

The Relationship Between Physical Activity Status and Dietary Habits with the Risk of Cardiovascular Diseases

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Abstract

Objectives: This study designed to evaluate the relationship between physical activity status and dietary habits with the risk of cardiovascular diseases (CVD).

Materials and Methods: In this cross-sectional study 207 medical students (107 female, 100 male) aged 15-25 years were recruited. Physical activity level and dietary habits assessed by Arab teens lifestyle study questionnaire. Risk of CVD was determined by Framingham, ASSIGN and British National Formulary scoring systems.

Results: In the present study the incidence of CVD was higher in males than females. Female spending more time in sedentary behaviour than male. The incidence of

different CVD was higher in male and female that spending more time in sedentary behaviour. Sedentary time, sugary drinks, French fries, potato chips intake were positively correlated with CVD. Eating fresh fruits, energy drinks and dairy products negatively correlated with CVD.

Conclusion: The risk of CVD is higher among male and increase in both sex with physical inactivity and sedentary life style. Sedentary behaviours regarded as independent risk factors for CVD. High sugary diet increases the incidence of CVD and dairy products decrease the incidence of CVD.

Keywords: Cardiovascular diseases, sedentary behaviour, dietary habits



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Introduction

Recommendation from many recent studies have documented that lifestyle modification in adolescents and young adults are necessary because of the increased tendency of various adverse health outcomes not otherwise typical for their age, including hypertension, dyslipidemia, and metabolic syndromes⁽¹⁾.

It is now well recognised that a physically active lifestyle is associated with decreased cardiovascular diseases (CVD) risk⁽²⁾. One of the mechanisms for decreased CVD risk with increasing physical activity is through the action of physical activity on established CVD risk factors, such as levels of blood pressure or lipids⁽³⁾.

Excessive energy intake and sedentary lifestyle in young adults can be associated with the increased prevalence of dyslipidemia, obesity, and CVD⁽⁴⁾. Particularly, sedentary lifestyle (e.g., watching TV) is associated with unhealthy snacking patterns, including low intake of fruits and vegetables and overconsumption of energy and fat^(4,5). Because the level of physical activity influences on physical condition, health status, and quality of life, it is important to undertake physical activity of different intensities until the age of 25-30 to maximize the development of motor skills and physical fitness^(6,7).

An important time to examine factors associated with CVD risk among adolescents and young adults is during the college years. College students engage in several high risk behaviours associated with CVD development including cigarette smoking, alcohol abuse, physical inactivity, and low fruit and vegetable consumption^(8,9). Weight gain is also common among college students⁽¹⁰⁾ with the frequency and magnitude of weight gain the possibility of gaining weight is greater among male than female⁽¹¹⁾.

Students also perceive that it is acceptable to engage in unhealthy behaviours during their college years, which may be a barrier to incorporating CVD preventive behaviours⁽⁸⁾. Because CVD risk behaviours such as

physical inactivity, obesity, and smoking increase during the transition from adolescence to emerging adulthood⁽¹²⁾. It is critical to have a greater understanding of perceptions related to CVD risk among emerging adults in college.

Materials and Methods

Observational cross-section study was conducted in Faculty of Medicine, Omdurman Ahlia University, Sudan. Two hundred and seven students (100 male, 107 female) aged 15 to 25 years were participated in this study. Participant with hypertension, diabetes, CVD and those taking lipid lowering drugs was excluded. All students signed a written consent form. Basic anthropometrical measurements including body weight and height were measured; weight was measured by body-weight measuring machine (measurement precision 0.1 kg, SECA device), height was measured using a flexible measuring tape (measurement precision 0.1 cm)

