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Nutritional Anthropometry and Dietary Habits of Public Secondary School Students in Bahrain: Policy Implication for Promoting Healthy Eating Habits through School Health Program

A Thesis Submitted in Partial Fulfillment of the Requirements for the Master's
Degree in Health Policy and Population Studies

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Dedication

In the name of Allah, The Beneficent, The Merciful

To my dear husband Ahmed Taheri and lovely children Omeed, Ali and Elnaz, for their patience, encouragement and support that contributed to accomplishment of this work..

To my beloved mother and mother in-law, who are always there when I am in need, in recognition of the amount of continuous and endless support, patience and assistance without question.

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Abstract

Background: In countries undergoing rapid urbanization and economic growth like Bahrain, changes in lifestyle and dietary habits are observed especially among adolescents, with a rise in obesity and other nutrition-related chronic diseases. Unhealthy dietary habits and an increase in the prevalence of overweight and obesity among the adolescent population in Bahrain have been reported. The continuing increase in the prevalence of obesity in Bahrain suggests the current measures to prevent and control obesity are inadequate. Prevention is now crucial, and adolescents should be a priority target, because of conducive eating patterns and lifestyles. Establishing healthy nutrition and physical activity habits in young boys and girls is considered to be an important factor in maintaining healthy lifestyle patterns that can persist through adolescence and into adulthood.

Objectives: 1- To assess students' nutritional status using weight and height measurements, 2-To determine the eating habits and the lifestyle of public secondary school students in Bahrain and the difference of these habits between male and female 3- To explore the possible relationship between obesity and eating habits and lifestyle among students in public secondary schools in Bahrain.

Aim: To provide base-line data for school Health Nutritional Program in Bahrain, on which a future modified school nutrition program can be implemented in order to promote healthy eating habits in schools, and improve the overall nutritional status of Bahraini adolescents.

Methods: A cross-sectional study comprising of 735 students (339 males and 396 females), ages 15-18 years, selected by multistage random

sampling from government secondary schools in all five governorates of Bahrain. Information on dietary habits and lifestyle were obtained by self administered questionnaire. Anthropometric measurements (height and weight) were taken and obesity was determined by using body mass index (BMI).

Results: Eating habits of Bahraini adolescents showed excessive ingestion of sweets, chocolates, soft drinks, canned fruit juices, snacks and fast foods especially among females. A large percentage (56%) of adolescents were not eating breakfast regularly, however skipping three meals were more popular among females than males (breakfast $P=0.000$, lunch $P=0.001$ and supper $P=0.000$). High percentage of adolescents (73.5%) was physically active and practicing sports, especially males. Gender difference was significant with practicing sports during school hours and outside school, however females' participation in sports activity inside the school was more than outside school ($P=0.026$). The prevalence of overweight and obesity were higher among females adolescent (17.4% and 19.4% respectively) than males (15.8% and 13.7% respectively). Since the prevalence of underweight was very low in both genders (8.6% of males and 2.3% of females) the sample was divided into two groups, overweight and obese ($BMI \geq 85^{th}$ percentile) and non-obese group ($BMI < 85^{th}$ percentile), with this category overall prevalence of overweight and obese group was higher in females adolescent (36.9%) than males (29.5%).

Of the determinants of obesity including socio-demographic variables, parents' level of education especially maternal literacy was directly associated with increased overweight and obesity among both genders. The results showed no significant association between unconventional

dietary habits and lifestyle with the prevalence of overweight and obesity among Bahraini adolescents. However, among adolescent males, fast food habits showed significant association between consuming large burger size ($P=0.003$) and nutritional status. Negative significant results showed among male adolescents between snaking habits and nutritional status.

Conclusion: Unhealthy dietary habits were observed, along with increasing prevalence of overweight and obesity among adolescents 15-18 years in Bahrain, especially among females. These findings indicate an urgent need for prevention program to tackle these problems. To ensure a healthy future, a comprehensive school-based nutrition program must become a national priority. Such a program should be an integral part of the school health programs and applied to the students from preschool through secondary school. Key policies that schools can use to improve students' nutrition and increase physical activity are suggested along with resources that can help schools to strengthen and implement these policies.

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Chapter One

Introduction

1. Introduction

1.1 Background of the study

Adolescence is one of the most dynamic and complex transitions in the lifetime of human beings. The growth, developmental and social-psychological changes that occur during adolescence can markedly affect eating behaviors and nutritional status (Story and et al, 2002). Rapid physical growth creates an increased demand for energy and nutrients. Total nutrient needs during adolescence are higher than at any other period in the lifecycle and failure to consume a balanced diet during this period can potentially affect growth and delay sexual maturation (Story, 1992). In addition to the impact on growth and development, dietary habits influence health and nutrition status of young people. Inadequacy dietary makes adolescents vulnerable to nutrition deficiency and disorders, such as iron deficiency, eating disorders, obesity, under-nutrition, bone weakness and dental caries (Mandell, 1993). Skipping breakfast, which is common among adolescents, may affect concentration, learning and scholastic performance (CDC, 1996). Faulty dietary habits during adolescence may also have long term health implications. For example, being overweight as an adolescent is associated with overweight as an adult, high fat intake during adolescence and into adulthood is associated with an increased risk for heart disease, and low calcium intake during adolescence is associated with low bone density and an increased risk for osteoporosis later in life (CDC, 1996).

Establishing healthy nutrition and physical activity habits and attitudes in young boys and girls is considered to be an important factor in maintaining

healthy lifestyle patterns that can persist through adolescence and into adulthood.

World and national surveys have found that children and adolescents often fail to meet dietary guidelines, both in terms of overall nutritional status and of specific nutrient intake (Musaiger and Gregory, 1992; Musaiger et al, 2000, Lytle et al, 2000, Neumark-Sztainer et al, 2003). Diet quality steadily declines with increasing age (Lino et al, 1998). Many children and adolescents have chosen diets high in fat and/or added sugars (energy-dense) at the expense of nutrient-dense fruits, vegetables whole grains and calcium-rich dairy foods (Department of Agriculture USA, 1999 and Neumark-Sztainer et al, 2002).

In countries undergoing rapid urbanization and economic growth, nutrition transition is observed, with a rise in obesity and other nutrition-related chronic diseases. The Kingdom of Bahrain, similar to the other Arabian Gulf countries, has been witnessing rapid economic growth during the past 35 years, mainly a result of increased oil revenue. This economic growth has resulted in marked changes in lifestyle, socio-economic status and dietary habits (Musaiger, 1990).

Concurrently, the dietary pattern in Bahrain has been moving steadily towards consumption of larger quantities of animal products and a higher fat intake, which are typical of the affluent diet in the industrialized countries (Ministry of Health, 2002). The changes in dietary habits and lifestyle, along with a rising life expectancy and increasing urbanization have resulted in the emergence of diets contributing to chronic diseases such as obesity, coronary heart disease, diabetes and cancer.

1.2 Statement of the Research Problem

Nutrition and physical growth are integrally related. Nutrition has a great influence on the growth process of adolescents. Besides nutrition effects on growth, some of the physiological processes that lead to diet related chronic disease begin during the childhood and adolescence stages (Woteki & Filer, 1995 and Neumark-Sztainer et al, 2002). It is expected that with the improvement of health services, food availability and nutrition awareness the new generation would be taller and heavier than their predecessors (Al Sindi et al, 2003). In comparison with adolescents from western countries, according to the US CDC revised growth charts Bahraini teenagers are shorter and have a similar weight, or are even heavier than their Western counterparts (Al- Sendi et al, 2003).

The high prevalence of obesity in all age groups poses such a serious problem to the extent that the World Health Organization (WHO) has described it as a global epidemic.

Worldwide, over 22 million children under the age of 5 are severely overweight, as are 155 million school-age children. The world-wide epidemic of obesity and the health and socio-economic implications of it, has promoted extended research during the last few decades on the etio-pathogenesis, treatment and prevention of this epidemic (Manios et al, 2000).

Data from the Arabian Gulf countries, including Bahrain, indicate an increase in the prevalence of overweight and obesity among the adolescent population (Musaiger, 1993; Al-Nuaim et al, 1996; Al-Sindi et al, 2003).

This is an alarming situation, because obesity at adolescence tends to persist in adulthood; children who are overweight tend to remain so up to 20 years of age. In general, they have a 1.5 to 2 fold higher risk of becoming overweight as adults (Nicklas et al, 2001) and the longer its duration, the higher its association with morbidity and mortality (Must et al, 1992). Diabetes, hypertension and other obesity-related chronic diseases that are prevalent among adults have now become more common in youngsters (CDC, 2005).

According to Bahrain Ministry of Health statistics, 59.9 per 100,000 (19.5%) of the death rate in Bahrain is due to cardiovascular diseases, 28.7 per 100,000 (10.5%) is due to endocrine, nutritional and metabolic disorders (diabetes) and 37.2 per 100,000 (12%) is due to cancer diseases (Ministry of Health, 2005).

One potential contributor to overweight among young people may be the reported shifts in their eating habits and physical activity over the past 30 years (Ebbeling et al, 2002). Diet quality steadily declines with increasing age (Lino et al, 1998; Lytle et al, 2000). National surveys and smaller longitudinal studies have found that children and adolescents often fail to meet dietary guidelines, both in terms of overall nutritional status and of specific nutrient intake (Neumark-Sztainer et al, 2003; Lin et al, 2001; Lytle et al, 2000).

Changes in specific eating habits (i.e. meal pattern and meal frequency, restaurant food and fast food consumption, portion sizes, snacking and skipping meals) also may explain the increase in adiposity and obesity in children and adolescents (Nicklas et al, 2001).

The continuing increase in the prevalence of obesity in Bahrain suggests the current measures to prevent and control obesity are inadequate. Obesity imposes a heavy health and social burden, and it is widely recognized that treatment is not only costly, but remarkably ineffective. Prevention is now crucial, and adolescents should be a priority target, even in developing countries, particularly in urban settings because of conducive eating patterns and lifestyles. In addition, obesity programs appear to be more successful in adolescents than adults, as suggested in a few studies (Gortmaker et al, 1993; Douketis et al, 1999).

1.3 Significance of the problem

1- Improving the dietary habits of adolescents should become a national priority. Nevertheless, the development of effective strategies requires an understanding of adolescent eating habits and the multiple and interacting factors that influence these habits. Thus, an understanding of the dietary habits and the relationship of these habits to the nutritional status of Bahraini adolescents is essential for any nutrition intervention program.

2- There is relatively little information regarding similarities and differences in life style behavior and attitudes between obese and non obese adolescent boys and girls in Bahrain. It is generally believed that obese children are less physically active and aerobically fit and consume poorer quality diets than non obese boys and girls. However, the data supporting these behavioral and attitudinal disparities are equivocal, and much of the data are derived from research outside Bahrain.

3- Nutritional status studies conducted in Bahrain have shown that the diet of young people frequently has poor nutritional value, and the food sold in

schools is high in fat and added sugars, and low in nutrient density (Musaiger, 2003). Improving the quality of students' dietary intake during the school day is important, because for many adolescents, meals and snacks consumed during school hours make a major contribution to the day's total intake of energy and nutrients. School sites offer multiple advantages for the implementation of efforts to prevent and control overweight by affording continuous and intensive contact with the majority of children and adolescents (Baranowski et al, 2002). The Center of Disease Control and Prevention (CDC) guideline for school health programs to promote lifelong healthy eating, calls for establishing school policies that promote healthful eating and provide a supportive environment in which to make healthful food choices.

This research project will attempt to assess adolescents' eating habits and their nutritional status, and the association of adolescents' obesity with their dietary habits and lifestyle. The findings from this research project will substantially add to the knowledge currently defining the relationship between the dietary habits and nutritional status of secondary school students in Bahrain. Furthermore, it may help in the future development of a School Health Program in providing these students with effective nutritional knowledge, skills and environmental reinforcement they need to adopt long-term, healthy eating behavior.

1.4 Research Questions

1. What is the nutritional anthropometry of public secondary school students in Bahrain?
2. What are the dietary habits of public secondary school students in Bahrain?
3. Is there any difference in dietary habits between male and female students in Bahrain public secondary schools?
4. Is there an association between obesity and the dietary habits and lifestyle of public secondary school students in Bahrain?

Hypotheses

1. There is a high prevalence of overweight and obesity among public secondary school students in Bahrain.
2. Public Secondary school students in Bahrain have poor dietary habits.
3. Dietary habits of female are different from male students in Bahrain public secondary schools
4. Obesity among public secondary school students is related to their dietary habits.

1.6 Definition of the variables and terms

Adolescents: the term adolescents as defined by WHO includes persons aged 10-21. The period of gradual transition from childhood to adulthood that normally begins with the onset of signs of puberty is characterized by important psychological and social changes, not only physiological changes (WHO, 2005). Adolescence may be divided into three developmental stages based on physical, psychological and social changes (WHO/UNICEF 1995):

- Early adolescence, 10-14 years
- Mid adolescence, 14-17 years
- Late adolescence, between 17-21 years

Nutritional Status: a global term that encompasses a number of specific components. A comprehensive approach to defining nutritional status uses medical, nutrition, medication histories, physical examination, anthropometric measurements and laboratory data (August et al, 2002).

BMI: Body Mass Index (BMI), expressed as body weight in kilograms divided by the square of the height in meters (kg/m^2), is a weight-for-height index (Roche et al, 1981). BMI is the standard obesity assessment in adults, and its use in children provides a consistent measure across age groups. It is one of the anthropometric measurements which is widely used to determine the underweight and overweight of adolescents (Brown, 2005).

Overweight: According to the International Obesity Task Force, overweight is defined as a body mass index more than or equal to 25 kg/m^2 , and less than 30 kg/m^2 (Cole et al, 2000). A BMI above the 85th percentile but below the 95th percentile is considered to be overweight, according to the recommendation of the WHO (WHO, 1995).

Obesity: obesity is generally defined conceptually as the condition of excess body fat in individuals (Ogden et al, 2003). According to the International Obesity Task Force, obesity is defined as a body mass index more than or equal to 30 kg/m^2 (Cole et al, 2000). In addition by WHO criteria obesity is defined as a body mass index more than or equal to the 95th percentile for age and sex (WHO, 1995).

Objectives of the study

1. To assess the overweight and obesity prevalence of public secondary school students in Bahrain, using weight and height measurements.
2. To determine eating habits and the lifestyle of public secondary school students in Bahrain.
3. To find out the difference in dietary habits between male and female students of Bahrain public schondary schools
4. To explore the possible relationship between obesity and eating habits and lifestyle of public secondary school students in Bahrain.

1.8 Aim of the study

To provide base-line data for School Health Nutritional Program in Bahrain, on which a future modified school nutrition program can be implemented in order to promote healthy eating habits in schools, and improve the overall nutritional status of Bahraini adolescents

Chapter Two

Literature Review

2. Literature review

2.1 Nutritional status

Nutritional status is usually measured by anthropometric measurements, laboratory tests and nutrient intake. Anthropometric measurements, such as height and weight, and calculation of body mass index (BMI), are widely used to determine the nutritional status of adolescents (Brown, 2005). In Arab Gulf countries, most studies have used body mass index and skin fold thickness to determine the nutritional status of adolescents (Al Sendi, 2000). BMI has a number of advantages over other available measures of adiposity as it can simply be calculated from height and weight (Sampei et al, 2001). Body Mass Index offers a reliable and valid measure of obesity in adults, children and adolescents, and is often employed in large scale nutritional and epidemiological studies (Pietrobelli et al, 1998; Malina & Katzmaryk, 1999).

Since no reference data for BMI exists for adolescents in the Arab countries, the WHO reference data for BMI were used in this study to determine the prevalence of underweight, normal, overweight and obesity of adolescents in Bahrain.

Indicators for measuring the nutritional status of adolescents according to the BMI categories are listed in Table 2.1 as recommended by the World Health Organization Expert Committee (WHO, 1995). Teenagers below the 5th percentile of weight for height, or BMI for age, are considered to be underweight, and should be referred for evaluation of metabolic disorders, chronic health conditions, or eating disorders. Adolescents with a BMI equal

to or above the 85th percentile, but below the 95th percentile, are considered to be at risk for overweight. They should be referred for a full medical evaluation to determine the presence or absence of obesity-related complications. Teenagers with a BMI equal to or greater than the 95th percentile are considered to be obese and should also be referred for medical evaluation. Referral to a weight management program specially designed to meet the needs of adolescents may also be warranted for overweight adolescents who have completed physical growth (Vargas et al 2001).

Table 2.1: Indicators for measuring the nutritional status of adolescents according to the BMI categories

Nutritional status	Cut off values for Body Mass Index
<i>Underweight</i>	BMI for age <5 th percentile
<i>Normal weight</i>	BMI for age 5 th - <85 th percentile
<i>Overweight</i>	BMI for age ≥85 th percentile, but <95 th percentile
<i>Obese</i>	BMI for age ≥95 th percentile

2.2 Effect of nutrition on adolescents' growth and health

Nutrition concerns the intake of foods and the substances they contain, and their actions and effects within the body. Good nutrition is based on eating a varied and healthy diet relative to physiological needs, which vary with age, sex and levels of activity. Poor nutrition concerns both under-nutrition (inadequate levels of energy and/or nutrients in the diet) and over-nutrition (where energy intake from the diet exceeds energy expenditure, sometimes leading to overweight and obesity). Good nutrition would enhance the

quality of life and contribute to better health outcomes. Poor nutrition adversely affects the development of children and adolescents, and contributes to the development of chronic diseases such as heart disease, diabetes and cancer (SIGNAL, 2001).

Concern for nutrition in adolescence has been rather limited, except in relation to pregnancy (Delisle et al, 2001). Immediate effects of unhealthy eating habits include under-nutrition, iron deficiency anemia, overweight and obesity (CDC, 2000). Under nutrition can have lasting effects on adolescents' cognitive development and school performance, and they have low energy which can limit their physical activity (CHPNP 1995).

Over-nutrition in childhood and adolescents can lead to obesity in adulthood, and multiplies the health risks for these individuals. Sixty one percent of children between five and fifteen who are overweight have one or more risk factors for cardiovascular disease and 27% of these children have two or more risk factors (Freedman et al, 1999). Overweight youths are 2.4 times as likely to have a high serum total cholesterol level and 43.5 times as likely to have three cardiovascular risk factors (Nicklas et al, 2001).

Diabetes mellitus is increasing in the adult population, while the age of onset of adults Type 2 diabetes is decreasing and is now commonly found among adolescents (Fagot-Campagna et al, 2000).

2.3 Prevalence of underweight among adolescents

Underweight is due to several environmental and health factors with poor food habits and low intake of nutritive foods perhaps being the most important. Even moderate underweight can have lasting effects on children

cognitive development and school performance. They are irritable and have difficulty concentrating, which can interfere with learning and they have low energy which can limit their physical activity (CHPNP, 1995). When adolescents are undernourished, they have difficulty resisting infection and are therefore more likely to be sick, to miss school and to be behind in class (CHPNP, 1995).

Under-nutrition, defined as a BMI <5th percentile of NCHS reference values (WHO, 1995), was found to be highly prevalent in India (53%), in Nepal (36%), (23%) in Benin (WHO, 2005) and 65% in rural Philippines (Kurz, 1996). Two studies conducted in Switzerland (Woringer & Schutz, 1998) and France (Rolland-Cachera et al, 1992), showed that the prevalence of underweight was growing in adolescents.

In most studies allowing comparisons of boys and girls, there was twice as much under-nutrition in boys as in girls (WHO, 2005). Gargari et al (2004) assessed the nutritional status of 1650 adolescent girls (14-20 years) living in Tabriz, a city in Iran. He found that 8% of the study subjects had a BMI below the 5th percentile which is an indicator of underweight.

A study conducted by Oner et al (2004) to determine the prevalence of underweight, overweight and obesity among adolescents between 12-17 years in Turkey, showed that the prevalence of underweight among girls was 11.1 % while it was 14.4% among boys.

The assessment of nutritional status of Omani girls showed that the prevalence of underweight was relatively high, and about one quarter (23.6%), of adolescent girls in Oman were underweight and (Musaiger, 1994). About 11% of Saudi girls were underweight (Abahussain et al, 1999).

Musaiger (1987), reported that unsound food habits, lack of nutrition awareness, low intake of some nutritive foods, and some health problems such as anemia, are the most important factors contributing to under nutrition in the Arab Gulf countries.

2.4 Prevalence of Overweight and Obesity among adolescents

The prevalence of childhood and adolescence overweight and obesity has increased in most developed and developing countries (WHO, 1998). Prevalence rates for overweight and obese people are very different in each region, with the Middle East, Central and Eastern Europe and North American having the highest prevalence rates (James, 2004).

James, 2004 stated that over the last decade, the prevalence of obesity in Western and Westernizing countries has more than doubled. In the past 25 years, the prevalence of overweight has more than doubled among American children and tripled among adolescents (CDC, 2002). Cross-sectional, nationally representative school-based surveys conducted in 1997-1998 in 13 European countries: (Austria, Czech Republic, Denmark, Flemish Belgium, Finland, France, Germany, Greece, Lithuania, Ireland, Portugal, Slovakia, Sweden, Israel, and the United States, on a total of 29242 boys and girls aged 13-15 years showed that the highest prevalence of overweight was found in the United States, Ireland, Greece, and Portugal (Lissau et al,2004).

The prevalence rates of overweight and obesity in Canadian adolescents are high, 15% of Canadian adolescents were overweight and 4.6% were obese in 2002 (Janssen et al, 2004). In New Zealand, the most current statistics indicate that 33.6% of 11 to 14 year olds, and 27% of 15 to 18 year olds, are considered overweight or obese (Hohepa et al, 2004). Consistently, a study

conducted in children and adolescents in Germany showed that the mean BMI of obese children treated in a specialized hospital increased by 1.9 kg/m² between 1985 and 1995 (Barth et al, 1997). In all Nordic countries, a steady increase in body weight and BMI is reported (Samuelson, 2000).

Obesity has become an epidemic problem worldwide, and in the Eastern Mediterranean Region, the status of overweight has reached an alarming level. A marked increase in obesity generally has been noted among adolescents, ranging from 15% to 45% (Musaiger, 2004).

Studies in the Arab Gulf countries also showed that overweight and obesity are growing rapidly among school children and adolescents. (Al-Rukban 2003; Al-Mousa & Parkash 2000; Musaiger et al, 2000).

2321 students (1068 males and 1253 females) aged 11-16 years were assessed to determine the prevalence of overweight and obesity in Tehran, the capital city of Iran. The overall prevalence of overweight and obesity was 21.1 and 7.8%, respectively. The prevalence of overweight among girl students (23.1%) was significantly higher than among boys (18.8%), (Mohammadpour-Ahranjani et al, 2004). Based on the US CDC definition growth chart, the similar findings were revealed from a study on Egyptian adolescents aged 11-19 years, the prevalence of overweight and obesity among girls was higher (18% and 8%) compared to boys (7% and 6%) respectively (Salazar et al, 2006).

