The Swedish Journal of Scientific Research

Original Article

Anthropometric Attributes and Dietary Practices of School aged Adolescents in Different Governorates of Oman

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ABSTRACT

Background: Adolescence begins with the onset of physiologically normal puberty and this period of development corresponds to the adolescents nutritional status. As stated by the World health Organization, anthropometric assessment represents a crucial indicator of a population health**. Objective:** This study aimed to assess the obesity prevalence and habitual dietary habits of school aged adolescents in different governorates of Oman. **Subjects & Methods:** This cross-sectional survey consisted of a convenient sample of 4252 subjects recruited from the eleventh governorates in Oman, their age ranged between 15-17 years. Written informed consent was obtained, and a diet, anthropometric, and a medical history questionnaire was administered to all enrolled study subjects. **Results:** The study showed that almost half of the population had a normal body mass index (BMI). Obesity, overweight and underweight represented (15%,11%, 23% respectively). Female had higher percentage of overweight and obesity, while male had higher percentage of underweight. Only 50% of the population had breakfast more than three times a week. Fifty and forty percent of adolescents were having fruits and vegetables servings less than 4 times a week, respectively. Surprisingly, 20% reported junk food consumption 4-7 times a week. There was a significant correlation between BMI and the geographic distribution of the population; Al Dakhilia governorate showed the highest percent for underweight (27.9%), overweight and obesity was highly noticed in Dofar governorate (25.6%, 20.6% respectively). **Conclusion:** Adolescence is a second sensitive developmental period in which puberty and brain maturation lead to a new set of behaviors and capacities. Early intervention program has an important role in changing nutritional behavior of adolescents to assure raising healthier generation.

Keywords: Adolescents, body mass index, habitual dietary habits, oman

INTRODUCTION

Due to urbanization and the rapid economic growth, there were dramatic changes in dietary patterns. Association was approved between changes in dietary habits, physical activity and urbanization, as well as the Westernization which occurred in the Arab countries during the past three decades, and the high prevalence of overweight and obesity in the region. Changes in lifestyle to a more sedentary existence, importation of high caloric density processed foods, an urbanized environment with poor access to parks or areas for exercise contributing to lack of physical activity, and so on are found in many of the Arab countries, particularly those members of the Gulf Cooperation Council. Adolescents were affected the most, as they might be strongly influenced by mass media and peer pressure for conformity. Food choices and purchases are increasingly made by the adolescent. Snacking, skipping meals and intake of junk foods are common features of

Access this article online

Website: http://sjsr.se/

ISSN: 2001-9211

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adolescents' diet in developed countries. Currently, adolescents have an increased intake of sweetened beverages, French fries, pizza, and fast food, and a consequent lack of recommended fruits, vegetables, dairy foods, whole grains, lean meats, and fish. This change in eating pattern results in consumption of excess fat, saturated fat, trans fats, and added sugars along with insufficient consumption of micronutrients such as calcium, iron, zinc, and potassium, as well as vitamins A, D, and C and folic acid.

Excessive food intake, has been shown to have detrimental effects on adolescents' health, such as increasing their susceptibility to diseases and precipitating diabetes, heart disease and hypertension. moreover, inadequate intake of carbohydrates, proteins, fat, vitamins and/or minerals has been shown to have severe consequences on growth during this stage. As an attempt to investigate associations between vitamin D status and dietary vitamin D intake among adolescents, a cross-sectional study was conducted with adolescents aged 14–18 years old (n=198). Vitamin D status was positively correlated with vitamin D intake. This result illustrates the importance of stimulating an adequate intake of vitamin D via natural food sources. Additionally, the adoption of a healthy lifestyle and a diversified healthy diet, should also be encouraged.

Poor dietary patterns can within a relatively short time lead to various types of morbidity. Good dietary habits and a diet that is safe and balanced can enhance the growth of children, improve immunological competence to overcome infections, sustain optimal cognitive function and contribute to a healthy reproductive system.

According to ministry of health in Oman, there is an increase in the nutritional deficiencies and metabolic disorders for the age group (15-19), this increase was rapidly among female subjects. Diet-related non-communicable diseases (NCD) such as obesity, cardiovascular disease, stroke, diabetes and some forms of cancer exist or are emerging as public health problems in many developing countries. Obesity and sedentary lifestyles have been involved in the etiology of many NCDs among adults. The World Health Organization (WHO) has recommended a diet low in fat, sugar and salt, and high in fruit and vegetables in order to protect against the development of obesity. WHO noted insufficient policy response and progress in curbing the burden of NCD; it has been and is calling countries to increase the action of NCD risk factors, including unhealthy diet, to reduce the preventable and avoidable burden of morbidity, mortality and disability due to NCD.

