

Risk Factors of Coronary Heart Disease among Medical Students in Almaarefa Colleges, Riyadh, Saudi Arabia

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ABSTRACT

Background: Nowadays, cardiovascular diseases (CVDs) represent an escalating worldwide public health problem. Providing consistent data on the magnitude and risk factors of cardiovascular diseases (CVDs) among young population will help in controlling the risks and avoiding their consequences.

Objective: The objective was to estimate the prevalence of risk factors of coronary heart disease (CHD) among medical students during their clinical clerkship (4th-6th years).

Methods: A cross-sectional study was done during the educational year 2016-2017 at Almaarefa Colleges. Ethical standards were followed and a multistage stratified random sample method was used for selection of 214 medical students. Data was collected through an interviewing questionnaire, measurements and laboratory investigations. Both descriptive and analytical statistics were done by SPSS version 21. Coronary heart disease (CHD) risk percent in thirty years was calculated using Framingham algorithm for each student, then the risk among all students was determined.

Results: The commonest risk factors of coronary heart disease (CHDs) were daily intake of high fat diet (73.4%), physical inactivity (57.9%), overweight/obesity (31.2%) and daily consumption of fast food (13.1%). Hypercholesterolemia (17.2%) and hypertension (9.3%) were also prevalent risk factors. Smoking prevalence was low (2.8%). Males had significantly higher mean scores for most of coronary heart disease (CHD) risk factors compared to females ($p < 0.05$). Systolic Blood Pressure was higher among males (119.47 ± 11.17) compared to females (112.26 ± 9.06). A highly statistical significant difference was present (Students test = 4.74, $p < 0.001$). Framingham Risk Score revealed that coronary heart disease (CHD) risk percent in thirty years among all students was 10.7%, 2.3% and 0.5% for mild, moderate and severe risk, respectively.

Conclusion: An alarmingly high prevalence of coronary heart disease (CHD) risk factors was prevailed among medical students, especially among males. However, a low prevalence of smoking may indicate the success of "Smoke-free Campus" program. Screening risk factors of coronary heart disease (CHD) among medical students and implementation of intervention programs are recommended. Programs to raise awareness about coronary heart disease (CHD) risk factors, encourage young adult students to adopt a healthy dietary behavior and promote physical exercise should be initiated.

Keywords: risk factors, coronary heart diseases, young adults, framingham risk score.

INTRODUCTION

Non-communicable diseases (NCDs) are on continuous rise worldwide ⁽¹⁾. Furthermore, developing countries is experiencing a double burden of diseases; both communicable diseases (CDs) and non-communicable diseases (NCDs) ⁽²⁾. It is estimated that in the developing countries non-communicable diseases (NCDs) will account for seven of each ten deaths by the year 2020. Among non-communicable diseases (NCDs), cardiovascular diseases (CVDs) are the leading cause of morbidity, disability and mortality worldwide ⁽¹⁾. The global rise in cardiovascular diseases (CVDs) is driven by both urbanization and its related lifestyle modifications ⁽³⁾. The Kingdom of Saudi Arabia

(KSA) is experiencing an alarming rising in incidence and death rates from cardiovascular diseases (CVDs) ⁽³⁻⁵⁾. A study done in the Eastern region of KSA revealed that 26% of total deaths were attributed to cardiovascular diseases (CVDs) (27% of deaths of males and 23.5% of females) ⁽⁵⁾. It is expected that the burden of cardiovascular diseases (CVDs) will continue to grow in KSA due to continuous exposure to risk factors. This increase is also considering the young population; as about 60% of the Saudi populations was less than 30 years ⁽⁴⁾. Coronary heart disease (CHD) is the commonest cause of death from cardiovascular diseases (CVDs). In addition, it is one of the leading causes of disease burden ⁽⁵⁾. Identification of risk factors contributing

