

## Assessment of Life Style, Physical Activity, Nutrition Status, Sleep Duration, and BMI among Schools' Adolescents in Oman (14-18): A Research Proposal

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### ABSTRACT

**Background:** In the past, life depended on rigorous physical activity both in occupation and recreation. Nevertheless, jobs and pleasure seeking life had drastically reduced exposure to physical activity and increased exposure to the availability of high-fats and dense-caloric foods, as a new trend influencing the life style. In addition, observation of physical education classes at the secondary stage in Oman assures the weakness of physical integration curriculum to healthy lifestyle. Such life style synergizes for developing hypokinetic related diseases (HRD) & non-communicable diseases (NCDs) incidence. In this millennium active life style and physical activity are necessary for children especially teenagers and adolescents. **Objective:** It is imperative to establish a base line data for Omani male and female subjects aged 14-18 years regarding healthy life style to combat HRD & NCDs. The main purposes of this research proposal are to describe current patterns related to: (1) daily physical activity and regular exercise activity among Omani adolescents;(2) dietary patterns in respect of daily macro- and micronutrients intake and frequency of food consumption of Omani adolescents; (3) Body mass index (BMI), total body fat (TBF). **Subjects and Methods:** A school-based cross-sectional multicenter collaborative project will be adopted. The participants are adolescent males and females enrolled across secondary schools in Sultanate of Oman. Evaluation and examination of the data will be conducted also when comparing gender differences on the above variables. **Results:** It is expected that the findings stemming from this strategic research endeavor will be substantial and very beneficial from public health perspectives. The results of this research will certainly supply us for the first time with a comprehensive and recent data on physical activity/inactivity patterns, eating habits, and sleep curtailment of Omani Adolescents, and their relationships to risk factors measures. **Conclusion:** Finally, this project will provide valuable baseline data for Ministry of education, Curriculum supervisors in PE, public health authorities and policy makers in the Sultanate of Oman, which are very essential for any strategy aimed at improving physical health education in schools and at preventing and controlling Hypokinetic and NCDs.

**Keywords:** *Physical Activity, Oman, Obesity, Non Communicable Diseases.*

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## INTRODUCTION

According to U.S. National Vital Statistics records beginning in 1900, coronary heart disease (CHD) was rarely given as the cause of death by physicians until after 1930. Arias et al, Kraus and Raab (1-2) were the first to use the term Hypokinetic (Hypo meaning low and Kinetic meaning movement) which refers to a disease related to, or caused by, insufficient activity and lack of regular exercise; a condition or disease resulting from a sedentary lifestyle or "too little activity." Examples include obesity, diabetes, hyperlipidemia, hypertension; CHD, lower back problems, and joint disorders, are all thought to be hypokinetic related diseases (HRD) which accounts for 70% of American population to have some type of HRD. Today the leading causes of death are HRD which also may be called noncommunicable diseases (NCDs). During the past century, the impact of infectious diseases has gradually declined, and NCDs are rapidly becoming the leading causes of morbidity, disability, and mortality in all regions of the world (3). This increased burden of NCDs is disproportionately borne by older adults who experience an increased relative risk of developing and ultimately dying from numerous chronic conditions, including cardiovascular disease, type 2 diabetes, obesity, and certain cancers (4-5).

In terms of health profile, Oman has also moved from a country dominated by infectious diseases to a country burdened by non-communicable diseases (NCDs) (6). Both HRD and NCDs are growing at an alarming rate and they spread when people believed myths like "too young to exercise," "exercising is dangerous for young," or "I don't have time to exercise." These diseases strike the young and old alike spreading to children all over the world and have become an epidemic worldwide. The World Health Organization (WHO) has warned of the escalating epidemic of obesity that could put the population in many countries at risk of developing non-communicable diseases.

The prevalence of overweight and obesity for males and females in a number of countries of the Region among males ranges from 10.5% in Pakistan to 64.0% in Saudi Arabia, while for females it ranges from 21.7% in Morocco to 79.0% in Bahrain (7). The regional adjusted mean for overweight and obesity is 54.2% for women compared to 31.4% among males. Obesity kills around 150 000 men and women a year in the GCC. The potential medical hazards of obesity have been documented extensively (8).

