

*volume oxygen Maximum
Table XIV: Relationships between Usual consumption of the different food groups in the sample (n=59) and sociodemographic.

<table>
<thead>
<tr>
<th></th>
<th>Meat group**</th>
<th>P-value*</th>
<th>Snack Group**</th>
<th>P-value*</th>
<th>Cereal Group**</th>
<th>p-value*</th>
</tr>
</thead>
<tbody>
<tr>
<td>MOTHER</td>
<td>0</td>
<td>3.00±0.84</td>
<td>2.50±0.94</td>
<td></td>
<td>2.72±0.95</td>
<td></td>
</tr>
<tr>
<td>EDUCATION</td>
<td>1</td>
<td>2.33±0.9</td>
<td>2.91±1.04</td>
<td>0.42</td>
<td>3.12±0.88</td>
<td>0.38</td>
</tr>
<tr>
<td>LEVEL</td>
<td>2</td>
<td>3.19±1.0</td>
<td>2.89±0.99</td>
<td></td>
<td>2.68±1.13</td>
<td></td>
</tr>
<tr>
<td>FATHER</td>
<td>0</td>
<td>2.86±1.0</td>
<td>3.08±1.16</td>
<td></td>
<td>3.00±0.90</td>
<td></td>
</tr>
<tr>
<td>EDUCATION</td>
<td>1</td>
<td>3.15±0.60</td>
<td>3.34±0.83</td>
<td>0.68</td>
<td>3.31±1.01</td>
<td>0.51</td>
</tr>
<tr>
<td>LEVEL</td>
<td>2</td>
<td>3.57±0.97</td>
<td>3.15±0.89</td>
<td></td>
<td>3.33±0.89</td>
<td></td>
</tr>
<tr>
<td>FATHER</td>
<td>0</td>
<td>3.13±1.18</td>
<td>3.75±0.86</td>
<td></td>
<td>3.38±0.97</td>
<td></td>
</tr>
<tr>
<td>WORK</td>
<td>1</td>
<td>3.57±0.90</td>
<td>3.26±1.09</td>
<td>0.42</td>
<td>3.62±1.20</td>
<td>0.54</td>
</tr>
<tr>
<td></td>
<td>2</td>
<td>3.66±1.15</td>
<td>3.52±1.17</td>
<td></td>
<td>3.80±1.01</td>
<td></td>
</tr>
<tr>
<td>MOTHER</td>
<td>0</td>
<td>2.86±1.18</td>
<td>2.07±0.91</td>
<td></td>
<td>2.50±1.20</td>
<td></td>
</tr>
<tr>
<td>WORK</td>
<td>1</td>
<td>2.14±1.01</td>
<td>2.52±1.27</td>
<td>0.33</td>
<td>2.62±1.14</td>
<td>0.62</td>
</tr>
<tr>
<td></td>
<td>2</td>
<td>2.38±1.11</td>
<td>2.63±1.01</td>
<td></td>
<td>2.25±0.93</td>
<td></td>
</tr>
</tbody>
</table>

*ANOVA was used. Statistical significance set at p-value less than 0.05
**Meat group, 0: ≤ 4, 1: value >4 and ≤6 and 2 :> 6.
**Cereal group, 0: ≤ 12, 1: value >12 and ≤15 and 2 :> 15.
**Milk group, 0: ≤ 8, 1: value >8 and ≤11 and 2 :> 11.
**Fruit & veg. group, 0: ≤ 8, 1: value >8 and ≤11 and 2 :> 11.
**Beverage group, 0: ≤ 7, 1: value >7 and ≤8 and 2 :> 8.
**Snack group, 0: ≤ 5, 1: value >5 and ≤8 and 2 :> 8.
Table XIV: Relationships between Usual consumption of the different food groups in the sample (n=59) and sociodemographic.

<table>
<thead>
<tr>
<th></th>
<th>Milk Group**</th>
<th>Fruit &amp; veg. group**</th>
<th>Beverage group**</th>
<th>p-value*</th>
</tr>
</thead>
<tbody>
<tr>
<td>MOTHER</td>
<td>0</td>
<td>2.66±1.08</td>
<td>2.73±0.87</td>
<td>2.55±1.05</td>
</tr>
</tbody>
</table>
| EDUCATION        | 1            | 2.82±0.80            | 2.80±1.39        | 0.76     | 2.92±0.99 | 0.35
| LEVEL            | 2            | 2.77±1.00            | 2.95±0.87        | 3.00±0.91|
| FATHER           | 0            | 3.25±0.68            | 3.22±0.87        | 3.30±0.73|
| EDUCATION        | 1            | 3.17±0.95            | 3.66±0.70        | 0.35     | 3.21±0.90 | 0.90
| LEVEL            | 2            | 3.05±1.05            | 3.13±1.05        | 3.15±1.21|
| FATHER           | 0            | 3.68±0.79            | 3.27±1.12        | 3.60±0.75|
| WORK             | 1            | 3.35±1.05            | 3.66±1.00        | 0.55     | 3.39±1.07 | 0.79
| MOTHER           | 0            | 2.72±1.12            | 2.47±1.12        | 2.35±1.08|
| WORK             | 1            | 2.23±1.09            | 2.20±1.03        | 0.54     | 2.52±1.19 | 0.74
|                  | 2            | 2.22±1.06            | 2.65±1.07        | 2.23±1.09|

*ANOVA was used. Statistical significance set at p-value less than 0.05

**Meat group, 0: ≤ 4, 1: value >4 and ≤6 and 2: >6.

**Cereal group, 0: ≤ 12, 1: value >12 and ≤15 and 2: >15.

**Milk group, 0: ≤ 8, 1: value >8and ≤11 and 2: >11.

**Fruit & veg. group, 0: ≤ 8, 1: value >8and ≤11 and 2: >11.

**Beverage group, 0: ≤ 7, 1: value >7 and ≤8 and 2: >8.

**Snack group, 0: ≤ 5, 1: value >5 and ≤8 and 2: >8
3.9 The Exploration of Possible Associations between Usual Consumption of Different Food Group and Anthropometric Characteristics

Table XV refer the significant relationship was found between snack group and weight (P-value=0.038), which the athletes consumed snack group and skin fold Sub-scapular (P-value=0.04) and the rest of athletes there was found relationship between Milk Group and BMC (P-value=0.04)

3.10 The Exploration of Possible Associations between Usual Consumption of Different Food Group and Biochemical Parameters

Table XVI refer for the rest of athletes there were found significant relation between cereal Group and Hgb (P-value=0.01), the significant relationship was found between snack group and MPV (P-value=0.02).

3.11 The Exploration of Possible Associations between Cardiorespiratory Fitness and Anthropometric Characteristics

Table XVII refer the significant relationship was found between performance and height (P-value=0.04), correlation was found between performance and BMI (P-value=0.04), the significant relationship found between performance and skin fold biceps (P-value=0.01), and relationship between performance and fat mass percentage (P-value=0.03)

3.12 The Exploration of Possible Associations between Cardiorespiratory Fitness and Biochemical Parameters

Table XVIII refer to the relationship between cardio respiratoriy Fitness and biochemical parameters there were no significant relationship found.
3.13 The Exploration of Possible Associations between Usual Consumption of Different Food Group and Cardio respiratory Fitness

Table XIX refer to the relationship between different food groups and Cardio respiratory Fitness there were no significant relationship found.

3.14 The Exploration of Possible Associations between Dietary Knowledge, Attitude, Self Efficacy and Biochemistry

Table XX refer to possible association there was no significant relation.
Table XV: Relationships between usual consumption of the different food groups in the sample (n=59) and Anthropometric characteristics.

<table>
<thead>
<tr>
<th></th>
<th>Meat group**</th>
<th>Snack Group**</th>
<th>Cereal Group**</th>
<th>p-value*</th>
<th>p-value*</th>
<th>p-value*</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>P-value</td>
<td>P-value</td>
<td>P-value</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Height</td>
<td>170.38±8.30</td>
<td>173.01±7.09</td>
<td>172.60±7.79</td>
<td>0.78</td>
<td>0.14</td>
<td>0.15</td>
</tr>
<tr>
<td></td>
<td>168.42±9.88</td>
<td>167.57±9.22</td>
<td>167.52±7.93</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Weight</td>
<td>58.88±9.29</td>
<td>64.95±6.44</td>
<td>62.74±9.44</td>
<td>0.61</td>
<td>0.03</td>
<td>0.18</td>
</tr>
<tr>
<td></td>
<td>58.10±10.08</td>
<td>56.93±10.90</td>
<td>56.68±9.24</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>BMI</td>
<td>20.36±2.33</td>
<td>20.44±2.50</td>
<td>19.94±1.96</td>
<td>0.33</td>
<td>0.15</td>
<td>0.19</td>
</tr>
<tr>
<td></td>
<td>21.25±2.24</td>
<td>20.18±2.06</td>
<td>20.64±2.41</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Waist</td>
<td>72.67±6.01</td>
<td>76.72±4.08</td>
<td>76.08±6.20</td>
<td>0.23</td>
<td>0.11</td>
<td>0.05</td>
</tr>
<tr>
<td></td>
<td>72.91±6.14</td>
<td>72.38±7.41</td>
<td>70.82±5.56</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hip</td>
<td>90.87±6.60</td>
<td>94.80±4.92</td>
<td>93.91±6.22</td>
<td>0.50</td>
<td>0.16</td>
<td>0.14</td>
</tr>
<tr>
<td></td>
<td>90.94±7.29</td>
<td>90.40±7.72</td>
<td>88.91±6.52</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>WH</td>
<td>.79±0.16</td>
<td>.80±0.02</td>
<td>.80±0.02</td>
<td>0.27</td>
<td>0.60</td>
<td>0.18</td>
</tr>
<tr>
<td>Ratio</td>
<td>.80±0.27</td>
<td>.80±0.02</td>
<td>.81±0.02</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*A*ANOVA was used. Statistical significance set at p-value less than 0.05

**Meat group, 0 ≤ 4; 1: value >4 and ≤6 and 2 > 6.

**Cereal group, 0 ≤ 12; 1: value >12 and ≤15 and 2 > 15.

**Milk group, 0 ≤ 8; 1: value >8 and ≤11 and 2 > 11.

**Fruit group, 0 ≤ 8; 1: value >8 and ≤11 and 2 > 11.

**Beverage group, 0 ≤ 7; 1: value >7 and ≤8 and 2 > 8.

**Snack group, 0 ≤ 5; 1: value >5 and ≤8 and 2 > 8.

55
Table XV: Relationships between Usual consumption of the different food groups in the sample (n=59) and Anthropometric characteristics.