Thirty years ago, most people of the Arabian Gulf countries were not familiar with the word obesity. Underweight, anemia & infectious diseases were predominant. However, the Arab Gulf countries, namely Bahrain, Kuwait, Oman, Qatar, Saudi Arabia and the UAE have experienced marked

changes in lifestyle, socio-economic status and dietary habits during the past three decades. These changes have had their impact on trends of diseases in the populations, with the development of non-communicable diseases, such as obesity, heart diseases, diabetes and cancer. Studies in the region have shown that overweight and obesity are growing rapidly among school children and adolescents.

The prevalence of obesity among adolescents, especially girls, in the Arab Gulf countries is alarming. Studies have revealed that obesity among adolescent girls in the age group of 10-13 years is about 25%, based on BMI, and the percentage of obesity among girls in the age group of 14-18 years is almost double that of the age group 10-13 years (Musaiger, 1998). Al Mousa and Parkash 2000 showed that about one third of Kuwaiti adolescents aged 14-17 years were overweight, and that it was more prevalent among females (31.1%) than among males (27%). In the United Arab Emirates, a high proportion of adolescent females are overweight or at risk for overweight, ranging from 13% for the age of 17 and 33% for the age of 11 years (Al Hourani et al, 2003). Al-Rukban (2003), assessed the prevalence of overweight and obesity and its correlates among Saudi male adolescents aged 12-20 years in Riyadh, Saudi Arabia. He found the prevalence of overweight was 13.8% and obesity was 20.5%.

Several studies have been carried out in Bahrain to determine the prevalence of obesity in the population. These studies have revealed that obesity is highly prevalent among adolescents and adults. A trend of high rate of obesity appears to have occurred in Bahraini adolescents during the period between 1986 and 2000 (Al Sendi et al, 2003). The overall prevalence of obesity among Bahraini boys and girls aged 12-17 years was high, especially in girls (21% in males and 35% in females) (Al Sendi et al, 2002).

2.5 Changes of dietary habits during adolescence

Unhealthy eating habits that contribute to chronic disease are established early in life. Young persons having unhealthy eating habits tend to maintain these habits as they age. Despite the importance of healthy eating during adolescence, studies have consistently shown that adolescents as a group have poor eating habits that do not meet current dietary recommendations (Barghardt et al, 1993).

Reasons for the shift in eating habits as children move into adolescence are likely to be due to lifestyle, developmental, social and environmental changes (Story and Neumark, 1999). Growing independence and eating away from home, concern with physical appearance and body weight, the need for peer acceptance and busy schedules all have an effect on eating habits and food choices (Story et al, 2002).

In two longitudinal studies, changes of food choice (Von Post-Skagegard et al, 2002) and nutrient intake (Post et al, 2001) during maturation and early adulthood were reported. The Swedish study (Von Post-Skagegard et al, 2002) reported changes of meal pattern between age 15 and age 21 years.

There has been considerable concern about the eating habits of adolescents in recent years, because of a number of problems existing in their diet. These problems include an over reliance on snacks and fast foods high in fat, low intake of fruits, vegetables, fiber and dairy foods and erratic eating habits, such as skipping meals (Neumark- Sztainer et al, 1997). Many children and adolescents have chosen diets high in fat and/or added sugars (energy-dense) at the expense of nutrient-dense fruits, vegetables, whole grains, and calcium-rich dairy foods (cavadini et al, 2000).

The food habits of the Arabian Gulf population have changed drastically during the past two decades with increased incomes as a result of oil revenue. The traditional diet, which consisted of dates, milk, rice, brown bread, fresh vegetables and fish, has changed with the introduction of fast food and less green vegetables and fruits (Musaiger, 1998).

Poor dietary habits such as skipping breakfast, low intake of milk, fruit and vegetables and high intake of carbonated beverages, sweet foods and fast foods were reported by several studies on school children in Saudi Arabia (Al-Shoshan, 1993; Al-Shehri, 1996; Al- Rukban, 2003).

2.5.1 Changes in type of food intake

Diet is considered to be an important variable in controlling weight status. There are changes in eating habits in adolescence that cause the lack of minerals and vitamins. Evidence shows that dietary quality declines from childhood to adolescence, intake of fruits, vegetables, milk and fruit juices decreases, whereas intake of soft drinks increases during this time (Lytle et al, 2000).

Adolescents' daily diet is mostly inadequate in terms of energy, fat, cholesterol and carbohydrates intake, as well as with regard to the low energy food rich in micronutrients and dietary fiber (vegetables, fruit, bread, cereals, rice and pasta). It was found that cholesterol was three to five times higher than recommended, mostly because of the very high intake of food of animal origin (Baric, 2000). There has been a decline in the percentage of total fat consumption coming from fats/oils, mixed meats (combination dishes), eggs, milk and desserts. In contrast, the percentage of total fat consumption coming from poultry, cheese and snacks has increased (Morton

and Guthrie, 1999). The largest increase has occurred in the soft drinks category (including carbonated water and carbonated juice drinks). Concomitantly, consumption of dairy products has decreased (Harmck et al, 1999).

According to the USDA's continuing survey of food intake by individuals (CSFII), adolescents 12 to 19 years of age had intakes of protein, total fat and saturated fat that were higher than recommended (USDA, 1998).

Munoz et al (1997), have compared the food intake of American children and adolescents as against dietary recommendations. Their findings revealed that the diet was too high in fat, low in some nutrients and high in sugar.

Studies on adolescents' food intake in different European countries showed similar findings in high consumption of fat, particularly saturated fat and low fiber input. Animal sources of protein represent about two-thirds of the total protein intake among adolescent girls, with a low intake of calcium and iron (Rolland-Cachera et al, 2000).

In a study conducted in Oman on the dietary habits of adolescent girls, it was observed that the overweight girls have a high intake of energy-rich foods. Generally Omani food contains high amounts of fat compared to other Arabian countries and this may play an important role in increasing the amount of energy consumed (Musaiger, 1994).

These data clearly support the need for a total diet approach that encourages high fiber, lower fat, low-added sugar options in helping children and adolescents make appropriate food choices, particularly with regard to fruit, vegetables, grains and dairy products (American Dietetic Association, 2002).

2.5.2 Skipping meals

Food habits might change during maturation. Among these dietary habits is daily breakfast intake, with quality and not only quantity of food being important. The importance of energy supply after the overnight fast for cognitive function and endurance has been reported (Wyon et al, 1997). Omitting breakfast interferes with cognition and learning, an effect that is more pronounced in nutritionally at-risk children (Pollitt & Mathews, 1998).

Abalkhail & Shawky (2002) found that the proportion of students who reported eating breakfast daily was significantly higher among students with excellent results as compared to those who failed or just passed their exams.

The food choice related to irregular intake of breakfast resulted in a lower total intake of protein, calcium, fiber and zinc and in the girls also of iron and vitamin C (Sjoberg et al, 2003).

Both the boys and girls with irregular breakfast intake differed from students consuming breakfast regularly, with a higher percentage of energy from in-between meals and snack food. This implies that omitting breakfast may increase the risk of a poorer nutrient intake (Sjoberg et al, 2003). Irregular breakfast and lunch intake had a different and less healthy food choice such as a lower intake of milk, especially low-fat milk, meat, vegetables, potatoes, roots, fruit and berries, and bread. Adolescents had a lower intake of brown bread and whole-meal bread, and instead had more white bread. They also had more soft drinks, sweets, potato crisps and popcorn compared to those with a regular meal pattern (Sjoberg et al, 2003). Children who consumed breakfast had significantly better Healthy Eating Index (HEI) scores for grains, fruits, milk products and variety than children who did not

(Cavadini et al, 2000). Eating a nutritious breakfast may help control body weight, due to reduced dietary fat intake and minimized impulsive snacking (Ortega and Andres, 1996).

Studies showing a link between obesity and skipping meals agreed that adolescents with a consistent meal pattern (three meals a day) were leaner than those with an inconsistent meal pattern (Wolfe et al, 1994, and Siega et al, 1998). A study carried out on Italian school children to analyze their breakfast habits showed that of the non-breakfast consumer subjects, 27.5% were overweight and 9.6% obese compared to 9.1 and 4.5% respectively in breakfast eaters (Vanelli et al, 2005).

Studies from developed and developing countries have shown that breakfast is often skipped by adolescents (Salmuelson, 2000). Several studies report that about 20% of adolescents admit to skipping breakfast (Johnson & Hackett, 1997).

A study from the western part of Sweden comprising about 7600 fifteen year olds, shows that many adolescents skipped breakfast, more often girls than boys and especially those who were smokers (Hoglund et al, 1998).

To omit breakfast was also a strong marker for omitting other principal meals. In a Swiss study on a large sample of children and adolescents, breakfast omission was related to lower consumption of hot lunches, but not to other main meals (Cavadini et al, 2000).

Skipping breakfast was reported by 14.9% of Saudi students in Jeddah City and this habit did not differ by age, sex, body mass index or social class (Abalkhail & Shawky, 2002). A study carried out among Saudi girls in

Riyadh revealed that 16.5% of the girls did not take breakfast at home and depended on snacks offered in the school canteen, which consisted mostly of biscuits, chocolate bars, potato chips and carbonated cola drinks (Al-Othaimeen et al, 1999). In Bahrain Musaiger (1993) found that 19.1% of boys and 21.95% of girls aged 6 to 18 years skipped breakfast and the percentage of skipping breakfast increased as the age of children increased. More older girls skipped breakfast than boys. Lunch was skipped less often than breakfast. The main reasons for skipping lunch were; dislike the food served at lunch and not feeling hungry.

Many Bahraini school children consumed sweets and soft drinks outside school on their way back home. This practice reduces their appetite for lunch and thus they consumed smaller amounts of food, or they skipped it (Musaiger, 1993). Musaiger (1993) suggested that “The irregularity in taking meals and the lack of interest in dietary habits were apparent among those who habitually skipped meals”.

2.5.3 Eating between meals (Snacking)

Several studies have indicated that eating between meals has become part of the culture in most countries. However adolescents eat more frequently between meals than other age groups, namely adults, and often eat food products rich in sugar and fat, and low in micronutrients, for example; confectionery, soft drinks and chips, even for main meals (Farthing, 1991).

Snacking behavior studies have shown that the energy contribution of snacks has increased considerably among children and young adults (Zizza et al, 2001). Snacking is common (60%) in adolescents of 16-17 years old as compared to (45%) in 11-13 year olds (Choquet & Ledoux, 1994).

The energy from in-between meals was much higher than the recommended 10% (Livingstone et al, 1992). High intake of energy from in-between meals, light meals and snacks, has also been shown in two other Swedish studies and an Irish study as contributing to 27–33% of total energy intake (Bergström et al, 1993; Samuelson et al, 1996).

During weekdays, and especially during weekends, snacking is particularly common in all the Nordic countries with an increasing tendency from 13 to 18 year olds (Samuelson, 2000). A study carried out on a USA representative sample of 16,810 individuals aged 12-29, showed that snacking trends are more varied. Salty snacks show the greatest percentage increase while desserts show the greatest percentage decrease, and the percentage of energy intake of salty snacks and soft drinks increased from 1977 to 1996 (Nielsen et al, 2002). The most popular snacking items were soft drinks, cakes, buns, crisps and ice cream (Samuelson, 2000).

A study carried out on the dietary habits of 452 Saudi students aged 16-25 years showed that eating between meals was a regular practice among the majority of these students (27.3%), and the youngest group (16-18 years) ate more snacks than the older group (19-25 years) (Al-Sudairy, 1992).

Morning snacks of Omani adolescents are usually obtained from school canteens. Canned drinks, cheese sandwiches, potato chips and falafel sandwiches were the main food consumed for morning snacks by Omani girls (Musaiger, 1994).

The most popular foods consumed between meals by adolescents in Bahrain were corn-puffs, carbonated beverages, chocolates, un carbonated canned drinks and fruits. The consumption of carbonated beverages increased

steeply with age, especially among girls. Of 6-10 year old girls 19.9% consumed carbonated beverages compared to 36.2% and 65.9% among 11-15 and 16-22 year olds respectively (Musaiger & Gregory, 1992).

Baseline data on types of foods consumed between meals (snacks) and how these foods contribute to the nutrient intake in relation to the overall diet are essential for a school meal program.

2.5.4 Fast food intakes

Eating away from home is becoming more common, and fast food restaurant use in particular is growing even more rapidly. The increasing popularity and availability of away from home food consumption over the past two decades has raised the proportion of nutrients consumed outside the home (Schoeller, 1995). Both adolescents and young adults are obtaining less of their energy intake at home and more at restaurants and fast food places (Nielsen et al, 2002). In the USA, between 1977 and 1995, the percentage of meals and snacks eaten at fast food restaurants increased by 200% (National Restaurant Association, 2002).

Fast food outlets are especially popular among adolescents (Lin et al, 1996). Adolescents want quick, good tasting, convenient and low cost meals, which are the main features of fast food. Unlike other restaurants, fast food restaurants welcome adolescents and provide a clean, friendly, brightly lit atmosphere and a socially acceptable place to spend time with friends (Story, 2002). The average adolescent visits a fast food restaurant twice a week, and fast food outlets provide almost one third (32%) of away from home meals to adolescents (Lin et al, 1999).

A survey of 4746 American students aged 11 to 18 reported that about 75% ate at fast food restaurant during the week (French et al, 2000).

Foods consumed outside the home are less healthful, contain more total and saturated fat, and are lower in fiber and calcium than foods obtained at home (Neumark et al, 1999). As away-from-home foods represent an ever-larger proportion of total energy intake, their nutrient profile becomes more important to examine. Studies have linked the frequency of eating at fast food restaurants with higher total daily energy and fat, and with increased body fatness (Jeffery & French et al, 1998). A survey conducted on 379 UK adolescents revealed that eating outside the home accounted for about 30% of daily energy (Adamson et al, 1996).

Al-Sindi reported that 47% of the boys and 51% of the girls in Bahrain eating takeaway fast food more than twice per week, and from these, girls who ate fast foods twice or more per week had higher risks of obesity than those who reported no intake or only once a week (Al-Sendi, 2002).

Other studies have demonstrated large shifts in the types of foods consumed at home and away from home. These shifts included large increases in soft drinks and high-fat grain-based dishes, and in potato consumption, and significant increases in consumption of pizza, cheeseburgers and salty snacks, and decreases in consumption of milk (Fisher et al, 2001).

Paeratakul et al (2003) observed that the children and adolescents who reported eating fast food had a significantly lower intake of bread and cereals. They also consumed fewer dark green vegetables and other vegetables, but significantly more fried potato. The intake of fruit and juices, milk, and legumes was lower compared with the intake of those who did not

eat fast food. The former group also reported eating chicken, meat mixture and carbonated soft drinks. In terms of energy and nutrients, the children who reported eating fast food had a significantly higher intake of total energy and fat and a lower intake of protein, vitamin A and beta-carotene.

In a study conducted to examine behavioral and dietary correlates of frequency of fast food restaurant use (FFFRU) in 4746 secondary school students in United States, FFFRU was positively associated with intake of total energy, percent energy from fat, daily serving of soft drinks, cheeseburgers, French fries and pizza, and was inversely associated with serving of fruits and vegetables, and milk (French et al, 2001).

In addition to concerns about higher fat and total energy intake, fast food use is associated with lower calcium intake, because it may encourages soft drink consumption and displace consumption of calcium rich foods including milk. This may contribute to lower calcium intake and lower bone mineral density gains among adolescents (Harmack et al, 1999). Low bone minerals density gains among adolescence may increase risk of osteoporosis later in life (Fassler et al, 1995).

2.5.5 Lifestyle

2.5.5.1 Television watching: Television watching has been found to be connected to increased obesity and decreased fitness behaviors (Anderson et al, 1998), because it has been cited as a contributing factor to higher energy or fat intake (Hill & Peters, 1998) and decrease physical activity and unhealthy dietary habits among children and adolescents (Lowry et al, 2002). Data from the 2001 Youth Risk Behavioral survey suggested that TV

exposure independently increases odds of overweight by 50% for both genders (Fleming-Moran & Thiagarajah 2005).

Television viewing tends to promote increased energy intake by several mechanisms:

1- It may contribute to higher energy or fat intake due to snacking in front of the television (Jeffery & French, 1998). In a study done on secondary school children in Flanders, Belgium, estimated daily energy intake accompanying TV viewing amounts to 19% of the Belgian average energy allowance in boys and between 12-14% in girls. On average, one hour of watching TV equals the consumption of 653 kJ and only 3.5% of the adolescents never eat snacks or drink soft drinks while they watch TV (Van den Bulck & Van Mierlo, 2004). A study done by Al-sendi (2002) on Bahraini adolescents showed that having meals while watching TV had a significant effect on BMI status and girls who frequently took their meals in front of the TV were twice as likely to be obese than those who seldom did so (Al-Sendi, 2002).

Musaiger found that in the United Arab Emirates, the main types of food eaten by secondary school girls while watching TV were chocolates, sweets, potato chips, nuts and carbonated beverages (Musaiger et al, 2000).

2- The length of time the adolescents spent watching TV, more recent statistics, however, showed a more rapid increase in the time spent on television and video watching, as well as on computer games, during the last decade (Samuelson, 2000). Overall, 26% of US children watched 4 or more hours of television per day (Andersen et al, 1998).

Chinese adolescents are unique compared to those in other developing countries. Current television watching habits are relatively low compared to

those in developed countries, and walking/biking is a common form of commuting. Only 8% of Chinese school children, regardless of gender, watch television ≥ 2 h/day, less than 1% watch ≥ 4 h/day (Tudor-Locke et al, 2003).

In the UAE the number of hours spent watching TV per day was 2.5 in adolescents aged 14-16 years and television watching during the weekends was significantly higher compared to schooldays (Henry et al, 2004). Fifty eight percent of Bahraini boys and 67% of Bahraini girls reported watching TV for more than three hours per day (Al-Sendi, 2002).

It was observed that BMI and physical activity pattern were both associated with hours of television watched. Both boys and girls who watch 4 or more hours of television per day had significantly greater body fat and BMI compared to those who watched less than 2 hours per day (Andersen et al, 1998). Respondents in the low, moderate and high physical activity categories who reported watching more than 4 hours of television per day were twice as likely to be overweight compared to those who watched less than one hour of television per day, irrespective of physical activity participation. Overall, the amount of TV viewing has been shown to be a strong predictor of obesity in children. In fact, each hourly increment of TV viewing by adolescents has been associated with a 2% increase in the prevalence of obesity (Hill & Trowbridge, 1998).

Excessive television viewing may encourage both sloth and gluttony and was shown to be an important determinant of obesity in Saudi children and adolescents (Al-Hazzaa, 2002).

3- Food is the most heavily advertised product on children's television. Exposure to food advertising, especially candy bars, cakes, cookies, carbonated beverages and fast food commercials, may influence viewers' food choices toward higher fat, higher energy foods (Jeffery & French, 1998). Over the last few years, the number of television food commercials targeting children and adolescents has increased especially when it comes to junk food in all its forms, the present use of food in movies and cartoons may lead to misconception of the notion of healthy nutrition and stimulate an excessive intake of poor nutritional food (Caroli et al, 2004). Given its pervasiveness in the lives of youth, television would seem to be an important environmental exposure that could promote greater fast food consumption among adolescents (French et al, 2001). In a study done to examine behavioral and dietary correlates of frequency of fast food restaurant use (FFFRU) in 4746 secondary school students in United States, television viewing was positively associated with FFFRU among both females and males (French et al, 2001).

The different regulations on programs and advertising directed to children could have a role in the reducing prevalence of children and adolescents obesity, television could be a convenient tool to spread correct information on good nutrition and obesity prevention (Caroli et al, 2004).

2.5.5.2 Physical activity: Physical activity is a key component of energy balance and is promoted in children and adolescents as a life long positive health behavior (Caspersen et al, 1985). Physical activity is defined as any body movement produced by the contraction of skeletal muscle that increases energy expenditure above the basal level (Malina, 1994). The greatest change within the latest few years has been the decrease in physical activity among all age groups (Gordon-Larsen et al, 1999). Data from a

study conducted by Epstein et al, (1996) suggest a remarkable downward trend in the prevalence of participation in physical activity in children with increasing age.

Studies from all European countries show a decreasing trend in physical activity during adolescence in all girls and in boys without regular sports training (Fogelhom, 1998 and Fox, 2004). In the Swedish study "Adolescents approaching the year 2000" (Bratteby et al, 1997) the time spent in inactivity was 9-10 hours, while high activity only occupied 0.5-1 hour per day.

There are decreased opportunities for physical activity due to changes in technology, mechanization, work habits, transportation. Children face the same environmental and lifestyle challenges that have made high energy dense food and drinks increasingly available and opportunities for energy expenditure through transport and active play less likely (Fox, 2004). As a result, the number of calories consumed is often greater than the amount expended through physical activity. Sedentary behavior contributes to the increased prevalence of obesity by competing with more physical behavior (Epstein et al, 2000). Janssen et al (2005) suggested that physical inactivity and sedentary behaviors are strongly related to obesity in Canadian adolescents.

Studies conducted in the Arabian Gulf countries showed that Saudi adolescents exercise less than those in developed countries and this may be due to inadequate physical activity programs for students in schools (Al-Rukban, 2003).

In a study conducted in the United Arab Emirates, 220 children aged 6-18 years were divided into two groups (obese and non obese) according to body

mass index. The result showed that diet and limited physical activity were significant factors for the development of obesity (Amine and Samy, 2000). The same finding was reported in a study carried out on Saudi male adolescents as lack of physical activity was considered to be the second important risk factor for obesity (the first important factor was family history) (Al-Rukban, 2003). In Kuwait, obesity among adolescent is high which suggests that Kuwaiti adolescents are on the whole physically inactive and have a positive energy balance due to overeating (Al-Isa, 2004).

It seems, therefore, that obesity among adolescents depends almost entirely on the level of physical activity they engaged in and the amount of food they take. The importance of encouraging physical activity among adolescents is based largely on the assumption that the behavior will become part of the person's life and carry into adulthood where it will help to lower the risk of several chronic diseases as well as premature mortality (Trost et al, 1996). Cross sectional observational and experimental intervention data suggest a significant short term influence of exercise training on weight loss in adolescents (US Department of Health and Human Service, 1996).