The WHO Eastern Mediterranean Region is exposed to NCD risk factors as part of risk-transition as a result of marked changes in the pattern of living in many countries of the Region, particularly countries of the Gulf Cooperation Council (GCC), where rapid increases in obesity are being recorded, primarily among children, adolescents and young adults (9-10). Overweight and obesity have raised 2-fold or more since 1980. Changes in food processing, production and type of food (fast food) have affected health in the majority of countries in the Region (11). Moreover, clustering of risk factors in obesity is

important because obese persons face more than a 65 percent chance of having at least one additional risk factor for CHD (12), and a 50 percent chance of having two or more other risk factors for heart disease (13).

According to the American Heart Association (AHA), obesity is a major independent risk factor for coronary heart disease (CHD), and it appears to interact with or amplify the effects of other cardiovascular risk factors, including hypertension, dyslipidemia, insulin resistance, and hyperinsulinemia (14). Yusuf et al (12) reported that the Middle East region has the second highest mean body mass index after North America. The Middle East region also has the second highest mean waist: hip ratio, after South America. During the last three decades, obesity among children and adolescents has emerged as a global epidemic (15) and is becoming a serious public health problem in the Eastern Mediterranean region (16).

In all countries, less than 2/3rds of the schoolchildren met public health recommendations, with the highest prevalence of inactivity in Egypt (90.8%, 95% CI: 86.8-94.8%) and the lowest in China (70.9%, 95% CI 67.8-73.9%). The prevalence of not walking or riding a bicycle to school ranged from 16.6% (95% CI: 10.2-22.9%) in China to 81.8% (95% CI: 79.5-84.2) in Cayman Islands. In more than half of the countries, over 1/3rd of the students spent three or more hours per day on sedentary activities, excluding the hours spent sitting at school and doing homework. (17). In the Arab countries, the prevalence of overweight and obesity has changed drastically during the past 3 decades (16).

According to the WHO, the most important risk factors of NCDs in the Arab countries included high blood pressure, high concentrations of cholesterol in the blood, inadequate intake of fruit and vegetables, overweight or obesity, physical inactivity and tobacco use. Five of these risks are closely related to improper diet and physical inactivity (18). Five of these risks are closely related to improper diet and physical inactivity and have been recorded in Oman except the tobacco use (19-20). This is called unhealthy life style which leads to the onset of NCDs. In Oman, the NCDs were distributed among diabetes (12%), overweight (30%), obesity (20%), high cholesterol (41%), and metabolic syndrome (21%) (21). People living in urban areas were more obese than those living in rural areas. Obesity and overweight combined were more prevalent in the Southern part of Oman. In 1991, more women than men were obese and overweight. The trend was reversed in 2000 with a decrease in the prevalence of overweight and obesity among women and an increase among men (22). On the other hand, regular physical activity and proper dietary habits can maintain and improve the individuals' physical and mental health and well-being and can relieve stress (23).

## STATEMENT OF THE PROBLEM

No longer is there any serious doubt about the strong impact of physical activity on promoting health and preventing disease, or achieving and maintaining a healthy body weight in all age stages (24-25). Despite the well-known benefits of regular physical activity, only about 15 percent of American adults regularly engage in the modest amount of activity required to obtain health benefits, while more than one fourth of adults are sedentary. In the past, people in most Arab countries were used to hard work, intense and strenuous exertion. Life depended on rigorous physical activity both in occupation and recreation. But the advent of western education that resulted to white collar jobs and pleasure seeking life had drastically reduced exposure to physical activity and increased exposure to the availability of high-fats and dense-caloric foods, as a new trend influencing the life style (26). Automobiles have become the dominant form of transportation, and physical activity at work and during leisure time is low. The number of hours of television watching is high, approximately 23 hours per week (27).