<table>
<thead>
<tr>
<th></th>
<th>Meat group**</th>
<th>P-value</th>
<th>Snack Group**</th>
<th>P-value*</th>
<th>Cereal Group**</th>
<th>P-value*</th>
</tr>
</thead>
<tbody>
<tr>
<td>Skin fold Biceps</td>
<td>4.26±3.03</td>
<td>5.57±2.73</td>
<td>5.12±3.15</td>
<td>4.34±1.58</td>
<td>0.60</td>
<td></td>
</tr>
<tr>
<td></td>
<td>4.80±1.89</td>
<td>0.70</td>
<td>4.30±2.16</td>
<td>0.22</td>
<td></td>
<td>4.85±1.77</td>
</tr>
<tr>
<td></td>
<td>4.84±1.90</td>
<td></td>
<td>4.55±1.78</td>
<td></td>
<td></td>
<td>6.93±2.73</td>
</tr>
<tr>
<td></td>
<td>6.15±2.32</td>
<td></td>
<td>8.10±1.76</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Skin fold Triceps</td>
<td>7.80±2.16</td>
<td>0.06</td>
<td>7.13±2.43</td>
<td>0.55</td>
<td>7.45±1.91</td>
<td>0.09</td>
</tr>
<tr>
<td></td>
<td>8.09±2.88</td>
<td></td>
<td>7.50±3.28</td>
<td></td>
<td></td>
<td>8.81±2.83</td>
</tr>
<tr>
<td>Skin fold Subscapular</td>
<td>7.84±1.93</td>
<td></td>
<td>9.30±1.98</td>
<td></td>
<td></td>
<td>8.35±1.82</td>
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<tr>
<td></td>
<td>7.90±1.82</td>
<td>0.34</td>
<td>7.62±1.94</td>
<td>0.04</td>
<td>7.84±1.68</td>
<td>0.61</td>
</tr>
<tr>
<td></td>
<td>8.67±2.23</td>
<td></td>
<td>8.08±1.91</td>
<td></td>
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<td>8.50±2.43</td>
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<tr>
<td></td>
<td>6.42±1.89</td>
<td></td>
<td>8.88±2.31</td>
<td></td>
<td></td>
<td>7.30±2.34</td>
</tr>
<tr>
<td>Skin fold Pelvic</td>
<td>7.20±2.15</td>
<td>0.07</td>
<td>6.88±2.31</td>
<td>0.10</td>
<td>6.65±2.24</td>
<td>0.09</td>
</tr>
<tr>
<td></td>
<td>8.63±3.83</td>
<td></td>
<td>7.23±3.60</td>
<td></td>
<td></td>
<td>8.84±3.78</td>
</tr>
</tbody>
</table>

*ANOVA was used. Statistical significance set at p-value less than 0.05
**Meat group, 0: ≤4, 1: value >4 and ≤6 and 2: > 6.
**Cereal group, 0: ≤12, 1: value >12 and ≤15 and 2: > 15.
**Milk group, 0: ≤ 8, 1: value >8 and ≤ 11 and 2: > 11.
**Fruit group, 0: ≤ 8, 1: value >8 and ≤ 11 and 2: > 11.
**Beverage group, 0: ≤ 7, 1: value >7 and ≤ 8 and 2: > 8.
**Snack group, 0: ≤ 5, 1: value >5 and ≤ 8 and 2: > 8.
Table XV: Relationships between Usual consumption of the different food groups in the sample (n=59) and Anthropometric characteristics.

<table>
<thead>
<tr>
<th></th>
<th>Meat group**</th>
<th>P-value</th>
<th>Snack Group**</th>
<th>P-value*</th>
<th>Cereal Group**</th>
<th>P-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fat Mass</td>
<td>16.08±4.01</td>
<td></td>
<td>17.15±2.99</td>
<td></td>
<td>17.11±3.65</td>
<td></td>
</tr>
<tr>
<td>Percentage</td>
<td>16.17±2.25</td>
<td>0.53</td>
<td>16.60±3.11</td>
<td>0.45</td>
<td>15.55±1.87</td>
<td>0.28</td>
</tr>
<tr>
<td></td>
<td>17.14±3.62</td>
<td></td>
<td>15.71±3.75</td>
<td></td>
<td>17.15±4.04</td>
<td></td>
</tr>
<tr>
<td></td>
<td>2257.67±438</td>
<td></td>
<td>2392.52±2</td>
<td></td>
<td>2322.24±38</td>
<td></td>
</tr>
<tr>
<td></td>
<td>.06</td>
<td></td>
<td>75.54</td>
<td></td>
<td>5.20</td>
<td></td>
</tr>
<tr>
<td>BMC</td>
<td>2233.44±472</td>
<td>.95</td>
<td>2205.33±4</td>
<td>.39</td>
<td>2277.57±44</td>
<td>.27</td>
</tr>
<tr>
<td></td>
<td>.40</td>
<td></td>
<td>84.28</td>
<td></td>
<td>1.71</td>
<td></td>
</tr>
<tr>
<td></td>
<td>2274.13±309</td>
<td></td>
<td>2219.64±3</td>
<td></td>
<td>2109.91±32</td>
<td></td>
</tr>
<tr>
<td></td>
<td>.93</td>
<td></td>
<td>53.97</td>
<td></td>
<td>9.43</td>
<td></td>
</tr>
<tr>
<td>BMD</td>
<td>1.16±0.11</td>
<td>.66</td>
<td>1.17±0.11</td>
<td>.60</td>
<td>1.20±0.21</td>
<td>.16</td>
</tr>
</tbody>
</table>

*ANOVA was used. Statistical significance set at p-value less than 0.05

**Meat group, 0: ≤ 4, 1: value >4 and ≤6 and 2: > 6.

**Cereal group, 0: ≤ 12, 1: value >12 and ≤15 and 2: > 15.

**Milk group, 0: ≤ 8, 1: value >8 and ≤11 and 2: > 11.

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Table XV: Relationships between Usual consumption of the different food groups in the sample (n=59) and Anthropometric characteristics.

<table>
<thead>
<tr>
<th></th>
<th>Milk Group**</th>
<th>P-value*</th>
<th>Fruit &amp; veg. Group**</th>
<th>P-value*</th>
<th>Beverage Group**</th>
<th>P-value*</th>
</tr>
</thead>
<tbody>
<tr>
<td>Height</td>
<td>0 172.06±8.54</td>
<td>168.88±8.8</td>
<td>0.20</td>
<td>169.06±8.76</td>
<td>0.74</td>
<td></td>
</tr>
<tr>
<td>1 167.16±9.57</td>
<td>167.87±9.0</td>
<td>0.63</td>
<td>168.63±8.51</td>
<td>0.74</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2 169.72±5.65</td>
<td>170.60±7.5</td>
<td>1</td>
<td>170.72±6.82</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Weight</td>
<td>0 62.20±10.68</td>
<td>58.81±10.5</td>
<td>0.38</td>
<td>58.63±10.00</td>
<td>0.23</td>
<td></td>
</tr>
<tr>
<td>1 57.85±9.97</td>
<td>59.26±9.35</td>
<td>0.9</td>
<td>57.55±8.73</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2 58.71±8.82</td>
<td>60.03±9.46</td>
<td></td>
<td>62.95±10.13</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>0 21.18±2.48</td>
<td>20.91±2.57</td>
<td>0.7</td>
<td>20.29±2.24</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>BMI</td>
<td>1 20.41±1.94</td>
<td>20.92±2.08</td>
<td>0.42</td>
<td>20.47±1.79</td>
<td>0.21</td>
<td></td>
</tr>
<tr>
<td>2 20.28±2.12</td>
<td>20.45±1.95</td>
<td>5</td>
<td>21.53±2.53</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>0 75.22±6.86</td>
<td>74.43±7.39</td>
<td></td>
<td>73.26±5.95</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Waist</td>
<td>1 72.77±6.26</td>
<td>73.93±7.54</td>
<td>0.49</td>
<td>73.04±6.54</td>
<td>0.48</td>
<td></td>
</tr>
<tr>
<td>2 73.41±6.68</td>
<td>73.77±5.10</td>
<td>0.9</td>
<td>75.56±6.42</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>0 92.74±7.64</td>
<td>91.83±7.94</td>
<td>4</td>
<td>90.92±7.01</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hip</td>
<td>1 90.55±7.24</td>
<td>92.35±8.16</td>
<td>0.66</td>
<td>90.90±7.03</td>
<td>0.35</td>
<td></td>
</tr>
<tr>
<td>2 92.00±6.86</td>
<td>91.65±6.44</td>
<td>7</td>
<td>94.1±6.77</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>0 0.81±0.02</td>
<td>.81±0.03</td>
<td>0.6</td>
<td>.80±0.02</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>WH Ratio</td>
<td>1 0.80±0.3</td>
<td>.79±0.02</td>
<td>0.37</td>
<td>.80±0.03</td>
<td>0.93</td>
<td></td>
</tr>
<tr>
<td>2 0.79±0.02</td>
<td>80±0.02</td>
<td>4</td>
<td>80±0.02</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*ANOVA was used. Statistical significance set at p-value less than 0.05
**Meat group. 0: ≤ 4. 1: value >4 and ≤6 and 2: > 6.
**Cereal group. 0: ≤ 12. 1: value >12 and ≤15 and 2: > 15.
**Milk group. 0: ≤ 8. 1: value >8 and ≤11 and 2: > 11.
**Fruit group. 0: ≤ 8, 1: value >8 and ≤1 and 2: > 8.**

**Beverage group. 0: ≤ 7, 1: value >7 and ≤8 and 2: > 8.**

**Snack group. 0: ≤ 5, 1: value ≥5 and ≤8 and 2: > 8.**

Table XV: Relationships between Usual consumption of the different food groups in the sample (n=59) and Anthropometric characteristics.

<table>
<thead>
<tr>
<th>Milk Group**</th>
<th>P-value*</th>
<th>Fruit &amp; Veg. Group**</th>
<th>P-value*</th>
<th>Beverage Group**</th>
<th>P-value*</th>
</tr>
</thead>
<tbody>
<tr>
<td>Skin fold</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>0</td>
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Table XVI: Relationships between Usual consumption of the different food groups in the sample (n=59) and Biochemical parameters.

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*ANOVA was used. Statistical significance set at p-value less than 0.05

**Meat group, 0: ≤ 4, 1: value >4 and ≤6 and 2 ≥ 6.

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<table>
<thead>
<tr>
<th></th>
<th>Meat group**</th>
<th>P-value*</th>
<th>Snack Group**</th>
<th>P-value*</th>
<th>Cereal Group**</th>
<th>p-value*</th>
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<table>
<thead>
<tr>
<th></th>
<th>Meat group**</th>
<th>Snack Group**</th>
<th>Cereal Group**</th>
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<td>P-value*</td>
<td>P-value*</td>
<td>p-value*</td>
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<table>
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<th>Milk Group**</th>
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<th>Beverage Group**</th>
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<table>
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<tr>
<th></th>
<th>Milk Group**</th>
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<th>P-value*</th>
<th>Beverage group**</th>
<th>p-value*</th>
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<td>6.8±1.31</td>
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<tr>
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</table>

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**Milk group, 0: ≤ 8, 1: value >8 and ≤11 and 2: ≥ 11.

**Fruit group, 0: ≤ 8, 1: value >8 and ≤11 and 2: ≥ 11.

**Beverage group, 0: ≤ 7, 1: value >7 and ≤8 and 2: ≥ 8.

64
Table XVII: Relationships between Cardio respiratory fitness (VO2 Max ) in the sample (n=59) and Anthropometric characteristics.

<table>
<thead>
<tr>
<th></th>
<th>Performance (vo2 Max)*</th>
<th>p-value**</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Height</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>0</td>
<td>169.63±5.19</td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>163.42±6.77</td>
<td>0.04</td>
</tr>
<tr>
<td>2</td>
<td>169.36±8.08</td>
<td></td>
</tr>
<tr>
<td>0</td>
<td>61.39±5.89</td>
<td></td>
</tr>
<tr>
<td><strong>Weight</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>55.07±7.46</td>
<td>0.06</td>
</tr>
<tr>
<td>2</td>
<td>55.09±8.64</td>
<td></td>
</tr>
<tr>
<td>0</td>
<td>21.15±1.35</td>
<td></td>
</tr>
<tr>
<td><strong>BMI</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>20.50±1.86</td>
<td>0.04</td>
</tr>
<tr>
<td>2</td>
<td>19.31±2.17</td>
<td></td>
</tr>
<tr>
<td>0</td>
<td>74.72±4.62</td>
<td></td>
</tr>
<tr>
<td><strong>Waist</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>71.54±5.29</td>
<td>0.27</td>
</tr>
<tr>
<td>2</td>
<td>71.33±6.39</td>
<td></td>
</tr>
</tbody>
</table>

*Vo2Max, 0: ≤ 38.18 , 1: value >38.18 and ≤38.66 and 2: > 38.66.

**ANOVA was used. Statistical significance set at p-value less than 0.05.
Table XVII: Relationships between Cardio respiratory fitness (VO2 Max) in the sample (n=59) and Anthropometric characteristics.