Nearly all adolescents attend schools; therefore the school can play a significant role in increasing their physical activity levels and habits. Unfortunately school PE programs in Bahrain suffer from major weaknesses both in terms of the amount of allocated PE time as well as the quality of the program offered. Students at the intermediate and secondary levels get only one 45-minute PE session a week (Al- Sendi 2002). A study conducted on adolescent school boys in Saudi Arabia, which has similar PE system, showed that the actual duration of PE was 32 minutes and that the mean time spent in moderately intense activity was 12.6 minutes (Al-Hazzaa, 2002). These results provide evidence that proper modification of the school PE

program is required to affect the activity levels of children and adolescents substantially.

2.6 Impact of school nutrition program in improving the nutritional status of adolescents

School-based nutrition education is particularly important because today's children and adolescents frequently decide what to eat with little adult supervision (Crockett & Sims, 1995). When children are young, their parents and families have a greater control over what they eat. As they get older, however, what their friends eat in the school environment, and what is available to them in school and elsewhere, will have an impact on what they eat (Neil, 1997).

What children eat at school is dependent on many factors, including the cafeteria environment, peer pressure, administrative support, teacher participation, cafeteria staff and the quality of food choices offered (Neill et al, 1997).

Food served by the school food service is an important part of the school health program. The school canteen plays a significant role in influencing the dietary habits of children by introducing many new food items. A study done by Gracey et al, on 480 students aged 15-16 years showed that the lack of healthy food in the school canteen and ignorance of the nutrient content of various foods were highly ranked as a reasons preventing students from eating a healthy diet (Gracey et al, 1996).

Kubik et al, 2005, suggest that parents and teachers are concerned about the nutritional health of students and the "state of health" of the school food

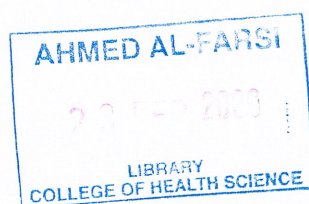
environment, and they agreed that the nutritional health of the students should be a school priority. Among both parents and teachers 90% agreed that more healthy snacks and beverages should be available in school vending machines and school canteens.

The school feeding program in Bahrain depends on canteens which sell soft drinks, chocolates, sweets, corn-puffs and various kinds of sandwiches. These foods are sold to the children during the mid-morning break. The high percentage of children who skipped breakfast, as well as those who ate poor breakfasts suggest that the food available in school canteens should supply adequate amounts of nutrients (Musaiger & Gregory, 1992). School wide food practices that supported frequent snacking and the consumption of foods and beverages high in calories and low in nutrients by students throughout the school day were common and adversely associated with BMI of the students (Kubik et al, 2005).

A school health program can help children and adolescents attain full educational potential and good health by providing them with the skills, social support and environmental reinforcement they need to adopt long-term, healthy eating behaviors (CDC, 1996). Nutritional status studies conducted in Bahrain have shown that the diet of the young people frequently has poor nutritional value. One possible reason that these diets are not as adequate as might be desired is because these people do not have sufficient nutritional knowledge (Musaiger, 1993). Young people need nutrition education to help them develop life-long healthy eating patterns. Knowledge about healthy food choices can be a predisposing factor for the adoption of a healthy diet (Thomas, 1994).

Interventions aimed at modification of adolescent eating habits have met with mixed success (CDC, 1996). This may be partly the result of an inadequate understanding of the factors associated with adolescent eating habits. Nutrition education refers to a broad range of activities that promote healthy eating behaviors. The nutrition education guidelines focus largely on classroom instruction, but they are relevant to all components of a comprehensive school health program-health education, a healthy environment, health services, counseling, psychological and social services, integrated school and community efforts, physical education, nutrition services and school-based health promotion for faculty and staff (Allensworth et al, 1987).

To ensure a healthy future for the children and adolescents of Bahrain, a comprehensive school based nutrition program should be an integral part of the school health programs and reach students from preschool through secondary school. School leaders, community and parents must commit to implementing and sustaining nutrition education programs within the schools. Such support is crucial to promote healthy eating behaviors in children and adolescents.



Chapter Three

Research Methodology

3. Methodology

3.1 Study Population

Bahraini and non-Bahraini, males and females students from grade 1 to 3 enrolled in public secondary schools during the academic year 2005-2006 from all five governorates of Bahrain (Capital, Al Muharaq, North, Central and South governorates).

3.2 Study Design

A descriptive cross-sectional study

3.3 Sampling Method

According to the following formula, 735 students were randomly selected from a population of 27833.

$$Z_{1-\alpha/2} = \frac{d}{\sqrt{\frac{P_0(1-P_0)(N-n)}{nN}}}$$

Where N is the population size, Z value is 1.645 for a 90% Confidence interval, P is the assumed prevalence of dietary habits (50%) and d is the precision (0.03).

Students have been selected using a multi-stage stratified and clustered random sampling technique according to the gender, governorates and grades. The final study sample size was 735 because students under the age of 15 or over the age of 18 were excluded, since there were too few to yield

any reliable data. The Kingdom of Bahrain is divided into five governorates: Capital, Al Muharaq, North, Central and South. Each governorate is served by a number of schools, which is proportional to the population density of a given governorate. The total number of secondary public schools was 30 (17 schools for females and 13 for males) at the time of the study. Males and females public secondary school children attend separate schools. A list of secondary schools in Bahrain was obtained from the Ministry of Education. Separate lists for males and females were used to obtain the sample, stratified by gender, Governorate and grade, clustered on schools and class. The schools in each governorate were first numbered and then depending on the student population density, one or two schools were chosen randomly from each governorate.

Table 3.1: The sample size of **Male** secondary school students selected from each governorate

Governorate	No of students	Name of secondary schools	Name of the schools selected for sampling
<i>Capital</i>	103	- Al Naa'im - Ahmed Al Omran - Al Jaberiah - Technical - Shaikh Abdul Aziz ben Moh'd Al- Khalifah	Ahmed Al Omran
<i>Al Muharaq</i>	57	- Al Hidayah Al Khlifia - Al Muharaq - Commercial - Shikh Khalifah Institute of Technology	Al Hidayah Al Khlifia
<i>North</i>	54	- Jid Hafs - Technical - Hamad Town	Hamad Town
<i>Central</i>	122	- Isa Town - East Rifa - Shikh Isa ben Ali - Commercial - Shikh Abdulla ben Issa - Technical	Isa Town East Rifa

Starting with the male secondary schools, Ahmed Al Omran was chosen from the Capital, Al Hidayah Al Khlifia from Al Muharaq governorate,

Hamad Town from the North governorate, East Riffa and Isa Town from the Central governorate, (there is no male secondary school in the South governorate of Bahrain). From the Capital governorate, Khawla secondary school was chosen for female schools, Al Muharaq Intermediate and Secondary school from Al Muharaq governorate, Sar secondary school from North governorate, Al Noor commercial secondary school from central

Table 3.2: The sample size of **Female** secondary school students selected from each governorate

Governorate	No of students	Name of secondary schools	Name of the schools selected for sampling
<i>Capital</i>	67	• Al Manama • Khawla • Al Horah - Commercial	Khawla
<i>Al Muharaq</i>	63	• Al Muharaq • Al Esteqlal - Commercial • Al Hid	Al Muharaq
<i>North</i>	92	• Hamad Town • Jid Hafs • Sar • Al Ahad Al Zaher	Sar
<i>Central</i>	115	• Sitra • Isa Town - Commercial • Al Noor Commercial • Omima Bint Al Noman - Commercial • Isa Town - Commercial	Al Noor Commercial
<i>South</i>	59	• West Rifa • Al Maarifah	West Rifa

governorate and West Riffa secondary school from the South governorate. A total of 10 schools were included in the study (see Tables 3.1 and 3.2). Using schools' records, one class from each grad (grades 1, 2 and 3) has been selected randomly.

3.4 Setting

The students were assembled in a classroom for a short meeting. The objectives of the study were explained to the students.

3.5 Ethical Consideration

Permission to conduct this research was obtained from the Education and Development Research Committee in the Ministry of Education, principals of the schools, teachers and the students before conducting the study.

The researcher ensured that the participants understood the nature and purpose of the study, and the possible benefits to the adolescents health and community. All information collected was treated confidentially and was only available to the project members. The results of the study will be offered to the Ministry of Education and the schools on request.

3.6 Reliability and Validity of the Questionnaire

Validity:

Face validity: The questionnaire was reviewed by nutrition specialist at Bahrain Center for Studies and Research and Ministry of Health in order to check in terms of the extent to which the items reflect the concept of identifying the dietary habits of adolescents.

Content validity: The content validity of the tool has been tested by experts in the field of nutrition and education from the Ministry of Health, Arabian Gulf University and Bahrain Center for Studies and Research, to ensure that the items in the questionnaire represent the objectives and provide adequate

coverage of the purpose of the study. They all generally agreed about the content, and some changes were incorporated according to their suggestions.

Reliability:

The stability of the questionnaire has been evaluated by test-retest reliability. The questionnaire has been administered to the students on two occasions during the pilot study. The comparison between the results of the first and the second questionnaire was obtained by computing Person Correlation, the result showed 0.87 which indicates that the questionnaire used in the study was reliable. Some of the items employed in the questionnaire have been used in similar previous studies on Bahraini adolescents by Musaiger, (1992) and Al-Sendi (2002).

Pilot study:

48 students (22 male and 26 female students, one class from male and female secondary school) were employed in the pilot study by completing the questionnaire after obtaining their permission and explaining the objectives of the study. The pilot study assessed the items where the participants were reluctant to answer any questions, also the practicality and the time needed to measure the height and weight and to complete the questions. 2-4 minutes time required to take height and weight measurements of the students by the nutrition specialist. The questionnaire required 15-20 minutes to be completed by the students. The final draft of the questionnaire has been modified based on the feedback received from the students. The two schools participated in the pilot study were excluded from the selected schools for the study.

3.7 Methods of Data Collection

3.7.1 Anthropometric Measurements: Nutritional status has been determined based on the height and weight of the students. Weight and height have been taken on the adolescent by a single qualified person (nutrition specialist).

Weight Measurement: weight was measured to the nearest 0.1 kg using a Seca portable scale. To ensure accuracy in measurement, the scale was checked for zero reading before each weighing. Subjects' weight without shoes and with light clothing was measured.

Height Measurement: Student's height was measured in a standing position to the nearest 0.1 cm using a portable Seca stadiometer attached to a smooth, straight wall. Students were asked to stand without shoes, back against the stadiometer, heels together and head in an upright position. The movable headboard was lowered till it firmly touched the subjects' scalp and a direct reading of height was obtained.

The Body Mass Index (BMI): The two measurements are used to calculate BMI, which is defined as the ratio of body weight to body height squared, expressed in Kg/m^2 . Since the BMI for the Arab population was not available, data by WHO (1995) were used. The standards used to determine the BMI categories are shown in Tables 1, 2 (Arabic version) and table 3 (English version) in the appendices, based on the first National Health and Nutrition Examination Surveys in the United States of America (NAHNES I) (Musaiger, 2005, *Arabic reference*) .

In order to contrast characteristics of obese teenagers from non-obese, the model of BMI classification (Must & Dallas, 1991) was employed in the assessment of the association between the selected determining factors and the dependent variable (BMI). The dependent variable, BMI for sex and age was categorized as:

Non-obese	(BMI <85 th percentile)
Over weight and Obese	(BMI ≥85 th percentile)

Participants were divided into two groups according to their BMI for age percentile-category, a non-obese group and a second group of overweight and obese adolescents.

Quality control at the anthropometric measurement level

The accuracy of the anthropometric data was ensured through the following:

- Standardized testing procedure were followed in all measurements.
- A single qualified person (Nutrition Specialist) was used for taking height and weight measurements.
- Instruments were inspected for damage and calibrally before use on subjects at each class by the researcher.

3.7.2 The questionnaire

The instrument selected to measure the identified variables (dietary habits and physical activities) is a structured, self administered, questionnaire (Appendix I). The questionnaire is divided to two parts: the first part relates to Socio-demographic data, including age, sex, educational status of parents, number of siblings and their birth order in the family. Parents' level of education was defined as low (illiterate, those who can read and write and

primary school education); middle (intermediate and secondary school education) and high (university education). Number of siblings was categorized into four intervals 0-2 siblings, 3-4 siblings, 5-6 siblings and seven and more siblings. Rank between siblings (birth order) was also distributed to four categories: first to second, third to fourth, fifth to sixth and seventh and above.

The second part consists of different questions pertinent to students' dietary habits, like eating breakfast daily, snacking habits, eating meals while watching TV and using the internet, and the frequency of intake of fruits and other common foods.

Information related to life style and physical activity such as frequency of playing sports inside and outside the school, and participation in physical education classes, is also recorded. The last part was anthropometric measurements taken and recorded by the researcher.

Quality control at the questionnaire level

The questionnaire was evaluated by experts in this field for content validity

- The questionnaire was translated into Arabic. A language expert then checked the translation to ensure that the meaning of the questions was the same in both the Arabic and English versions.
- It was tested prior to data collection in the form of a pilot study.
- The questionnaire was administered to all students by the researcher in their classes. She explained the questions to the students and answered their questions.

- The questionnaire was collected by the researcher from each student after measuring his/her height and weight by the nutrition specialist and recording them in last part of the questionnaire specified for the height and weight measurement.

Data Validation

The researcher reviewed all questionnaires for completion immediately after administering them to the students in the school. All data were entered directly from the pre coded questionnaires. Computer printouts of the data were reviewed for any information that was out of range.

3.8 Data analysis

The Statistical analysis was undertaken using the Statistical Package Social Sciences (SPSS), version 12 relevant descriptive statistics, as well as inferential statistics were compiled.

Participants were divided into two groups according to their BMI category for age percentile-category membership and Chi- square tests were used to determine the presence of association between the variables.

Chapter Four

Results

4- Results

This chapter presents the findings from analyses undertaken to determine the prevalence of body mass index, its characteristics and determinants in Bahraini adolescents. It is organized into four major sections. The first section describes the socio-demographic and anthropometric characteristics of the study participants. Section two represents the nutritional status of Bahraini and non-Bahraini adolescents based on body mass index. The third section describes the dietary habits and lifestyle of Bahraini and non-Bahraini adolescents. Section four investigates the determinants of obesity in this population including: socio- demographic characteristics, dietary habits and lifestyle (physical activities, watching TV and using the internet).

4.1.1 Socio-demographic characteristics of the adolescent participants

Table 4.1.1 summarizes the socio-demographic characteristics of the participants in this study. The sample consists of 735 Bahraini and non Bahraini adolescents (both male and female students) aged between 15- 18 years old. Three hundred and thirty nine of the participants were males (46%) and 396 were females (54%).

The findings revealed there was no significant difference in age distribution between males and females. About 22 % of the adolescents' fathers and 32% of their mothers are of low level of education. A higher level of education for the fathers (31.2%) was observed, as compared with that of the mothers (25.2%).

Parents' level of education shows significant gender differences between the boys and girls (father's education $p= 0.048$, mother's education $p= 0.021$).

Since a substantial proportion of the Bahrain society is still a traditional Arabic-extended family, is not surprising to have families with seven children or more. About 36.9% of the adolescents belonged to medium size families with 3 to 4 siblings.

Table 4.1.1 Socio-demographic characteristics of Bahraini & Non-Bahraini adolescents aged 15-18 years

		Gender					
		Total		Male		Female	
Number	(%)	N	%	n	%	n	%
		735	100	339	46.1	396	53.9
Age (years)							
15		220	29.9	90	26.5	130	32.8
16		239	32.5	119	35.1	120	30.3
17		215	29.3	108	31.9	107	27.0
18		61	8.3	22	6.5	39	9.8
Father's Education							
Low		160	21.8	61	18.0	99	25.0
Middle		346	47.1	162	47.8	184	46.5
High		229	31.2	116	34.2	113	28.5
Mother's Education							
low		233	31.7	93	27.4	140	35.4
middle		317	43.1	147	43.4	170	42.9
high		185	25.2	99	29.2	86	21.7
Number of Siblings							
0-2		101	13.7	48	14.2	53	13.4
3-4		271	36.9	136	40.1	135	34.1
5-6		179	24.4	85	25.1	94	23.7
7+		184	25.0	70	20.6	114	28.8
Rank between siblings							
0-2		325	44.2	160	47.2	165	41.7
3-4		217	29.5	113	33.3	104	26.3
5-6		102	13.9	40	11.8	62	15.7
7+		91	12.4	26	7.7	65	16.4

*Statistically significant

One fourth (25%) of the adolescents belonged to large families with more than seven siblings and only 13.7% belonged to small families which had 2 siblings or less. A further 44.2% of the adolescents ranked the first or the second between his/her siblings and 43.4% of them ranked in the middle (between 3-6), while only 12.4% ranked more than seventh. The gender shows no significant difference for the siblings factor ($p=.077$). Meanwhile, the rank between the siblings factor explains a significant difference ($p=0.001$), the proportion of the female adolescents who are ranked in the last rank (more than 7 siblings) was higher (16.4%) than the male adolescents (7.7%).

4.1.2 Anthropometric characteristics of adolescents' participants

Anthropometric data of male and female adolescents are summarized in Table 4.1.2. The table summarizes the means, median and standard deviations for height, weight and the BMI for each age group.

The mean value for height and weight increased with age for both boys and girls. However, the variation in weight was greater than the variation of height. In general, the weight and height of males is greater than females. In females, weight showed less variation at age 15 to 17 years than age 18 years, whereas in males weight variability appeared to increase with age. In females, height showed no variation from age 15 to 17 years and from 18 years age started to increase. In males height also showed a remarkable increase with age, although it remained the same at ages 17 and 18 years.

Table 4.1.2 also shows the derived anthropometric BMI indicator by age group category for the males and females. Mean BMI showed a slight variation with age and gender in these age groups and slightly higher in

females than males. In males, BMI showed a slight increase from age 15 to 16 years, followed by a slight decrease at age 17 years, and then it continued an upward trend at age 18 years, whereas in females the mean value of BMI showed a remarkable increase with age from 15 to 18 years.

Table 4.1.2 Anthropometric characteristics of Bahraini & Non-Bahraini adolescents aged 15-18 years (N=735) and the derived anthropometric indicators

Gender	Age	No	Height			Weight			BMI		
			Mean	Median	St.d	Mean	Median	St.d	Mean	Median	St.d
<u>Female</u>	15	130	157.4	157.1	6.3	59	55	17	23.64	21.95	6.25
	16	120	157.5	157.2	6.0	60	58	16	24.30	22.64	5.86
	17	107	157.4	157.3	5.8	61	58	16	24.63	24.15	6.31
	18	39	159.9	159.7	6.3	66	59	21	25.53	24.34	6.98
<u>Male</u>	15	90	162.9	166.6	21.8	59	57	16	24.24	20.42	25.82
	16	119	166.2	169.3	24.6	67	62	21	24.37	21.64	12.91
	17	108	171.4	171.1	7.0	69	66	18	23.31	22.51	5.35
	18	22	171.3	169.5	7.0	72	72	15	24.54	22.92	4.83

4.2.1 Nutritional status of adolescents based on body mass index (BMI) categories

The classification of nutritional status for this study is based on the BMI for age criteria of the World Health Organization Expert Committee (WHO, 1995), which is based on the reference data published by Must & Dallas (1991).

Table 4.2.1 shows that only 2.3% of females and 8.6% of males were underweight. A higher percentage of underweight was observed at age 16 years in both males and females (10.3%) and (4.2%) respectively, where as

the lowest proportion was at age 15 years in females (0.8%) and none at age 18 years in males.

Table 4.2.1 BMI status of Bahraini & Non-Bahraini male & female adolescents aged 15-18 years

Age (years)	N	Nutritional Status			
		Underweight	Normal	Overweight	Obese
		n %	n %	n %	n %
Male					
15	89	8 9.0	59 66.3	14 15.7	8 9.0
16	117	12 10.3	69 59.0	16 13.7	20 17.1
17	108	9 8.3	66 61.1	19 17.6	14 13.0
18	22	0 0	14 63.6	4 18.2	4 18.2
Total	336	29 8.6	208 61.9	53 15.8	46 13.7
Female					
15	130	1 0.8	86 66.2	19 14.6	24 18.5
16	120	5 4.2	68 56.7	23 19.2	24 20.0
17	107	2 1.9	63 58.9	22 20.6	20 18.7
18	39	1 2.6	24 61.5	5 12.8	9 23.1
Total	396	9 2.3	241 60.9	69 17.4	77 19.4

More than half of the males (61.9%) and females (60.9%) were normal weight for age. This was observed around the age of 15 years in both male and female adolescents (66%).

The prevalence of overweight was higher in females (17.4%) than in males (15.8%). The highest rate of overweight occurred at age 17 years for females (20.6%) and at age 18 years for males (18.2%), whereas the lowest rate was at age 18 years for females (12.8%) and age 16 years for males (13.7%).

Females had a higher rate of obesity (19.4%) compared to males (13.7%). Those aged eighteen year old for both genders had the highest prevalence rate of obesity, where in females, the percentage was 23.1%, and males

18.2%. In both males and females as age increased the rate of obesity also increased, except at age 17 years there was a sudden drop, 18.7% in females and 13% in males.

Prevalence of overweight and obesity among adolescent participants

The sample studied was divided into two groups, a non obese group (BMI for age <85th percentile) and a second group including overweight and obese (BMI for age ≥85th percentile). The reason behind this distribution is that the low percentage of underweight (5.2%) as shown in our study indicates that in Bahrain adolescents, body weight tends to be more normal or high. The rate of overweight and obesity shown in Table 4.2.1 (overweight 16.7% and obese 16.8%) indicates that overweight and obesity are the main nutrition problems in this age group of adolescents. Therefore, since the prevalence of underweight is very low, it was decided in the analysis to group the adolescents into two groups, overweight and obese (BMI ≥85th) and non-obese (BMI <85th).

Table 4.2.2 Prevalence of overweight & obesity among male & female adolescent participants aged 15-18 years

Age(years)	Gender							
	Male				Female			
	Non obese		overweight & Obese		Non obese		overweight & Obese	
	N	n %	n %	N	n %	n %	n %	
15	89	67 75.3	22 24.7	130	87 66.9	43 33.1		
16	117	81 69.2	36 30.8	120	73 60.8	47 39.2		
17	108	75 69.4	33 30.6	107	65 60.7	42 39.3		
18	22	14 63.6	8 36.4	39	25 64.1	14 35.9		
Total	336	237 70.5	99 29.5	396	250 63.1	146 36.9		

A comparison of the obese and non-obese rates between male and female adolescents showed in Table 4.2.2 revealed that the females have a higher rate of overweight and obesity (36.9%) than the males (29.5%). The greatest increase in the weight among female students occurred at ages 16, 17 years (39%) while the lowest was at age 15 (33.1%). In addition there was a decline in the rate of overweight and obesity to 35.9% at the age of 18 years among the female participants. In comparison, in the male participants, the highest rate was 36.4% at 18 years old and the lowest 24.7% at the age of 15 years old. In general, female adolescents at 16 and 17 years of age are at a critical cut-off point, because 39% of them were overweight and obese.