to the incidence of coronary heart disease (CHD) is one of the major achievements of epidemiology in the 20th century⁽⁶⁾. Smoking, hypertension, diabetes mellitus, high dietary fat intake, and lack of physical exercise have been documented as independent risk factors for the development of coronary heart disease (CHD)⁽⁷⁾. Risk factor profiles in young adulthood (18–24 years) strongly predict long-term coronary heart disease (CHD) risk⁽⁸⁾. Understanding the magnitude and types of coronary heart disease (CHD) risk factors among young adults is an important aspect in establishing targeted intervention, before disease progression occurs, through promoting lifestyle changes^(7,8). Despite these evidences, risk assessment and disease prevention efforts are lacking in this age group. Most of young adults are not screened and are not aware of their coronary heart disease (CHD) risk. This leads to underestimation of the risk in spite of its high prevalence⁽⁸⁾. Hence, the prevalence of coronary heart disease (CHD) risk factors among young adults needs to be urgently addressed. Risk prediction algorithms have been used to detect persons at high risk for developing cardiovascular diseases (CVD) and to pick individuals who need intensive preventive interventions. Framingham-based equations have been the most extensively used equations for clinical practice guidelines⁽⁹⁾. Despite these facts, limited number of studies has been conducted on estimating the prevalence of coronary heart disease (CHD) risk factors among young adults in Saudi Arabia⁽⁷⁾. There is also lack of studies using the Framingham algorithm for coronary heart disease (CHD) risk assessment. Furthermore, the American Heart Association⁽¹⁰⁾ recommended that screenings should include assessment of all coronary heart disease (CHD) risk factors including lifestyle habits (diet, exercise, and smoking), blood pressure, glucose, and body mass index (BMI) in addition to the traditional lipid panel. However, most of the conducted studies in the Saudi Arabia lack of some of the recommended items⁽⁷⁾. In addition, scanty studies conducted for coronary heart disease (CHD) risk assessment among medical students in Riyadh. So, such studies are urgently needed. The objective of the current study was to estimate the prevalence of risk factors of Coronary Heart Diseases among medical students, during their clinical clerkship years, at Almaarefa Colleges.

METHODS

Ethical statement: the study was approved by the Institutional Review Board (IRB) of the Almaarefa Colleges. The whole study was conformed to the ethical standards of the Helsinki Declaration". A written consent was taken from each participant upon his/her acceptance to participate in the study. In addition, all administrative approvals were taken. A cross-sectional study was done during the Fifth Year Survey Elective Module of the Family and Community Medicine in the educational year 2016/2017. The study population was the medical students enrolled in their clinical clerkship years (4th - 6th) in Almaarefa Colleges. A multistage stratified random sample method was used. A sample frame was constructed and contained information on the stratification variables according to gender and grade of medical students target population. The first stratification phase was done according to gender. Then the second stratification phase was done according to their grades. The male and female leaders of each of the three grades invited and encouraged students to participate in the study. Among the selected subjects, the response rate was about 60%, with a higher response rate among females compared to males. The cause of this low response rate may be because the study included taking of a fasting blood sample from participants. The sample size was calculated using the following formula⁽¹¹⁾:

$$n = \frac{z^2 \times p \times q}{2^d}$$

n: the minimum sample size, z = constant (1.96), p is the prevalence of cardiovascular disease (CVDs) risk factors, q = (1-p), Z is the standard normal deviation of 1.96 which correspond to the 95% confidence interval and d is the desired degree of accuracy. As the exact prevalence of cardiovascular disease (CVDs) risk factors among young adults in Riyadh is unknown, so, the prevalence (p) = (q) was considered 50% (the most conservative assumption) and d was set at 0.05 to tolerate a 5% error. The calculated sample size was 196 students and it was increased during the fieldwork to reach 214 for stratification purpose. Each student accepted to participate in the study and signed the written informed consent was requested to come to the General Clinic of Almaarefa Colleges, fasting for at least 12 hours, on the next day.

Data was collected through data collection sheet included

I. Questionnaire: An anonymous, confidential and self-administered questionnaire was used to collect:

➤ Personal and socio-demographic characteristics (gender, educational year, family income and parents' education and job).

➤ History of use of drug for treatment of a chronic condition.

➤ Risk factors of coronary heart disease (CHD) as nutritional factors (frequency of eating foods rich in saturated fat or fast foods, frequency of eating vegetables and fruits/week), smoking habits, physical activity (regular practice of physical exercise, number of times/week and the duration of practice), time spending in TV watching or using computer.

II. Measurements: After completing the questionnaire, measurement was taken as described by *D'Agostino et al.* ⁽¹²⁾ and included:

➤ Weight and height: both were obtained from a lightly clothed student.