<table>
<thead>
<tr>
<th></th>
<th>Performance (vo2 Max)*</th>
<th>p-value**</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hip</td>
<td>0</td>
<td>92.52±4.25</td>
</tr>
<tr>
<td></td>
<td>1</td>
<td>89.90±5.61</td>
</tr>
<tr>
<td></td>
<td>2</td>
<td>89.25±6.90</td>
</tr>
<tr>
<td></td>
<td>0</td>
<td>80±0.02</td>
</tr>
<tr>
<td>WII Ratio</td>
<td>1</td>
<td>.79±0.02</td>
</tr>
<tr>
<td></td>
<td>2</td>
<td>79±0.03</td>
</tr>
<tr>
<td></td>
<td>0</td>
<td>4.85±0.86</td>
</tr>
<tr>
<td>Skin fold Biceps</td>
<td>1</td>
<td>5.64±2.26</td>
</tr>
<tr>
<td></td>
<td>2</td>
<td>3.70±1.12</td>
</tr>
<tr>
<td></td>
<td>0</td>
<td>8.11±2.60</td>
</tr>
<tr>
<td>Skin fold Triceps</td>
<td>1</td>
<td>8.19±2.58</td>
</tr>
<tr>
<td></td>
<td>2</td>
<td>6.91±2.03</td>
</tr>
<tr>
<td></td>
<td>0</td>
<td>8.65±1.23</td>
</tr>
<tr>
<td>Skin fold Sub scapular</td>
<td>1</td>
<td>7.97±1.19</td>
</tr>
<tr>
<td></td>
<td>2</td>
<td>7.44±2.17</td>
</tr>
<tr>
<td></td>
<td>0</td>
<td>8.66±3.50</td>
</tr>
<tr>
<td>Skin fold Suprailiac</td>
<td>1</td>
<td>7.66±2.88</td>
</tr>
<tr>
<td></td>
<td>2</td>
<td>6.61±2.21</td>
</tr>
<tr>
<td></td>
<td>0</td>
<td>16.59±2.92</td>
</tr>
<tr>
<td>Fat Mass Percentage</td>
<td>1</td>
<td>17.03±2.50</td>
</tr>
<tr>
<td></td>
<td>2</td>
<td>14.55±2.18</td>
</tr>
<tr>
<td></td>
<td>0</td>
<td>2312.14±350.07</td>
</tr>
<tr>
<td>BMC</td>
<td>1</td>
<td>2.115±88429.40</td>
</tr>
<tr>
<td></td>
<td>2</td>
<td>221715±420.10</td>
</tr>
<tr>
<td></td>
<td>0</td>
<td>1.15±0.10</td>
</tr>
<tr>
<td>BMD</td>
<td>1</td>
<td>1.15±0.11</td>
</tr>
<tr>
<td></td>
<td>2</td>
<td>1.14±0.10</td>
</tr>
</tbody>
</table>

*ANOVA was used. Statistical significance set at p-value less than 0.05
**VO2Max, 0: ≤38.18, 1: value >38.18 and ≤38.66 and 2: >38.66.
Table XVIII: Relationships between Cardio respiratory fitness (VO2 Max) in the sample (n=59) and Biochemical parameters.

<table>
<thead>
<tr>
<th></th>
<th>Performance (vo2 Max)</th>
<th>p-value**</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>0</td>
<td>4.64±0.84</td>
</tr>
<tr>
<td>Glucose</td>
<td>1</td>
<td>4.92±0.49</td>
</tr>
<tr>
<td></td>
<td>2</td>
<td>4.42±0.35</td>
</tr>
<tr>
<td></td>
<td>0</td>
<td>4.73±1.60</td>
</tr>
<tr>
<td>WBC</td>
<td>1</td>
<td>5.31±1.43</td>
</tr>
<tr>
<td></td>
<td>2</td>
<td>5.86±1.36</td>
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<tr>
<td></td>
<td>0</td>
<td>5.21±0.37</td>
</tr>
<tr>
<td>RBC</td>
<td>1</td>
<td>5.28±0.53</td>
</tr>
<tr>
<td></td>
<td>2</td>
<td>5.21±0.33</td>
</tr>
<tr>
<td></td>
<td>0</td>
<td>142.20±6.01</td>
</tr>
<tr>
<td>Hgb</td>
<td>1</td>
<td>137.80±9.62</td>
</tr>
<tr>
<td></td>
<td>2</td>
<td>140.80±9.46</td>
</tr>
<tr>
<td></td>
<td>0</td>
<td>.42±0.01</td>
</tr>
<tr>
<td>Het</td>
<td>1</td>
<td>.42±0.02</td>
</tr>
<tr>
<td></td>
<td>2</td>
<td>.42±0.02</td>
</tr>
<tr>
<td></td>
<td>0</td>
<td>82.26±5.83</td>
</tr>
<tr>
<td>MCV</td>
<td>1</td>
<td>80.58±6.07</td>
</tr>
<tr>
<td></td>
<td>2</td>
<td>81.63±4.04</td>
</tr>
<tr>
<td></td>
<td>0</td>
<td>27.36±1.99</td>
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<tr>
<td>MCH</td>
<td>1</td>
<td>26.30±2.85</td>
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<tr>
<td></td>
<td>2</td>
<td>27.06±1.59</td>
</tr>
</tbody>
</table>

*VO2Max, 0: ≤ 38.18, 1: value >38.18 and ≤38.66 and 2: > 38.66.

**ANOVA was used, Statistical significance set at p-value less than 0.05
Table XVIII: Relationships between Cardio respiratory fitness (VO2 Max ) in the sample (n=59) and Biochemical parameters.

<table>
<thead>
<tr>
<th></th>
<th>Performance (vo2 Max)*</th>
<th>p-value**</th>
</tr>
</thead>
<tbody>
<tr>
<td>MCHC</td>
<td>1</td>
<td>325.60±12.73</td>
</tr>
<tr>
<td></td>
<td>2</td>
<td>331.60±6.83</td>
</tr>
<tr>
<td></td>
<td>0</td>
<td>253.20±35.28</td>
</tr>
<tr>
<td>Platelet</td>
<td>1</td>
<td>291.40±55.76</td>
</tr>
<tr>
<td></td>
<td>2</td>
<td>282.20±75.23</td>
</tr>
<tr>
<td></td>
<td>0</td>
<td>12.30±0.500</td>
</tr>
<tr>
<td>RDW</td>
<td>1</td>
<td>14.26±4.94</td>
</tr>
<tr>
<td></td>
<td>2</td>
<td>12.65±0.95</td>
</tr>
<tr>
<td></td>
<td>0</td>
<td>6.60±</td>
</tr>
<tr>
<td>MPV</td>
<td>1</td>
<td>6.98±0.55</td>
</tr>
<tr>
<td></td>
<td>2</td>
<td>7.22±1.28</td>
</tr>
</tbody>
</table>

*Vo2Max, 0: ≤ 38.18 , 1: value >38.18 and ≤38.66 and 2 :> 38.66.  
**ANOVA was used. Statistical significance set at p-value less than 0.05

Table XIX: Relationships between Usual consumption of the different food groups in the sample (n=59) and Cardio respiratory fitness (VO2 Max ).

<table>
<thead>
<tr>
<th></th>
<th>Meat</th>
<th>P-</th>
<th>Snack</th>
<th>P-</th>
<th>Cereal</th>
<th>p-</th>
</tr>
</thead>
<tbody>
<tr>
<td>VO2 Max</td>
<td>0</td>
<td>37.89±1.45</td>
<td>0.29</td>
<td>38.04±1.00</td>
<td>0.29</td>
<td>38.40±1.44</td>
</tr>
<tr>
<td></td>
<td>1</td>
<td>38.83±1.43</td>
<td></td>
<td>38.95±1.24</td>
<td></td>
<td>38.62±1.44</td>
</tr>
<tr>
<td></td>
<td>2</td>
<td>38.63±1.29</td>
<td></td>
<td>38.53±1.81</td>
<td></td>
<td>38.76±1.62</td>
</tr>
</tbody>
</table>

*ANOVA was used. Statistical significance set at p-value less than 0.05  
**Meat group, 0: ≤ 4, 1: value >4 and ≤6 and 2 :> 6.  
**Cereal group, 0: ≤ 12, 1: value >12 and ≤15 and 2 :> 15.  
**Milk group, 0: ≤ 8, 1: value >8and ≤11and 2 :> 11.  
**Fruit group, 0: ≤ 8, 1: value >8and ≤11and 2 :> 11.  
**Beverage group, 0: ≤ 7, 1: value >7 and ≤8 and 2 :> 8.  
**Snack group, 0: ≤ 5, 1: value >5 and ≤8 and 2 :> 8.
Table XIX: Relationships between Usual consumption of the different food groups in the sample (n=59) and Cardio respiratory fitness (VO2 Max).

<table>
<thead>
<tr>
<th>Food Group</th>
<th>P-value*</th>
<th>Fruit &amp; veg. group*</th>
<th>P-value*</th>
<th>Beverage group*</th>
<th>P-value*</th>
</tr>
</thead>
<tbody>
<tr>
<td>Milk Group**</td>
<td>0 38.73±1.33</td>
<td>38.64±1.33</td>
<td>39.05±1.66</td>
<td></td>
<td></td>
</tr>
<tr>
<td>VO2Max</td>
<td>1 38.25±1.46</td>
<td>38.34±0.79</td>
<td>0.73</td>
<td>0.81</td>
<td>38.54±1.19</td>
</tr>
<tr>
<td>2 38.56±1.63</td>
<td>38.75±1.67</td>
<td>38.05±1.23</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*ANOVA was used. Statistical significance set at p-value less than 0.05
**Meat group, 0: ≤ 4, 1: value >4 and ≤6 and 2: >6.
**Cereal group, 0: ≤ 12, 1: value >12 and ≤15 and 2: >15.
**Milkgroup, 0: ≤ 8, 1: value >8 and ≤11 and 2: >11.
**Fruit group, 0: ≤ 8, 1: value >8 and ≤11 and 2: >11.
**Beverage group, 0: ≤ 8, 1: value >8 and ≤11 and 2: >8.
**Snack group, 0: ≤ 5, 1: value >5 and ≤8 and 2: >8.

Table XX: Relationships between dietary knowledge, attitude, self-efficacy and biochemistry (n=22).

<table>
<thead>
<tr>
<th>Dietary knowledge**</th>
<th>Glucose</th>
<th>WBC</th>
<th>RBC</th>
<th>p-value*</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>4.73 ± 0.58</td>
<td>5.39 ± 0.91</td>
<td>5.43 ± 0.42</td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>4.60 ± 0.45</td>
<td>5.29 ± 1.09</td>
<td>5.25 ± 0.36</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>4.31 ± 0.74</td>
<td>5.18 ± 0.69</td>
<td>5.16 ± 0.33</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Dietary attitude****</th>
<th>Glucose</th>
<th>WBC</th>
<th>RBC</th>
<th>p-value*</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>4.40 ± 0.83</td>
<td>5.18 ± 0.69</td>
<td>5.41 ± 0.33</td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>4.63 ± 0.40</td>
<td>5.69 ± 1.49</td>
<td>5.33 ± 0.41</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>4.30 ± 0.47</td>
<td>5.49 ± 1.77</td>
<td>5.09 ± 0.37</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Dietary self-efficiency *****</th>
<th>Glucose</th>
<th>WBC</th>
<th>RBC</th>
<th>p-value*</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>4.23 ± 0.48</td>
<td>5.67 ± 1.69</td>
<td>5.20 ± 0.37</td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>4.73 ± 0.57</td>
<td>5.16 ± 1.29</td>
<td>5.29 ± 0.46</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>4.35 ± 0.68</td>
<td>5.83 ± 0.77</td>
<td>5.44 ± 0.23</td>
<td></td>
</tr>
</tbody>
</table>

*ANOVA was used. Statistical significance set at p-value less than 0.05.
**Dietary knowledge, 0: ≤ 74, 1: value >74 and ≤84 and 2: >84.
***Dietary attitude, 0: ≤ 20, 1: value >20 and ≤22 and 2: >22.
Table XX: Relationships between dietary knowledge, attitude, self-efficacy and biochemistry (n= 22).

<table>
<thead>
<tr>
<th>Dietary Knowledge**</th>
<th>Hgb</th>
<th>P-value*</th>
<th>Hct</th>
<th>P-value*</th>
<th>MCV</th>
<th>P-value*</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>147.83 ± 10.41</td>
<td>0.44 ± 0.02</td>
<td>82.43 ± 2.13</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>141.33 ± 9.50</td>
<td>0.42 ± 0.02</td>
<td>81.30 ± 5.32</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>144.28 ± 8.67</td>
<td>0.42 ± 0.01</td>
<td>82.87 ± 3.73</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Dietary attitude **</td>
<td>146.50 ± 8.87</td>
<td>0.43 ± 0.02</td>
<td>80.71 ± 3.39</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>142.76 ± 11.58</td>
<td>0.43 ± 0.03</td>
<td>81.13 ± 4.79</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>140.66 ± 9.56</td>
<td>0.42 ± 0.01</td>
<td>83.90 ± 5.07</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*ANOVA was used. Statistical significance set at p-value less than 0.05

**Dietary knowledge, 0: ≤ 74, 1: value >74 and ≤84 and 2: > 84.

***Dietary attitude, 0: ≤ 20, 1: value >20 and ≤22 and 2: > 22.
Table XX: Relationships between dietary knowledge, attitude, self-efficacy and biochemistry (n= 22).