In fact, there was no information available on the prevalence of exercise vs. sedentary life in Oman. Physical activity which includes all movements in everyday life, including work, recreation, exercise, sporting activities, and in physical education is also an important factor with nutrition for catalyzing and maintaining bone development (28). Recent ATLS research group led by Kilani et al (in progress) have found high prevalence of sedentary behaviors, physical inactivity and unhealthy dietary habits among Omani adolescents in Muscat city public schools. Recently it has been observed a high prevalence of short sleep duration among Saudi adolescents 15 to 19 year olds and that short sleep duration was significantly associated with increased risk of overweight and obesity (29).

In addition, Kilani, et al (in progress) have questioned the probability of children age between 7-15 years old, who have higher fitness level are less susceptible to be deficient in vitamin D and BMD. While those children who are ranked in overweight and low fit are susceptible to be in the risk of vitamin D deficiency. Many studies have suggested that ultraviolet light and vitamin D also might have a role in cardiovascular disease (30-31). In a recent cohort study, it was found that low levels of vitamin D were an independent risk factor for myocardial infarction in men. (32).

Finally, people live in a society who hide from sun exposure spend a great deal of time indoors with, computers, and watching TV. Besides, they tend to imitate what they see from media to get the junk food and increase the sedentary life time effect. A tendency to become depressed is a probability.

The Arab Teens Lifestyle Study (ATLS) project was recently initiated to assess the physical activity patterns, sedentary activity and eating habits of randomly selected

samples of secondary-school boys and girls (15-18 years) living in major Arab cities. 9 major Arab cities, including Riyadh, Jeddah, and Al-Khobar (Saudi Arabia), Dubai (United Arab Emirates), Bahrain, Kuwait, Al-Mosul (Iraq), Amman (Jordan), Cairo (Egypt) and Muscat included lately in the study (18, Kilani, et al in progress). The lack of physical education curriculum related to healthy life style is one of the major issue has to be solved. Thus, developing and implementing an integrated curriculum is beneficial to students and the instructor as well.

## **SIGNIFICANCE OF THIS RESEARCH PROPOSAL**

Of significance to this study proposal is the finding that many NCDs are susceptible to modification through lifestyle change. Longitudinal studies confirm that lifestyle and environmental risk factors explain approximately 75% of the occurrence of coronary heart disease (5) as well as numerous other chronic diseases and Conditions (33). It is now well documented that major NCDs share common preventable lifestyle-related risk factors that are both behavioral (unhealthy diets, physical inactivity, and smoking) and biological (hypertension, obesity, and dyslipidemia) (34-35). In addition, social, economic, and environmental determinants of health are additional factors that can be linked with NCDs; among these are education, availability, and affordability of healthy food; access to health services; and policies and infrastructures that support a healthy lifestyle (36).

There should be a need to conduct this study that has a major healthy life style investigation in the Omani nationals where HRD, NCDs and Obesity are spreading rapidly. It is expected that the findings stemming from this strategic research endeavor will be substantial and very beneficial from public health perspectives. The results of this research will certainly supply us for the first time with a comprehensive and recent data on physical activity/inactivity patterns, eating habits, and sleep duration of Omani Adolescents, and their relationships to risk factors measures.

Finally, this project will provide valuable baseline data for Ministry of education, Curriculum supervisors in PE, public health authorities and policy makers in the Sultanate of Oman, which are very essential for any strategy aimed on improving physical health education at schools and on preventing and controlling Hypokinetic and NCDs. In addition, National Standards for Initial Physical Education Teacher Education (2008) National Association for Sport and Physical Education (NASPE) emphasize that physical education teacher candidates should achieve and maintain a health-enhancing level of fitness throughout their career (37). Therefore, this research results will help physical educators to expand the scope of fitness testing, and recognize the need for programs that teach children the basic concepts of health and fitness and how to influence present and future health status through physical activity (37).