On the other hand, 70.5% of male students were non-obese compared to 63.1% of the female participants. The highest rate of non-obese adolescents is categorized at the age of 15 years in both genders (male 73.3% and female 66.9%), followed by 69% at 16 and 17 years old in males and 64% in females.

4.3 Dietary habits & lifestyle of adolescents' participants

4.3.1 Meal Patterns

Table 4.3.1 shows small proportion (13.2 %) of adolescents totally skips breakfast.

Almost 55.9 % of the adolescents did not eat breakfast regularly. Among them, females were nearly double, 62.8 %, than males, 37.2 %. The gender difference was highly statistically significant ($p=0.000$). Similar trends were observed among girls who did not eat lunch and dinner regularly 68.3% and 66.5% respectively.

Breakfast was mostly eaten at home (61%) and a few students ate breakfast at school (26%). Gender difference was highly significant with place of breakfast intake ($P=0.001$).

Table 4.3.1 Meal patterns of male & female adolescents in Bahrain

Meal Pattern	Gender						P-value
	Total		Male		Female		
	N	%	n	%	n	%	
Eating breakfast regularly							
No	411	55.9	153	37.2	258	62.8	0.000*
Yes	324	44.1	186	57.4	138	42.6	
Place of eating breakfast							
At Home	448	61.0	203	45.3	245	54.7	0.001*
At School	190	25.9	105	55.3	85	44.7	
Don't eat	97	13.2	31	32.0	66	68.0	
Bring food from home							
No	482	65.6	284	58.9	198	41.1	0.000*
Yes	253	34.4	55	21.7	198	78.3	
Eating during school break time							
No	88	12.0	49	55.7	39	44.3	0.057
Yes	647	88.0	290	44.9	357	55.1	
Eat from school canteen							
No	215	29.3	104	48.4	111	51.6	0.431
Yes	520	70.7	235	45.2	285	54.8	
Eating food while going home							
No	580	78.9	257	44.3	323	55.7	0.057
Yes	155	21.1	82	52.9	73	47.1	
Eating lunch regularly							
No	123	16.7	39	31.7	84	68.3	0.000*
Yes	612	83.3	300	49.0	312	51.0	
Eating supper regularly							
No	194	26.4	65	33.5	129	66.5	0.000*
Yes	541	73.6	274	50.6	267	49.4	

* statistically significant

Three times (78.3%) more female adolescents brought food from home to be eaten during break time than males (21.7%). The gender difference was

statistically significant ($p=0.000$). Altogether 88 % consumed food during school break time most of them (70.7 %) ate from school canteen, while (34.4%) ate home-prepared food. Most of the adolescents reported not eating food while going home in the afternoon (78.9%). However, there was no significant gender difference.

Supper was less likely to be eaten regularly (73.6%) than lunch (83.3%). There was significant difference between males and females in eating lunch ($p=0.000$) and supper ($p=0.000$) regularly.

4.3.2 Snacking habits

Of adolescent participants, 17.1% reported that they always ate food between breakfast and lunch, compared to 32.1% who always ate between lunch and supper, as shown in Table 4.3.2 Only a few of the adolescents (18% and 12.7%) never ate morning and evening snacks, respectively.

Table 4.3.2 Snacking habits of adolescents in Bahrain

Snacking Habits	Gender						P-value
	Total		Male		Female		
	N	%	N	%	n	%	
Eating between breakfast and lunch							
Always	126	17.1	59	46.8	67	53.2	0.686
Sometimes	477	64.9	215	45.1	262	54.9	
Never	132	18.0	65	49.2	67	50.8	
Eating between lunch and supper							
Always	236	32.1	116	49.2	120	50.8	0.498
Sometimes	406	55.2	180	44.3	226	55.7	
Never	93	12.7	43	46.2	50	53.8	
Eat mid-night snacks							
Always	139	18.9	62	44.6	77	55.4	0.303
Sometimes	286	38.9	142	49.7	144	50.3	
Never	310	42.2	135	43.5	175	56.5	

There was no significant difference between male and female in snacking habits. However the percentage of adolescents who did not eat mid-night snacks increased to 42.2 % whereas only 18.9% of adolescents reported eat mid-night snacks regularly. Of them, 44.6% were males and 55.4% were females. However, the gender difference was not statistically significant.

3.3. Type & Frequency of food consumed by adolescents

Food frequency intake by adolescents is presented in Table 4.3.3 One fourth of the respondents reported eating **fruit** daily; 32.4 %, 1-3 times a week; and 14.6 %, 4-6 times per week.

Table 4.3.3 Type and frequency of food consumed by adolescents aged 15-18 years in Bahrain

Gender							
Frequency of eating different types of food /week	Total		Male		Female		P-value
	N	%	n	%	n	%	
Fruit							
Every day	186	25.3	95	51.1	91	48.9	0.000*
4-6 times	107	14.6	60	56.1	47	43.9	
1-3 times	238	32.4	115	48.3	123	51.7	
Rarely	204	27.7	69	33.5	135	66.5	
Vegetables/Salad							
Every day	193	26.3	102	52.8	91	47.2	0.125
4-6 times	70	9.5	31	44.3	39	55.7	
1-3 times	192	26.1	89	46.4	103	53.6	
Rarely	280	38.1	117	41.8	163	58.2	
Milk & dairy products							
Every day	273	37.1	129	47.3	144	52.7	0.017*
4-6 times	100	13.6	57	57.0	43	43.0	
1-3 times	198	26.9	92	46.5	106	53.5	
Rarely	164	22.3	61	37.2	103	62.8	
Meat							
Everyday	147	20.0	84	57.1	63	42.9	0.000*
4-6 times	125	17.0	67	53.6	58	46.4	
1-3 times	305	41.5	134	43.9	171	56.1	
Rarely	158	21.5	54	34.2	104	65.8	

* statistically significant

Table 4.3.3 (continued) Type and frequency of food consumed by Bahraini adolescents

Frequency of eating different types of food /week	Gender						P-value
	Total		Male		Female		
	N	%	n	%	n	%	
Fish							
Every day	51	06.9	31	60.8	20	39.2	0.003*
4-6 times	114	15.5	62	54.4	52	45.6	
1-3 times	284	38.6	135	47.5	149	52.5	
Rarely	286	38.9	111	38.8	175	61.2	
Chicken							
Every day	134	18.2	74	55.2	60	44.8	0.067
4-6 times	172	23.4	83	48.3	89	51.7	
1-3 times	364	49.5	154	42.3	210	57.7	
Rarely	65	08.8	28	43.1	37	56.9	
Lentils/beans							
Every day	30	04.1	15	50.0	15	50.0	0.841
4-6 times	74	10.1	37	50.0	37	50.0	
1-3 times	172	23.4	80	46.5	92	53.5	
Rarely	459	62.4	207	45.1	252	54.9	
Nuts							
Every day	56	07.6	24	42.9	32	57.1	0.144
4-6 times	67	09.1	39	58.2	28	41.8	
1-3 times	198	26.9	95	48.0	103	52.0	
Rarely	414	56.3	181	43.7	233	56.3	
Sweets							
Every day	231	31.4	86	37.2	145	62.8	0.003*
4-6 times	105	14.3	47	44.8	58	55.2	
1-3 times	193	26.3	93	48.2	100	51.8	
Rarely	206	28.0	113	54.9	93	45.1	
Chocolates							
Every day	239	32.5	85	35.6	154	64.4	0.000*
4-6 times	95	12.9	45	47.4	50	52.6	
1-3 times	191	26.0	92	48.2	99	51.8	
Rarely	210	28.6	117	55.7	93	44.3	
Soft drinks							
Every day	310	42.2	175	56.5	135	43.5	0.000*
4-6 times	91	12.4	45	49.5	46	50.5	
1-3 times	130	17.7	50	38.5	80	61.5	
Rarely	204	27.8	69	33.8	135	66.2	
Canned fruit juice							
Every day	176	23.9	66	37.5	110	62.5	0.053
4-6 times	125	17.0	57	45.6	68	54.4	
1-3 times	206	28.0	104	50.5	102	49.5	
Rarely	228	31.0	112	49.1	116	50.9	

* statistically significant

Of those who rarely ate fruit, 33.5% were males and 66.5% females. There was a significant difference in frequency of consuming fruit between male and females ($p=0.000$).

Vegetables and salads were rarely eaten by of the respondents (38.1 %) and was seen in females more (58.2 %) than males (41.8 %). The reverse trend was observed concerning the consumption of **milk and other dairy products**, as 37.1% of the adolescents daily consumed milk, cheese and yoghurt. Females consumed dairy products (52.7 %) compared to males (47.3%). Difference in the consumption of milk products was statistically significant for gender ($P = 0.017$).

The gender difference was significant with **Meat** consumption ($p=0.000$), 42.9% of females and 57.1% of males ate meat daily. As far as frequency was concerned, 20.0 % ate every day, 17.0 % , 4-6 times and 41.5 % ate 1-3 times a week. Although 21.5 % rarely ate meat, the females exceeded the males 65.8%, 34.2% respectively. A higher percentage of participants (38.9 %) rarely ate **fish**. Only 6.9 % were regular consumers (every day) which suggest that the adolescents preferred meat/chicken over fish. Difference in fish eating by gender was significant ($P = 0.003$). Eating **chicken** was more popular among the students, with only 8.8 % reports rarely eating it. Regular eaters were 18.2 % (55.2% males and 44.8% females) while 23.4%consumed it 4-6 times a week and 49.5 %, 1-3 times. The highest proportion (62.4 %) rarely consumed **lentils/beans**. Among the reminder, 4.1 % ate these natural (vegetable) sources of protein every day. Similar trends were depicted for **nuts** (56.3 % rarely and only small proportion 7.6 % regularly ate nuts). **Sweets and chocolates** were preferred by 72 % of adolescents, and obviously in excess by females, 62.8 % and 64.4 %, as compared with males, 37.2 and 35.6 % respectively who daily consumed

sweets ($p=0.003$) and chocolates ($p=0.000$). There was wide range of preference for **soft drinks** with 42.2 % drunk every day; 12.4%, 4-6 times a week; 17.7% , 1-3 times / week; and 27.8% rarely consumed; among them 66.2% were female and 33.8% were male ($P=0.000$). **Canned fruit juices** were less preferred by adolescents. Thirty one percent rarely consumed canned fruit juice and 23.9% everyday (37.5% males compared to 62.5% females).

4.3.4 Frequency and portion size of Fast Food consumed by adolescents

In general, there was significant difference between gender and the habits of eating fast foods as shown in Table 4.3.4. Only 14.4% of adolescents ate fast food daily, 37.7% ate 1-3 times a week, 18.9% ate 4-6 times a week and the rest (29%) rarely did so.

Gender difference was significant with eating fast food out and inside the home. Most of the males (63.3%) ate fast food regularly (four times and more) outside the home, compared to 36.7% females ($p=0.000$). While girls preferred to eat fast food at home ($P= 0.006$), 59.5% of them ate regularly (4 times and more) compared to 40.5% of males. Eighteen percent of the adolescent participants never ate fast food outside the home, while 17.2% never ate fast food inside the home.

Most of adolescents reported eating burgers. The majority (68.8%) preferred regular size **burgers**. Gender difference was significant with size of burger preferred by adolescents ($p=0.000$), a higher number of females (58.9%) reported for regular burgers size as compared to males (41.1 %). Regular size **potato chips** servings were preferred by 63.3 % of the adolescents; among them 58.9 % were females and 41.1 % were males.

There was significant difference between gender and size of chips preferred (P= 0.002).

Table 4.3.4: Frequency and size of fast food consumed by Adolescents aged 15-18 years in Bahrain

Fast food Habits	Gender					
	Total		Male		Female	
	N	%	n	%	N	%
Frequency of eating Fast Food/week						
Everyday	106	14.4	52	49.1	54	50.9
4-6 times	139	18.9	68	48.9	71	51.1
1-3 times	277	37.7	132	47.7	145	52.3
Rarely	213	29.0	87	40.8	126	59.2
Frequency of eating Fast Food outside home/week						
Never	133	18.1	49	36.8	84	63.2
one time	153	20.8	55	35.9	98	64.1
Two times	171	23.3	66	38.6	105	61.4
Three times	131	17.8	76	58.0	55	42.0
four times +	147	20.0	93	63.3	54	36.7
Frequency of eating Fast Food inside home/week						
Never	126	17.2	77	61.1	49	38.9
one time	136	18.5	60	44.1	76	55.9
Two times	166	22.6	75	45.2	91	54.8
Three times	101	13.8	44	43.6	57	56.4
four times +	206	27.9	83	40.5	123	59.5
Size of burger preferred						
Don't eat	62	8.4	25	40.3	37	59.7
Regular	506	68.8	208	41.1	298	58.9
Large	167	22.7	106	63.5	61	36.5
Size of chips preferred						
Don't eat	91	12.2	52	57.8	38	42.2
Regular	465	63.3	191	41.1	274	58.9
Large	179	24.4	96	53.1	84	46.9
Size of soft drinks preferred						
Don't drink	85	11.6	45	52.9	40	47.1
Small	270	36.7	114	42.2	156	57.8
Medium	268	36.5	117	43.7	151	56.3
Large	112	15.2	63	56.2	49	43.8

* statistically significant

Only 12.2% of the adolescents reported not eating chips at all, While 24.4% preferred large size, of which 53.1% were male and 46.9% were female. The majority of adolescents consumed small and medium sizes of **soft drink**, while 15.2% preferred the large size and small proportion (11.6%) never consumed them. The gender difference was also significant ($P = 0.036$). Surprisingly, females showed a higher rate in consuming small and medium size of soft drinks (57.8% and 56.3%) compared to males, 42.2% and 43.7% respectively. While 56.3% of males preferred large size than female (43.8%).

4.3.5. TV and Internet viewing

Table 4.3.5 represents hours spent and food consumed by adolescents while watching TV and the Internet. It also summarizes eating habits of adolescents while feeling board and depressed. A low proportion (5.3 %) did not **watch TV** everyday. Among those who watched, 29.8 % spent 1-2 hrs, 36.7% spent 3-4 hrs and higher proportion (38.2%) spent five and more hours per day in front of the TV. Besides watching TV, 41.8 % always ate while watching TV, while only 18.0 % never ate. Although no significant difference was shown between gender and watching TV, females showed a higher rate in watching TV as well as eating while watching, than male.

More than fifty percent (54.8 %) browsed the **Internet** for 1-2 hrs every day, and 17.7% used it for 3-4 hrs, while 27.5% did not use it.

Both boys and girls used the Internet. Although it was used more by females than males, the difference was not significant. A very small proportion of adolescents (4.2 %) ate while browsing and 67.8% did not eat.

The majority of the adolescent participants 46% reported not eating while feeling bored. Of those adolescents who ate, 22.9 % always and 31.2 % sometimes consumed food in this situation.

Table 4.3.5: TV & Internet viewing and dietary habits among adolescents aged 15-18 years in Bahrain

Tv & Internet viewing	Gender						P-value
	Total		Male		Female		
	N	%	n	%	n	%	
Hours watching TV every day							
Not watching	39	5.3	16	41.0	23	59.0	0.756
1-2 hrs	219	29.8	101	46.1	118	53.9	
3-4 hrs	270	36.7	121	44.8	149	55.2	
5+ hrs	207	28.2	101	48.8	106	51.2	
Eating while watching TV							
Always	307	41.8	135	44.0	172	56.0	0.145
Sometimes	296	40.3	133	44.9	163	55.1	
Never	132	18.0	71	53.8	61	46.2	
Hours using Internet every day							
Not using	202	27.5	87	43.1	115	56.9	0.095
1-2	403	54.8	200	49.6	203	50.4	
3-4	130	17.7	52	40.0	78	60.0	
5+	0	0	0	0	0	0	
Eating while using Internet							
Don't use	206	28.0	89	43.2	117	56.8	0.068
Don't eat	498	67.8	241	48.4	257	51.6	
Yes	31	4.2	9	29.0	22	71.0	
Eating while feeling bored							
Always	168	22.9	56	33.3	112	66.7	0.000*
Sometimes	229	31.2	106	46.3	123	53.7	
Never	338	46.0	177	52.4	161	47.6	
Eating while feeling depressed							
Always	94	12.8	31	33.0	63	67.0	0.001*
Sometimes	107	14.6	39	36.4	68	63.6	
Never	534	72.7	269	50.4	265	49.6	

* statistically significant

A significant difference was shown between gender and eating while feeling bored ($p=0.000$); more females (66.7%) than males (33.3%) always

consumed food while feeling bored. A low proportion of adolescents ate while feeling depressed, 12.8 % always and 14.6 % sometimes ate when depressed and the majority 72.7% did not eat. Also in this situation more females consumed food than males, and the difference was significant ($P = 0.001$).

4.3.5 Physical Activity:

Table 4.3.6 shows that more than a quarter (26.5%) of the respondents never practiced any sports activity.

Table 4.3.6: Physical activity among adolescents aged 15-18 years in Bahrain

	Gender						P-value
	Total		Male		Female		
	N	%	n	%	n	%	
Practicing any sports activities							
No	195	26.5	41	21.0	154	79.0	0.000*
Yes	540	73.5	298	55.2	242	44.8	
Frequency of practicing sport/week							
None	195	26.5	40	20.5	155	79.5	0.000*
1-2	167	22.7	62	37.1	105	62.9	
3-4	168	22.9	94	56.0	74	44.0	
5-6	72	9.8	51	70.8	21	29.2	
7+	133	18.1	92	69.2	41	30.8	
Participating in sports activities at school							
Always	587	79.9	268	45.7	319	54.3	0.026*
Sometimes	103	14.0	42	40.8	61	59.2	
Never	45	6.1	29	64.4	16	35.6	
Participating in sports activities outside school							
Always	266	36.2	217	81.6	49	18.4	0.000*
Sometimes	298	40.5	88	29.5	210	70.5	
Never	171	23.3	34	19.9	137	80.1	

* statistically significant

Of those who participated, 22.7 and 22.9 % practiced 1-2 times and 3-4 times per week respectively. Only 18.1% were reported regularly participate in physical activity. Among those who did not take part in any sports, 79.5 % were females. Gender difference was significant with practicing sports activities ($p=0.000$) and the frequency of practicing sports per week ($p=0.000$). Nearly 80% of the adolescents participated in **sports activities in the school** and only 6.1 % never took part in school sports; gender difference was significant ($p = 0.026$) in favor of the females. From the adolescent participants who always engaged in **sports activities outside school**, the majority (81.6%) were males while only 18.4 % were females. Trends were exactly the reverse for those who never participated in sports activities outside school; 19.9 % of them were males and 80.1 % were females.

4.4 Determinants of obesity in the study population

In this section socio-demographic, dietary factors and lifestyle were examined to determine whether they were associated with an increased risk of overweight and obesity in the sample of Bahraini adolescents.

4.4.1 Socio-demographic factors

Table 4.4.1 summarizes the relationship between the socio-demographic characteristics of Bahraini adolescents and obesity. The socio-demographic characteristics studied included age, parents' level of education, number of siblings and rank between siblings.

Table 4.4.1 Associations of socio-demographic factors & nutritional status of adolescent males & females in Bahrain categorized as overweight and obese group ($\geq 85^{\text{th}}$ P) and non-obese group ($<85^{\text{th}}$ P) of BMI for age percentile

	Gender									
	Male					Female				
	Non-obese		overweight & obese		P- Value	Non-obese		overweight & obese		P- Value
	<85 th P		≥85 th P			<85 th P		≥85 th P		
	N	%	n	%		n	%	n	%	
Age										
15	67	75.3	22	24.7	0.654	87	66.9	43	33.1	0.717
16	81	69.2	36	30.8		73	60.8	47	39.2	
17	75	69.4	34	30.6		65	60.7	42	39.3	
18	15	63.6	9	36.4		25	64.1	14	35.9	
Father's Education										
Low	48	81.4	11	18.6	0.087	63	63.6	36	36.4	0.311
Middle	114	70.4	48	29.6		122	66.3	62	33.7	
High	75	65.2	40	34.8		65	57.5	48	42.5	
Mother's Education										
Low	75	81.5	17	18.5	0.025*	88	62.9	52	37.1	0.007*
Middle	96	66.2	49	33.8		119	70.0	51	30.0	
High	66	66.7	33	33.3		43	50.0	43	50.0	
Number of Siblings										
0-2	28	58.3	20	41.7	0.054 *	31	58.5	22	41.5	0.846
3-4	94	70.7	39	29.3		85	63.0	50	37.0	
5-6	58	68.2	27	31.8		62	66.0	32	34.0	
7+	57	81.4	13	18.6		72	63.2	42	36.8	
Rank between siblings										
0-2	110	69.6	48	30.4	0.032 *	112	67.9	53	32.1	0.170
3-4	72	63.7	41	36.3		62	59.6	42	40.4	
5-6	33	84.6	6	15.4		33	53.2	29	46.8	
7+	22	84.6	4	15.4		43	66.2	22	33.8	

* statistically significant

4.4.1.1 Age

In both genders no significant difference was found between age group and nutrition status. However obesity tended to increase with age in both genders. Older males had a higher percentage of obesity (36.4%) compared to the younger ones (24.7%). The same was observed for the females, although obesity tended to decrease at the age of 18 years, which finding could be due to the small sample number of this age group (14 participants). The variation within this sample group was therefore high. There was no significant association between age and risk of being obese in both genders.

4.4.1.2 Parents' level of education

There was no significant association between level of education of father and being overweight or obese in adolescent participants ($P=0.087$ for male and $P=0.311$ for female). Female with high educational level fathers were more likely to be in the group of overweight and obese (42.5%). In males the higher rate of overweight and obesity (34.8%) also showed among adolescents with higher educated fathers.

Mother's level of education was significantly associated with being overweight or obese for both males ($P=0.025$) and female ($P=0.007$). Overweight and obesity was more likely to occur among females with high educational level mothers (50%), whereas among males, showed more in adolescents with high (33.3%) and middle (33.8%) educational level mothers.

4.4.1.3. Number of siblings and birth order

No significant association was found between the numbers of adolescents' siblings and overweight and obesity status ($P=0.054$ for males and $P=0.846$ for females). With the increasing number of siblings, there was a tendency for males to be in overweight and obese groups, whereas in females no specific trend was noted.

There was a significant association between the birth order of the male adolescents and overweight or obesity status ($P=0.032$). Adolescent males ranked in the fifth and above showed a lower rate of overweight or obese (15.4%) than the first four siblings rank. However among females, there was a tendency to increase weight in adolescent girls ranked 3rd to 6th, while it dropped slightly at the birth order 7+ (33.8%).