➤ Blood pressure (BP) measurement: It was done while the student in the sitting position after 4minute of rest. Systolic and diastolic blood pressure was identified at the beginning of the first and the fifth phase of the Korotkoff sounds using a mercury sphygmomanometer applying the appropriate cuff on the right arm ⁽¹²⁾.

III. Laboratory investigations: Blood sample was obtained from each participant from the antecubital vein after 12 hours of fasting. It was taken from the antecubital vein while the student in the sitting position. The biochemical evaluation was performed in the laboratory of King Saud Medical City and following the criteria of the World Health Organization Lipid Reference Laboratories. Upon arrival, the samples were centrifuged to obtain the plasma Levels of total cholesterol (TC), glucose and triglycerides (TG). They were measured by a chromate metric enzymatic method ⁽¹²⁾.

Statistical analysis

Data was coded and analyzed using statistical package for social science (SPSS) version 21 (SPSS Inc, Chicago, Ill., USA). The following statistical calculations were done to classify:

➤ Body Mass Index (BMI): it was calculated by dividing weight in kilograms by the square of height in meters. Body mass index (BMI) was then divided

into normal (< 25), overweight (25 - <30), and obese (≥ 30) ⁽¹³⁾.

➤ Hypertension: classification was based on the recommendations of "The Seventh Report of the Joint National Committee on Prevention, Detection, Evaluation and Treatment of high blood pressure (JNC-7). It was defined as systolic blood pressure (SBP) ≥ 140 mmHg and/or diastolic blood pressure (DBP) ≥ 90 or concurrent use of antihypertensive agents" ⁽¹⁴⁾.

➤ Fasting plasma glucose was classified according to the WHO classification into:

1. Normal fasting blood sugar: level plasma glucose is < 110mg/dl.

2. Impaired fasting glucose (IFG) and hyperglycemia:

Fasting blood glucose is ≥ 110 mg/dl or history of treatment from diabetes ⁽¹⁴⁾.

➤ Dyslipidemias were defined according to the USA national cholesterol education program (NCEP) criteria high in low density lipoprotein (LDL) cholesterol as 130 mg%, hypertyriglyceridemia as 150 mg/dl and low in high density lipoprotein (HDL) cholesterol as < 40 mg/dl in males and < 50 mg/dl in females. High total cholesterol: HDL ratio was defined as > 4.5 ^(15,16).

The coronary heart disease (CHD) full risk percent in thirty years was calculate using the Framingham algorithm based on BMI. The calculation of coronary heart disease (CHD) was not done according to lipid profile, as there were some missed cases in the triglycerides analysis. Coronary heart disease (CHD) risk assessment data of each student (sex, age, systolic blood pressure, use of antihypertensive treatment, smoking, diabetes mellitus, body mass index) was entered separately, case by case, on the web site excel sheet using the calculator of the Framingham algorithm, which developed according to Pencina and D' Agostino ⁽⁶⁾. Then the estimated risks of each subject entered into the statistical package for social science (SPSS) data file. Coronary heart disease (CHD) risk of all subjects was calculated by statistical package for social science (SPSS). Stratified analysis was used to compare between risk among males and females. The 30-year risk model offered excellent discrimination (cross validated C statistic 0.803; 95% CI, 0.786 to 0.820; internally validated C statistic 0.802; 95% CI, 0.772 to 0.832) and calibration ⁽⁹⁾. The Framingham Risk Score has been

validated in the USA, both in men and women, both in European Americans and African American. While several studies have claimed to improve the score, there is little evidence for any improved prediction beyond Framingham risk score. Based on this Score, subjects were stratified in 5 risk classes (< 5% low-risk; 5- < 10% mild risk; 10- < 20% moderate-risk; 20- < 40% high-risk; > =40% very high-risk)" (6).

Descriptive and analytical statistics were conducted. Chi-square test was used for comparison between two categorical variables. Student's test was performed to compare between two independent means. A "p < 0.05" was considered statistically significant.