## LONG TERM & SHORT TERM OBJECTIVES

The main goal is to identify life style pattern of Omani adolescents aged 14 to 18 related to hypokinetic disorders that should be addressed by suitable intervention programs of primary and secondary prevention. The specific objectives are to:

Characterize the life style patterns of Omani adolescents aged 14-18 years related to hypokinetic disorders in terms of daily physical activity and regular exercise activity, dietary patterns and body weight. Portray the rates of physical activity by and types of physical exercises by grade, sex and social class. Describe the frequency of food consumption and the daily intake of macro and micro nutrients intake by grade, sex and social class. Classify adolescents in relation to body mass index (BMI) and total body fat (TBF) by grade, sex and social class. Assess the relation between physical activity, dietary pattern, sleep pattern, body mass index and total body fat.

## GENERAL IMPORTANCE

**Popularity:** Its contribution has been realized in health education, as an added value activity that supports the comprehensive educational system and curriculum integration between health education and physical education. It has contributed to health and fitness industry, through the promotion of healthy lifestyle and the protection of individuals and societies from HRD & NCDs. In addition, it has contributed indirectly in increasing productivity, since; it frees the individual from mental stress and illness caused by the current modern lifestyle. **Risk due to lack of knowledge:** Many people are not aware of the hidden symptoms that may occur to them early in life due to current life style, unless they encounter the reality of diseases occurrences. Even, the effect of unhealthy life style on the lay people is devastated.

In Oman, no data is available about the prevalence of sedentary life style and to provide precious baseline data for public health authorities and policy makers in the Sultanate of Oman, which are very essential for any strategy aimed on preventing and controlling HRD and NCDs. This is most important for school physical education curricula modification. A volley of information will be portrayed to the Omanis' students and their respective instructors of healthy life style, HRD & NCDs, during the data collection. Benefits of Physical Activity for the Individual Persons and Societal Benefits of Promoting Physically Active Lifestyles Among adolescents will be available in these project publications.

## SUBJECTS AND METHODS

**Variables:** Life Style (exercise and dietary patterns) and the demographic variables which are statistically treated as independent variables include Social Demographic such as Age, gender, residency, and class level that might mediate the effect of the IV on the



DV. Dependent variables: Responses of the following: Dietary intake using a food frequency questionnaire (FFQ); Appetite problems (poor, good or excellent); Questionnaire for (Global Physical Activity Questionnaire (GPAQ); and Arab Teens Lifestyle Study (ATLS), and the Scores of the following: Anthropometric measurements and Physical activity scoring sheet (obesity, abdominal obesity, BMI, and sleep duration).

**Hypothesis:** Lifestyle adopted by Omani adolescents increases the probability of having higher onset of risk factors to HRD & NCDs.

**Population:** Target population of the current survey is adolescents in the age group of 14 years to 18 years. Inclusion criteria: All Omani males and females age group of 14 years to 18 years residing in Sultanate of Oman will be included. Exclusion criteria: All males and females with any existing health problem will be excluded. Informed written consent will be obtained after explaining the benefits and risks. The participation is completely voluntary and the subjects.

**Sampling Techniques:** A school-based cross-sectional multicenter collaborative project will be used. The participants are adolescent males and females enrolled across secondary schools (public and private) in Sultanate of Oman. According to the Ministry of national economy, 2009/10 (38) in the government sectors the total enrollment in grades 10-12 of general education schools was 123,121 students; while 1702 students were enrolled in private schools in grades 10-12(38). Muscat is the capitol of Sultanate and is located in the central region. The Omani population at this age group in Muscat, 209062 male students and 197944 female students. Based on this fact, the estimated number of Omani in the age group of 16, 17, and 18 years is 3844, 4128, and 3136 male students and 3897, 3900, 3571 female students respectively. Similar calculations for urban and rural region will be drawn and established. The minimum sample size in Muscat city will be determined so that the sample proportion would be within  $\pm 0.05$  of the population proportion with a 95% confidence level. The population proportion has been assumed to be 0.50, as this magnitude yield the maximum possible sample size required. For example, in the city of Muscat, where the population of male students in the public secondary schools was about (209062 male and 197944 females), the minimum needed sample size for male students is 500 and for female 440.