Assessment of Physical Activity Status and Dietary Habits

Physical activity and dietary habits were assessed by using Arab Teens Lifestyle Study (ATLS) questionnaire⁽¹³⁾. The physical-activity part of the questionnaire intended to collect information on frequency, duration, and intensity of a variety of light-, moderate-, and vigorous intensity physical activities during a typical week and across different activity domains (transport, house hold, fitness, and sports activities). Metabolic equivalent (MET) values were attributed to the physical activities based on the compendium of physical activity and the compendium of physical activity for youth. Physical activity levels were then classified into two categories (active or inactive) based on a cut-off value for total METs-min/week of below or 1,680 MET-min/week. These cut-offs were employed as a score of 1,680 METs-min/week is equivalent to 60 minutes of moderate-intensity daily physical activity (60 minutes 3-7 days 3-4 METs 51,680 METs-min/week), and a score of 2,520 METs-min/week is equivalent to 60 minutes of moderate-to vigorous- intensity daily physical activity (60 minutes 3-7 days 3-6 METs 52,520 METs-min/

week). Sedentary behaviours were then assessed by asking how much time in a typical day was spent watching TV, playing video games, and using the computer and internet. To classify total screen time, the “American Academy of Pediatrics” guidelines of a maximum of 2 h/day was employed.

The dietary habit section of the questionnaire covered healthy and unhealthy dietary behaviours and asked how many times in a typical week the participants consumed breakfast, vegetables (cooked and uncooked), fruit, milk and dairy products, sugar-sweetened drinks including soft beverages, donuts and cakes, candy and chocolate, energy drinks and fast foods. Possible responses ranged from zero intake (never) to a maximum intake of 7 days/week (every day). Participants were then classified into two categories based on the frequency of their intake for each respective food (41 days/week, <4 days/week).

Assessment of the Incidence for CVD

For assessment of the risk for CVD three CVD scoring systems were used which are Framingham, ASSIGN, and British National Formulary. The variables required for risk calculation by these scoring systems include time in years over which risk is calculated, age of the subjects, sex of the subjects, number of cigarettes smoked per day, smoking status, family history of premature cardiovascular disease, presence of diabetes, presence of left ventricular hypertrophy on ECG, Scottish index of multiple deprivations (usually 20) Systolic blood pressure in mmHg, total cholesterol in mmol/L and high density lipoprotein total cholesterol (HDL-C) in mmol/L.

Venous blood was collected in the morning after an overnight fast of 12 hours. The total cholesterol and HDL-C were measured by using spectrophotometer by kits from Bio-system Company Costa Brava, 30, Barcelona (Spain). Blood pressure was measured by sphygmomanometer.

Statistical Analysis

Data was analysed by using PASW for Windows® version 24.0 software (formerly SPSS Statistics Inc. Chicago, Illinois). Our data was normally distributed.

Results were presented as mean ± standard deviations for all variables. Student t-test was used to compared between two groups. Pearson correlation was used to correlate between CVD and other variables. P<0.05 was considered significant difference.

Results

Among 207 participants included in the study, 107 of them (51.7%) were female, 100 (48.3%) were male. Regarding physical activity 20 (18.7%) of female and 39 (39%) of male regarded as physically active. As shown in Table 1, age, weight, height and the sum of MET which represent the physical activity were statistically significantly higher in male than females (p≤0.05). Results presented in Table 2, showed that the risk of CVD according

Table 1. Anthropometric characteristics and activity status of the study population according to genders

Variables	Male (n=100) Mean ± SD	Female (n=107) Mean ± SD	P value
Age (year)	19.50±1.58	19.07±1.10	0.002
Weight (kg)	67.04±13.88	60.57±13.23	0.001
Height (m)	1.72±0.64	1.59±0.06	0.000
Sum of MET	1775.08±1841	1158.3±1272	0.005
Sedentary time (h/d)	1.86±0.35	1.88±0.33	0.695

Sum of MET: Sum of metabolic equivalent, n: Number of the patients, SD: Standard deviation

Table 2. Comparison of the different CVD between male and female

Variables	Male (n=100) Mean ± SD	Female (n=107) Mean ± SD	P value
CVD - Framingham	0.296±0.52	1.00±8.83	0.424
CHD	0.507±0.91	0.774±8.01	0.440
MI	0.212±0.54	0.598±6.19	0.534
Stroke	0.040±0.03	0.018±0.01	0.000
Risk of Death from CHD	0.002±0.02	0.591±6.11	0.337
Risk of Death from CVD	1.204±1.30	1.317±8.67	0.939
CVD - BNF	0.546±0.92	0.792±8.01	0.762
CVD - ASSIGN	1.727±1.09	0.599±0.42	0.000
Systolic BP	119.47±9.34	111.93±7.71	0.000
Diastolic BP	74.81±6.99	71.80±7.39	0.003