RESULTS

The study population was composed of 214 medical students whose age ranged from 20-28 years with a mean of 20.09 ± 1.0 . Table 1 shows personal and socio-demographic characteristics of medical students enrolled in the study. Females represented about three quarters (75.2%) of the sample. Regarding the educational year, 35.5%, 39.3% and 25.2% of students were enrolled in the fourth, fifth and sixth year, respectively. Concerning family income, 83.5% earn more than 10,000 Saudi Riyals. About two-thirds (69.6%) of students' fathers and 60.7% of mothers have a university degree and above. Concerning past history of diseases, 8.9%, 8.4% and 0.5% of medical students reported having hypercholesterolemia, hypertension, and diabetes, respectively. The prevalence of habitual risk factors is illustrated in Table 2. It is apparent from the table that 57.9% of medical students do not practice physical exercise.

Daily eating of food rich in fat and fast food is prevalent among 73.4% and 13.1% of students, respectively. On the other hand, about three-quarters (76.6%) and two-fifths (38.3%) of students eat fruits and vegetables weekly. Furthermore, more than half (53.2%) of the students use computers more than 14 hours per week while 10.7% watched TV for the same duration weekly.

Only a small percentage of students (2.8%) reported being current smokers. Table 3 demonstrates prevalence of coronary heart disease (CHD) risk factors among medical students according to measurements and laboratory results. About one-third of students (31.8%) weighed above

the normal; 19.1% are overweight and 12.7% are obese. Hypercholesterolemia was detected among 17.2% and a similar percentage of students (16.0%) had a high level of low density lipoprotein (LDL). The prevalence of hypertension according to JNC-7 classification was 9.3%; 3.7% and 7.9% of students had high systolic and diastolic blood pressure, respectively.

About 97.9% of students had normal fasting blood glucose level, while 2.1% had high fasting blood glucose level (Impaired fasting glucose and hyperglycemia). Figure 1 demonstrates that males have higher rates of overweight and obesity compared to females. It is apparent from the figure that only about one-half (52.8%) of males had normal weight, while 28.3% and 18.9% were overweight and obese, respectively. The corresponding rates for females were 16.2% and 10.6%, respectively.

A statistical significant difference was present ($X^2 = 7.54, p < 0.01$). Analysis of our results shows that the prevalence of hypertension was much higher among males (20.8%) compared to females (5.8%). A highly statistical significant difference was present ($X^2 = 10.82, p < 0.01$). Table 4 shows that that male students had higher mean levels of most of measurements compared to females. The calculated mean of BMI for males (26.27 ± 6.10) was higher than that of the females (23.30 ± 4.631). A highly statistical significant difference was found (Students test = 3.72, $p < 0.001$). The mean of systolic blood pressure (SBP), diastolic blood pressure (DBP), triglyceride (TGs), total: high density lipoprotein (HDL) cholesterol were also higher among males compared to females.

Highly statistical significant differences were present. On the other hand, the mean of protective high density lipoprotein (HDL) in mmol/l was higher for females (1.60 ± 0.40) compared to males (1.23 ± 0.29). The results also showed that 18.5% of males and 14.0% of females had low HDL below the cutoff values for both genders. Using Framingham algorithm revealed that coronary heart disease (CHD) risk stratified lifetime full risk percent in thirty years based on body mass index (BMI) among total students was 10.7%, 2.3% and 0.5% for mild, moderate and severe risk, respectively. It is much higher among males compared to females (moderate and severe risk among males was 9.4% and 1.9%, respectively) (Table 5).

“Personal and socio-demographic” data of the sample medical students:

Variable	No.	Percent
Gender		
Male	53	24.8
Female	161	75.2
The student’s grade		
Fourth year	76	35.5
Fifth year	84	39.3
Sixth year	54	25.2
Father’s education		
University and above	149	69.6
Less than university	65	30.4
Mother’s education		
University and above	130	60.7
Less than university	84	39.3
Father’s occupation		
Professional	151	71.2
Non-professional	61	28.7
Mother occupation		
Professional	84	39.3
Non-professional and housewife	130	60.8
Family income*		
Less than 5000	7	3.3
5000-10000	28	13.2
More than 10,000	177	83.5

*2 students refused to answer about their family income.