The sample size (n) was estimated using the Epi-info software (2008) based on a population (N) of 40000 students (39). A multistage stratified cluster random sampling technique will be used to select the sample. In the first stage, a systematic random sampling procedure will be used to select the schools. The schools will be stratified into boys and girls secondary schools, with public and private schools. 20 schools will be selected from each of the three geographical areas in Muscat city. These areas were north, middle and south. At the second stage, classes will be selected at each grade (level) using a simple random sampling design. In this way, 2 classes will randomly be selected in

each of the three grades (grades 10, 11 and 12) in each secondary school. Thus, we will select at least 40 classes (20 each from the boys and girls schools).

All students in the selected classes, who are free from any physical deformity, will be invited to participate in the study. Because of differences in class size between schools, the sample sizes for the participating schools differ. The data will be collected during the first year of the achieved grant 2013-2014. Additional data for the girls will also be collected during the second year of the project. The study protocol and procedures will be approved by the Research Center at Sultan Qaboos University as well as by the General Directorate of School Education in Muscats' governorate (Ministry of Education). We also will obtain schools and parental consents as well as students' approval for conducting the survey. The total sample size consisted of 940 adolescents (500 males and 440 females). They will be asked to complete the study questionnaire included questions related to: (I) Socio-demographic data, (II) Dietary intake using a food frequency questionnaire (FFQ). Appetite problems (poor, good or excellent) were also reported. (III) Anthropometric measurements of cases and controls (IV) Biochemical assessment (V) Physical activity scoring sheet (VI) Questionnaire for depression/anxiety/stress (VII) (Global Physical Activity Questionnaire (GPAQ) (VIII) Arab Teens Lifestyle Study (ATLS).

**Anthropometry:** Anthropometric variables included body weight, height and waist circumference (WC). Measurements will be performed in the morning by trained researchers using standardized procedures. Body weight will be measured to the nearest 100 g, with minimal clothing and without shoes, using a calibrated portable scale. Height will be measured to the nearest cm with the subject in the full standing position without shoes using calibrated portable measuring rod. Body mass index (BMI) will be calculated as body weight in kg divided by height squared in meters. The International Obesity Task Force (IOTF) age- and sex-specific BMI reference values will be used to define overweight and obesity in adolescents aged 14–17 years. For participants aged  $\geq 18$  years, we will use the cut-off points for adults (overweight, 25–29.9 kg/m<sup>2</sup>; obesity  $\geq 30$  kg/m<sup>2</sup>). WC will be measured horizontally at navel level and at the end of gentle expiration to the nearest 0.1 cm using a non-stretchable measuring tape. Waist height ratio (WHtR) will be calculated as the ratio between WC in cm and height in cm. A WHtR cutoff point of 0.50 was used to define abdominal obesity in males and females.

ATLS research instrument (with permission of ATLS Team). The ATLS research instrument that will be used to record lifestyle information consisted of 47 items. Of these, the first five items were essential, and were age, weight, height, waist circumference and student's level of study. Items 6–34 comprised the physical activity questionnaire, items 35–37 recorded sedentary activities and items 38–47 focused on dietary habits. To ensure accurate and consistent measurements throughout this multicenter project, all data collection centers followed a standardized protocol. Written



instructions were provided to the researchers on sampling procedures, weight, height and waist circumference measurements, and how to conduct the questionnaire.

**Physical Activity Assessment:** A self-reported questionnaire will be used to assess the level of physical activity of the participants. The original questionnaire was previously shown to have a high reliability (intra-class coefficient 0.85; 95% confidence interval [CI] 0.70–0.93) and acceptable validity ( $r = 0.30$ ;  $p < 0.05$ ) against pedometer assessed activity in a convenient sample of young males aged 15–25 years (18). The ATLS physical activity questionnaire was also validated against pedometer assessed activity in females and males aged 14–19 years, and had an acceptable validity coefficient ( $r = 0.37$ ,  $p < 0.001$ ). The participants will complete the ATLS questionnaire in their classrooms under supervision of their teachers and least one research assistant. The physical activity part of the questionnaire was designed to collect information on the frequency, duration and intensity of light-, moderate- and vigorous-intensity physical activities during a typical (usual) week. The physical activity questionnaire covers several domains, including transport, the household, fitness and sporting activities.