<table>
<thead>
<tr>
<th>Dietary Knowledge**</th>
<th>MCH</th>
<th>p-value*</th>
<th>MCHC</th>
<th>p-value*</th>
<th>Platelet</th>
<th>p-value*</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>27.28</td>
<td>± 1.29</td>
<td>330.66</td>
<td>± 9.72</td>
<td>297.00</td>
<td>± 65.52</td>
</tr>
<tr>
<td>1</td>
<td>26.94</td>
<td>± 2.05</td>
<td>331.44</td>
<td>± 7.55</td>
<td>274.11</td>
<td>± 80.68</td>
</tr>
<tr>
<td>2</td>
<td>28.05</td>
<td>± 1.85</td>
<td>338.57</td>
<td>± 9.79</td>
<td>277.85</td>
<td>± 52.06</td>
</tr>
<tr>
<td>Dietary attitude **</td>
<td>0</td>
<td>27.13</td>
<td>± 1.48</td>
<td>336.16</td>
<td>± 5.63</td>
<td>258.66</td>
</tr>
<tr>
<td></td>
<td>1</td>
<td>26.84</td>
<td>± 2.14</td>
<td>330.53</td>
<td>± 9.70</td>
<td>303.76</td>
</tr>
<tr>
<td></td>
<td>2</td>
<td>27.65</td>
<td>± 2.43</td>
<td>329.33</td>
<td>± 12.12</td>
<td>247.83</td>
</tr>
<tr>
<td>Dietary self-</td>
<td>0</td>
<td>27.43</td>
<td>± 1.62</td>
<td>334.10</td>
<td>± 10.24</td>
<td>284.80</td>
</tr>
<tr>
<td>efficiency ***</td>
<td>1</td>
<td>27.54</td>
<td>± 1.74</td>
<td>331.90</td>
<td>± 8.73</td>
<td>270.50</td>
</tr>
<tr>
<td></td>
<td>2</td>
<td>26.30</td>
<td>± 3.08</td>
<td>331.33</td>
<td>± 15.47</td>
<td>280.16</td>
</tr>
</tbody>
</table>

*ANOVA was used. Statistical significance set at p-value less than 0.05

**Dietary knowledge, 0: ≤ 74, 1: value >74 and ≤84 and 2: > 84.

***Dietary attitude, 0: ≤ 20, 1: value >20 and ≤22 and 2: > 22.
Table XX: Relationships between dietary knowledge, attitude, self-efficacy and biochemistry (n= 22).

<table>
<thead>
<tr>
<th></th>
<th>p-value*</th>
<th>RDW</th>
<th>MPV</th>
<th>p-value*</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Dietary Knowledge**</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>0</td>
<td>11.50 ± 0.24</td>
<td>6.80 ± 1.10</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>12.54 ± 1.01</td>
<td>6.74 ± 1.33</td>
<td>0.99</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>12.00 ± 0.53</td>
<td>6.75 ± 1.20</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Dietary attitude **</td>
<td></td>
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<tr>
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<td>6.41 ± 1.39</td>
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<tr>
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<td>6.82 ± 1.06</td>
<td>0.60</td>
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<tr>
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<td>12.95 ± 1.47</td>
<td>7.05 ± 0.81</td>
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<tr>
<td>Dietary self-efficacy</td>
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<td></td>
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*ANOVA was used. Statistical significance set at p-value less than 0.05

**Dietary knowledge, 0: ≤ 74, 1: value >74 and ≤ 84 and 2: > 84.

***Dietary attitude, 0: ≤ 20, 1: value >20 and ≤22 and 2: > 22.

****Dietary self-efficacy, 0: ≤ 17, 1: value >17 and ≤20 and 2: > 20.
3.15 The Exploration of Possible Associations between Dietary Knowledge, Attitude, Self Efficacy, BMD, BMC, BMI and Fat Mass Percentage

Table XXI refer to the relationships between dietary knowledge, attitude and self-efficacy with BMD (bone mineral density), BMC (bone mineral concentration), BMI (body mass index) and Fat mass percentage. There was negative correlation between them.
Table XXI: Relationships between dietary knowledge (n=51), attitude (n=53), self-efficacy (n=57) and BMD (bone mineral density), BMC (bone mineral concentration), BMI (body mass index) and Fat mass percentage (n = 22).

<table>
<thead>
<tr>
<th>Dietary Knowledge**</th>
<th>BMD (g/cm²)</th>
<th>p-val</th>
<th>BMC (g)</th>
<th>p-val</th>
<th>BMD (kg/m²)</th>
<th>p-val</th>
<th>Fat mass percentage</th>
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<td>20.82±2</td>
<td>55</td>
<td>17.22±3.30</td>
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<tr>
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<td>57</td>
<td>2096.08±</td>
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<td>19.87±2</td>
<td>18</td>
<td>16.18±1.42</td>
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<th>p-val</th>
<th>BMC (g)</th>
<th>p-val</th>
<th>BMD (kg/m²)</th>
<th>p-val</th>
<th>Fat mass percentage</th>
<th>p-val</th>
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<td>19.82±2</td>
<td>26</td>
<td>16.43±3.40</td>
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</table>

<table>
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<th>p-val</th>
<th>BMC (g)</th>
<th>p-val</th>
<th>BMD (kg/m²)</th>
<th>p-val</th>
<th>Fat mass percentage</th>
<th>p-val</th>
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</tbody>
</table>

*ANOVA was used. Statistical significance set at p-value less than 0.05

**Dietary knowledge, 0: ≤ 74, 1: value >74 and ≤84 and 2: > 84.

***Dietary attitude, 0: ≤ 20, 1: value >20 and ≤22 and 2: > 22.

****Dietary self-efficacy, 0: ≤ 17, 1: value >17 and ≤20 and 2: > 20.
CHAPTER 4: DISCUSSION

This work was aimed at studying the relationships between dietary habits and practices, health and cardio respiratory fitness in young athletes in the United Arab Emirates.

This work is providing one of the first detailed and complete pictures of the current nutritional status, health status and physical performance in young athletes in one of the GCC country.

It has been shown that, in spite of a quite good nutritional knowledge, the young athletes who were studied here had some inadequate dietary practices. In addition, a low cardio respiratory fitness has been observed which may alter their physical performance. Sport anemia has been detected in a third of the young athletes.

Interestingly, the family environment has been identified as one of the factor influencing the nutritional knowledge and habits of these young athletes.

The study of dietary practices revealed some key behaviors likely to affect health and performance of the young athletes.

It is well-admitted that unless an individual is deficient in a given nutrient, supplementation with that nutrient does not have a major effect on performance (Reilly, 1997). In our sample, almost 50% of the athletes reported to take vitamin supplements over the last year.

Since we did not measure any vitamin levels in the athletes, it remains difficult to conclude if this supplementation was justified or not. Nonetheless, according to
other studies which were interested in dietary practices among athletes and nutritional supervision at the club, it has been suggested that coaches and trainers often assume responsibility for providing their athletes with nutrition education (Briefel, 2009; Li M et al., 2010; Venter I et al., 2010).

This means that, most of the time, athletes receive nutritional recommendations from persons who do not have any nutritional background. This issue was approved in study conducted in Oman show that athletes have fair nutritional knowledge and they mainly take their concept from many sources that are not dieticians (Waley, 2013) There were also study done UAE conclude that almost all helpers/instructors for Ice Hockey were untrained and inexperienced in coaching, mostly father of the hockey school players (Taruvuori, 2011).

While the concepts of sports nutrition may be of benefit to all athletes, given the cost and other resources required, it is almost impossible to recruit trained professionals such as dieticians and nutritionists to work with all athletes in the world. As a consequence, the role of knowledgeable coaches becomes important as they are in a position to positively influence eating behaviours (Hossen, 2013).

While the importance of pre and post meal event/training is well demonstrated, in our sample, it has been highlighted that almost 60% of the athletes were not taking any pre meal event/training and exactly half of the athletes consume their meal after training.

Whereas, the pre-event or pre-training meal serves two purposes; it keeps the athlete from feeling hungry before and during the exercise session, and it
maintains optimal levels of blood glucose for the exercising muscles, the meal before a sporting event is also important for performance as it prevents hunger and improves muscle recovery (Çotunga, 2005). The American Dietetic Association, Dieticians of Canada, and the American College of Sports Medicine confirm that physical activity, athletic performance, and recovery from exercise are enhanced by optimal nutrition. These organizations recommend appropriate selection of foods and fluids, timing of intake, and supplement choices for optimal health and exercise performance (Hossen, 2013).

The meat and meat products intake of the adolescent soccer players of this study was (5.93±2.28) 1-3 times per week which is among the highest levels of consumption observed in other studies. The 2008 YRBS in South Africa investigated the frequency of meat intake amongst male adolescents and found that 66.6% of the study population ate meat 4 or more times a week (Reddy et al., 2008). The QFFQ used in the study in Western Cape, South Africa investigated the intake of 5 different types of meat products which included high-fat red meat, low-fat red meat, sausage, hamburgers and meat stew. The majority of players ate each option 1-3 times a week. Interestingly, the most frequently type of meat consumed in our sample was processed meats, especially sausage which was consumed by 51.3% of players at least 1-3 times per week. Since the processed meat is recognized for its high content in saturated fat, trans fat and salt, which are related to high risk for obesity and other chronic diseases, this raises a nutritional concern for these young athletes.
In addition the amount of protein of this type of meat is usually lower that red or white meat which again could be an issue for these young athletes with high protein needs due to both growth and training.

Regarding fruits and vegetables which consumption is recommended to be at least 5 a day, in our sample, majority of the athletes reported frequency of consumption of less than 1 per day. Fruits and vegetables are particularly recommended for their micronutrients, necessary to optimize biological functions including metabolism, a significant component of the physical performance.

Hydration is a key point for health and physical performance. Athletes, especially, are expected to sweat a lot during exercise and fluid must be replaced. The quality of fluid replacement plays a role. The benefits of water and some sport drinks rich in micronutrients are admitted and they are usually well recommended for athletes. But in our population, the most frequently consumed beverages were rather carbonated drinks. Energy drinks, which are still under debate for their potential benefit on physical performance (Australian Institute of Sport, 2009) (American College of Sports Medicine, 2007) (Kristiansen, 2005; Slater, 2003) but are accused to exert dangerous effects on cardiovascular system due to their high caffeine content, were consumed by almost 30% of the athletes 1 to 2 times a week. These remains lower compared to other similar populations like South Africa where more than 70% of the young soccer players reported to consume energy 1 to 3 times per week, at least.
More than 30% of our sample reported to consume sport drink 1 to 2 times a week.

The US Soccer Federation suggested that sports drinks are a better choice than water and carbonated and caffeine beverages should be avoided. Nonetheless, sports drinks provide lots of additional energy which may be converted to fat if not utilised and will contribute to the already high fat stores (Cheng et al., 2010). A study by Nichols et al. (2005) found that despite being aware of the recommendations, players did not always adhere to the advice or were unsure of the specific fluid amounts they were meant to consume (Shirreffs, 2001).

The soccer club should therefore not only ensure that players are well educated regarding the importance of hydration status, they should also provide specific, practical advice to ensure it is followed through. Clubs could even further assist by providing a specific drinking schedule for each player to utilise as a guide before, during and after training sessions and matches. It is also important for the parents as well as the coaches to be educated about the importance of hydration, the quantities which should be consumed and the preferred type of fluid to consume. They can play an important role in encouraging, assisting and allowing the players to adhere to the advice.

A very low consumption of dairy products has been observed in our population.