Table 2: Coronary Heat Diseases risk factors” among medical students according to their habits

Variable	No.	Percent
Frequency of fruits intake		
Never	12	5.6
Daily	38	17.8
Weekly	164	76.6
Frequency of vegetables intake		
Never	5	2.3
Daily	127	59.3
Weekly	82	38.3
Frequency of intake of foods rich in fats		
Never	6	2.8
Daily	157	73.4
Weekly	51	23.8
Frequency of fast foods intake		
Never	12	5.6
Daily	28	13.1
Weekly	174	81.3
Frequency of soft drinks intake		
Never	62	29
Daily	45	21
Weekly	107	50
Smoking		
Yes, current	6	2.8
Former smoker	5	2.3
Never	203	94.9
Practice exercise		
Yes	90	42.1
No	124	57.9
Hours spent watching TV weekly		
Do not watch	77	36
Less than 14 hours	114	53.3
More than 14 hours	23	10.7
Hours spent on computer weekly		
Do not use it	7	3.3
Less than 14 hours	93	43.5
More than 14 hours	114	53.2

Table 3 Coronary heart diseases risk factors among medical students according to measurements and laboratory investigations:

Percent	Number	Variable
BMI		
68.2	146	Normal
19.1	41	Overweight
12.7	27	Obese
Systolic blood pressure		
96.3	206	Normal
3.7	8	High
Diastolic blood pressure		
92.1	197	Normal
7.9	17	High
Systolic and/or Diastolic hypertension		
90.7	194	Normal
9.3	20	Hypertension
Fasting blood sugar*		
97.9	184	Normal fasting level
2.1	4	High fasting level
Cholesterol		
82.8	177	Normal
17.2	37	High
Low density lipoprotein		
84.0	180	Normal
16.0	34	High
Triglyceride**		
91.1	175	Normal
8.9	17	High for age

*26 missed cases for fasting blood sugar.

**22 missed cases for triglycerides.

Table 4 Comparison of means of anthropometric and laboratory parameters among male and female medical students

Variables	Male (Mean \pm SD)	Female (Mean \pm SD)	Student's t- test	p
Weight (kg)	79.59 \pm 21.02	58.43 \pm 12.86	8.75	0.001
Height (m)	1.74 \pm .068	1.57 \pm 0.13	8.39	0.001
Body mass index	26.27 \pm 6.10	23.30 \pm 4.631	3.72	0.00
Waist circumference (cm)	92.18 \pm 15.65	72.99 \pm 9.06	10.99	0.001
SBP (mm Hg)	119.47 \pm 11.17	112.26 \pm 9.06	4.74	0.001
DBP (mm Hg)	78.55 \pm 8.47	73.54 \pm 9.33	3.47	0.001
Total cholesterol (mmol/l)	4.33 \pm 0.80	4.53 \pm 0.79	1.44	0.152
Triglyceride (mmol/l)	0.84 \pm 0.32	0.67 \pm 0.29	3.35	0.001
LDL (mmol/l)	4.97 \pm 0.68	4.96 \pm 0.89	1.11	0.155
HDL (mmol/l)	1.23 \pm 0.29	1.60 \pm 0.40	4.42	0.001
Total HDL	3.71 \pm 0.90	2.98 \pm 0.74	4.52	0.001

Table 5 Framingham stratified lifetime risk Score percent of Coronary Heart Diseases in thirty years among medical students in Almaarefa Colleges:

Risk class	Males	Females	Total
< 5% (Low risk)	58.5%	95.7%	86.4%
5%- 9.9% (Mild-risk)	30.2%	4.3%	10.7%
10- 19.9 (Moderate- risk)	9.4%	0.0%	2.3%
20-39.9 (High-risk)	1.9%	0.0%	0.5%

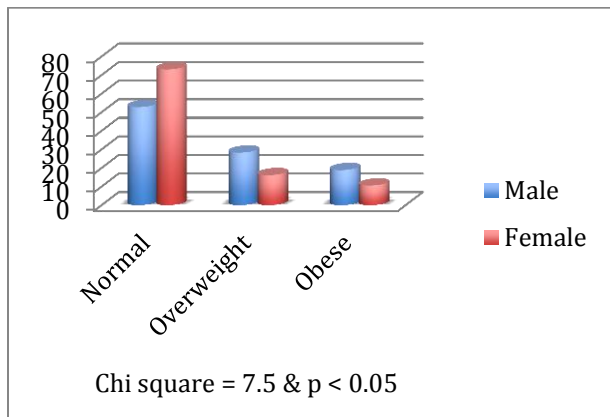


Figure 1 Relationship between gender and Body Mass Index among clinical years medical student in Almaarefa Colleges.