CVD: Cardiovascular diseases, CHD: Coronary heart disease, MI: Myocardial infarction, BNF: British National Formulary, BP: Blood pressure, n: Number of the patients, SD: Standard deviation

to ASSIGN criteria, stroke according to Framingham criteria, systolic blood pressure and diastolic blood pressure were statistically significantly higher in male than females ($p \leq 0.05$). As shown in Table 3, only risk of death from coronary heart disease was significantly higher in the inactive male ($p \leq 0.05$). Regarding time spending

Table 3. The risk of death from CHD among active and inactive males

Variable	Gender	Activity	n	Mean \pm SD	p value
Risk of Death from CHD	Male	Inactive	61	0.0036 \pm 0.01	0.007
		Active	39	0.0005 \pm 0.00	

CHD: Coronary heart disease, SD: Standard deviation, n: Number of the patients

Table 4. Comparison of different CVD in relation to time spending in sedentary behaviour according to gender

Variable	Gender	Sedentary time	n	Mean \pm SD	P value
MI	Male	High	86	0.239 \pm 0.57	0.04
		Low	14	0.046 \pm 0.08	
CVD -Framingham	Male	High	86	0.326 \pm 0.55	0.04
		Low	14	0.118 \pm 0.12	
CVD -ASSIGN	Male	High	86	1.792 \pm 1.14	0.032
		Low	14	1.332 \pm 0.61	
CVD -ASSIGN	Female	High	94	0.567 \pm 0.39	0.39
		Low	13	0.831 \pm 0.58	

CVD: Cardiovascular diseases, MI: Myocardial infarction, n: Number of the patients, SD: Standard deviation

Table 5. Correlation of CVD with the sedentary activity in males

Variable	Gender	Correlation	Time spending on computer per day	Watching TV or videos per week end
Death from CVD	Male	Pearson Correlation Sig. (2-tailed)	0.212* 0.034	0.233* 0.020
Systolic BP	Male	Pearson Correlation Sig. (2-tailed)		0.215* 0.032
Diastolic BP	Male	Pearson Correlation Sig. (2-tailed)		0.195* 0.052

CVD: Cardiovascular diseases, BP: Blood pressure, Sig: Significance test

Table 6. Correlation of CVD with the sedentary activity in females

Variable	Gender	Correlation	Watching TV or videos per day
Stroke	Female	Pearson Correlation Sig. (2-tailed)	-0.237* 0.014
CVD-ASSIGN	Female	Pearson Correlation Sig. (2-tailed)	-0.209* 0.032

CVD: Cardiovascular diseases, Sig: Significance test

in sedentary activity results presented in Table 4, showed that the risk of myocardial infarction, CVD according to Framingham criteria is statistically significantly higher in high sedentary male. Risk for development of CVD according to ASSIGN criteria is statistically significant higher in high sedentary male and female ($p \leq 0.05$). Regarding correlation of cardiovascular diseases with the time spending in different types of sedentary activity in male results presented in Table 5, showed that the risk of death from CVD statistically significantly positively correlated with time spend on the computer and/or internet per day and watching TV and/or DVD per weekend. Systolic blood pressure and diastolic blood pressure were statistically significantly positively correlated with the watching TV and/or DVD per weekend ($p \leq 0.05$). While in female results presented in Table 6, showed that the incidence of CVD according to ASSIGN criteria and stroke according to Framingham is statistically significantly negatively correlated with time spending in watch TV and/or videos per day ($p \leq 0.05$). Regarding the correlation of CVD with dietary habits, male results that presented in Table 7, showed that the incidence of CVD according to SSIGN criteria statistically significantly positively correlated with eating fresh fruit. Systolic blood pressure

significantly negatively correlated with drinking energy drinks. Diastolic blood pressure statistically significantly positively correlated with sugar drink and negatively correlated with eating fresh fruit. While the female results that presented in Table 8, showed that systolic blood pressure statistically significantly negatively correlate with eating diary product. Diastolic blood pressure statistically significantly negatively correlated with eating French fries or potato chips, sweet and chocolate ($p \leq 0.05$).