Indeed, around 35% of the athletes reported to consume cheese, Labna, ice cream and whole milk at least 1 to 2 times a week and only a quarter reported to consume yogurt 1 to 2 times a week. This is even less than young south African soccer players half of them are consuming milk on 4 or more days of the week. Knowing
that dairy products, in youth, are advised to be at least 3 servings a day. the athletes of our sample are far for satisfying the recommendations.

This put them potentially at risk for growth impairment, alteration of their bone health and decrease of their physical performance. Bone health is crucial for athletes, especially young athletes, due to growth period and risk of fractures. Even though, increasing intake of milk in physically active adolescent boys has been demonstrated to potentially enhance bone health. (Jeff S et al., 2003), we did found significant relationship between dairy products consumption and bone health and there were no significant relation between dairy products and cardio respiratory fitness.

Interestingly, the most frequently consumed type of carbohydrates was simple sugars, as shown by the highest level of consumption of food products rich in simple sugars like sweets, pastries compared to other complex carbohydrate rich products like rice and pasta or bread.

Since carbohydrate is the major source of energy during exercise and may help in delay fatigue, physically active adolescents, as in the present study population, will require additional carbohydrates (Mahan et al., 2012).

Petrie et al. (2007) recommended that the carbohydrates intake for adolescent athletes should be 50% of Total energy intake(Petrie et al., 2004), the importance of carbohydrates as a substrate in high intensity exercise is well recognised even though its benefits specifically in this population remain unclear (Petrie et al.,
This is also in line with the South African FBDG which advises that starch should be the basis of all meals (Wolmarans et al., 2001).

In our study, none of the food group frequency of consumption was related to neither anthropometry cardio respiratory fitness parameters.

Even though, some other studies, most often conducted in non-athletic populations, identified some relationships between food habits and anthropometric parameters, i.e. Body mass index was found to be positively associated with glycemic index. A higher intake of fruits, vegetables, and whole grains was recently confirmed to be associated with smaller gains in body mass index (BMI) and waist circumference (Newby et al., 2003; X Guo et al., 2004), and in the Third National Health and Nutrition Examination Survey (NHANES III), in adolescent boys and girls, central body fat measures were inversely associated with mean dairy and grain intakes. (Bradlee et al., 2004).

The investigation, in our population, of the associations between food habits and practices and anthropometry demonstrated a significant relation (p <0.05) between snack consumption and weight and between fruit and vegetable consumption and skin fold thickness (biceps). This can be related to the method used to report food consumption.

It is not uncommon for athletes to have misinformed beliefs about their nutritional needs (Quatromoni, 2008), but in terms of nutritional knowledge, in the presented study the level was quite good. This may be related to either to the school
environment or to the family or both. We do not have enough data related to the information provided by the school, the staff in terms of nutrition.

Previous studies have found that coaches and trainers often assume responsibility for providing their athletes with nutrition education (Briefel et al., 2009; Li et al., 2010; Venter et al., 2010). While the concepts of sports nutrition may be of benefit to all athletes, given the cost and other resources required, it is almost impossible to recruit trained professionals such as dietitians and nutritionists to work with all athletes in the world. As a consequence, the role of knowledgeable coaches becomes important as they are in a position to positively influence eating behaviors. (Jessica, 2012).

Regarding the potential role of the family, it was interestingly observed that when mother’s educational level was increasing, athletes were consuming more frequently meat products. Similar relationship, but statistically borderline was detected with score of knowledge. This suggests that there is a potential role of the mother’s education on the dietary knowledge and practice of the child. This has been frequently observed in other studies highlighting in the same way the string impact of the family environment on children’s behaviours and body compositions. (Mushtaq et al., 2011; Jessica, 2012) But here, the relationship with meat products consumption is positive, meaning that a greater educational level of the mother is promoting high consumption of meat products. Considering the previous observation on type of meat consumed by the adolescents of this study, this would mean that educated mothers are encouraging consumption of processed meat products. This can be related to cultural issues. Indeed, in the United Arab
Emirates, it is frequent and well-seen to have meals outside home of to eat food delivered at home. This means that the consumption of fast food meals, rich in processed products, may be high in this population.

Even though, relationships between dietary practices, educational level of the parents and weight status in adolescents have been identified in some works (Mushtaq et al., 2011; Nelson et al., 2009), here, no significant relationship has been observed between educational level of the mother and weight status of the adolescent or as mentioned earlier between meat products consumption and weight status.

The nutritional attitude in our sample was assessed in a “What would you do?” series of questions. The result is much more higher compared to other studies. In a study done in Clemson university, mean score for the attitude items was 5.89 (SD=1.67) (58.9%). The mean score for females was 6.19 (SD= 1.53) (61.9%) and for males was 5.60 (SD= 1.76) (56.0%). While females had higher mean scores and both the highest and lowest scores, males had a wider range of variability within their responses (Dunning, 2010), and which is almost the same for this presented study.

The quite good attitude score in our sample indicates that many of the participants are able to identify a healthy dietary choice and probably understand the relationship between good eating habits and good health.

The self-efficacy which is a key component in the evaluation of the motivation and ability of individuals to change their dietary behaviors to make them
healthier, was evaluated in a “How sure are you?” series of questions. Most of the athletes did not reach the median score, indicating a poor ability to change.

Overall, the young athletes studied here seem to have a quite good conception of what is a healthy diet but, are not able to convert this knowledge into practice and even show a limited ability to change. This is not surprising since it has been well demonstrated that the major challenge for eating well comes from applying (rather than possessing) nutrition knowledge (Adelzadeh, 2004; Bernadot et al., 2004; Wilk et al., 2002) and there is often a gap between knowledge and practice. It is still not well demonstrated if knowledge could be automatically converted into practice.

Regarding the health status, some abnormalities were identified. In terms of BMI; the results are contradictory when comparing the mean BMI in our population to other populations at the same age and with the same gender (Hoosen, 2013). Rico-Sanz et al., (1998), recommended a mean body weight and percentage body fat for junior soccer players (14-18 years) to be 67.2 kg (62.5-72.3 kg) and 10.1% (7.6-12.1%), respectively (Rico-Sanz, 1998). The results of the present study fall without this recommended range. It remains difficult to compare with similar other groups since results are different from a study to another one. It is interesting to note that a study performed on French adolescent soccer players in (2002) by Leblanc et al., demonstrated a lower mean body weight than what was recommendation by Rico-Sanz et al. (1998) which is less than the weight for this presented study (Ruiz et al., 2005; Gutierrez et al., 2005). This can be explained by the variety of tools used to assess BMI and body composition.
The BMC and BMD results that were conducted from DEXA show they were in mean of (2247.64±401.76) (g), (1.17±0.15) (g/cm²) respectively by comparing this result to a study done in Lebanon to establish normative data for BMD in healthy Lebanese children and adolescents. Three hundred sixty-three healthy children aged 10 to 17 years (mean±SD: 13.1±2.0) were studied. BMD, bone mineral content (BMC), and lean mass were measured by dual-energy X-ray absorptiometry (DXA). Mean BMC values in the study group were significantly lower (P<0.01) than Western normative values, with Z scores ranging between -0.2 and -1.1.

By comparing this study to the establish paper from the previous study (Appendix 13) its showed that all the athletes from this study belonged to the normal range (Arabi A, 2004).

In our population, biochemistry data revealed a high prevalence of anaemia among these young athletes, concerning a third of the group. It is well-known that athletes are more at risk for anaemia, especially iron anaemia due to iron loss of red blood cell destruction, sweat, gastrointestinal blood loss and also more at risk for B vitamins or folate anaemia. (Reilly, 1997; Chatard, 1999; American College of Sports Medicine, American , Dietetic Association, and Dietitians of Canada, 2009). Iron, B vitamins and folate are playing crucial biological functions in human body like oxygen transportation and inadequate body levels may affect physical performance of the athletes. (Maughan, 1997; Reilly, 1997). Although short-term marginal deficiencies of B vitamins have not been observed to impact performance, severe deficiency of vitamin B12, folate, or both may result in
anemia and reduce endurance performance (American College of Sports Medicine, American Dietetic Association, and Dietitians of Canada, 2009).

A condition referred to as “sports anaemia” has been reported in athletes. Sports anaemia is characterized by a lower Hematocrit and a global lower red blood cell count profile. Sports anaemia is interpreted in different ways.

They have been suggested to be directed related to exercise and training effects and false anaemia. They would be in fact a beneficial adaptation to aerobic exercise, caused by an expanded plasma volume that dilutes red blood cells, increased red blood cells destruction and a decreased concentration of haemoglobin (the iron-rich part of red blood cells). But, in our population, the red blood cells count was within the normal range, suggesting that athletes might not be affected by such a false anaemia. True anaemia related to impaired iron store is also possible in athletes. This seems to be the case in our population since lower MCV, MCHC and haemoglobin have been observed and supporting an impaired haemoglobin synthesis. This iron anaemia could be hence the result of disequilibrium between iron use, iron destruction and iron store repletion primarily depending on dietary intake of iron.

But, in our study, no significant relationship was observed between iron anemia-related parameters like MCV, Hemoglobin, RDCW and consumption of major dietary sources of iron like meat, suggesting an adequate iron intake.
Interestingly, another hypothesis related to sports anemia has been suggested. It could be caused by an inadequate protein intake particularly in athletes in growth or at the early stage of training. During growth, adolescent athletes are expanding their blood volume as well as growing rapidly which may contribute to red blood cells dilution and in the same time reinforce the competition between the protein demand to form additional muscle tissue and to form additional hemoglobin, thus causing the anemia. (Mairbaurl, 2013; Eichner, 1992) No significant relationship between anemia-related parameters and consumption of main dietary sources of protein like dairy products, meat and meat products was observed in our work.

Nonetheless, a significant relationship was found between cereal products and anemia-related parameters. Cereal products are considered as a quite good source of non heme iron and their low consumption could at least in part contribute to explain the iron anemia observed in our population.

Interestingly, where false anaemia does not seem to affect physical performance, but true anaemia does. (Mairbaurl, 2013). In our population, there was no relation between anaemia (Hct, Hgb, RDW level) and cardio respiration fitness.

Nonetheless, in the population the majority of athletes demonstrated limited cardio respiratory abilities. If no data are available in similar populations in the near gulf countries, the comparison with other countries in the world revealed a weaker result. In some other studies, 33% higher cardio respiratory fitness has been reported. (Pinaki et al., 2009) and on another hand there are studies that show the
athletes VO2 Max are below the result (Amra et al., 2009). In another study for athletes from Kuwait, the VO2 Max was higher than this study but also their age was little higher than our samples (Ghloun & Hajji, 2011).

Many factors can influence cardio respiratory fitness including diet, training and genetic. Genetic cannot be ignored to explain the differences between populations originated from different countries or regions of the world (Wilmore, 1982). But in our population the standard deviation of VO2 Max variable was tight, reflecting a similar level of cardio respiratory fitness in the group of athletes. The weak cardio respiratory fitness in this group may be more related to their diet and training. Nonetheless, the investigation of the relationships between cardio respiratory fitness and dietary habits, practices and knowledge did not show any significant relationships (Spronk et al., 2013; Meyer et al., 2007; Jeukendrup et al., 2011; Mairbäurl, 2013; Eichner, 1992; Ferrar et al., 2014).

Diet and training are not the only factors likely to impact on cardio respiratory fitness. It can also be affected by body composition. And, a positive association of cardio respiratory fitness with height (p-value = 0.04), BMI (p-value = 0.04), skin fold thickness, especially biceps, (p-value = 0.01) and fat mass percentage (p-value = 0.03) were identified.

Some studies revealed that height can play a significant role in contributing to success in some sports by offering certain natural advantages. For those sports where this could be a contributing factor, height can be useful (although certainly not in all cases, and is not the only factor) since in general, it affects the average
between muscle volume and bones towards greater speed of movement and power, depending on overall build, fitness and individual ability. In addition, a strong contribution of body composition to the training-induced adaptations, and a possible influence of body composition on various physiological parameters resulting in an enhanced Maximal work performance were emphasized by Venkata et al. (2004).

Even though it is usually emphasized to ensure an adequate body composition in order for athletes to maximize their performance (Hloosen, 2013), the results regarding the relationship between cardio respiratory fitness and body fat mass percentage remains contradictory (Wilmore, 1982; Jorge Mota, 2002; Högström et al., 2012; Goran et al., 2000).