4.4.2 Dietary habits and food intake of adolescents

Dietary habits and eating behaviors, namely: eating breakfast, lunch and dinner regularly, snacking habits, eating while watching TV and using the Internet, eating when feeling bored, eating when depressed and upset, frequency of eating fast food, place of eating breakfast and place of eating fast food were examined to assess the strength of association between these factors and nutritional status among the adolescent participants using the BMI category. Tables 4.4.2 to 4.4.5 show the results of dietary habits of adolescents in Bahrain using the BMI category.

4.4.2.1. Eating breakfast, lunch and supper

As shown in table 4.4.2 the prevalence of overweight and obesity group was higher in those adolescents who skipped breakfast. Of those who skipped breakfast, 30% of males and 40.3% of females were classified as overweight or obese compared to 29% and 30.4% of the breakfast eating group, respectively.

More than half (61%) of the adolescents, male and female, reported eating breakfast at home. Of those who ate breakfast at home, 25.7% of male and 34.3% of females were found to be in overweight and obese group compared to 34.3% and 42.4% who ate breakfast at school, respectively.

In respect to other meals, both genders showed great concern in having lunch and supper. In relation to adolescents' nutritional status, 24.3% and 40.5% of overweight and obese group of males and female were skipping lunch respectively. However 32.3% and 40.3% of this group in both male and female were skipping supper respectively.

4.4.2.2 Eating food at school

A high percentage of adolescents (88%) reported having food during school break time. Among those who ate during the break 29.5% of males and 35.1% of female were overweight or obese. Table 4.4.2 showed that there is significant association between nutritional status and eating during school break time in female (P-Value=0.047).

Table 4.4.2 Associations between food intake & nutritional status of adolescent males & females in Bahrain categorized as overweight and obese group ($\geq 85^{\text{th}}$ P) and non-obese group ($<85^{\text{th}}$ P) of BMI for age percentile

	Gender									
	Male					Female				
	Non obese		overweight & obese		P- Value	Non obese		Overweight & obese		P- Value
	<85 th P		≥85 th P			<85 th P		≥85 th P		
	n	%	n	%		n	%	n	%	
Eating breakfast regularly										
No	105	70.0	45	30.0	0.847	154	59.7	104	40.3	0.052 *
Yes	132	71.0	54	29.0		96	69.6	42	30.4	
Place of eating breakfast										
At Home	150	74.3	52	25.7	0.172	161	65.7	84	34.3	0.371
At School	69	65.7	36	34.3		49	57.6	36	42.4	
Don't eat	18	62.1	11	37.9		40	60.6	26	39.4	
Bring food from home										
No	200	71.2	81	28.8	0.562	111	56.1	87	43.9	0.004*
Yes	37	67.3	18	32.7		139	70.2	59	29.8	
Eating during school break time										
No	34	70.8	14	29.2	0.961	19	48.7	20	51.3	0.047*
Yes	203	70.5	85	29.5		231	64.9	126	35.1	
Eating from school canteen										
No	72	70.6	30	29.4	0.989	67	60.4	44	39.6	0.476
Yes	165	70.5	69	29.5		183	64.2	102	35.8	
Eating food while going home										
No	176	69.3	78	30.7	0.379	198	61.3	125	38.7	0.112
Yes	61	74.4	21	25.6		52	71.2	21	28.8	
Eating lunch regularly										
No	28	75.7	9	24.3	0.467	50	59.5	34	40.5	0.440
Yes	209	69.9	90	30.1		200	64.1	112	35.9	
Eating dinner regularly										
No	44	67.7	21	32.3	0.576	77	59.7	52	40.3	0.324
Yes	193	71.2	78	28.8		173	64.8	94	35.2	

* Statistically significant

Almost three quarters of the adolescents (70.7 %) preferred eating food from the school canteen than bringing food from home. There was highly significant association between nutritional status and not eating home-made food at school in adolescent females ($P=0.004$). Among those who bring food from home most are non-obese (70.2% females and 67.3% males). In comparison 39.6% females and 29.4% males who did not eat from the school canteen were reported to be overweight or obese. Although only 21.1% of the participants reported eating food on the way going home from school, among this group, 28.8% of females and 25.6% of males were overweight or obese.

4.4.2.3 Snacking Habits

Table 4.4.3 shows negative significant results for male adolescents in relation to nutritional status and eating between breakfast and lunch ($P=0.005$). Among those males who always eat morning snack only 12.1% were found to be overweight or obese, while overweight and obesity were showed higher (36.5%) among those males who never and (32.1%) sometimes eat between breakfast and lunch.

A similar trend was observed in relation to eating between lunch and dinner. Thirty five percent of males who never consumed afternoon snacks and 34.3% who sometimes consumed afternoon snacks were overweight or obese, compared to 20% who always consumed afternoon snacks. There was a significant association between afternoon snacking and nutritional status among males ($P=0.023$).

No significant association was found between mid-night snacks and nutritional status in both male and female adolescents. Table 4.4.3 shows 41.6% of females who were reported always eating mid-night snacks were overweight or obese, whereas among males, obesity occurred more among those who never ate mid-night snacks (31%).

Table 4.4.3 Associations of snacking habits & nutritional status of adolescent males & females in Bahrain categorized as overweight and obese group ($\geq 85^{\text{th}}$ P) and non-obese group ($<85^{\text{th}}$ P) of BMI for age percentile

	Gender									
	Male					Female				
	Non-obese		overweight & obese		P- Value	Non-obese		overweight & obese		P- Value
	<85 th P		≥85 th P			<85 th P		≥85 th P		
	N	%	n	%		n	%	n	%	
Eating between breakfast and lunch										
Always	51	87.9	7	12.1	0.005*	44	65.7	23	34.3	0.128
Sometimes	146	67.9	69	32.1		171	65.3	91	34.7	
Never	40	63.5	23	36.5		35	52.2	32	47.8	
Eating between lunch and dinner										
Always	92	80.0	23	20.0	0.023*	84	70.0	36	30.0	0.164
Sometimes	117	65.7	61	34.3		137	60.6	89	39.4	
Never	28	65.1	15	34.9		29	58.0	21	42.0	
Eating mid-night Snacks										
Always	47	77.0	14	23.0	0.466	45	58.4	32	41.6	0.633
Sometimes	97	69.3	43	30.7		93	64.6	51	35.4	
Never	93	68.9	42	31.1		112	64.0	63	36.0	

* Statistically significant

In general our study showed that group of overweight and obese female adolescents consumed more snacks (morning, afternoon and midnight) than males. 34%, 30% and 41.6% of overweight and obese females always ate morning, afternoon and mid-night snacks respectively, compared to overweight and obese group of males 12.1%, 20% and 23% respectively.

4.4.2.4 Food frequency intake

Different types of food taken by adolescents per week are summarized in Table 4.4.4. No significant association was found between frequency of different types of food consumed and nutritional status in both males and females. Our study showed that overweight and obese group in females have low intake of fruit and vegetable than overweight and obese group in males, 38.5% and 35% of females and 22.4% and 24.1% of males rarely ate fruit and vegetables respectively.

Dairy products consumption was assessed and the result showed that among those participants who consumed dairy products daily, 30.2% of males and 35.4% of females were from overweight and obese group. In relation to meat, fish and chicken intake, both genders showed a higher consumption of meat and chicken and a lower consumption of fish. In respect to nutrition status, among those males who ate meat, fish and chicken daily 21.7%, 35.5% and 17.6% were from overweight and obese group, whereas in female 36.5%, 45%, 41.7%, were overweight or obese respectively.

Both genders reported low consumption of lentils and beans. It is interesting that among this group, 32.2% of males and 39.7% of females were overweight or obese.

Female adolescents showed a higher percentage in daily consumption of sweets and chocolates compared to males. Among these daily sweet and chocolate consumers 23.5% and 25% of males and 38.6% and 35.1% of females were from overweight and obese group respectively.

Table 4.4.4 Associations of group of food intake & nutritional status of adolescent males & females in Bahrain categorized as overweight and obese group ($\geq 85^{\text{th}}$ P) and non-obese group($<85^{\text{th}}$ P) of BMI for age percentile

Frequency of eating different types of food / week	Gender									
	Male					Female				
	Non-obese		Overweight & Obese		p-value	Non-obese		Overweight & Obese		p-value
	<85 th P		≥85 th P			<85 th P		≥85 th P		
	n	%	n	%		n	%	n	%	
Fruit										
Every day	61	65.6	33	34.4	0.269	58	63.7	33	36.3	0.939
4-6 times	39	65.0	22	35.0		29	61.7	18	38.3	
1-3 times	84	73.0	31	27.0		80	65.0	43	35.0	
Rarely	52	77.6	17	22.4		83	61.5	52	38.5	
Vegetables/Salad										
Every day	68	68.0	33	32.0	0.489	60	65.9	31	34.1	0.676
4-6 times	21	67.7	12	32.3		23	59.0	16	41.0	
1-3 times	60	67.4	29	32.6		61	59.2	42	40.8	
Rarely	88	75.9	28	24.1		106	65.0	57	35.0	
Milk/Cheese/Yoghurt										
Every day	90	69.8	39	30.2	0.240	93	64.6	51	35.4	0.167
4-6 times	44	77.2	14	22.8		32	74.4	11	25.6	
1-3 times	58	63.7	34	36.3		59	55.7	47	44.3	
Rarely	45	76.3	15	23.7		66	64.1	37	35.9	
Meat										
Every day	65	78.3	19	21.7	0.233	40	63.5	23	36.5	0.724
4-6 times	45	67.2	23	32.8		37	63.8	21	36.2	
1-3 times	93	70.5	39	29.5		112	65.5	59	34.5	
Rarely	34	63.0	21	37.0		61	58.7	43	41.3	
Fish										
Every day	20	64.5	11	35.5	0.466	11	55.0	9	45.0	0.237
4-6 times	40	65.6	21	34.4		27	51.9	25	48.1	
1-3 times	94	70.1	40	29.9		99	66.4	50	33.6	
Rarely	83	75.5	27	24.5		113	64.6	62	35.4	
Chicken										
Every day	61	82.4	13	17.6	0.087	35	58.3	25	41.7	0.656
4-6 times	54	65.9	28	34.1		58	65.2	31	34.8	
1-3 times	103	67.8	49	32.2		131	62.4	79	37.6	
Rarely	19	67.9	9	32.1		26	70.3	11	29.7	
Lentils/beans										
Every day	10	66.7	5	33.3	0.238	8	53.3	7	46.7	0.270
4-6 times	25	67.6	12	32.4		26	70.3	11	29.7	
1-3 times	63	79.7	16	20.3		64	69.6	28	30.4	
Rarely	139	67.8	66	32.2		152	60.3	100	39.7	
Nuts										
Every day	20	83.3	4	16.7	0.244	20	62.5	12	37.5	0.428
4-6 times	31	79.5	8	20.5		15	53.6	13	46.4	
1-3 times	63	67.7	30	32.3		71	68.9	32	31.1	
Rarely	123	68.3	57	31.7		144	61.8	89	38.2	

About half of male and female participants reported rare consumption of nuts, whereas 31.7% males and 38.2% females of this group were overweight or obese. More than half of male adolescents reported daily consumption of soft drinks, among them 24.9% were from overweight or obese, while from the 43.5% of females who drank soft drinks every day, 36.3% were overweight or obese. Thirty nine percent of males and 31.8% of females who had a daily consumption of canned fruit juice were from overweight/obese group.

Table 4.4.4 (continued) Crud associations of group of food intake & nutritional status of adolescent males & females in Bahrain categorized as overweight or obese ($\geq 85^{\text{th}}$ P) and non-obese ($<85^{\text{th}}$ P) of BMI for age percentile

Frequency of eating different types of food / week	Gender							
	Male				Female			
	Non-obese		Overweight & Obese		Non-obese		Overweight & Obese	
	$<85^{\text{th}}$ P		$\geq 85^{\text{th}}$ P		$<85^{\text{th}}$ P		$\geq 85^{\text{th}}$ P	
	n	%	N	%	n	%	n	%
Sweets								
Every day	65	76.5	20	23.5	89	61.4	56	38.6
4-6 times	37	80.4	9	19.6	37	63.8	21	36.2
1-3 times	61	66.3	31	33.7	67	67.0	33	33.0
Rarely	74	65.5	39	34.5	57	61.3	36	38.7
Chocolates								
Every day	63	75.0	21	25.0	100	64.9	54	35.1
4-6 times	31	70.5	13	29.5	34	68.0	16	32.0
1-3 times	68	74.7	23	25.3	62	62.6	37	37.4
Rarely	75	64.1	42	35.9	54	58.1	39	41.9
Soft drinks								
Every day	130	75.1	43	24.9	86	63.7	49	36.3
4-6 times	33	73.3	12	26.7	29	63.0	17	37.0
1-3 times	31	62.0	19	38.0	46	57.5	34	42.5
Rarely	43	63.2	25	36.8	89	65.9	46	34.1
Canned fruit juice								
Every day	39	60.9	25	39.1	75	68.2	35	31.8
4-6 times	44	77.2	13	22.8	46	67.6	22	32.4
1-3 times	71	68.3	33	31.7	56	54.9	46	45.1
Rarely	83	74.8	28	25.2	73	62.9	43	37.1

4.4.2.5 Fast Food Habits

There was no significant difference between frequency of consumption of fast foods and nutritional status in males and females as shown in Table 4.4.5. Among the participants who ate fast food every day, 26.9% of males and 33.3% of females were overweight or obese. A higher percentage of males took fast food outside the home, while more females ate fast food inside the home more than four times per week. Among adolescents who ate fast food outside the home, 21.7 % of males and 29.6 % of females were from overweight/obese group. However the overweight and obesity prevalence was 19.3% among male and 35.2% among female participants belonging to the group who ate fast food inside the home. The place of eating fast food was not associated with obesity.

Table 4.4.5 represents three common types of fast foods namely: burger, potato chips and soft drinks. The size of these foods was assessed by selecting either regular or large or not eating fast foods. In males, chi square reveals significant association between burger size ($p=0.003$) and nutritional status. The percentage of overweight or obese males who consumed the large size of the mentioned foods were 41%, 37.9% and 31.7% respectively, compared to overweight or obese females who were 42.6%, 39.3% and 38.8% respectively.

Table 4.4.5 Associations of Fast Food habits & nutritional status of adolescent males & females in Bahrain categorized as overweight and obese group ($\geq 85^{\text{th}}$ P) and non-obese group ($<85^{\text{th}}$ P) of BMI For age percentile

	Gender									
	Male					Female				
	Non obese		overweight & obese		P- Value	Non obese		overweight & obese		P- Value
	<85 th P	≥85 th P	<85 th P	≥85 th P						
	n	%	n	%		n	%	n	%	
Frequency of eating fast food/week										
Every day	38	73.1	14	26.9	0.264	36	66.7	18	33.3	0.917
4-6 times	54	79.4	16	20.6		43	60.6	28	39.4	
1-3 times	86	66.7	43	33.3		92	63.4	53	36.6	
Rarely	59	67.8	29	32.2		79	62.7	47	37.3	
Frequency of eating fast food/week outside home										
Never	36	73.5	13	26.5	0.292	53	63.1	31	36.9	0.519
one time	37	67.3	18	32.7		62	63.3	36	36.7	
Two times	42	63.6	24	36.4		60	57.1	45	42.9	
Three times	50	67.6	24	32.4		37	67.3	18	32.7	
Four times +	72	78.3	20	21.7		38	70.4	16	29.6	
Frequency of eating fast food/week inside home										
Never	53	69.7	23	30.3	0.072	27	55.1	22	44.9	0.433
one time	42	70.0	18	30.0		51	67.1	25	32.9	
Two times	44	59.5	30	40.5		61	67.0	30	33.0	
Three times	31	72.1	12	27.9		32	56.1	25	43.9	
Four times +	67	80.7	16	19.3		79	64.8	43	35.2	
Size of burger preferred										
Don't eat	22	88.0	3	12.0	0.003*	21	56.8	16	43.2	0.366
Regular	153	74.3	53	25.7		194	65.1	104	34.9	
Large	62	59.0	43	41.0		35	57.4	26	42.6	
Size of chips preferred										
Don't eat	39	76.5	12	23.5	0.062	22	57.9	16	42.1	0.634
Regular	139	73.5	50	26.5		177	64.6	97	35.4	
Large	59	62.1	36	37.9		51	60.7	33	39.3	
Size of soft drinks preferred										
Don't drink	32	72.7	12	27.3	0.866	22	55.0	18	45.0	0.469
Small	83	72.8	31	27.2		105	67.3	51	32.7	
Medium	79	68.7	36	31.3		93	61.6	58	38.4	
Large	43	68.3	20	31.7		30	61.2	19	38.8	

* Statistically significant

4.4.3 Lifestyle

4.4.3.1 TV/Internet use and eating while viewing

The majority of the participants reported watching TV for 3-4 hours daily (36.7%). Hours of daily watching TV revealed no significant difference between non-obese, overweight and obese male ($P=0.715$) and female ($P=0.362$) adolescents (Table 4.4.6). Eating while watching TV presents no significant association with nutritional status either in males ($P=0.304$) or females ($P=0.383$). Among male and female adolescents who were always eating food while watching TV, 24.8% and 34.3% were respectively from overweight/obese group.

Using the Internet has become very popular in Bahrain society, especially among adolescents, this service has entered most homes and many Internet café shops provide it to the public at affordable prices. The results in Table 4.4.6 revealed that 72.5% of the participants used the Internet daily. Of those adolescents who used the Internet for 3-4 hours daily, 32.7% males and 41% females were overweight or obese. No significant association was found between using the Internet and nutritional status in the adolescents studied.

Eating while using the Internet also did not show any significant association with nutritional status. While the majority (67.8%) of the participants who reported not eating any type of food while using the Internet, 40.9% of the females and 44.4% of the males who reported eating while using the Internet were considered to be overweight or obese.

No significant association was found between eating while feeling bored or depressed and nutritional status in our study.

Table 4.4.6 Associations of lifestyle & nutritional status of adolescent males & females in Bahrain categorized as overweight and obese group ($\geq 85^{\text{th}}$ P) and non-obese group ($<85^{\text{th}}$ P) of BMI for age percentile

	Gender								p-value	
	Male				Female					
	Non-obese		overweight & obese		Non-obese		overweight & obese			
	<85 th P		≥85 th P		<85 th P		≥85 th P			
	n	%	n	%	N	%	n	%		
Hours watching TV every day										
Not watching	12	75.0	4	25.0	0.715	14	60.9	9	39.1	0.362
1-2 hrs	74	74.0	26	26.0		82	69.5	36	30.5	
3-4 hrs	80	67.2	39	32.8		88	59.1	61	40.9	
5+ hrs	71	70.3	30	29.7		66	62.3	40	37.7	
Eating while watching TV										
Always	100	75.2	33	24.8	0.304	113	65.7	59	34.3	0.383
Sometimes	90	68.2	42	31.8		103	63.2	60	36.8	
Never	47	66.2	24	33.8		34	55.7	27	44.3	
Hours using Internet everyday										
Not using	60	69.0	27	31.0	0.744	76	66.1	39	33.9	0.603
1-2	142	72.1	55	27.9		128	63.1	75	36.9	
3-4	35	67.3	17	32.7		46	59.0	32	41.0	
5+	0	0.00	0	0.00		0	0.00	0	0.00	
Eating while using Internet										
Don't use	61	68.5	28	31.5	0.512	78	66.7	39	33.3	0.619
Don't eat	171	71.8	67	28.2		159	61.9	98	38.1	
Yes	5	55.6	4	44.4		13	59.1	9	40.9	
Eating while feeling bored										
Always	43	78.2	12	21.8	0.272	69	61.6	43	38.4	0.241
Sometimes	75	72.1	29	27.9		85	69.1	38	30.9	
Never	119	67.2	58	32.8		96	59.6	65	40.4	
Eating while feeling depressed										
Always	23	74.2	9	25.8	0.871	34	54.0	29	46.0	0.217
Sometimes	28	71.8	13	28.2		42	61.8	26	38.2	
Never	186	69.9	80	30.1		174	65.7	91	34.3	

A higher percentage of females who were always ate while feeling bored (38.4%) or depressed (46%) were from overweight/obese group than males, 21.8% and 25.8%, respectively.

Table 4.4.7 Associations of physical activity & nutritional status of adolescent males & females in Bahrain categorized as overweight and obese group ($\geq 85^{\text{th}}$ P) and non-obese group($<85^{\text{th}}$ P) of BMI for age percentile

	Gender									
	Male					Female				
	Non-obese		overweight & obese		p-value	Non-obese		overweight & obese		p-value
	<85 th P		≥85 th P			<85 th P		≥85 th P		
	n	%	n	%		n	%	n	%	
Practicing any sports activities										
No	30	75.0	10	25.0	0.509	102	66.2	52	33.8	0.307
Yes	207	69.9	89	30.1		148	61.2	94	38.8	
Frequency of practicing sport/week										
None	30	76.9	9	23.1	0.196	106	68.4	49	31.6	0.313
1-2	47	75.8	15	24.2		61	58.1	44	41.9	
3-4	58	61.7	36	38.3		42	56.8	32	43.2	
5-6	34	68.0	16	32.0		13	61.9	8	38.1	
7+	68	74.7	23	25.3		28	68.3	13	31.7	
Participating in sports activities at school										
Always	189	70.8	78	29.2	0.163	205	64.3	114	35.7	0.401
Sometimes	25	61.0	16	39.0		34	55.7	27	44.3	
Never	23	82.1	5	17.9		11	68.8	5	31.2	
Participating in sports activities outside school										
Always	154	71.3	62	28.7	0.851	29	59.2	20	40.8	0.352
Sometimes	60	68.2	28	31.8		128	61.0	82	39.0	
Never	23	71.9	9	28.1		93	67.9	44	32.1	

4.4.3.2. Physical activity

Table 4.4.7 reveals no significant association between practicing physical activity and nutritional status either in male ($P=0.509$) or female ($P=0.307$)

adolescents. Thirty six percent and 40.8% of females who always participated in sports activities inside and outside school were overweight or obese respectively, compared to 29.2% and 28.7% of males respectively. There was no statistically significant difference between time spent per week in practicing sport and obesity, among males ($P=0.196$) and females ($P=0.313$). In general, overweight and obese females spent more time per week participating in sports than overweight and obese males.

Chapter Five

Discussion

5. Discussion

5.1 Nutritional status of adolescents (BMI)

5.1.1 Anthropometric characteristics

Anthropometry is commonly used to address nutrition and health status. It is especially useful during adolescence as it is a reliable indicator for evaluating physical growth and maturity. Over the past 100 years in industrialized countries and recently in some developing ones, children have been getting taller and growing to maturity more rapidly (Eveleth and Tanner, 1990). The occurrence of secular increase in height has been well documented from many countries. The average secular increase in height in Europe has been greatest during adolescence because of changes in rate of growth (2-3 cm per decade), less during childhood (1-2 cm per decade) and the least for adults (about 1 cm or less per decade), (Rolland-Cachera et al, 2000).