DISCUSSION

As to our best knowledge the current study is the first study looks at coronary heart disease (CHD) risk factors among young adult population in Riyadh using the Framingham algorithm to calculate the 30- years predicted risk of coronary heart disease (CHD). It may be also the first study used the recommendation of the American Heart Association’s 2013 for coronary heart disease (CHD) risk assessment. All coronary heart disease (CHD) risk factors including lifestyle habits (diet, exercise, and smoking), blood pressure (BP), glucose, and body mass index (BMI) in addition to the traditional lipid panel were assessed. Students were screened and told about their measurement and investigations and given the appropriate recommendations. About 90% of individuals with coronary heart disease (CHD) have at least one risk

factor as smoking, diabetes, hypertension and/or hypercholesterolemia ⁽¹⁷⁾. Furthermore, the US National Health and Nutrition Examination Surveys (NHANES) data among young adults aged 20-45 years (1999-2006) revealed that two-thirds have at least one cardiovascular disease (CVD) risk factor ⁽¹⁰⁾. Nowadays, overweight and obesity are recognized as a rising pandemic ⁽¹⁸⁾.

The current study revealed that about one-third (31.8%) of all medical students were either overweight (19.1%) or obese (12.7%). These findings concur with results of *Burke et al.* ⁽¹⁹⁾ from USA who reported a similar rate of overweight/obesity (33%) among college students in University of New Hampshire’s in 2009.

In the present study, the prevalence of overweight or obesity was 26.8% among females. A similar prevalence (29.1%) was reported before 2012, among females from 4 colleges of Dammam University, KSA ⁽²⁰⁾. Our work revealed a higher prevalence of overweight and obesity among male (47.2%) compared to females (26.8%). Similarly, a study conducted at the School of Medicine, Crete University; as their corresponding rates were 40% and 23%, for males and females, respectively ⁽¹⁸⁾. *Burke et al.* ⁽¹⁹⁾ reported also that males had a higher body mass index (BMI) compared to females. Furthermore, the rate of overweight and obesity among males in the present work coincides with results of other Saudi studies. *Sabra et al.* ⁽⁷⁾ reported a very similar rate (47.1%) among male medical students in King Fahd University in Dammam city, KSA. Comparable rates were also reported from two other Saudi studies one done among male medical students in Qaseem University (46.5%) ⁽²¹⁾ and the other study was done among male and female medical students in Tibia University (44.8%) ⁽²²⁾.

Higher rates of overweight (31%) and obesity (23.3%) were reported among male students at King Saud University, Riyadh, KSA ⁽²³⁾. These alarming high rates of overweight and obesity among Saudi young adults, especially males, may require rapid targeted university intervention. On the other hand, the rates of the present study are much higher than that reported among male medical students from USA, 1999, as only one-fifth of the participants were either overweight or obese ⁽²⁴⁾. The cause of discrepancy between the current study and the USA study may be attributed to the outcome of

the USA health promotion programs or due to the older time of conduction of the USA study. Our study showed that nutritional risk factor of coronary heart disease (CHD) was apparent.

This is apparent from high students' daily intake of fat- rich foods (73.4%) and fast-foods (13.1%). Meanwhile, there was low intake of healthy diet a svege tables and fruits. *Sabra et al.*⁽⁷⁾ found also that 20.1% of medical male students were consuming fast foods in a frequency of 6– 10 times/week. Similarly, *Larson et al.*⁽²⁵⁾ 2008, found that 24% of male and 21% of female adolescents in Minnesota reported frequent intake of fast food (≥ 3 times/week) and these rates increased during the young adulthood. In their other newer study, 2011, they reported also that frequent away from home fast food eating is associated with higher daily energy intake, poorer diet quality, and greater weight gain⁽²⁶⁾. Regular practicing of physical activity provides significant benefits in reducing morbidity and mortality from coronary heart disease (CHD)⁽⁷⁾. However, our results showed that the prevalence of non-practicing physical exercise was high (57.9%). Sedentary behaviors as playing computer games and watching TV are reported to be associated with increased prevalence of obesity and hence risk of coronary heart disease (CHD)^(7,27). From our results, it was found that 10.7% and 53.2% of medical students spending ≥ 14 hours/week in watching TV and in computer usage, respectively. These results agree with results of *Sabra et al.*⁽⁷⁾.