If an impact of fat mass on movement ability and gravity cannot be denied, the contradictory results suggest that fat free mass could be more important in terms of impact on cardio respiratory fitness. This could be explained by the fact that fat free mass is directly related to blood volume and hence, oxygen transportation capacity.

This is confirmed by the fact that lots of researchers found a positive relationship between cardio respiratory fitness and bone health parameters (Wilmore, 1982). Unfortunately, in our sample, no significant relationship was observed between bone health and VO2 Max.
CHAPTER 5: Conclusion

This study is the first one to provide data on diet, health and cardio respiratory fitness among young athletes in the UAE and to study the relationships between these 3 sets of parameters.

A quite good dietary knowledge but limited healthy dietary practices and limited ability to change were observed, with a significant influence of the family environment. A high prevalence of anaemia and a low cardio respiratory fitness were also demonstrated.

Even though no significant associations were found between the dietary habits and health or cardio respiratory fitness, the potential impact of diet on these two sets of parameters is more than likely. For this reason, it is highly recommended to encourage and promote a healthy diet inside school for athletes, to discourage deviations like energy drinks over consumption, to focus on hydration, adapted intakes of the different nutrients, and use of supplements. The meal sequence, including pre and post training/competition meals is also another crucial point to be emphasized. Indeed, this may alter drastically the physical performance.

An evaluation of the nutritional background and environment of the school of the athletes should be done in order to complete the pictures we described in this work with the school side component.

This would enable to then plan the corresponding relevant changes to promote healthy diet inside the school.
From the research perspective, in order to adapt diet and optimize performance without affecting global health, it would be interested to investigate more the origin of anaemia detected in these athletes, to better identify the role of adipose tissue in cardio respiratory fitness level and better understand the underlying mechanisms.
CHAPTER 6: Recommendations for Further Research

The following recommendations for further study are warranted based on the data obtained and questions that surfaced throughout the course of the investigation. Future investigations should seek to select a larger sample size which reflects the larger population of athletes. Future research could include athletes from additional clubs.

1. A study examining the effects of nutrition seminars or lectures on the nutritional knowledge of student-athletes.

2. A study examining the differences between the general student population's nutritional knowledge to the student-athlete population.

3. Future investigations should find where student-athletes obtain the majority of their nutritional knowledge.

4. Future studies should consider the use of validated methods to determine dietary intake such as repeated 24-hour recall and weighed food diaries which are more accurate. The validity and accuracy of the QFFQ should be determined with the doubly labeled water technique and indirect calorimetry which are very accurate indicators of energy expenditure.

5. Alternative methods to determine body composition include underwater weighing and neutron activation analysis. The findings of this study is in agreement with recommendations and evidence of previous studies which state that in addition to weight and BMI, athletes should be classified with additional anthropometrical measurements such as skin folds and circumferences.
6. Dietetic professionals should use the findings of this study to implement targeted intervention for this population. By providing accurate and evidence-based data, they will help to ensure healthy adolescent soccer players with optimal nutritional status and development which will result in maximal training and playing performance. Providing education to the players as well as the coaches, bio kineticists and all involved staff about the importance of meeting, but not exceeding, energy, macronutrient, micronutrient and fluid requirements is imperative.
CHAPTER 7: Limitation

1) Lack of dietary data from national data for adolescent athletic.

2) Over and under report from some athletes.

3) The biochemical data (blood result) were collected from several laboratories.

4) There were no data in UAE regarding adolescent athlete and limited data found in the Middle East.
Figure 1: Flow chart of the research study

One hundred 13-18 years old athletes
Football Academy, Al Jazira Sports Club Abu Dhabi

Recruitment
59 athletes, 13-18 years old

Anthropometry and questionnaire
59 athletes

Bone Mineral Density
55 athletes

Biochemistry
27 athletes

Cardiorespiratory fitness
athletes 29

59 athletes

29
Bibliography:


Fjortoft, I., Pedersen, A. V., Sigmundsson, H., & Vereijken, B. (2011). Measuring physical fitness in children who are 5 to 12 years old with a test battery that is functional and easy to administer. Physical therapy, 91(7), 1087-1095.


**Study No.**

**SCREENING VISIT**

Subject’s Number: □ □

Initials: □ □

**Inclusion/Exclusion criteria**

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<th>Inclusion Criteria</th>
<th>YES</th>
<th>NO</th>
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<tbody>
<tr>
<td>Age between 13 and 18 years old.</td>
<td>□</td>
<td>□</td>
</tr>
<tr>
<td>Involved in serious training for not less than 1 year</td>
<td>□</td>
<td>□</td>
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<tr>
<td>Training in United Arab Emirates sporting clubs</td>
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<thead>
<tr>
<th>Exclusion Criteria</th>
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<tbody>
<tr>
<td>Eating disorders</td>
<td>□</td>
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<tr>
<td>Endocrinial disorders (thyroid disorders, etc.)</td>
<td>□</td>
<td>□</td>
</tr>
<tr>
<td>Intake of any hormones</td>
<td>□</td>
<td>□</td>
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<tr>
<td>Intake of cortisone containing drugs</td>
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If the inclusion criteria are satisfied and if it does not exist any exclusion criteria, the subject can be included in the study.

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<thead>
<tr>
<th>Study N</th>
<th>SCREENING VISIT</th>
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<tbody>
<tr>
<td>Subject’s Number:</td>
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<tr>
<td>Initials:</td>
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<tr>
<td>Date of the visit for assessment</td>
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<tr>
<td>Date of the visit for assessment</td>
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Certificat of obtaining the consent fourme

I informed the subject of the goal, the type and the predictable risks of this study.

The subject was informed that the results will be kept anonymous.

I certified having obtained the consent form before any procedure.

Date obtaining the consent form: 00 00 00

Name of the person taking consent:

Signature of the investigator
## نادي الجزيرة الرياضي

المدرسة الاكاديمية – أبوظبي

### Appendix 3

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<thead>
<tr>
<th>الرمز</th>
<th>المعلومات</th>
<th>الإدخال</th>
<th>اللاحقة</th>
<th>النهاية</th>
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المعلومات الغذائية

أ. وجبات الطعام

هل أكلت الوجبات اليومية والوجبات الخفيفة التالية وأين ؟ يرجى استخدام H للمنزل و S للمدرسة

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<th>إفطار</th>
<th>وجبة خفيفة 1</th>
<th>الغداء</th>
<th>وجبة خفيفة 2</th>
<th>العشاء</th>
<th>وجبة خفيفة 3</th>
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2. أين تأكل عندما تكون خارج المنزل (اختر التطيبات) وحدد كم مرة في الأسبوع؟

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<th>الـ</th>
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<th>هارديز</th>
<th>بيتزا هات</th>
<th>بيرس كريم</th>
<th>دونات</th>
<th>مطعام - م</th>
<th>مطعام - م</th>
<th>مطعام محلية</th>
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3. كم مرة تستهلك الطعام، الشرب، والوجبات الخفيفة في المدرسة؟

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<th>أبدا</th>
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إذا كنت تشتري ما هي الأنواع؟
التاريخ: 

الرقم الشخصي: 

استبيان التردد الغذائي 

كم مرة تستهلك المواد الغذائية من القائمة المقدمة؟ 

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<tr>
<th>وصف الغذاء</th>
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البقوليات، 
المكسرات 
ومنتجات الحبوب

رز

مكسوك (الرز واللحوم 
والكسرات والزبيب)

أنواع الخبز المختلفة 
جريش ربيان

المعكرونة مع صلصة 
البشاميل

خبيس (وجبة طحين 
القمح)
الهريس
المعرونة
انوسي
البوليات (الفون و
الحنس)
المكسرات (البراءة،
الكاجو، النوزو والفستق)
صالونه

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<td>والحضيرات</td>
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<td>Alimentary and Gastronomy</td>
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<td>Other fruits</td>
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<td>Other vegetables</td>
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<tbody>
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<td>Other drinks</td>
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<tr>
<td>Other beverages</td>
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<td>Other fruits</td>
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<td>k</td>
<td>4n</td>
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<td>(1)</td>
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</tbody>
</table>
المعلومات الغذائية

1. هل تتناول بعض من مكملات فيتامينات خلال السنة؟

   لا  نعم

2. هل تتناول بعض من مكملات البروتينات خلال السنة؟

   لا  نعم

3. هل تتناول عادة وجبة ما قبل التمرين؟

   لا  نعم

أدا كانت الإجابات على سؤال السابق ب نعم ، متى تتناول هذه الوجبة قبل التمرين؟

   0-30 دقيقة قبل التمرين  1-2 ساعة قبل التمرين  1-30 دقيقة قبل التمرين  أكثر من ساعتين قبل التمرين
ما هي الوجبة التي تتناولها؟

هل تتناول عادة وجبة بعد التمرين؟

لا □ نعم □

إذا كانت الإجابة على سؤال السابق ب نعم ، متى تتناول هذه الوجبة بعد التمرين؟

□ 30-60 دقيقة بعد التمرين
□ بعد التمرين 1-2 ساعة بعد التمرين
□ أكثر من ساعتين بعد التمرين

ما هي الوجبة التي تتناولها؟
الرمز الشخصي:

5. هل تتناول عادة وجبة قبل البدء بالمسابقة (المنافسة)?

- لا □
- نعم □

إذا كانت الإجابة على سؤال السابق ب نعم ، متى تتناول هذه الوجبة قبل البدء بالمسابقة (المنافسة)?

- 30-60 دقيقة قبل التمرين □
- 0-30 دقيقة قبل التمرين □
- أكثر من ساعتين قبل التمرين □
- 2-1 ساعة قبل التمرين □

ما هي الوجبة التي تتناولها؟

6. هل تتناول عادة وجبة بعد انتهاء المسابقة (المنافسة)?

- لا □
- نعم □

إذا كانت الإجابة على سؤال السابق ب نعم ، متى تتناول هذه الوجبة بعد المسابقة (المنافسة)?

- 30-60 دقيقة بعد التمرين □
- 0-30 دقيقة بعد التمرين □
ما هي الوجبة التي تتناولها؟

هل تعتقد أنه ينصح ب، اكل المزيد أو نفس المقدار أو أقل من هذه الأطعمة؟

<table>
<thead>
<tr>
<th></th>
<th>أكثر المقدار</th>
<th>نفس المقدار</th>
<th>أقل المقدار</th>
<th>لا</th>
</tr>
</thead>
<tbody>
<tr>
<td>الخضروات</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>الأطعمة السكريه</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(الحلويات)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>اللحم الاحمر</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(البقر. الخروف. الهمبرجر)</td>
<td></td>
<td></td>
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<td></td>
</tr>
<tr>
<td>الأطعمة الدسمه</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>الفواكه</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>الأطعمة الملحه</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
التاريخ: 

الرمز الشخصي: 

2. كم عدد الحصص الغذائية في اليوم الواحد من الخضروات والفواكه تعتقد أنه من الواجب تناولها؟

<table>
<thead>
<tr>
<th>≥5</th>
<th>4</th>
<th>3</th>
<th>2</th>
<th>≤1</th>
</tr>
</thead>
</table>

3. كم مرة تعتقد أنه يجب عليك أن تتناول الوجبات الغنية بالدهون أو المشروبات السكرية؟

- على حسب الرغبة
- مره واحدة، وليس كل يوم
- عدة مرات في اليوم

4. هل تعتقد أن هذه الأطعمة تحتوي على نسبة عالية أو قليلة من الدهون؟

<table>
<thead>
<tr>
<th></th>
<th>عالية</th>
<th>قليلة</th>
</tr>
</thead>
<tbody>
<tr>
<td>لا</td>
<td></td>
<td></td>
</tr>
<tr>
<td>دجاج مشوي</td>
<td></td>
<td></td>
</tr>
<tr>
<td>نزه مع زبده</td>
<td></td>
<td></td>
</tr>
<tr>
<td>معكرونة (بدون صلصة)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>بقوليات مطبوخة ب صلصة الطماطم</td>
<td></td>
<td></td>
</tr>
<tr>
<td>اللحم الأحمر</td>
<td></td>
<td></td>
</tr>
<tr>
<td>العسل</td>
<td>البيض</td>
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<td></td>
</tr>
<tr>
<td>المكسرات</td>
<td>الخبز</td>
<td></td>
</tr>
<tr>
<td>رقاق البطاطس</td>
<td>العقال</td>
<td></td>
</tr>
<tr>
<td>مفرشات</td>
<td>لبته</td>
<td></td>
</tr>
<tr>
<td>الزبدة النباتية</td>
<td>بينزا جبن</td>
<td></td>
</tr>
<tr>
<td>ارز (بدون صلصة)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