The present study is a cross-sectional study, a design which is not suitable for measuring secular trends with age. However, it is evident from the present study that anthropometric measurements, including Body Mass Index (BMI), are high. Mean values for height and weight increased with age in both sexes, with greater variation in weight than height. It is interesting to note that weight variability appears to increase with age among males from 15-18 years while females grow slower than boys for the corresponding age.

The present study shows that growth patterns have improved for Bahraini adolescents as compared with the earlier survey conducted in 1989 on

adolescents aged between 15.5 to 19.5 years by Mater et al,1990. This can be attributed to improved health services, better nutritional status and probably changing dietary habits over the last two decades. Our findings were similar to those reported by Al-Sendi et al (2003) among school children 12-17 years old.

When compared to the growth of adolescents in other Arab Gulf countries, Bahraini girls were taller than Omani but similar to Saudi girls in height, while heavier in weight than Omani and Saudi girls (Musaiger, 1996 and Abahussain, et al 1999). Bahraini boys were taller than Saudis and a similar height to Omanis, while in weight Bahraini boys were heavier than Saudis and Omanis (Al-Nuaim et al, 1996, and Musaiger, 1991).

In comparison with adolescents from western countries, Bahraini teenagers are shorter, but a similar weight or even heavier than their American counterparts, according to the US-CDC Revised Growth Charts (CDC, 2000). Population variations in growth are the result of interaction between genetic and ethnic factors as well as a variety of environmental influences, including socio-economic status and nutrition, and health status.

Mean BMI for age was higher than those reported from earlier studies conducted on Bahraini adolescents of corresponding age range (Musaiger and Gregory, 2000 and Al-Sendi et al, 2003), which may be indicated an increase in fat accumulation among the adolescent population that appears to have occurred during the last decade. In general, Bahraini adolescents' BMI values were higher than those of Kuwaiti (Al-Mousa and Parkash, 2000), Saudi (Al- Rukban, 2003 and Abahussain et al, 1999), Omani (Musaiger, 1994) and UAE (Al-Hourani et al, 2003) for corresponding age. In comparison with BMI data from western countries, such as the US CDC

BMI chart (CDC 2000) we found that the BMI values for secondary school Bahrainis were higher.

Similarly, Musaiger (1993) found that the median BMI for secondary school Bahraini girls aged 15-20 was higher than the median BMI for their American counterparts. The finding that girls have a higher BMI than boys is in good agreement with those reported in the UAE for the same age group by Moussa et al (1994). The fact that Bahraini females have higher BMI levels than their counterparts in many Western countries means that there is more adipose fat among Bahraini females (Musaiger, 1993).

5.1.2 Prevalence of Obesity

It is widely accepted that more and more children and adolescents are becoming overweight due to changes in lifestyle and dietary habits which have occurred during the past two decades (Musaiger et al, 2000). The classification of weight status among the study participants was determined using the criteria of the WHO Expert Committee (WHO,1995). Previous studies on Bahrain and other Arabian Gulf countries have estimated overweight and obesity using the 85th and 95th percentile of BMI for age. Thus, to allow for comparison with these reports we have also used these BMI percentile cut offs to define overweight and obesity in our sample. The clarification of the categories of BMI (underweight, normal, overweight and obese) is presented in Table 2.1.

An equal percentage of adolescent males and females (61%) belonged to normal weight for age. Under-nutrition is not a significant problem in the Kingdom of Bahrain. Our results showed that the proportion of males was higher (8.6%) in this category than that of females (2.3%). These estimates

were in agreement with the previous study done in the Kingdom by Al-Sendi et al, 2002) where 10.8% of boys and 3.5% of girls were underweight, and in Kuwait (Al-Mousa & Parkash, 2000), Saudi Arabia (Abahussain et al, 1999) and Iran (Gargari et al, 2004). Further analysis of categories of BMI of our participants indicated a high prevalence of overweight and obesity among the adolescent population in Bahrain, the same as in other Arabian Gulf countries such as Saudi Arabia (Al-Rukban, 2003), Kuwait (Al-Mousa and Parkash, 2000), and the UAE (Al-Haddad et al, 2005). These results coincide with previously documented increases in overweight and obesity in the United States and Western European countries. However, Bahraini adolescents are more likely to be obese than American adolescents (Hedley et al, 2004, Kuczmarski et al, 2000).

In comparison with the latest research work done by Al-Sendi et al in year 2002 on the similar population, our study showed a slight decline in overweight and obesity among females from 18.7% and 20.2% to 17.4% and 19.4% respectively, while in males, the prevalence of overweight showed some increase from 13.3% to 15.8 % while obesity declined from 16.5% to and 13.7 %.

Existing information is sufficient to show that obesity is increasing everywhere and in all age groups. It needs to be monitored worldwide. There are many reports on spreading obesity among young people in the Middle-East, but using different criteria (Delisle et al, 2001). In countries undergoing rapid urbanization, nutrition transition is observed with rises in obesity and other nutrition-related chronic diseases. Changes in the structure of diets and levels of physical activity obviously have to be incriminated, even if the genetic predisposition may be present. These determinants of obesity will be discussed in the next section.

5.2 Determinants of obesity

The food habits of adolescents are of concern since this vulnerable group has greater energy and nutrient needs than the adult population. There is a relationship between meal pattern and lifestyle factors, and irregularities in breakfast eating have been suggested to be useful indicator of lifestyle (Hoglund et al, 1998).

A healthful diet may be conceptualized as one that provides recommended amounts of essential nutrients without excessive intake of energy or food components (such as fat) linked to chronic diseases. Dietary intake of adolescents is currently less than adequate in several respects. Notably, prevalence of obesity among the young has increased dramatically in recent years (as evident from various local and regional studies) suggesting that energy intake exceeds their needs. At the same time, intake of several important nutrients, such as calcium and iron, is less than recommended (Oppert and Rokand-Cachera, 1998).

Both genetic and environmental factors appear to be important in the etiology of obesity. Among the environmental factors that have been implicated in childhood and adolescent obesity are socio-demographic factors, dietary habits and lifestyle. The following section discusses the relationship between these factors and the prevalence of overweight & obesity based on the results of the present study.

5.2.1 Socio-demographic factors

Age, sex, parents' educational status, number of siblings and birth order are the principle determinants influencing the other variables such as dietary

habits and lifestyle. Although socio-economic status is relevant, it has not been included in the scope of the present study.

Although no significant association was found between obesity and age in both sexes, there was a tendency for obesity to increase with increasing age in the present study. A higher percentage of obesity was observed in older adolescents of both sexes. (36.4% of males aged 18 and 39.3% for females aged 17 years old). The results of the present study provide evidence that the proportion of overweight and obese females is higher than that of males, the same as the findings of earlier studies conducted in Bahrain (Al-Sendi, et al 2003, and Musaiger et al, 2000). Similar results were reported in other Arabian Gulf countries (Al-Rehaimi and Bjourtop 1992, Al-Nuaim et al, 1996, and Al-Mousa and Parkash, 2000). The risk of obesity in Brazilian adolescent girls was twice as high as among boys (Neutzling et al, 2000).

In most of the studies, the level of fatness among adolescent girls was found to be higher than among boys. During adolescence, and especially during puberty, both girls and boys undergo fat storage. Since the spurt of height in boys is higher than in girls, the BMI of boys appears to be lower than girls. Moreover, boys lose fat during puberty faster than girls (Forbes, 1977, and Poskitt, 1989), but girls still store more fat during the spurt of height than boys, and the fat deposition among girls continues throughout puberty (Meredith and Dwyer, 1991). The difference in obesity between the sexes may further be explained by difference in the level of physical activity between them; boys tend to be more physically active than girls. We conclude that a combination of high income, abundant food supply, easy access to high calorie foods and decreased physical activity may be responsible for the increase in obesity among adolescents.

Family income, parents' educational level and their occupation are all significant predictors of weight status as they influence the child's energy intake and physical activity. Obesity in school children is strongly linked to the families' socio economic status (Power and Parsons, 2000). In our study as far as educational status of the parent is concerned, there was no significant association between the father's educational level and obesity in both genders.

However, significant association existed between the mother's level of education and the prevalence of overweight/obese ($p= 0.007$ for females and 0.025 for males). The prevalence was higher among girls whose mothers were illiterate. The reverse trend was observed by Al-Sendi (2000) whereas, the prevalence of obesity was found to be higher among girls whose mothers were highly educated. In contrast, Musaiger (1993) found that the prevalence of obesity was higher among students whose fathers were highly educated and mother's education was positively associated with obesity in adolescent boys not in girls. In UAE, Moussa et al (1994) also found that the mother's education was a significant factor for the development of overweight and obesity among school children aged 6-18 years.

Improved female literacy is favorable for the human development and contributes positively towards children's health, particularly nutritional health (Sandiford et al, 1995). A probable explanation is that higher educated mothers are working mothers which leads to affluence; neglect/ignorance of the child's nutritional needs (both quality and quantity) and increased consumption of food from outside the home (high energy food).

No significant association was found between the number of siblings and the nutritional status of the participants. However, among boys, as the number

of siblings increased, the prevalence of overweight and obesity decreased, whereas in girls no specific trend was noted. Al-Sendi (2002) and Musaiger (1993) found similar trends for increasing family size and increasing obesity in males. This study showed an inverse proportion between birth order and the prevalence of obesity among boys while in girls a direct association was shown.

5.2.2 Dietary habits, food intake of adolescents

Adolescents are vulnerable from a nutritional point of view, due to their particular lifestyle and dietary habits, and to their high energy and nutrient requirements (WHO, 1999). Eating patterns are frequently erratic in adolescents, as personal preferences take precedence over eating habits. The following features are quite typical of adolescents, and have a bearing on diets and in turn on obesity: search for identity; struggle for independence and acceptance; concern about physical appearance; vulnerability to commercial and peer pressures; and limited concerns for health. Girls may be more prone than boys to inadequate intake because of dieting, low calorie content, social discrimination, and pregnancy (Cavadini et al, 2000). Common dietary patterns among adolescents are: snacking, usually energy-dense foods; meal skipping, particularly breakfast, or irregular meals; wide use of fast foods; low consumption of fruit and vegetables and of dairy products; faulty dietary practices in girls; and unconventional dietary practices (Delisle et al, 2001).

The percentage of children and adolescents who are overweight and obese is now higher than ever before. Poor dietary habits and inactivity are reported to contribute to the increase of obesity in youth (CDC, 2005).

One of the purpose of the present study was to examine the association between dietary habits with the prevalence of overweight and obesity among Bahraini adolescent (15-18 years old). There is a remarkable increase in skipping breakfast among Bahraini adolescents. In the present study, 45% and 65% respectively of males and females skipped breakfast, while in 1992, in a study carried out by Musaiger and Gregory, the percentage of breakfast skippers was found to be 19.1 % in boys and 21.9 % in girls. Skipping breakfast was reported by 14.9% of Saudi students in Jeddah City (Abalkhail & Shawky, 2002).

In our study the percentage of adolescent girl skippers was more than boys. Similar findings revealed from studies in Nordic countries (Iceland, Norway, Sweden, Finland & Denmark) have shown that breakfast is often skipped by adolescents. A study from the western part of Sweden showed that many adolescents skipped breakfast, more often girls than boys (Samuelson, 2000). An interesting reason is that the adolescent girls believed that omitting breakfast was a good dietary practice to lose weight. Musaiger & Gregory (1992) found that skipping breakfast to help in weight reduction was a widely held belief among females in the Gulf region. This may result in consuming an increased quantity of food at lunch time and thus putting on more weight.

Other reasons for not eating breakfast by adolescents are: woke up late, not accustomed to eating breakfast, not hungry, did not like the preparation served for breakfast (Musaiger And Gregory, 1992). Cooksey and Ojeman (1983) reported that breakfast was omitted more often when family members did not eat together or when there was no one to prepare it for the child. The practice of segregation of the sexes, and parents from children while eating,

discourages the child from eating breakfast and even other meals (Musaiger & Gregory, 1992).

The prevalence of overweight and obesity in this group (breakfast skipper) was also observed to be more among females (40%) as compared to males (30%), and was less (30 %) in females who ate breakfast. A strong association between obesity and eating habits in Bahraini adolescents was documented by Al-Sendi (2002). She observed that adolescents who practiced eating behaviors which are generally considered to be unhealthy, such as skipping breakfast, frequent snacking and intake of fast foods, have a significantly high risk of developing obesity. The author further states that girls who skipped breakfast were more than twice as likely to be obese as those who ate breakfast. Wolfe et al (1994), and Siega et al (1998), also agreed that adolescents with a consistent meal pattern (three meals a day) were leaner than those with an inconsistent meal pattern.

Alternatively, our findings revealed that those who did not eat breakfast at home may eat from school canteen during the school break, which was similar to the observation by Al-Othaimeen et al, (1999) that among Saudi girls in Riyadh, 16.5% of the girls did not take breakfast at home and depended on snacks offered in the school canteen.

Our findings showed that the girls who did not bring home food, tended to be more obese (43.9%) than boys (28.85). Although the majority ate lunch (88.5%) and dinner (80.8 %), 24.3 % and 32.3 % respectively who did not eat lunch and dinner were obese. This indicates that they must be snacking in between. Sjoberg et al (2003) documented that boys and girls with an irregular breakfast intake had a high percentage of energy from in between meals. They also had significantly higher energy consumption from 'snack

food', 26% in both boys and girls vs 20% in boys and 19% girls (all $P < 0.001$). The main part of that intake was from in between meals.

Eating between meals has become part of the culture of developed countries. Adolescents eat more frequently between meals than the other age groups, and often eat food products rich in sugar and or fat, and low in micronutrients, (e.g. confectionery, soft drinks and chips) even for main meals (Amorim Gruz, 2000). There is great variation in dietary patterns among adolescents in Bahrain. Affluence, easy pocket money, peer influence and food fancy are some of the factors contributing to a wide range of pattern, frequency and types of food consumption (French et al, 2004).

Our study showed that frequent snacking (eating between breakfast and lunch; lunch and dinner; mid-night snacks) is not a significant risk factor for overweight and obesity and was observed for all the three patterns mentioned earlier.

Similar findings were reported by Musaiger et al (1989). However, results from two studies by Amine and Samy, 2000 in United Arab Emirates and Musaiger (1994) on Omani adolescent girls found significant association between snacking and frequency of meals and obesity.

Regarding the frequency of food intake, in the present study no significant association was found between the frequency of different types of food consumed and the risk of being overweight and obese in both males and females.

Protective foods (fruit and vegetables) are essential components of "Healthy diet" because most of these foods are low calorie and high in fiber and

micronutrients. A higher percentage of females showed low intake of fruits and vegetables than males. Although a high percentage of males (33.5 % and 41.8 %) and females (66.5% and 58.2 %) rarely consumed fruit and vegetables respectively, there was no significant association between overweight and obesity and frequency of consumption of protective foods.

In a study done in Iran, consumption of high fat and salty snacks and carbohydrates, particularly bread, rice and pasta, was significantly higher while consumption of fruit and vegetables was significantly lower in overweight and obese subjects as reported by Kelishadi et al (2003).

Our study showed that a good number of both male and female Bahraini adolescents consumed dairy products, meat and chicken, and less fish. Similar findings were observed in some European countries where animal sources of protein represent about two-third of total protein intake among adolescent girls, with a low intake of calcium and iron (Rolland-Cachera et al, 2000).

It is difficult make precise comparisons here between countries and regions, since survey methods, population and intake data expressions vary between studies. However, trends in the diet of adolescents can be expressed. Similarities are numerous: energy intake seems adequate everywhere, consumption of fat, in particular saturated fat, is always high, yielding a low P/S ratio, CHO and fiber input is low.

Our study and studies of other countries (Al-Rukban, 2003, French et al, 2000, Lin et al, 1999, Nielsen et al, 2002 and National Restaurant Association, 2002) showed that fast foods are becoming an integral part of the life style of the younger population. Clearly, the results of fast food

users' studies showed that higher fat and energy intake, and lower calcium intake among frequent fast food restaurant users, is an important concern because of its effect on the nutritional health of adolescents (Kesteloot & Joossens, 1992).

Home delivery fast food restaurants have become very popular in Bahrain in the past few years, especially among the younger generation. Our findings showed that a higher percentage of our female participants ate takeaway fast food inside the home than males, who were more likely to take fast food outside the home. This could be due to more restrictions for girls, while boys have easy access (transport and pocket money), so girls have to content themselves by making home delivery fast foods. Same findings were revealed in the year 2002 by Al-Sendi who reported that 47% of the boys and 51% of the girls in Bahrain ate takeaway fast food more than twice per week, and the girls who ate fast foods twice or more per week had higher risks of obesity than those who reported no intake or only once a week (Al-Sendi, 2002). Our findings showed no significant association between the frequency of fast food consumption and the risk of being overweight or obese in both genders.

No significant association was found between soft drink consumption and obesity in the present study, although a higher percentage of our male and female adolescents who consumed a medium and a large size were overweight or obese. The same findings have been obtained from European studies (Janssen et al, 2005).

adolescents (38.2%) watched TV for more than five hours a day and among them, 41.8% always ate while watching TV. No significant association was observed between obesity and watching TV, eating while viewing TV and use of the Internet. However earlier studies conducted in Bahrain (Al-Sendi 2002, Musaiger et al, 2000 and Musaiger and Gregory, 2000) showed the existence of a direct relationship between frequency of TV viewing and BMI status. Several investigators have found that duration and frequency of TV watching was directly related to obesity in children and adolescents (Gordon-Arsen et al, 1999) and Anderson et al., 1998). Studies from other countries for example, the UAE (Abduelkarem, 2005), Iran (Kelishadi et al, 2003) and France (Deheeger et al, 1997) suggested that time spent watching TV was significantly greater in overweight and obese adolescents. In the NHANESIII (Third National Health and Nutrition Examination Survey), Anderson et al (1998) reported that both boys and girls who watch 4 or more hours of television per day had significantly greater body fat and BMI compared to those who watched less than 2 hrs per day. An intervention study by Robinson (2001) showed that reducing television watching and video games resulted in significant reduction in BMI, triceps skin fold, and waist circumference of the children studied. Other studies, however, failed to detect a significant association between TV watching time and adiposity in young children (DuRant et al, 1994) and adolescents (Robinson et al, 1993 and Robinson, 2001)

Unlike other forms of sedentary activity, TV viewing may promote greater energy intake. Investigators have hypothesized that television viewing causes obesity by one or more of three mechanisms: (1) displacement of physical activity, (2) increased calorie consumption while watching or caused by the effects of advertising, and (3) reduced resting metabolism (Robinson, 2001). Al-Sendi (2002) reported that having meals while

watching TV had a significant and positive effect on BMI status; Bahraini girls who frequently took their meals in front of the TV were twice as likely to be obese than those who seldom did so (Al-Sendi, 2002). In the UAE, Musaiger et al (2000) found that more than half of secondary school girls frequently eat while watching TV. Frequent consumption of energy-dense snacks while watching TV has been documented among adolescent girls in other Gulf countries as well.

Physical activity: The Center for Disease Control (CDC) launched in early 2000 a "Healthy People, 2010" report in which 10 leading health indicators were identified. The living health indicators highlight the importance of health promotion and disease prevention. Physical activity, not surprisingly, came as the first living health indicator, followed by obesity (CDC, 2000). In children and adolescents, maintaining an optimal level of physical activity is particularly important as it not only reduces risk of overweight but also improves body composition and growth pattern (Deheeger et al, 1997).

The majority of the adolescent participants admitted participating in physical activity. The exact nature and duration of activity could not be ascertained owing to the fact that students encountered difficulties in describing the activity correctly. Gender difference was significant with practicing sports during school hours and also outside school, however, females were less active than males. Similar findings reported from other Arabian Gulf countries in the UAE (Amine and Samy 2000) and Saudi Arabia (Rasheed, 1999). Rasheed, 1999, observed that exercise is not part of the daily routine for females living in Saudi Arabia. Even among the obese, exercise was not popular, and this was combined with a poor attitude and low level of knowledge about exercise. In general he concluded that negative attitude and lack of motivation, and unacceptable reasons such as laziness or lack of

time, largely prevailed among the Saudi females. In Bahrain fewer opportunities exist for female to participate in organized sport and competitive games or engage in physical activities through outdoor playing than boys. A study in which barriers to practicing exercise and sport in Bahraini women was investigated, showed that 79% of the females studied perceived lack of facilities and special clubs for women as the main reasons for not indulging in physical exercise (Al-Amer, 1996). The physical activity classes represents the only opportunity available for girls to engage in regular physical activity (Al-Sendi, 2002). The observation that Bahraini boys had a higher level of participation in sport than girls was in line with the gender differences in level of physical activity reported in other literature (Gordon-Larsen et al, 1999 and Taylor & Sallis, 1997).

Analysis showed no significant association between obesity and physical activity in both males and females. This aspect needs more qualitative research to examine the correlation which is beyond the scope of the present study. A previous study done by Al-Sendi (2002) showed a strong association between physical activity and obesity in Bahrain boys but not in girls. In the UAE, Amine & Samy (2000) reported among female university students, limited physical activity and long afternoon napping were found to be important contributors to the development of obesity. Another study in the UAE by Moussa et al (1994) showed that the chance of school children (6-18 years) being obese was 13 times more for inactive children compared with highly active children.

Results from European and American studies (McMurray et al, 2000, Kemper et al, 1999 and Berkey et al, 2000) on children and adolescents, support the existence of a relationship between obesity and physical activity.

However, another study showed no significant correlation between adolescents' weight status and physical activity (Hohepa et al, 2004).

Participation in the school physical education program showed no significant association with obesity in the adolescents. This finding is similar to that of Al-Sindi 2002. However, other studies found a strong positive impact of the participation in the school PE program on the physical activity level of US adolescents (Gordon-Larsen et al, 1999 and Luepker et al, 1996). The lack of association between PE classes and weight status in our participants appears to be due to low variability in the students' responses as participation in school PE classes is compulsory for students.

Our results revealed no significant relationship between playing sport outside school and risk of overweight and obesity in adolescents, while studies by Al-Sendi, (2002) in Bahraini teenagers and Moussa et al, (1994), in UAE school children, supported the existence of a negative relationship between playing sport outside school and risk of obesity.

However, because of the difficulty of measuring physical activity due both to the uncertainty of what is meant by physical activity and to the lack of a valid, widely accepted tool for measuring it, few definitive conclusions are warranted. Perhaps the most reasonable conclusion is that low physical activity leads to weight gain, while weight gain leads to further diminution of activity. Further research/study would be required to look for more reasonable evidence to support a causal relationship.