In 2015, the methodology of the Child Health and Nutrition Research Initiative (CHNRI) was used to establish global research priorities in adolescent health. It includes several areas such as: management of non-communicable diseases, mental health, nutrition and physical activity.

Adolescence is a sensitive developmental period in which puberty and brain maturation lead to a new set of behaviors and capacities. In addition to basic health and nutrition care, interventions such as prevention of drug and alcohol abuse, life skills, vocational training, health literacy and preparedness for parenthood can also impact on the Early Childhood Development (ECD) of the next generation.

The most effective public health interventions to improve nutrition in the long term are those that focus on changing food frequency, eating habits, and the size of daily portions. Increasing school children's food frequency through nutrition education programs would improve their quality of life in the long term and possibly throughout their lives.

Al-Sinani and others in their study, which aimed to assess the effectiveness of dietary and lifestyle advice. Counselling diabetic patients about the impact of food, nutrition and exercise on diabetes shifted the patients from "Poor" to "Good" control in terms of metabolic outcome.

Al-Lamki emphasized on the active role of university faculty and staff in educating the public regarding good nutrition and disease prevention and called to take positive and definitive steps to improve the health of the community in particular the young ones.

SUBJECTS AND METHODS

Study Design and Population

This cross-sectional study was conducted from February to November 2016, in different governorates of Oman, with a sample of 4252 Omani schools aged 15-17 years (2122 males and 2130 females) from all of the 11 sultanate governorates (Musandam, Al Batina North, Al Batina

South, and Al Dhahera governorates). All study subjects were recruited on voluntary basis, and they were all healthy, non-smokers, and free of endocrine disorders, eating disorders, gastrointestinal diseases, or any non-communicable diseases (cardiovascular diseases, diabetes, and hypertension). None of the study participants were consuming any multivitamins supplementation.

Socio-demographic Characteristics

These characteristics include; age, gender, residential status, medical family history, vitamins or nutritional supplements, monthly income, educational level, and physical activity. The data was collected during personal interviews with all study participants.

Anthropometric Assessment

Measurements of weight, height, and percentage body fat and waist circumference were taken by highly research assistants. The subject's height was measured with socks and shoes removed, standing upright with feet together in the center of the base plate. Height (m) was measured to the nearest 0.1 cm. Weight was measured to the nearest 100 g using a TANITA scale, with subject in light clothing without shoes. Body mass index (BMI) was calculated by the measured height and weight recorded during the interview. The interviewer measured the height and weight of each individual twice. The average of these two measurements was calculated to determine a height and weight to use in the calculation of BMI.

Nutritional Assessment

Dietary assessment was estimated for all study participants. The Participants reported retrospectively the frequency of consumption of each food group on the basis of 6 levels of frequencies by asking the participants to report the frequency of weekly consumption: from rarely or never to more than 7 times a week. Data was analyzed with IBM SPSS Statistical software, version 23. The used food frequency questionnaire (FFQ) was tested for its validity, reliability and reproducibility before conducting the study. The FFQ included 9 different food groups (breads/cereals, vegetables, fruits, meat/meat substitutes, milk/dairy products, deserts, beverages, sandwiches, and traditional Omani dishes).

STATISTICAL ANALYSIS

Depending on the distribution of the variable of interest, descriptive statistics of continuous data will be presented by using the mean and standard deviation, and the median and the interquartile range. Categorical data will be presented as frequencies and percentages. Unpaired student's *t*-test will be used to detect differences between groups for continuous variables, while chi-square will be used to investigate possible correlations between categorical variables. ANOVA test will be used to detect significant differences in BMI within the groups. Differences with p-values < 0.05 were considered significant. All statistical analyses were conducted using Statistical Package for Social Sciences (SPSS 21.0) and statistical significance was set at.05.

RESULTS AND DISCUSSION

There was a significant correlation between BMI categories and gender. Female had higher percentage of overweight and obesity, while male had higher percentage of underweight, Figure 1. Recent reports suggested that there was a direct relationship between adolescent fatness and increased risk of cardiovascular diseases. Moreover, there was a significant correlation between BMI categories and the geographic distribution of the sample. Al Dakhilia governorate showed the highest percent for underweight (27.9%), overweight and obesity was highly noticed in Dofar governorate (25.6%, 20.6% respectively). Dhofar and Al Wusta governorate had the lowest percent of normal weight (40.1%,42.1% respectively). Thirty-three percent of the sample were taking breakfast on a weekly basis, while (38.7%) were taking breakfast once, twice a week or not at all. There was a significant correlation ($P<.05$) between weekly breakfast serving and BMI categories. As illustrated in Figure 2, BMI increases as breakfast servings decreases. Obesity was at the highest level when there was no breakfast serving. According to