Discussion

The present study revealed that most our college students were physically inactive and spending their time in sedentary activities, These findings concur with a number of previous studies^(8,9). Moreover, our results indicated that development of CVD diseases was higher in male than female, this in accordance with the investigators that suggest the lifetime risk for developing CVD is higher among men than women⁽¹⁴⁾ across most age groups⁽¹⁵⁾. Emerging adult males, those 18-25 years of age,⁽¹⁶⁾ may be particularly at risk for engaging in CVD risk behaviours due to greater independence, less parental monitoring, and financial instability. Cardiovascular risk factors established during adolescence and emerging

adulthood have been shown to extend into later adulthood,⁽¹⁷⁾ increasing the risk for CVD. In the current study we observed that the risk of CVD was higher in physically inactive male than physically active ones. Furthermore, the risk of CVD was higher in the high sedentary male and female. These finding agree with the recommendation for ideal cardiovascular health that adopted by the American Heart Association which included lifestyle-related recommendations for physical activity and dietary behaviours, not smoking, and a body mass index less than 25 kg/m²⁽¹⁸⁾.

In the current study it is clear that sedentary behaviour is independent risk factor for different type of CVD and its risk factors in male and females, this finding agree with a number of previous studies that conclude prolonged sedentarism is regarded as independent risk factor for CVD independent of physical activity and other potentially confounding factors^(19,20). Moreover regarding physical inactivity pattern that potentially affect the CVD, our finding showed that the time spending on the computer and/or internet per day and watching TV was significantly associated with the CVD and its associated risk factors in male and females, these findings are in accordance with a research that reported TV watching appear to be separate

Table 7. Correlation of CVD with the dietary habits in males

Variable	Gender	Correlation	Eating fresh fruit	Taking energy drinks	Sugary drink
CVD-ASSIGN	Male	Pearson Correlation Sig. (2-tailed)	0.195 0.05		
Systolic BP	Male	Pearson Correlation Sig. (2-tailed)		-0.215* 0.032	
Diastolic BP	Male	Pearson Correlation Sig. (2-tailed)	-0.250* 0.012		0.226* 0.024

CVD: Cardiovascular diseases, BP: Blood pressure, Sig: Significance test

Table 8. Correlation of CVD with the dietary habits in females

Variable	Gender	Correlation	Eating diary product	Eating French fries or potato chips	Eating sweets or chocolate
Systolic BP	Female	Pearson Correlation Sig. (2-tailed)	0.224* 0.020		
Diastolic BP	Female	Pearson Correlation Sig. (2-tailed)		-0.190 0.050	-0.205* 0.034

CVD: Cardiovascular diseases, BP: Blood pressure, Sig: Significance test

entities and is independently associated with cardio-metabolic risk^(21,22).

Regarding association between dietary habits and CVD we observed that in males, the sugary drinks increases the diastolic blood pressure, eating French fries and/or potato chips decreases diastolic blood pressure. While in females the dairy products significantly decrease systolic blood pressure, eating French fries and/or potato chips, sweets and/or chocolates decreases the diastolic blood pressure.

Furthermore, present study found that high consumption of fruit, increases the risk for development of CVD according to ASSIGN this might be due to intake of high sugary fruit juices with fast food.

Study Limitations

This study is limited in the term of calculation of incidence of cardiovascular diseases because we used cross-sectional study that is suitable to our study population.

Conclusion

The risk of cardiovascular diseases is higher among male and increases in both sex with physical inactivity and sedentary life style. Sedentary behaviours regarded as independent risk factors for cardiovascular diseases. High sugary diet increases the incidence of cardiovascular diseases and dairy products decrease the incidence of cardiovascular diseases.

Ethics

Ethics Committee Approval: This study approved by ethical committee of the faculty of medicine International Africa University (number 27-2017)

Informed Consent: Informed consent was obtained from the patients.

Peer-review: Externally and internally peer-reviewed.

Authorship Contributions

Concept: A.A.O., Z.M.A., Design: A.A.O., Z.M.A., Data Collection or Processing: A.A.O., Z.M.A.,

Analysis or Interpretation: A.A.O., Z.M.A., Literature Search: A.A.O., Z.M.A., Writing: A.A.O., Z.M.A.

Conflict of Interest: No conflict of interest was declared by the authors.

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