Physical activities were assigned metabolic-equivalent (MET) values based on the compendium of physical activity and the compendium of physical activity for youth (40). Moderate-intensity physical activities include normal pace walking, brisk walking, recreational swimming, household activities, and recreational sports such as volleyball, badminton and table tennis. Moderate-intensity recreational sports were assigned an average MET value equivalent to 4 METs. Household activities were given an average MET value of 3. Slow walking, normal pace walking and brisk walking were assigned MET values of 2.8, 3.5 and 4.5 METs respectively, based on the modified MET values in the compendium of physical activity for youth (40). Vigorous-intensity physical activities and sports included stair climbing, jogging, running, cycling, self-defense, weight training, soccer, basketball, handball, and singles tennis. Vigorous-intensity sports were assigned an average MET value of 8. To measure the participants' levels of physical activity, the total METs-min per week and the METs-min per week spent in each of the moderate- and Vigorous-intensity physical activity was used. For physical activity cut-off values, three categories (low, medium and high activity) based on tertiles of total METs-min per week, METs-min per week from vigorous-intensity physical activity, and METs-min per week from moderate-intensity physical activity was used.

**Sedentary Behavior Assessment:** The questions on sedentary behaviors followed the physical activity questions, and will be designed to assess typical time spent per day on sedentary activities, including television (TV) viewing, video games, and computer and internet use. Participants will be asked to state their typical time (hours) spent on these activities without differentiating between weekdays and weekend. For total screen viewing time cut-off values, we will use the American Academy of Pediatric guidelines of a maximum of 2 h per day.

**Eating Habits:** The ATLS questionnaire also included 10 specific questions designed to assess the frequency of certain dietary habits during a typical (usual) week. The questions asked the participants to state how many times per week they consume breakfast, sugar-sweetened drinks (including soft drinks), vegetables (cooked and uncooked), fruits, milk and dairy products, donuts/cakes, sweets and chocolates, energy drinks and fast foods. The fast foods in this regard included some examples from Western fast foods and Arabic fast foods, such as shawarma (grilled meat or chicken in pita bread with some salad). The questions covered some healthy and unhealthy dietary habits. The student was given a choice of answers, ranging from zero intake (never) to a maximum intake of 7 days per week (every day). We categorized the dietary habits into three levels of intake:  $\geq 5$  days per week, 3–4 days per week and  $< 3$  days per week.

**Statistical Analysis:** Data at each center will be checked and entered into a computer using standardized entry codes written on an SPSS data file. Data will then be analyzed using SPSS version 19 (SPSS, Inc, Chicago, IL, USA) at Sultan Qaboos University. Descriptive statistics will be presented as means  $\pm$  standard deviations (SD) or proportions. Data that are not normally distributed, such as physical activity scores in METs-min per week, will be logged transformed before performing analysis of variance (ANOVA). Differences in anthropometric measurements between regions will be tested separately for each of the males and females using one-way ANOVA. The proportions of Omani males and females who exceeded specific cut-off values for sedentary behaviors, physical activity and dietary habits will be calculated. Two-way analysis of covariance (ANOVA; sex  $\times$  BMI category, and sex  $\times$  WHtR category) while controlling for the effects of age to test for differences in lifestyle variables across sex (males and females) and obesity indicators will also be used.

Finally, multinomial logistic regression to examine the independent associations between sex, school type and lifestyle factors with each of dependent measures of obesity (overweight/obesity versus normal weight and above versus below 50% of WHtR), which will be entered separately will be performed. In preliminary logistic regression models, analysis for age, location, sex and public/private schools will be adjusted. However, this did not materially change the observed associations and will thus be excluded. Adjusted-for age odds ratios (ORs) and 95% CIs will be calculated for each independent variable. In these models, several parameters (namely the consumption of fast foods, French fries, cakes/donuts, sweets and energy drinks) will be set to zero because they are redundant due to high co-linearity with other independent variables. The level of significance will be set at  $p < 0.05$ .

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