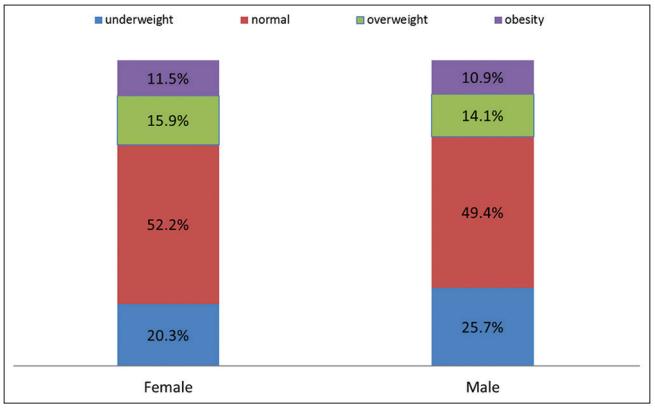

Figure 1: Correlation between body mass index categories and gender

Al Kailani (2013), skipping breakfast was dominant among the Omani adolescence. Half of the sample were taking sweetened drinks five to seven times a week. Thirty-nine percent of the obese adolescents were having five to seven sweetened drinks a week. Only (23%) of the sample were drinking power drinks. Thirty-seven percent of the participants were having fruits five times or more a week (37%) and (41%) were taking vegetables on the same base, which is lower than the adequate fruits and vegetables consumption level. There was a significant difference ($P<.005$) in male and female fruits and vegetables' consumption; where males' consumption was higher by (7%) than female, for both vegetables and fruits.

Based on a regional cross-country study there were a significant difference in male and female consumption of fruits and vegetables; where Omani male ate fruits and vegetable more than five times a day. Interventions should take into consideration the psychosocial, environmental and socio-environmental factors influencing fruits and vegetables intake within countries. Dietary recommendations for a healthful diet across Europe recommend consumption of at least five portions of fruit and vegetables a day reduced intakes of saturated fat and salt, and increased consumption of complex carbohydrates and fiber.

Descriptive statistics of the dietary practices variables among males and females are displayed in Table 1. There was a statistically significant negative association between being male and vegetable intake, percent of MUFA (mono-unsaturated fatty acids) and percent of PUFA (poly-unsaturated fatty acids). The males consumed almost one serving of vegetables less than females (p=0.0063). The males reported consuming significantly more energy (kcal) and percent of kcals from saturated fat than the females. The mean caloric intake among the males was 2780 kcal compared to only 2298 kcal reported in the females as a comparison group (p=0.033). The males consumed 3.8% more calories from saturated fat than the females (p<0.0001). Also of interest, the mean intake of goodies, including cakes, cookies, and pies, was 1.91 among males compared to 0.72 in females (p=0.0002).

At the individual level, the adjusted analyses suggest that the males consumed fewer servings of vegetables, and a lower percentage of energy from MUFA and PUFA. The males also consumed a greater amount of energy intake, whole grains, and a greater percentage of energy from saturated fat. Surprisingly, there were not as many significant differences between the males and females in the nutritional intake as was initially hypothesized. This may be because more traditional