5. هل تعتقد أن هذه الأطعمة تحتوي على نسبة عالية أو قليلة من الملح |

<table>
<thead>
<tr>
<th>عالي</th>
<th>قليلة</th>
<th>لا</th>
</tr>
</thead>
<tbody>
<tr>
<td>اللبنه</td>
<td></td>
<td></td>
</tr>
<tr>
<td>جبن الشيدر</td>
<td></td>
<td></td>
</tr>
<tr>
<td>النقانق</td>
<td></td>
<td></td>
</tr>
<tr>
<td>المكرون أو</td>
<td></td>
<td></td>
</tr>
<tr>
<td>الأرز</td>
<td></td>
<td></td>
</tr>
<tr>
<td>اللحم الأحمر</td>
<td></td>
<td></td>
</tr>
<tr>
<td>الخضروات</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
الرمز الشخصي:

6. أي من المشروبات التالية تحتوي على أقل نسبة من السكريات؟

- بيبسي/كولا العادية

7. أي من التالي يحتوي على أقل نسبة من الدهون؟

- همبرجر مع جبن
- همبرجر مع طماطم وخيار ومخللات
- همبرجر مع بطاطس مقلي

8. تعد الدهون مهمة لعمل الجسم

- نعم
- لا

9. ما هو نوع السكر المناسب للرياضيين الشباب؟

- مكعبات السكر
- العسل
- الموز
10. خلال القيام با لنشاط الرياضي يعد الشعور بالعطل مؤثر كافي لحاجة جسمية للسوائل؟

لا اعلم □ نعم □

11. الغاء الوجبات يعد أمر مقبولًا في سبيل خسارة الوزن؟

لا □ نعم □

12. يعد الحليب ومشتقاته من الإغذية المهمة لنمو الجسم

لا اعلم □ نعم □

13. تتساوى الخضروات المجففة والمغلبة والطازجة في القيمة الغذائية للجسم

لا اعلم □ نعم □

14. يجب على الرياضيين تناول مجموعات متنوعة من المجموعة الغذائية من يوم إلى آخر؟

لا اعلم □ نعم □

15. نوعية الطعام التي يتناولها الرياضي تأثر علي ادائه الرياضي؟

لا اعلم □ نعم □
الرمز الشخصي:

ماذا ستفعل؟

1. ما هو الاختيار الامثل لوجبه خفيفه صحية؟
   - رقائق البطاطس
   - لوح الشكولاتة
   - دونا
   - لوح من الحبوب الكاملة

   ماذا ستفعل؟

2. تتناول ذرة بدون زبدة
   - تتناول ذرة مع زبدة

3. ما هو الاختيار الامثل للفطيرة الصحية؟
   - شريحتين من الخبز مع جبن الشيدر وطماطم وخيار
   - شريحتين من الخبز مع دجاج بالمايونيز

4. ماذا ستفعل؟
   - معكرون مع قليل من صلصة
5. ما هو الاختيار الأفضل للغداء الصحي؟

- دجاج مشوي مع خضروات
- همبرجر مع بطاطس مقلية
- دجاج مشوي مع بطاطس مقلية
- همبرجر مع بطاطس مقلية

6. ماذا ستختار لوجبة الإفطار؟

- بيض وجبن
- خبز وعسل
7. لماذا يتطلب من الوجبات التالية في أحد المطاعم السريعه

- همبرجر دجاج الحجم الاعتيادي
- همبرجر دجاج الحجم الكبير

8. لماذا يتطلب من الأهل للشراء من الجمعية؟

- بعض من الفاكهة
- بعض من شرائح البطاطس

9. لماذا استختار كمشروب؟

- مشروبات غازية خالية من السكر
- مشروبات عادية

10. ما هو الاختيار الامثل من الوجبات التالية قبل البدء بالتمرين الرياضي ومسابقات الرياضية؟

- لوح من الشوكولاته
- البسكوت
- رقائق البطاطس
- موز
11. ماهو الاختيار الامثل من الوجبات التالية بعد الامام من التمرين الرياضي ومسابقات الرياضي؟

☐ لوح من الشكولاتة

☐ حليب بنكهة

☐ رقائق البطاطس

12. لماذا سوف تشرب خلال التمرين أو مسابقة؟

☐ مشروبات غازية

☐ ماء

☐ ريد بل
<table>
<thead>
<tr>
<th>لا اعلم ان كنت استطيع</th>
<th>لا اعتقد انني استطيع</th>
<th>لا اعتقد انني استطيع ولا اقدر</th>
</tr>
</thead>
<tbody>
<tr>
<td>في البداية، استطيع ان اطلب النظر قبل من الايس كريم</td>
<td></td>
<td></td>
</tr>
<tr>
<td>اننا استطيع ان اتناول الفواكه كل يوم</td>
<td></td>
<td></td>
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<tr>
<td>اننا استطيع ان اشرب الماء بدل الصودا</td>
<td></td>
<td></td>
</tr>
<tr>
<td>في البيت، استطيع ان اطلب بيتزا الخضروات بدل من بيتزا الجبن</td>
<td></td>
<td></td>
</tr>
<tr>
<td>استطيع ان اطلب الذرة بدون زبدة</td>
<td></td>
<td></td>
</tr>
<tr>
<td>استطيع ان اشرب الصودا الخالية من السكر باعديه من الصودا العادية</td>
<td></td>
<td></td>
</tr>
<tr>
<td>في الوجه الخفيف، استطيع ان اتناول المقروشات بدل من نوح الشكلاته</td>
<td></td>
<td></td>
</tr>
<tr>
<td>استطيع ان اتناول حبه خضروات با</td>
<td></td>
<td></td>
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<tr>
<td>اليوم</td>
<td></td>
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<td></td>
</tr>
<tr>
<td>في البقالة، استطيع أن أطلب لوح من الحبوب الكاملة بدل من رقائق البطاطس</td>
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</tbody>
</table>
## BAECKE QUESTIONNAIRE

<table>
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<tr>
<th>Code</th>
<th>Information</th>
<th>Response</th>
<th>Entry</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Subject ID</td>
<td>□□□</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Name of Interviewer</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Date of interview</td>
<td>□□/□□/□□□□</td>
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<td>dd mm yy</td>
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<tr>
<td></td>
<td>Signature of Supervisor</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Data Entry</td>
<td>□□/□□/□□□□</td>
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<td>dd mm yy</td>
<td></td>
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<tr>
<td></td>
<td>Signature of supervisor</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Subject ID □□□  Date □□-□□-□□

Dietary information

a. Meals

1. Do you eat the following meals and snacks daily and where? (use H for Home and S for school)

<table>
<thead>
<tr>
<th>Breakfast</th>
<th>Snack 1</th>
<th>Lunch</th>
<th>Snack 2</th>
<th>Dinner</th>
<th>Snack 3</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

2. Where do you eat when you are outside the house (select all applied) How often/week?

<table>
<thead>
<tr>
<th>KFC</th>
<th>McDonald</th>
<th>Hardees</th>
<th>Pizza Hut</th>
<th>Ice-cream</th>
<th>Donuts</th>
<th>Local R</th>
<th>Others</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
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<td></td>
<td></td>
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<td></td>
</tr>
</tbody>
</table>

Local R: Local restaurant
3. How often do you buy foods, drinks and snacks from school?

Daily □  Sometimes □  Never □  I bring them from

home □

If buy, what kinds?
Food Frequency Questionnaire

How often do you consume foods from the list provided?

Please indicate both the amount and frequency for each category of food. If the child does not know, indicate as appropriate.

<table>
<thead>
<tr>
<th>Food description</th>
<th>Frequency</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Never (0)</td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td>1. Cereals, legumes, nuts, grain products</td>
<td></td>
</tr>
<tr>
<td>Rice</td>
<td></td>
</tr>
<tr>
<td>Makboos (rice, meat, nuts, raisins)</td>
<td></td>
</tr>
<tr>
<td>Bread (different types)</td>
<td></td>
</tr>
<tr>
<td>Food description</td>
<td>Frequency</td>
</tr>
<tr>
<td>-----------------------------------</td>
<td>-----------</td>
</tr>
<tr>
<td></td>
<td>Never (0)</td>
</tr>
<tr>
<td>2 Milk, Dairy products</td>
<td></td>
</tr>
<tr>
<td>Whole milk</td>
<td></td>
</tr>
<tr>
<td>Food description</td>
<td>Frequency</td>
</tr>
<tr>
<td>------------------</td>
<td>-----------</td>
</tr>
<tr>
<td></td>
<td>Never (0)</td>
</tr>
<tr>
<td>Evaporated Milk (Rainbow)</td>
<td></td>
</tr>
<tr>
<td>Cheese (different types)</td>
<td></td>
</tr>
<tr>
<td>Yogurts (Laban)</td>
<td></td>
</tr>
<tr>
<td>Labna</td>
<td></td>
</tr>
<tr>
<td>Milk shakes</td>
<td></td>
</tr>
<tr>
<td>Ice-cream</td>
<td></td>
</tr>
<tr>
<td>3. Meat, fish</td>
<td></td>
</tr>
<tr>
<td>Chicken</td>
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<tr>
<td>Meat (e.g. lamb, beef, hamburger, goat, Keema, mince)</td>
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<tr>
<td>Meat products (pies, sausages, burger)</td>
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<tr>
<td>Eggs</td>
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<tr>
<td>Food description</td>
<td>Frequency</td>
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<td></td>
<td>Never (0)</td>
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<td>4. Fruits and Vegetables</td>
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<tr>
<td>Fresh fruits (apples, oranges, pear)</td>
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<tr>
<td>Plums, cherries, grapes, strawberries</td>
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<tr>
<td>Dates</td>
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<tr>
<td>Tomatoes, cucumber</td>
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<tr>
<td>Other vegetables</td>
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<td>Garden Rocket</td>
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<td>Potatoes</td>
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<td>French fries</td>
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<thead>
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<th>Frequency</th>
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<td>5. Snack food</td>
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<td>Sandwiches</td>
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<td>Food description</td>
<td>Frequency</td>
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<tr>
<td></td>
<td>Never (0)</td>
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<tr>
<td>Potato chips, crisps</td>
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<tr>
<td>Cereal bar</td>
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<tr>
<td>Chocolate bar</td>
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<tr>
<td>Cake, biscuit, sweet pie</td>
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<td>Sweets (Arabic sweets and pastries)</td>
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<td>6. Beverages</td>
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<td>Soft drinks</td>
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<td>Fruit juices</td>
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<td>Milk base drinks</td>
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<td>Sport drink</td>
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<td>Energy drink</td>
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</table>
Subject ID □□□□ Date □□-□□□□

Dietary Information

7. Do you take some vitamin supplements sometimes during the year?

Yes□ No□

8. Do you take some protein supplements sometimes during the year?

Yes□ No□

9. Do you usually eat something before training?

Yes□ No□

If YES.
When before starting the training?

0-30 minutes before □ 30-1h before □

1-2 hours before □ More than 2 hours before □

What do you eat?

______________________________
10. Do you usually eat something after training?

Yes □  No □

If YES,
When after starting the training?

0-30 minutes after □  30-1h after □

1-2 hours after □  More than 2 hours after □

What do you eat?


11. Do you usually eat something before competition?

Yes □  No □

If YES,
When before starting the competition?

0-30 minutes before □  30-1h before □

1-2 hours before □  More than 2 hours before □

What do you eat?
12. Do you usually eat something after competition?

Yes ☐ No ☐

If YES,

When after starting the competition?

0-30 minutes after ☐ 30-1 h after ☐

1-2 hours after ☐ More than 2 hours after ☐

What do you eat?
What do you think?