The present work reported that the rate of current smoking is low (2.8%) compared to other similar studies. *Sabra et al.*⁽⁷⁾ reported much higher rate; about 19% of male medical students were smokers. The discrepancy between the current and the Dammam study may be because the current study was conducted between both male and female, with a small male sample, while the other study was conducted only among male with a higher prevalence of smoking. It may be also attributed to the success of Smoke-free Campus program implemented in Almaarefa Colleges. Regarding hypertension, it was found that about one tenth (9.3%) of medical students in the present study were diagnosed as having hypertension; 3.7% as systolic and 7.9% as diastolic hypertension. This finding should be viewed with much concern because of the tendency of high BP to track into adult life, and because of the possibility of secondary hypertension in this age group. The study *Sabra et al.*⁽⁷⁾ reported

higher corresponding rates of systolic and diastolic hypertension (13.8% and 3.7%, respectively).

This difference may be because their study was done only among males. The current study revealed that the prevalence of hypertension was much higher among males (20.8%) compared to females (5.6%). This agrees with results from the Grete study⁽¹⁸⁾. An older study, 1998, conducted among black and Indian medical students of University of Natal, South Africa, reported lower rates between both sexes (2.5% and 4.2%, respectively)⁽²⁸⁾.

The cause of the discrepancy between the current study and South African study may be attributed to the time of conduction of their study or due to difference between the two study populations. In the current study it was found that 2.1% had high fasting blood sugar level. This coincides with results of Greece study; 1.9% of male students and 0.6% of female students had high fasting glucose level⁽¹⁸⁾. Our study showed that male participants had higher levels of triglycerides while females had higher prevalence of the protective HDL (18.5% of males and 14.0% of females had low high density lipoprotein (HDL) below the cutoff values for both genders). These results are similar to results of *Burke et al.*⁽¹⁹⁾ and also with other findings from an Indian study conducted among the population aged 20-29years⁽²⁹⁾. Using Framingham algorithm of BMI full risk score revealed that coronary heart disease (CHD) risk percent in thirty years among all students was 10.7%, 2.3% and 0.5% for mild, moderate and severe risk, respectively. This result is in line with another study conducted in the USA and found that the Framingham Risk Score was below 10% for all the Chicago Heart Association Detection Project in Industry predicted risk among the 18 to 29 years old cohort⁽¹⁷⁾. Finally, eighty percent of heart disease can be prevented through diet and lifestyle modifications. Young adults are ideal targets for prevention efforts because they are in the process of establishing lifestyle habits, which track forward into adulthood⁽⁸⁾. Early detection of these risk factors among Saudi young adults will be very beneficial in prevention of coronary heart disease (CHD) after that.

LIMITATIONS OF THE STUDY

The number of females was higher than the number of males as the acceptance rate among

females was higher than males. Some of the finding like smoking, body mass index (BMI) and blood tests may be affected. There is a limitation of applying Framingham risk score for non-central population, young population and whether the risk score was previously standardized to be used for Saudi population. On the other hand, although several studies have claimed to improve on the Framingham risk score, there is little evidence for any improved prediction beyond this score.

CONCLUSION

An alarmingly high prevalence of different coronary heart disease (CHD) risk factors revealed among medical students in Almaarefa Colleges in the current study. Males had a worse risk factor profile compared to females. Among the study population, the commonest risk factors of coronary heart disease (CHDs) were daily intake of high fat diet, physical inactivity, overweight/or obesity and daily consumption of fast food. Hypercholesterolemia and hypertension were also prevalent risk factors. Using Framingham Risk Score revealed that coronary heart disease (CHD) risk percent in thirty years among all students was mild, moderate and severe risk, respectively. It is much higher among males compared to females. Educational programs to raise health awareness of medical students about coronary heart disease (CHD) risk factors and to encourage them to adopt a healthy dietary behavior, promote physical exercise and smoking cessation should be initiated. Promotion of healthy active lifestyle and prevention of obesity should be a health priority. Implement medical school interventions including through regulatory and legislative actions, for the coronary heart disease (CHD) related risk factors as tobacco use, unhealthy diet, lack of physical activity is also required.

COMPETING INTERESTS

There are no financial or non-finical competing interests.

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