Chapter six

Conclusion and Recommendations

6. Conclusion

Eating habits of our adolescents shows excessive ingestion of soft drinks, sweets and fast food. Female adolescents were more likely to consume sweets, chocolates, soft drinks, canned fruit juice and fast foods than males. The previous studies conducted in Bahrain identified several important and potentially modifiable factors, such as skipping breakfast, frequent snacking, and eating while watching television were associated with the risk of obesity in Bahraini adolescents. However the present study provides little support to these findings.

The other factor which is lifestyle (sedentary lifestyle and physical activity), also showed no significant association with the prevalence of overweight and obesity. Further research is needed to establish this relationship. However, there is enough documentary evidence from studies conducted in Bahrain and in the region to show that physical inactivity and a sedentary lifestyle are important determinants of the increased prevalence of overweight and obesity among children and adolescents. These factors constitute appropriate targets for planning preventive strategies in order to reduce obesity level and the obesity related health problems in adolescents.

A high prevalence of obesity among both Bahraini male and female adolescents aged between 15 and 18 years was reported in this study. A good proportion of males (13.7 %) and females (19.4%) belonged to the category of obese. This together with the overweight group of males and females accounts for about 30% and 37%, respectively, and this can reasonably be classified as a high risk group. Since obesity in childhood and adolescence predisposes them to increased risk of morbidity and mortality in

later life from chronic diseases (cardiovascular disease, diabetes and other metabolic and macula-skeletal disorders). Preventive efforts might be more fruitful if they were focused on those at high risk for developing obesity.

In comparison with the studies conducted in 1986 (Musaiger et al, 1989), Musaiger et al (1993), and Al sendi et al (2003), the current results showed a marked increase in the mean BMI values of Bahraini adolescents of both sexes, indicating that the prevalence of adolescent obesity has increased in the last decade and it is likely that this trend will continue. Therefore, programs to control and prevent the development of obesity in childhood and adolescents should be a high priority in our school health program.

The results of the study confirmed previous reports about the relationship between socio-demographic status and risk of obesity in Bahraini adolescents. Parents' level of education, especially maternal literacy, was directly associated with increased obesity among both sexes.

Although no significant association was found between unhealthy dietary habits and risk of obesity among adolescents in the present study, this could be due to the relatively small sample size, which may have limited the power of the study. Further investigation in this area is needed, but many other studies showed that total caloric intake and quality of food is responsible for an increased prevalence of overweight and obesity among adolescents. We need to take that into consideration whenever the establishment of a dietary education program is decided upon.

Dietary habit is learned and if we are to prevent obesity, correct health messages and habits should be adopted at early age. Most important, schools can help children and adolescents to reduce obesity and adopt healthy eating

and physical activity habits. At present there is no special nutrition course in schools. Knowledge about diet and nutrition is included in the curriculum of other subjects, such as science and home economics, and is often provides the conventional information and it's not specifically related to obesity and other health problem issues.

The nutrition list criteria for schools that determine which foods and beverages can and cannot be offered on a school campus is available, but there is no restricted policy from Ministry of Education or Ministry of Health to prohibit the use of the foods of minimal nutritional value “like; soft drinks, candies, chocolates and chips” in the schools. Strengthening and implementing school nutrition policies to control and prohibit the use of unhealthy food is crucial at this stage.

This thesis suggests key policies (strategies) that schools can use to improve students' nutrition and increase physical activity and identifies important resources that can help schools implement those policies.

6- Recommendations

Poor eating habits along with physical inactivity contribute to obesity and other serious health problems. Obesity is a widespread problem in the world, statistics from developed and many developing countries suggest that the prevalence of childhood and adolescent obesity has increased substantially in the last few decades (WHO, 2000). The obesity epidemic is one of the greatest public health, social and economic challenges of this century (CDC, 2005). Therefore, prevention of childhood and adolescents' obesity is one of the most important public health goals. Prevention strategies should aim to modify eating habits and physical activity patterns of children and adolescents. However, the habits that are formed during adolescence will carry into adulthood, so the healthy habits of adolescents should be nurtured and stressed in order to develop healthy weight during adulthood.

Several unhealthy dietary and life style habits of Bahraini adolescents have been assessed in this thesis. These factors constitute appropriate targets for intervention and can be best addressed within school health programs. School is one of the primary sites through which children and adolescents learn about the factors that influence their health. It also a critical part of the social environment that shapes young people's eating behaviors and can therefore play a large role in helping to improve their diet. Young people need nutrition education to help them develop lifelong healthy eating habits. Adolescents are more likely to receive a strong, consistent message when healthy eating is promoted through a comprehensive school health program. A comprehensive school health program empowers students with not only the knowledge, attitudes, and skills required to make positive health

decisions, but also the environment, motivation, services, and support necessary to develop and maintain healthy behaviors (CDC, 1996)

The School is an ideal setting for nutrition and physical education for several reasons:

- physical environment (e.g., making healthier choices available in cafeterias and vending machines) have the potential to promote healthful dietary practices and regular physical activity (Dietz and Gortmaker, 2001).

School-based nutrition education can improve the eating habits of young persons (Lytle and Achterberg, 1995 and Contento et al, 1992), but classroom lessons alone might not be enough to effect lasting changes in adolescents' eating behaviors (CDC,1996). The influence of school goes beyond the classroom and includes normative messages from peers and adults regarding foods and eating patterns. However, schools cannot achieve this goal on their own when the cultural milieu has a large influence on food-related beliefs, values, and practices (Lytle and Achterberg, 1995). Families, food stores, restaurants, the food industry, religious institutions, community centers, government programs, and the mass media must also support the principles of the school nutrition policies and guidelines.

This paper intends to make evidence-based recommendations directed at adolescents' nutritional health to improve the contribution of both the Ministry of the Health and Ministry of Education to the school health program, particularly in nutrition to encourage healthy eating habits and reduce the prevalence of overweight and obesity among adolescents.

Promoting healthy eating through a comprehensive school health program in Bahrain

Based on the results of this study and previous studies that documented a high prevalence of obesity among the adolescent population in Bahrain, some recommendations are provided for ensuring a quality nutrition policy within a school health program. These recommendations address the need of a coordinated school nutrition policy that promotes healthy eating through classroom lessons and a supportive school environment. District policies and guidelines are needed to reflect a commitment to students' nutritional needs, physical development, and knowledge to support lifetime health and physical activity practices. Successful implementation of these policies requires the coordinated and sustained support from Ministry of Education and Ministry of Health, as well as active support from the families and student is necessary to ensure success.

These policies address students' nutrition education, school curriculum for nutrition and physical education, staff and teachers training, family and community involvement, school canteens and school-based screening, counseling and referrals for obesity.

1- School curriculum for nutrition and physical education: School curricula should be restructured. At present there is no special nutrition course in Bahrain's schools. Nutrition information is included in subjects such as science and home economics as general information. Such curriculum should be reviewed and evaluated to ensure that besides providing conventional information it should briefly describe the role of

good nutrition in promoting childhood growth, health, and learning and discuss the role of child and adolescent nutrition in reducing the risk for chronic diseases of adulthood (Musaiger, 2001, Arabic reference). School curricula could accommodate non-class activities related to healthy nutrition and life style, to ensure it's efficacy in reducing prevalence of overweight and obesity in the population.

- Effective teaching methods should be used to achieve the desired student outcomes related to nutritional health and physical activity, such as enjoyable participatory activities that involve social learning strategies(Musaiger, 2001, Arabic reference).
- Nutrition education can be integrated into the lesson plans of other school subjects eg; math lessons could analyze nutrition intake or reading lessons could feature texts on nutrition. The integration into other lessons can complement, but should not replace sequential nutrition education courses within a school curriculum.
- Nutritional professionals can provide expert advice and guidance to school curriculum organizers and educational program officials in preparing nutrition courses for different educational level.
- Computer-based lessons on nutrition can be effective. Interactive, highly entertaining, and well-designed computer programs are now available to help young people learn healthy food selection skills and assess their own diets (National Agricultural Library, 1995). Computer-based lessons allow students to move at their own pace and can capture their attention.
- The Ministry of Education should continue support that physical education is compulsory and facilities such as; certified teachers with

specialization in physical education and free-of-hazard sports equipment are made available in all schools.

- Non-class nutrition education lessons should stress the importance of combining regular physical activity with sound nutrition as part of an overall healthy lifestyle. Physical education classes, in turn, should include guidance in food selection.

2- School canteens: Although substantial changes and improvement have been made in the type of foods served in school canteens and some roles and regulations have been issued for schools' canteen regarding providing nutritious food, but still many schools offer high sugar and high fat snacks such as chips, chocolates, candies and soft drinks. In general, schools cannot prohibit selling these products, because these products raise the revenue of the school canteen sponsors. Offering only nutritious choices can help reinforce a positive nutrition message everyday of school. Even small improvements in students' eating habits can have an impact on their health and school's canteen can continue to make money by selling healthy products.

- The goal of the school canteen should be the provision of nutritionally appropriate foods, at a reasonable price to encourage students the practice of positive dietary habits.
- The planning, management and delivery of the food to be directed by a qualified food service sponsors.
- There should be coordination between school canteen sponsor and school health program coordinators to reinforce messages on healthy eating habits.

- Integrated school health program should emphasize on availability of nutritious food in school canteens; advantages of protective foods(fresh and green leafy vegetables and fruits); and untoward effects of junk recipes (fast food, carbonated drinks and canned food), stress importance of – milk, yoghurt, fruits, salads, nuts and dates
- Students to be involved in the selection of food provided in school canteen .
- Foods offered to students should include a variety of healthful foods and beverages, particularly fresh fruit, fresh vegetables and whole grain products to make it easier for students to make healthful food choices.
- Food with minimal nutritional value such as soft drinks, candies, chips, should be prohibited

3- *Students' nutrition education:* Results of this study revealed unhealthy dietary habits and life style among our adolescents. These factors constitute appropriate targets for Implementation of nutrition education from preschool through secondary school as part of a sequential school health education curriculum to help students adopt healthy eating habits.

- Nutrition education activities should focus on understanding the relationship between personal behavior and health.
- Adolescents are more likely to adopt healthy eating behaviors when they learn about these behaviors through fun, participatory activities rather than through lectures.
- Help adolescents develop practical skills and self-confidence in preparing foods, reading food labels, and making healthy food choices through observation and hands-on practice.

- Enable adolescents to critically analyze socio-cultural influences, including advertising, on food selection, to resist negative social pressures, and to develop social support for healthy eating.
- Students with special dietary needs (eg; diabetic, anemic, etc) to have a written individualized food plan as part of their individualized education plan.
- Students should be involved daily in quality, health-related physical activity and motor skills instruction.
- Physical education instructors should help adolescents understand the relationship between nutrition and physical activity
- Schools to have periodic exhibitions of student nutrition projects or health fairs and students' participation in World Health National Day.

4- School teachers training: Training in nutrition and health education can increase the extent to which teachers implement a curriculum, which in turn affects the likelihood that students' eating behaviors will change. Ongoing school staff development is effective in assuring achievement of the school nutrition guidelines

- Provide staff involved in nutrition education with adequate and ongoing in-service training that focuses on teaching strategies for behavioral change.
- The teachers and school nurses to have appropriate training in nutrition education.
- The nutritionist to be involved in identifying teachers' development needs.

- The training program should be designed to meet the specific needs of the teachers and are based on the teachers' level of nutrition knowledge and experience with the suggested teaching strategies.
- Training should address teaching techniques and focus on giving teachers the skills they need to use the non-lecture/active learning method.

5-Family and community involvement: district policies and administrative guidelines is crucial to enhance a commitment to effective school/ family and community relationships in order to get their support and help in reinforcing healthy nutritional and physical activity habits, because family and community strongly can influence the eating and lifestyle habits of their children.

- Involve parents in nutrition and physical education programs such as; sports activities and nutrition seminars.
- Increase awareness among the parents (especially mothers) about the nutritional needs and the dietary habits of their children.
- Insistence on home-made food, regular eating of breakfast and principal meals (lunch and dinner) is essential to meet the nutritional needs (quality and quantity) of adolescents. Eating together with family members ensures adequate consumption, helps develop emotional bonding, and inculcates desirable habits among adolescents.
- Parents should encourage physical activity among their children by being role model themselves, and healthy food habits by discouraging eating away from home and rewarding for not using TV, the Internet or the automobile

- Parents to be involved in foods selection and evaluation of the school food services.
- Schools to have periodic exhibitions of student nutrition projects or health fairs and invite families to attend.
- Schools to offer nutrition education workshops and screening services for the families.
- Community organizations to provide counseling or nutrition and physical activity education campaigns
- Issues related to overweight, obesity, dietary habits, the nutritional quality of locally available food stuffs, the adverse effects of unhealthy foods, including soft drinks, etc needs to be addressed through mass communication media
- The school physical activity program must be implemented regularly and should also participate in organizing public events for the benefit of the community

6- *School-based screening, counseling and referrals for obesity:* Regularly evaluate the effectiveness of the school health program in promoting healthy eating, and change the program as appropriate to increase its effectiveness.

- School counselors and nurses has an important role to provide guidance on health and physical fitness, if necessary, referrals for nutritional problems such as; overweight or underweight.
- The BMI monitoring could be carried out in schools through systematic, perhaps yearly measurement of weights and heights. Those students above 95th percentile for age and gender could be referred to health services for further assessment and counselling.

- The administrator, the school nurse and school health coordinator should review at least annually reports on the status of the food and nutrition services and progress of students' nutritional status and physical fitness.
- Policymakers should regularly review the effectiveness of the school nutrition program and consult the evaluation specialist to identify methods and materials for evaluating the effectiveness of the program.

To ensure a healthy future for our children, school-based nutrition education programs must become a national priority. These programs should be part of school health programs and reach students from preschool through secondary school. The above sex recommendations provide the framework for establishing such program. By adopting these recommendations, its hoped that schools can help ensure all school-age children attain their full educational potential and good health.

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Appendices



Ref. :

الاشارة :

Site :

التاريخ : ١١ يونيو ٢٠٠٥م

حضرة الفاضل الأستاذ ناصر الشيخ المحترم
مدير إدارة المدارس الإعدادية والثانوية
وزارة التربية والتعليم - مملكة البحرين

السلام عليكم ورحمة الله وبركاته، وبعد،

تقوم طالبة الماجستير زهره بدر من جامعة الخليج العربي بإجراء بحث ميداني لرسالة
الماجستير في " السياسات الصحية والدراسات السكانية "، وسيكون موضوع أطروحتها عن "العادات الغذائية
ونظم التغذية بين طلاب مدارس الثانوية الحكومية في البحرين".

هذا ونود أن نبين ان هذا البحث مقرر ضمن البرامج، وان معلومات الاستبيان ستعامل
بسرية تامة لأغراض علمية بحثه. لذلك نأمل منكم الموافقة على تسهيل مهمتها لإجراء هذه الدراسة في
القسم الثانوي بمدارس البنات والبنين.

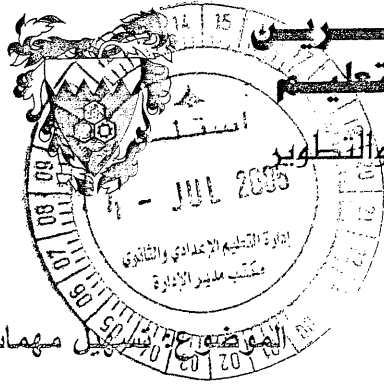
ولكم جزيل الشكر والامتنان على تعاونكم،،،

أ.د. رنده ربحي حماده
أستاذ ومديرة برنامج الماجستير
"السياسات الصحية والدراسات السكانية"

Kingdom of Bahrain
Ministry of Education

Educational Research and Development Centre

الرقم: 102/4-1 م ب ت 2005



في: 3 / 7 / 2005 م

الموضوع: تسليم مهمات باحث

إقرار من مقدم الطلب:

هذا التصريح بإجراء البحث لغرض تقديمه إلى الجهة الطالبة المشار إليها أدناه فقط. ولا يحق لي استخدامه لأغراض أخرى أو نشره أو توزيعه.

توقيع الباحث:

اسم الباحث: زهرة حسب بدر
الجهة الطالبة: جامعة الخليج العربي - كلية
موضوع البحث: الدراسات التربوية المرحلة الثانوية والعلوم الطبية
المهمات المطلوبة تنفيذها: تطبيق الاستبيان في عشرة مدارس الثانوية (البنين والبنات)
مرفقات: الاستبيان
حقوق استخدام الأدوات محفوظة للباحث فقط



رأي مركز البحوث التربوية والتطوير :

بعد الإطلاع على المرفقات والبيانات المطلوبة :

✓ يوافق المركز على تنفيذ المهمة أعلاه

○ لا يوافق المركز على تنفيذ المهمة المطلوبة.

الاسم: د. لطيفة علي المناعي

الوظيفة: رئيسة مركز البحوث التربوية والتطوير

ختم المركز.

التوقيع:

رأي الجهة المعنية: إدارة التعليم الإداري والتأديبي

بعد الإطلاع على المرفقات وبناء على رأي مركز البحوث التربوية والتطوير

○ توافق الإدارة على تنفيذ المهمة أعلاه

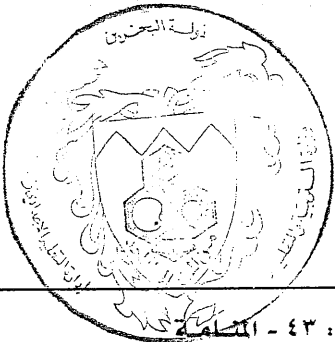
○ لا توافق الإدارة على تنفيذ المهمة المطلوبة.

الاسم: ناصر محمد الشبيخ

الوظيفة: مدير إدارة التعليم الإداري والتأديبي

ختم الإدارة.

التوقيع:



هاتف : ٦٨٠٠٨٣ (٠٠٩٧٣) - فاكس : ٦٨٠١٦٨ (٠٠٩٧٣) - ص.ب : ٤٣ - المنامة

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البريد الإلكتروني: moe.research@bahrain.gov.bh

www.education.gov.bh

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العادات الغذائية عند طلبة المرحلة الثانوية في المدارس الحكومية في مملكة البحرين

اسم المدرسة: -----

عزيزي الطالب/ عزيزتي الطالبة

تحية طيبة وبعد...

تهدف الدراسة إلى تشخيص العادات الغذائية عند طلبة المرحلة الثانوية في المدارس الحكومية وعلاقتها بالسمنة ، لذا نرجو منكم المساهمة في هذه الدراسة وذلك بملئ الاستمارة المرفقة. الرجاء قراءة الأسئلة والإجابة عليها بدقة و موضوعية . ونفيدكم علماً بأن جميع بياناتكم ستحظى بالسرية التامة و لن يطلع عليها أحد غير الباحثة و المشرفين على البحث وسوف تستخدم نتائج هذا الدراسة لغرض البحث العلمي فقط.

الباحثة : زهرة بدر

معلومات عامة

1. العمر:----- سنة
2. الجنس: ☐ ذكر ☐ أنثى
3. المسار: ☐ علمي ☐ أدبي ☐ تجاري ☐ صناعي
4. مستوى تعليم الاب: امي ☐ يقرأ ويكتب ☐ ابتدائي ☐ اعدادي ☐ ثانوي ☐ جامعي
5. مستوى تعليم الام: امي ☐ يقرأ ويكتب ☐ ابتدائي ☐ اعدادي ☐ ثانوي ☐ جامعي
6. عدد الاخوات و الاخوان:-----
7. ترتيب الطالب/الطالبة بين الاخوان:-----

العادات الغذائية

8. هل تتناول وجبة الفطور : ☐ يومياً ☐ أحيانا ☐ لا أتناول
9. اين تتناول وجبة الفطور: ☐ في المنزل ☐ في المدرسة ☐ لا أتناول
10. هل تجلب معك أي نوع من الأغذية من المنزل: نعم ☐ وهي:-----
☐ لا أجلب معي
11. ما هي الأغذية التي تتناولها في الفسحة:-----
☐ لا أتناول
12. ماهي الاطعمة المفضل شراؤها من المقصف المدرسي:-----
☐ لا أشتري من المقصف المدرسي
13. هل تتناول أي مأكولات عند الانصراف من المدرسة: نعم ☐ لا ☐
هل تتناول الوجبات التالية بانتظام :
- 14 - الفطور ☐ اتناولها بانتظام ☐ لا اتناولها غالباً
- 15 - الغداء ☐ اتناولها بانتظام ☐ لا اتناولها غالباً
- 16 - العشاء ☐ اتناولها بانتظام ☐ لا اتناولها غالباً
- 17 - هل تتناول طعاما بين الفطور والغداء: غالباً ☐ أحياناً ☐ لا أتناول
- 18 - هل تتناول طعاما بين الغداء و العشاء: غالباً ☐ أحياناً ☐ لا أتناول

- 19- كم مرة في الأسبوع تتناول الأطعمة السريعة خارج المنزل: ----- مرة ☐ لا أتناول
- 20- كم مرة في الأسبوع تتناول الأطعمة السريعة داخل المنزل: ----- مرة ☐ لا أتناول

إذا كنت تتناول الأطعمة السريعة هل تأخذ:

- 21- البرجر العادي ☐ البرجر الكبير ☐
- 22- البطاطا العادية ☐ البطاطا الكبيرة ☐
- 23- المشروبات الغازية الصغيرة ☐ المتوسطة ☐ الكبيرة ☐

كم مرة في الأسبوع تتناول الأغذية التالية:

- 24- الخضراوات الطازجة/السلطة ☐ يومياً ☐ 4-6 مرات ☐ 1-3 مرات ☐ نادراً ما أتناول ☐
- 25- الفواكه الطازجة ☐ يومياً ☐ 4-6 مرات ☐ 1-3 مرات ☐ نادراً ما أتناول ☐
- 26- الأطعمة السريعة (الهمبرجر والبيتزا .. الخ) ☐ يومياً ☐ 4-6 مرات ☐ 1-3 مرات ☐ نادراً ما أتناول ☐
- 27- الحليب والجبن واللبن ☐ يومياً ☐ 4-6 مرات ☐ 1-3 مرات ☐ نادراً ما أتناول ☐
- 28- اللحوم ☐ يومياً ☐ 4-6 مرات ☐ 1-3 مرات ☐ نادراً ما أتناول ☐
- 29- الأسماك ☐ يومياً ☐ 4-6 مرات ☐ 1-3 مرات ☐ نادراً ما أتناول ☐
- 30- الدجاج ☐ يومياً ☐ 4-6 مرات ☐ 1-3 مرات ☐ نادراً ما أتناول ☐
- 31- الحلويات ☐ يومياً ☐ 4-6 مرات ☐ 1-3 مرات ☐ نادراً ما أتناول ☐
- 32- المكسرات ☐ يومياً ☐ 4-6 مرات ☐ 1-3 مرات ☐ نادراً ما أتناول ☐
- 33- الشوكولاته ☐ يومياً ☐ 4-6 مرات ☐ 1-3 مرات ☐ نادراً ما أتناول ☐
- 34- المشروبات الغازية ☐ يومياً ☐ 4-6 مرات ☐ 1-3 مرات ☐ نادراً ما أتناول ☐
- 35- عصائر الفواكه المعلبة ☐ يومياً ☐ 4-6 مرات ☐ 1-3 مرات ☐ نادراً ما أتناول ☐
- 36- البقوليات / العدس / الفول ☐ يومياً ☐ 4-6 مرات ☐ 1-3 مرات ☐ نادراً ما أتناول ☐