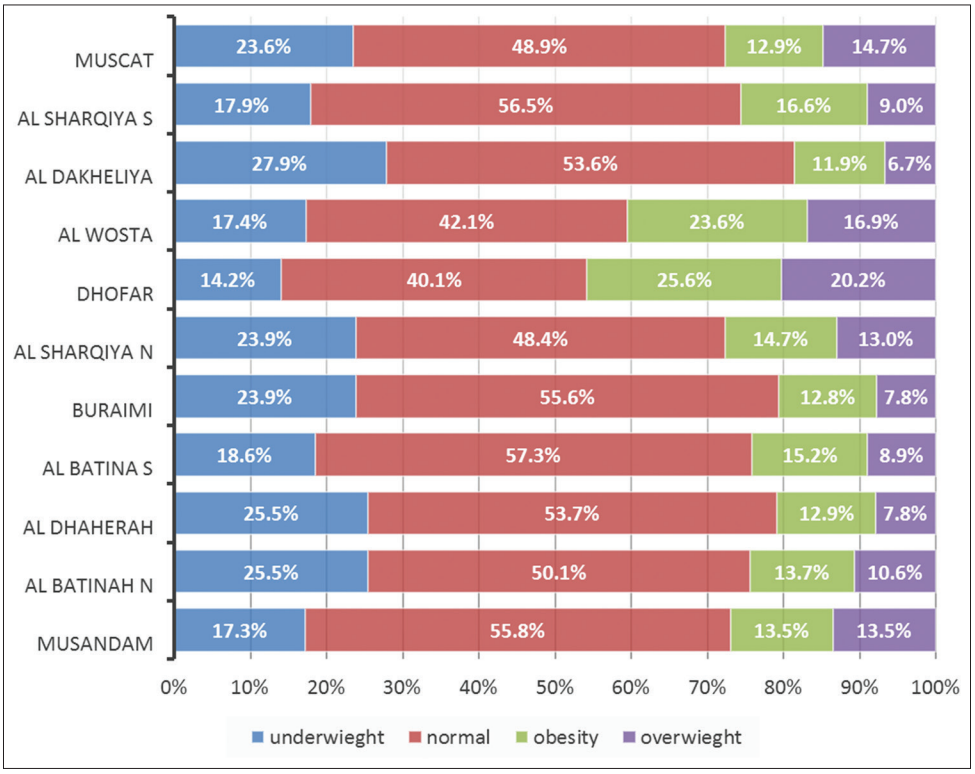

Figure 2: Correlation between body mass index categories and governorate

Table 1: Comparison of dietary practices between the males and females study participants

Variable	Males (N=2122)	Females (N=2130)	*p* of Significance
Energy (kcal/day)	2780 (871)	2298 (871)	0.0326*
Fruits (servings/day)	2.6 (2.8)	1.4 (3.4)	0.0964
Vegetables (servings/day)	1.2 (1.5)	1.9 (1.9)	0.0063*
Whole Grains (servings/day)	2.2 (2.4)	1.6 (1.9)	0.1524
Total Fiber (g/day)	23.6 (10.6)	19.3 (8.5)	0.3057
Soluble Fiber (g/day)	6.7 (2.9)	5.4 (2.4)	0.4129
Insoluble Fiber (g/day)	16.7 (8.4)	13.5 (6.6)	0.2626
% kcal from fat/day	38.0 (8.6)	36.8 (10.0)	0.7665
% kcal from Sat fat/day	16.7 (4.7)	12.6 (4.4)	0.0001*
% kcal from MUFA/day	12.6 (3.1)	14.1 (4.4)	0.0493*
% kcal from PUFA/day	5.5 (2.9)	7.1 (3.5)	0.0027*
Trans Fat (g/day)	5.9 (2.7)	5.9 (4.2)	0.1052
Omega 3 Fatty Acids (g/day)	1.8 (1.1)	1.5 (0.9)	0.9492
Red Meat (servings/day)	1.9 (3.0)	2.2 (2.8)	0.2303
Processed Meat (servings/day)	1.84 (2.09)	1.3 (1.8)	0.3106

Results are expressed as Mean (SD), MUFA (mono-unsaturated fatty acids), PUFA (poly-unsaturated fatty acids), *Significantly different, P<0.05

high-fat and high-calorie diet, utilizing foods were consumed. To our knowledge, there is no current population-based research in the literature describing dietary practices in the school aged Omani adolescents and there is very limited population-based research examining the nutritional status and/or diet.

This research was more exploratory in nature, with the goal being to better describe the nutritional intake and dietary practices of the school aged adolescents community to generate potential hypotheses to explain the high prevalence rates of obesity and overweight. The results from this research will also increase the understanding of the culture, nutritional intake, and dietary behaviors in the adolescents population as a high risk group for non-communicable diseases, which fills a large gap in the literature. These results may also aid in the future direction for health related research and dietary interventions in the Omani adolescents as these data could be used to develop a food frequency questionnaire (FFQ) culturally relevant for this population and to be used in future epidemiological studies. In conclusion, these results may provide more direction for future chronic-disease research conducted within this high risk group of the Omani adult's population.

CONCLUSION

The association between diet and lifestyle habits and adolescents is well documented in literature and has been well studied in other populations. However, such studies in the Omani population are scarce. Our study results have provided baseline diet and lifestyle characteristics for adolescence is a second sensitive developmental period in which puberty and brain maturation lead to a new set of behaviors and capacities. However, as nutritional deficiencies and metabolic disorders are noticeably increasing over the last five years and normal body mass index are only around fifty percent. Preventive actions are highly recommended to insure a healthy generation. Evidence was found for the effectiveness of especially multicomponent interventions promoting a healthy diet in school-aged children. It is an important time to intervene with their nutritional intake to meet nutrient needs and develop dietary patterns that may persist into adulthood. An early intervention program will contribute in creating a fundamental foundation for correcting the current dietary pattern and raising a well-equipped community.

Conflict of Interests

The authors declare that there is no conflict of interests regarding the publication of this paper.

Authors' Contributions

Majed S. Al-Busafi and Kashef Zayed conducted the field work, data collection, and data analysis. Other authors conceptualized the study and supervised the whole research activity. All authors have made equal

contribution in developing, revising and editing the manuscript.

Acknowledgments

The authors thank all subjects for participating in this study.

Sources of Funds

The authors would like to acknowledge the financial support of the His Majesty (HM) grant fund offered to Sultan Qaboos University, SR/SQU/PHED/13/01.

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