16. Do you think it is recommended to eat more, the same amount or less of these foods:

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<tr>
<th></th>
<th>More</th>
<th>Same</th>
<th>Less</th>
<th>Don't know</th>
</tr>
</thead>
<tbody>
<tr>
<td>Vegetables</td>
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<tr>
<td>Sweet foods</td>
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<td>Red Meat (beef, lamb, hamburger...)</td>
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<td>Fatty foods</td>
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<td>Fruit</td>
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<tr>
<td>Salty foods</td>
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</table>

17. How many servings of fruit and vegetables per day do you think it is recommended to eat?

- ≤1 □
- 2 □
- 3 □
- 4 □
- ≥5 □
18. How often you should eat foods that have lots of fat or beverages with lots of sugar in them?

- As often as you like
- Only once in a while, not every day
- Several times each day

19. Do you think these foods are high or low in fat?

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<tr>
<th>Food</th>
<th>High</th>
<th>Low</th>
<th>Don’t know</th>
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</thead>
<tbody>
<tr>
<td>Grilled chicken</td>
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<tr>
<td>Corn with butter</td>
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<tr>
<td>Pasta (without sauce)</td>
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<tr>
<td>Baked beans with tomato sauce</td>
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<td>Red meat</td>
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<td>Honey</td>
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<td>Food</td>
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<td>Don’t know</td>
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<tr>
<td>Potato chips</td>
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<td>Fries</td>
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<td>Crackers</td>
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<td>Labnah</td>
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<td>Margarine</td>
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<td>Cheese pizza</td>
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<tr>
<td>Rice (without sauce)</td>
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</table>

20. Do you think these foods are high or low in salt?
21. Which beverage has the lowest amount of sugar?

- Diet pepsi/cola ☐
- Regular pepsi/cola ☐

22. Which will have the lowest amount of fat?

- Hamburger with cheese ☐
- Hamburger with tomato, lettuce and pickle ☐
- Hamburger with fries ☐

23. Fats are important for the body work

- Yes ☐
- No ☐
- Do not know ☐

24. Which type of sugar is the most suitable for young male athlete?

- Cube sugar ☐
- Honey ☐
- Banana ☐

25. During activity, feeling thirsty is an enough indicator of my need of liquid?

- Yes ☐
- No ☐
- Do not know ☐
26. Skipping meals is justifiable to lose weight

Yes □ No □ Do not know □

27. Milk and milk products are important for my growth

Yes □ No □ Do not know □

28. Fresh, canned and frozen vegetables all have similar value for my body

Yes □ No □ Do not know □

29. Athletes should eat a wide variety of food types from day to day

Yes □ No □ Do not know □

30. The type of food an athlete eats affects his performance

Yes □ No □ Do not know □

What would you do?

13. Which would be the best choice for a healthy snack?

Potato chips □

Chocolate bar □

Donut □

Cereal bar □
14. Which would you do?

Eat corn without butter  □

Eat corn with butter  □

15. Which would be the best choice for a healthy sandwich?

2 slices of bread with cheese cheddar, tomato and cucumber  □

2 slices of bread with chicken mayonnaise  □

16. Which would you do?

Pasta with a little sauce on the top □

Pasta with a lot of sauce on the top  □

17. Which would be the best choice for a healthy lunch?

Grilled chicken with vegetables  □

Hamburger with fries  □

Roasted chicken with fries □

Hamburger with cheese  □
18. Which would you choose for breakfast?

- Egg and cheese  
- Bread and honey

19. Which would you order at a fast food restaurant

- Regular chicken burger
- Extra chicken burger

20. Which would you ask the adults in your house to buy?

- Bag of apples
- Bag of potato chips

21. Which would you choose to drink?

- Diet soda
- Regular soda

22. Which would be the best choice for food before competition or training?

- Chocolate bar
- Biscuit
- Chips
- Banana
23. Which would be the best choice for food after competition or training?

- Chocolate bar  □
- Flavored milk  □
- Potato chips  □

24. Which would you drink during competition or training?

- Red bull □
- Water □
- Soda □

How sure are you?

<table>
<thead>
<tr>
<th></th>
<th>I know I can</th>
<th>I think I can</th>
<th>I am not sure I can</th>
<th>I know I can’t</th>
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<td>I can eat a fruit every day</td>
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<td>I can drink water instead of soda</td>
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<td>At home, I can ask for vegetable pizza instead of cheese pizza</td>
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<td>I can ask for corn with no butter</td>
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<td>I can drink diet soda instead of regular soda</td>
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<td>For snack, I can eat crackers instead of chocolate bar</td>
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<td>I can eat one vegetable per day</td>
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<td>At the store, I can ask for a cereal bar instead of potato chips</td>
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# Socio-demographic questionnaire

Subject’s Number: □□

Initials: □□

## Demographic information

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<td>Mother's Educational level</td>
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الرمز الشخصي

المعلومات الديموغرافية

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# Anthropometry assessment sheet

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### Aerobic Capacity

**One-Mile Run / 20m PACER / Walk Test**

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<td>V02Max standards not available for students ages 5 through 9.</td>
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::> The score is less than or equal to the indicated value.
Height-for-age WHO reference (WHO, 2006)  

**Height-for-age BOYS**  
5 to 19 years (percentiles)
BMI-for-age WHO reference chart

BMI-for-age BOYS
5 to 19 years (z-scores)

2007 WHO Reference
Per cent ile charts for triceps of adolescent males (NHANES 1999-2002)  Appendix10

Table 30. Triceps skinfold thickness in millimeters for children and adolescents aged 2 months-19 years by sex and age, by mean, standard error of the mean, and selected percentiles: United States 2003-2006.

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<th>Mean</th>
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## Table 27. Subscapular skinfold thickness in millimeters for children and adolescents aged 2 months-19 years by sex and age. By mean, standard error of the mean, and selected percentiles: United States 2000-2002.

<table>
<thead>
<tr>
<th>Sex and age1</th>
<th>Mean</th>
<th>Standard error</th>
<th>Percentile1</th>
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<td>Boys</td>
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<td>6-11 months</td>
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<td>11-17 months</td>
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<td>19 years</td>
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</table>

| Girls         |      |                |             |
| 2 months      |      |                |             |
| 3-6 months    |      |                |             |
| 6-11 months   |      |                |             |
| 11-17 months  |      |                |             |
| 1 year        |      |                |             |
| 2 years       |      |                |             |
| 3 years       |      |                |             |
| 4 years       |      |                |             |
| 5 years       |      |                |             |
| 6 years       |      |                |             |
| 7 years       |      |                |             |
| 8 years       |      |                |             |
| 9 years       |      |                |             |
| 10 years      |      |                |             |
| 11 years      |      |                |             |
| 12 years      |      |                |             |
| 13 years      |      |                |             |
| 14 years      |      |                |             |
| 15 years      |      |                |             |
| 16 years      |      |                |             |
| 17 years      |      |                |             |
| 18 years      |      |                |             |
| 19 years      |      |                |             |

1 Figures do not meet standards of reliability or precision.
2 Age categories by age at time of examination.
3 NOTE: Percentile categories are inclusive.
Table: Gender-specific values of bone mineral content (BMC), bone mineral density (BMD) and apparent volumetric BMD (BMAD) by age group

<table>
<thead>
<tr>
<th>Age</th>
<th>L1-L4 BMD* and a (g/cm)</th>
<th>L1-L4 BMD* and a (g/cm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>10-10.9</td>
<td>0.056±0.0 0.58±0.0 0.61±0.0 0.65±0.0 0.75±0.0 0.79±0.0 0.85±0.0 0.91±0.1</td>
<td>0.056±0.0 0.58±0.0 0.61±0.0 0.65±0.0 0.75±0.0 0.79±0.0 0.85±0.0 0.91±0.1</td>
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<td>11-11.9</td>
<td>0.056±0.0 0.58±0.0 0.61±0.0 0.65±0.0 0.75±0.0 0.79±0.0 0.85±0.0 0.91±0.1</td>
<td>0.056±0.0 0.58±0.0 0.61±0.0 0.65±0.0 0.75±0.0 0.79±0.0 0.85±0.0 0.91±0.1</td>
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<td>12-12.9</td>
<td>0.056±0.0 0.58±0.0 0.61±0.0 0.65±0.0 0.75±0.0 0.79±0.0 0.85±0.0 0.91±0.1</td>
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<td>14-14.9</td>
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<td>15-15.9</td>
<td>0.056±0.0 0.58±0.0 0.61±0.0 0.65±0.0 0.75±0.0 0.79±0.0 0.85±0.0 0.91±0.1</td>
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<td>16-16.9</td>
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<td>17-17.9</td>
<td>0.056±0.0 0.58±0.0 0.61±0.0 0.65±0.0 0.75±0.0 0.79±0.0 0.85±0.0 0.91±0.1</td>
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الملخص

الأهداف: تمثل أهداف هذا المشروع: 1) تقييم الوضع التغذوي، 2) تقييم المعرفة التغذوية، 3) تقييم الممارسات الغذائية، والعادات الغذائية للفرد الرياضي في دولة الإمارات العربية المتحدة، ثم التحقق في علاقات ما بين حالات التغذية و المعرفة الغذائية مع الأداء.

المنهجية: سيتم إجراء دراسة مستعمرة في عينة من 59 من الرياضيين المعينين من أكاديميكين نادي الجزيرة الرياضي في دولة الإمارات العربية المتحدة لتقييم الممارسات الغذائية والهيئة التغذوية، وسيتم تقييم الممارسات، والعادات باستخدام الاستبيان، وتقييم القائمة الغذائية عن طريق قياس (الوزن، تكوين الجسم، وسمك طية الجلد، القياسات البيوميكانيكية) والأداء البدني. وسيتم استخدام برنامج SPSS لدراة التحليل الإحصائي.

النتائج: تم الفصل المواد الغذائية إلى ستة مجموعات غذائية رئيسية في استبان استهلاك الغذاء وهي: 1) الحبوب والبقلعات والمكسرات (4.56 ± 14.11، 0.00)، (2) الخضروات ومنتجات الألبان (10.00 ± 3.32)، (3) الفواكه والخضروات (2.00 ± 3.25، 11.11)، (4) الوجبات الخفيفة (7.91 ± 3.46، 11.11)، و (5) المشروبات (2.55 ± 0.01، 2.55). وتم اكتشاف علاقة ذات دالة إحصائية بين مستوى التغذية والوزن، ومجموعة الفواكه والخضروات (P = 0.038 القيمة)، ونجد هناك علاقة ذات دالة إحصائية بين مجموعة وجبات الخفيفة والوزن (P = 0.05 القيمة)، وبين استهلاك وجبات الخفيفة وسمك الجلد (P = 0.04 القيمة)، وبهذا أيضًا علاقة بين مجموعة الحبوب ومجموعة الخضروات (P = 0.01 القيمة)، ونجد علاقة ذات دالة إحصائية بين مجموعة الحبوب والبيوميكانيكية (P = 0.02 القيمة)، كانت نتيجة المعرفة التغذوية (P = 0.88 ± 8.31، 0.01) تحقق الكفاءة الذاتية (P = 18.88 ± 80.73، 0.00) النتيجة الإداري في بعض مواقع (P = 1.88 ± 21.30، 0.00).

الاستنتاجات: إن الغالبية العظمى من لاعبي كرة القدم المشاركين في هذه الدراسة في فئة الوزن الطبيعي، وكذلك وجد أن الرياضيين لديهم فائض من مخازن الدهون في الجسم، ووجد لدى البعض فور الدم «بشكل عام تعتبر نتائج فحوصات الدم لديهم في أعلى مستوى طبيعي ووجد في بعض من مستويات أقل من الطبيعي، رغم سماكة الجلد من المرعب فيه، وهذه النتيجة غير مرجوب فيها للاعبي كرة القدم. وقد لوحظ...
جامعت الامارات العربية المتحدة

كلية العلوم

برنامج ماجستير علوم البيئة

الحالة التغذوية والعادات الغذائية والممارسات الغذائية والمعرفة التغذوية وعلاقتها في إداء الرياضين في سن المراهقة في دولة الامارات العربية المتحدة

رسالة مقدمة من الطالبة

سهار محمد الريش

إلى

جامعات الامارات العربية المتحدة

استكمالًا لمتطلبات الحصول على درجة الماجستير في علوم البيئة

مايو 2014