ما هو تكرار حدوث السلوكيات التالية لديك

- 37- أتناول الطعام عند مشاهدة التلفزيون ☐ غالباً ☐ أحياناً ☐ نادراً
- 38- أتناول الطعام عندما أكون ممتلئاً ☐ غالباً ☐ أحياناً ☐ نادراً
- 39- أتناول الطعام عند ما أكون غضباً/محبطاً ☐ غالباً ☐ أحياناً ☐ نادراً
- 40- أتناول الطعام في ساعات متأخرة من الليل ☐ غالباً ☐ أحياناً ☐ نادراً

نمط الحياة والمعيشة

- 41- كم ساعة في اليوم تشاهد التلفزيون: ----- ساعة ☐ لا أشاهد
- 42- هل تتناول أي أطعمة أثناء مشاهدة التلفزيون: نعم وهي: -----
- 43- كم ساعة في اليوم تستخدم الإنترنت: ----- ساعة ☐ لا استخدم الإنترنت
- 44- هل تتناول أي أطعمة أثناء استخدام الإنترنت: نعم وهي: -----
- 45- هل تمارس أي نوع من الرياضة: نعم وهي : ----- ☐ لا أتناول الطعام ☐ لا استخدم الإنترنت
- 46- إذا كنت تمارس الرياضة كم مرة في الأسبوع: ----- ☐ لا أمارس
- 47- إذا كنت تمارس ما هي مدة الممارسة في كل مرة : ----- ☐ لا أمارس
- 48- هل تشارك في حصة الرياضة المدرسية: ☐ دائماً ☐ أحياناً ☐ لا أشارك
- 49- هل تمارس الرياضة خارج المدرسة: ☐ دائماً ☐ أحياناً ☐ لا أمارس

المقاييس الجسمية:

الطول: ----- سنتيمتر

الوزن: ----- كيلوجرام

Dietary Habits of secondary school students in government schools of Bahrain

Name of school: _____

General information

Age: _____ years

Gender: Male Female

Level of father education:

Illiterate Read & Write Primary Elementary Secondary University

Level of mother education:

Illiterate Read & Write Primary Elementary Secondary University

Number of siblings: _____

Rank between siblings: _____

Dietary habits

Do you eat breakfast? Everyday Sometimes Don't eat

Where do you eat breakfast? Home School Don't eat

Do you bring any food from home? Yes, I bring: _____

_____ Don't bring

What kind of food do you eat at school break time? _____

_____ Don't eat

What kind of food do you prefer to buy from school canteen? _____

_____ Don't buy from school canteen

Do you eat any food while going home from school? Yes No

Do you eat the following meals regularly?

Breakfast Yes No

Lunch Yes No

Dinner Yes No

Do you eat any food between breakfast and lunch? Always Sometimes Never

Do you eat any food between lunch and dinner? Always Sometimes Never

How many times a week do you eat fast food outside the home _____ times Don't eat

How many times a week do you eat fast food inside the home _____ times Don't eat

If you eat fast food, what do you prefer?

Regular size burger	Large size burger	
Regular size chips	Large size burger chips	
Small size soft drinks	Medium size soft drinks	Large size soft drinks

How many times a week do you eat the following foods:

Vegetables/Salad	Everyday	4-6 times	1-3 times	Rarely
Fruits	Everyday	4-6 times	1-3 times	Rarely
Fast foods (hamburger, pizza, etc)	Everyday	4-6 times	1-3 times	Rarely
Milk, cheese, yoghurt	Everyday	4-6 times	1-3 times	Rarely
Meat	Everyday	4-6 times	1-3 times	Rarely
Fish	Everyday	4-6 times	1-3 times	Rarely
Chicken	Everyday	4-6 times	1-3 times	Rarely
Chocolates	Everyday	4-6 times	1-3 times	Rarely
Sweets	Everyday	4-6 times	1-3 times	Rarely
Soft drinks	Everyday	4-6 times	1-3 times	Rarely
Nuts	Everyday	4-6 times	1-3 times	Rarely
Lentils	Everyday	4-6 times	1-3 times	Rarely
Can fruit juices	Everyday	4-6 times	1-3 times	Rarely

How often do you eat food while:

watching TV	Always	Sometimes	Never
feeling bored	Always	Sometimes	Never
feeling angry or depressed	Always	Sometimes	Never
at midnight	Always	Sometimes	Never

Life style and habits

How many hours do you watch TV everyday? _____ hours Don't watch

Do you eat any food while watching TV? Yes, I eat: _____
_____ Don't eat

How many hours do you use Internet everyday? _____ hours Don't use

Do you eat any food while using internet? Yes, I eat: _____
_____ Don't eat Don't use

Do you usually practice any type of sports? Yes, I Practice _____
_____ Don't Practice

If yes, how many times per week do you practice? _____ times Don't practice

If yes, how many hours do you practice sports during a week? _____ hours Don't practice

Do you participate in school physical activity? Always Sometimes Never

Anthropometric measurements:

Height: _____ Cm
Weight: _____ Kg

جدول رقم (١)

استخدام مؤشر كتلة الجسم (BMI) لقياس النحافة والسمنة للأعمار من ٦ إلى ٢٤ سنة (الذكور)

النسب المئوية					العمر (سنة)
%٩٥	%٨٥	%٥٠	%١٥	%٥	
١٨,٠٢	١٦,٦٤	١٤,٥٤	١٢,٤٣	١٢,٨٦	٦
١٩,١٨	١٧,٣٧	١٥,٠٧	١٣,٨٥	١٣,٢٤	٧
٢٠,٣٣	١٨,١١	١٥,٦٣	١٤,٢٨	١٣,٦٣	٨
٢١,٤٧	١٨,٨٥	١٦,١٧	١٤,٧١	١٤,٠٣	٩
٢٢,٦٠	١٩,٦٠	١٦,٧٢	١٥,١٥	١٤,٤٢	١٠
٢٣,٧٣	٢٠,٣٥	١٧,٢٨	١٥,٥٩	١٤,٨٣	١١
٢٤,٨٩	٢١,١٢	١٧,٨٧	١٦,٠٦	١٥,٢٤	١٢
٢٥,٩٣	٢١,٩٣	١٨,٥٣	١٦,٦٢	١٥,٧٣	١٣
٢٦,٩٣	٢٢,٧٧	١٩,٢٢	١٧,٢٠	١٦,١٨	١٤
٢٧,٧٦	٢٣,٦٣	١٩,٩٢	١٧,٧٦	١٦,٩٥	١٥
٢٨,٥٣	٢٤,٤٥	٢٠,٦٣	١٨,٣٢	١٧,٠١	١٦
٢٩,٣٢	٢٥,٢٨	٢١,١٢	١٨,٦٨	١٧,٣١	١٧
٣٠,٠٢	٢٥,٩٢	٢١,٤٣	١٨,٨٩	١٧,٥٤	١٨
٣٠,٦٦	٢٦,٣٦	٢١,٨٦	١٩,٢٠	١٧,٨٠	١٩
٣١,٢٦	٢٦,٨٧	٢٢,٠٧	٢٠,٣١	١٨,٦٦	٢٤-٢٠
٣١,٧٢	٢٨,٠٨	٢٤,١٩	٢٠,٩٨	١٩,١١	٢٩-٢٥
٣١,٩٩	٢٨,٧٥	٢٤,٩٠	٢١,٥١	١٩,٥٢	٣٤-٣٠
٣٢,٢٣	٢٩,١٨	٢٥,٢٥	٢١,٧١	١٩,٥٥	٣٩-٣٥
٣٢,٤١	٢٩,٣١	٢٥,٤٩	٢١,٧٥	١٩,٥٢	٤٤-٤٠
٣٢,٤٠	٢٩,٣٩	٢٥,٥٥	٢١,٧٢	١٩,٤٥	٤٩-٤٥
٣٢,٢٧	٢٩,٣١	٢٥,٥٤	٢١,٦٦	١٩,٣٥	٥٤-٥٠
٣٢,١٨	٢٩,٢٤	٢٥,٥١	٢١,٥٨	١٩,٢٥	٥٩-٥٥
٣٢,٠٨	٢٩,١٧	٢٥,٤٧	٢١,٤٩	١٩,١٥	٦٤-٦٠
٣١,٩٨	٢٩,٠٨	٢٥,٤١	٢١,٣٩	١٩,٠٥	٦٩-٦٥
٣١,٨٧	٢٨,٩٩	٢٥,٣٣	٢١,٢٩	١٨,٩٤	٧٤-٧٠

المقاييس

- أقل من ٥٪ ناقص الوزن (Underweight)
 ٥٪ إلى أقل من ٨٥٪ معتدلاً (Normal)
 ٨٥٪ إلى أقل من ٩٥٪ زائد الوزن (Overweight)
 ٩٥٪ فأكثر سميناً (Obese)

استخدام مؤشر كتلة الجسم (BMI) لقياس النحافة والسمنة للأعمار من 6 إلى 74 سنة (الإناث)

جدول رقم (٢)

المؤشرات					العمر (سنة)
٪٩٥	٪٨٥	٪٥٠	٪١٥	٪٥	
١٧,٤٩	١٦,١٧	١٤,٣١	١٣,٣٧	١٢,٨٣	٦
١٨,٩٣	١٧,١٧	١٤,٩٨	١٣,٧٩	١٣,١٧	٧
٢٠,٣٦	١٨,١٨	١٥,٦٦	١٤,٢٢	١٣,٥١	٨
٢١,٧٨	١٩,١٩	١٦,٣٣	١٤,٦٦	١٣,٨٧	٩
٢٣,٢٠	٢٠,١٩	١٧,٠٠	١٥,٠٩	١٤,٢٣	١٠
٢٤,٥٩	٢١,١٨	١٧,٦٧	١٥,٥٣	١٣,٦٠	١١
٢٥,٩٥	٢٢,١٧	١٨,٣٥	١٥,٩٨	١٤,٩٨	١٢
٢٧,٠٧	٢٣,٠٨	١٨,٩٥	١٦,٤٣	١٥,٣٦	١٣
٢٧,٩٧	٢٣,٨٨	١٩,٣٢	١٦,٧٩	١٥,٦٧	١٤
٢٨,٥١	٢٤,٢٩	١٩,٦٩	١٧,١٦	١٦,٠٠	١٥
٢٩,١٠	٢٤,٧٤	٢٠,٠٩	١٧,٥٤	١٦,٣٧	١٦
٢٩,٧٢	٢٥,٢٣	٢٠,٣٦	١٧,٨١	١٦,٥٩	١٧
٣٠,٢٢	٢٥,٥٦	٢٠,٥٧	١٧,٩٩	١٦,٧١	١٨
٣٠,٧٢	٢٥,٨٥	٢٠,٨٠	١٨,٢٠	١٦,٨٧	١٩
٣١,٢٠	٢٦,١٤	٢١,٤٦	١٨,٦٤	١٧,٣٧	٢٤-٢٠
٣٣,١٦	٢٧,٦٨	٢٢,١٠	١٩,٠٩	١٧,٨٤	٢٩-٢٥
٣٤,٥٨	٢٨,٨٧	٢٢,٦٩	١٩,٤٥	١٨,٢٣	٣٤-٣٠
٣٥,٣٥	٢٩,٥٤	٢٣,٢٥	١٩,٩١	١٨,٥١	٣٩-٣٥
٣٥,٨٥	٣٠,١١	٢٣,٧٤	٢٠,٢٠	١٨,٦٥	٤٤-٤٠
٣٦,٠٢	٣٠,٥٦	٢٤,١٧	٢٠,٤٥	١٨,٧١	٤٩-٤٥
٣٥,٩٥	٣٠,٧٩	٢٤,٥٤	٢٠,٦٦	١٨,٧٩	٥٤-٥٠
٣٥,٨٨	٣١,٠٠	٢٤,٩٢	٢٠,٦٨	١٨,٨٨	٥٩-٥٥
٣٥,٨٠	٣١,٢١	٢٥,٢٩	٢١,٠٦	١٨,٩٦	٦٤-٦٠
٣٥,٧٠	٣١,٤٠	٢٥,٦٦	٢١,٢٥	١٩,٠٣	٦٩-٦٥
٣٣,٥٨	٣١,٥٨	٢٦,٠١	٢١,٤٤	١٩,٠٩	٧٤-٧٠

المقاييس

(Underweight)

(Normal)

(Overweight)

(Obese)

أقل من ٥٪ ناقص الوزن

٥٪ إلى أقل من ٨٥٪ معتدلا

٨٥٪ إلى أقل من ٩٥٪ زائد الوزن

٩٥٪ فأكثر سميما

Table (3)

Smoothed 85th and 95th percentiles of body mass index from NHANESI subjects aged 6-74 y

Whites											Blacks					Population				
Age	n	5th	15th	50th	85th	95th	n	5th	15th	50th	85th	95th	n	5th	15th	50th	85th	95th		
		kg/m ²						kg/m ²						kg/m ²						
Males																				
6	117	12.93	13.46	14.62	16.52	17.75	47	12.68	13.66	14.49	16.83	18.58	165	12.86	13.43	14.54	16.64	18.02		
7	122	13.30	13.88	15.15	17.31	18.98	40	13.11	14.03	14.98	17.29	19.56	164	13.24	13.85	15.07	17.37	19.18		
8	117	13.67	14.31	15.70	18.10	20.22	30	13.54	14.41	15.49	17.76	20.51	149	13.63	14.28	15.62	18.11	20.33		
9	121	14.04	14.75	16.24	18.88	21.45	55	13.98	14.81	16.00	18.26	21.45	177	14.03	14.71	16.17	18.85	21.47		
10	146	14.42	15.19	16.79	19.67	22.66	29	14.44	15.21	16.53	18.78	22.41	177	14.42	15.15	16.72	19.60	22.60		
11	123	14.81	15.64	17.38	20.47	23.87	44	14.86	15.62	17.06	19.32	23.42	169	14.83	15.59	17.28	20.35	23.73		
12	153	15.21	16.11	17.93	21.28	25.01	50	15.56	16.06	17.61	19.85	24.39	204	15.24	16.06	17.87	21.12	24.89		
13	134	15.69	16.65	18.57	22.12	26.06	42	15.89	16.64	18.28	20.62	25.26	177	15.73	16.62	18.53	21.93	25.93		
14	131	16.16	17.22	19.25	22.97	27.02	42	16.43	17.22	18.94	21.54	26.13	173	16.18	17.20	19.22	22.77	26.93		
15	128	16.57	17.79	19.94	23.82	27.86	43	16.97	17.79	19.56	22.50	27.05	175	16.59	17.76	19.92	23.63	27.76		
16	131	17.00	18.35	20.63	24.63	28.69	40	17.51	18.37	20.19	23.45	27.95	172	17.01	18.32	20.63	24.45	28.53		
17	133	17.29	18.72	21.13	25.44	29.50	33	17.86	18.77	20.70	24.41	28.89	167	17.31	18.68	21.12	25.28	29.32		
18	91	17.50	18.95	21.46	26.08	29.89	28	18.05	19.03	21.09	25.06	29.35	120	17.54	18.89	21.43	25.92	30.02		
19	108	17.77	19.25	21.88	26.53	29.98	24	18.32	19.35	21.51	25.38	29.62	137	17.80	19.20	21.86	26.36	30.66		
20-24	423	18.62	20.26	23.09	27.02	31.43	82	18.43	19.84	22.59	25.76	32.00	514	18.66	20.21	23.07	26.87	31.26		
25-29	582	19.10	21.02	24.17	28.45	31.89	81	18.98	20.26	23.87	27.81	32.68	671	19.11	20.98	24.19	28.08	31.72		
30-34	390	19.45	21.58	24.90	28.76	32.04	63	18.44	20.75	24.49	29.34	32.95	466	19.52	21.51	24.90	28.75	31.99		
35-39	394	19.44	21.82	25.29	29.17	32.12	49	18.58	20.90	24.47	29.99	33.09	451	19.55	21.71	25.25	29.18	32.23		
40-44	412	19.44	21.87	25.54	29.34	32.21	58	18.67	20.94	24.66	30.64	33.27	474	19.52	21.75	25.49	29.37	32.41		
45-49	446	19.39	21.84	25.61	29.36	32.15	81	18.73	20.90	24.70	30.83	33.45	532	19.45	21.72	25.55	29.39	32.40		
50-54	452	19.34	21.78	25.60	29.29	32.04	75	18.82	20.87	24.61	30.82	33.52	531	19.35	21.66	25.54	29.31	32.27		
55-59	406	19.23	21.70	25.58	29.23	31.95	57	18.92	20.81	24.47	30.40	33.59	468	19.25	21.58	25.51	29.24	32.18		
60-64	377	19.14	21.60	25.54	29.17	31.87	46	19.02	20.75	24.32	30.16	33.67	378	19.13	21.49	25.47	29.17	32.08		
65-69	888	19.06	21.50	25.49	29.10	31.78	184	19.12	20.67	24.15	29.90	33.77	1084	19.05	21.39	25.41	29.08	31.98		
70-74	616	18.98	21.39	25.41	29.01	31.69	129	19.21	20.60	23.97	29.60	33.86	752	18.94	21.29	25.33	28.99	31.87		
Females																				
6	118	12.81	13.37	14.33	16.14	17.49	42	12.52	13.40	13.83	16.24	18.58	161	12.83	13.37	14.31	16.17	17.49		
7	126	13.18	13.82	15.00	17.16	18.93	47	12.88	13.79	14.55	17.36	19.56	174	13.17	13.79	14.98	17.17	18.93		
8	118	13.57	14.27	15.68	18.19	20.36	35	13.25	14.17	15.26	18.49	20.51	153	13.51	14.22	15.66	18.18	20.36		
9	125	13.96	14.72	16.35	19.21	21.78	47	13.63	14.57	15.98	19.64	21.45	173	13.87	14.66	16.33	19.19	21.78		
10	152	14.36	15.18	17.02	20.23	23.20	41	14.02	14.96	16.69	20.79	22.41	194	14.23	15.09	17.00	20.19	23.20		
11	177	14.76	15.64	17.59	21.24	24.59	43	14.41	15.36	17.39	21.96	23.42	163	14.60	15.53	17.67	21.18	24.59		
12	129	15.17	16.11	18.36	22.25	25.95	47	14.83	15.77	18.11	23.15	24.39	177	14.98	15.98	18.35	22.17	25.95		
13	151	15.59	16.55	18.91	23.13	27.07	47	15.33	16.23	18.78	24.41	25.26	199	15.36	16.43	18.95	23.08	27.07		
14	141	15.89	16.89	19.29	23.87	27.97	49	15.72	16.66	19.24	25.46	26.13	192	15.67	16.79	19.32	23.88	27.97		
15	117	16.21	17.23	19.69	24.28	28.51	47	16.20	17.07	19.67	26.04	27.05	164	16.03	17.16	19.69	24.29	28.51		
16	142	16.55	17.59	20.11	24.68	29.10	30	16.65	17.48	20.11	26.68	27.95	173	16.37	17.58	20.09	24.74	29.10		
17	114	16.76	17.84	20.39	25.07	29.72	44	16.92	17.81	20.45	27.38	28.89	159	16.59	17.81	20.36	25.23	29.72		
18	109	16.87	18.01	20.58	25.34	30.22	29	17.04	18.06	20.78	27.92	29.35	140	16.71	17.99	20.57	25.56	30.22		
19	104	17.00	18.20	20.80	25.58	30.72	37	17.20	18.35	21.11	28.40	29.62	142	16.87	18.20	20.80	25.85	30.72		
20-24	956	17.47	18.61	21.38	25.78	31.20	261	17.26	18.97	22.38	28.81	32.00	1244	17.38	18.64	21.46	26.14	31.20		
25-29	1093	17.90	19.05	21.94	27.16	33.16	191	17.64	19.70	23.88	31.03	32.68	1307	17.84	19.09	22.10	27.68	33.16		
30-34	900	18.21	19.48	22.47	28.38	34.58	180	18.23	20.41	25.06	32.28	32.95	1092	18.23	19.54	22.69	28.87	34.58		
35-39	815	18.48	19.84	22.99	29.25	35.35	185	18.66	21.00	25.87	32.98	33.09	1017	18.51	19.91	23.25	29.54	35.35		
40-44	799	18.61	20.13	23.48	29.90	35.85	183	18.76	21.60	26.61	34.06	33.27	999	18.65	20.20	23.74	30.11	35.85		
45-49	519	18.67	20.40	23.91	30.38	36.02	79	18.66	21.97	27.07	34.75	33.45	603	18.71	20.45	24.17	30.56	36.02		
50-54	529	18.76	20.62	24.30	30.66	35.95	83	18.82	22.19	27.32	35.11	33.52	615	18.79	20.66	24.54	30.79	35.95		
55-59	416	18.84	20.83	24.69	30.93	35.88	74	18.38	22.40	27.52	35.50	33.59	492	18.83	20.86	24.92	31.00	35.88		
60-64	394	18.92	21.04	25.08	31.20	35.80	68	18.21	22.60	27.71	35.92	33.67	463	18.96	21.06	25.29	31.21	35.80		
65-69	958	18.99	21.25	25.46	31.46	35.70	194	18.01	22.79	27.87	36.32	33.77	1157	19.03	21.25	25.66	31.40	35.70		
70-74	711	19.06	21.45	25.84	31.70	35.58	134	17.78	22.93	28.00	36.67	33.86	848	19.09	21.44	26.01	31.58	35.58		

جامعة الخليج العربي

برنامج السياسات الصحية
والدراسات السكانية



كلية الطب والعلوم الطبية

المقاييس الانثربومترية و العادات الغذائية لدى طلبة المرحلة الثانوية في المدارس الحكومية في البحرين: نحو تعزيز سلوكيات غذائية صحية من خلال برنامج الصحة المدرسية

رسالة مقدمة كجزء من متطلبات الحصول على درجة الماجستير في
السياسات الصحية والدراسات السكانية

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