Students' Corner
Original Article

Dietary modification, Body Mass Index (BMI), Blood Pressure (BP) and cardiovascular risk in medical students of a government medical college of Karachi

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Abstract

Objective: To determine the prevalence of major risk factors including dietary modification, Body Mass Index (BMI), Blood Pressure (BP) and physical activity in medical students of government teaching hospitals of Karachi.

Methods: A cross sectional study was conducted on students of Dow Medical College, Karachi, Pakistan through a structured pre-tested questionnaire. Non-probability purposive sampling was used. Smoking, hypertension, family history of cardiovascular disease (CVD), overweight and low physical activity levels are risk factors the presence of which can lead to development of CVD. Prevalence of these risk factors was determined by asking appropriate questions and through measurement of BMI and blood pressure for overweight and hypertension respectively. Awareness of risk factors was determined through knowledge of the effect of various food substances on development of CVD and of adoption of dietary changes keeping in mind the risk of developing CVD. SPSS 16.0 was used for statistical analysis.

Results: A total of 132 medical students were included in the study of which 57 (43.2%) and 75 (56.8%) were male and female respectively with mean age of 20.85 ± 1.21 years. About 15.9% of students had elevated blood pressure i.e. ≥ 140/90 mmHg. Twenty eight percent of the total students were found to be underweight and 17.4% were overweight, 5% had some history of CVD, 56.8% had family history of CVD, 9.4% were smokers and 29.5% had high physical activity level. About 87.1% had modified their diet for preventing CVD. Most of the students had adequate knowledge about the cardiovascular risk factors

Conclusion: Majority of students were not overweight. A high prevalence of cardiovascular risk factors; family history and elevated blood pressure was present. Awareness in terms of knowledge was satisfactory but implementation in terms of diet modification and adequate physical activity was lacking (JPMA 60:970; 2010).

Introduction

Cardiovascular diseases (CVD) are a leading cause of death worldwide.[1] A significant fraction of deaths and disability from cardiovascular diseases (CVD) occur in low- and middle-income countries.[2] Countries such as India, Pakistan, Bangladesh, Sri Lanka, and Nepal comprising 20 per cent of the world's population have a very high prevalence of CVD.[2]

The high burden of CVD in developing countries is attributable to urbanization and higher risk factor levels (such as obesity, diabetes, dyslipidaemia, hypertension, etc).[3] The relatively early age at which these risk factors manifest, large population size, and the high proportion of young adults in these countries results in increased, morbidity and mortality of CVD.[3]

The risk factors for cardiovascular disease can be categorized into independent or non-modifiable risk factors and dependent or modifiable risk factors. Independent risk factors include age, male gender and family history. Dependent factors of the 1st grade include smoking, hypertension, lipid disorders, and diabetes, while dependent factors of the 2nd grade include overweight, improper dietary habits and stress.[4]

Pakistan, like other South Asian countries has a higher prevalence of CVD risk factors as compared to other parts of the world.[5]

Smoking, hypertension, diabetes, abdominal obesity, psychosocial factors, consumption of fruits, vegetables, alcohol, and regular physical activity are major factors that determine the risk of CVD.[6] Consumption of fruits and vegetables, alcohol consumption in small amount and physical activity are major cardio-protective factors.[4,6]

It has been observed that one of the most effective methods of combating the epidemic rise in cardiovascular diseases is to increase awareness about the risk factors and

the adoption of healthy lifestyle modifications for disease prevention. Healthcare professionals play a vital role in creating awareness. Medical students of today will be the healthcare providers of tomorrow. Their perceptions regarding prevention of diseases will strongly motivate the future clinical practice.[7] It is well known that dietary modification along with control of weight and blood pressure among other factors are important determinants of cardiovascular risk. It is therefore, important to determine the prevalence of these factors and lifestyle practices of medical students.

This study was conducted to determine the risk factors in medical students of the Dow Medical College, Karachi.

Subjects and Methods

A cross-sectional study was conducted from August to December 2008 at Dow Medical College Karachi. The target population for the survey was all medical students enrolled in the MBBS programme at the Dow Medical College. Non-probability purposive sampling was used. Written consent was taken from all participants. The data was collected through a structured self-administered questionnaire designed by the investigators based on a review of similar studies. The study was approved by the Ethical Review Board of Dow University of Health Sciences.

The questionnaire included sociodemographic data, family history of CVD, diet modifications, smoking habits, alcohol consumption, and knowledge regarding body mass index (BMI), obesity and hypertension. Diet modification was defined as change in food consumption on the basis of the role of that particular food in the development of cardiovascular disease. The options that were given in the questionnaire to select from included: additional intake of food product that was not previously included in the diet or increase in consumption of food product already being consumed due to its beneficial role in prevention of CVD, decrease in consumption or complete stoppage of consumption of food products already being consumed and no change in consumption. The different food products that were inquired about are given in Table-1.

Physical activity level was assessed through the standardized WHO Global Physical Activity Questionnaire version 2. This questionnaire has been developed by WHO for physical activity surveillance in countries. It collects information on physical activity participation in three settings (or domains) as well as sedentary behaviour and intensity of physical activity is expressed according to Metabolic Equivalents (METs).[8]

Intensities of physical activities are commonly expressed in terms of Metabolic Equivalents (METs). MET is the ratio of a person's working metabolic rate relative to the resting metabolic rate. The energy cost of sitting quietly has been assigned one MET, and is equivalent to a caloric consumption of 1 kcal/kg/hour. Existing guidelines recommended by WHO have been adopted for the analysis of GPAQ data. According to the guidelines: compared to sitting quietly, a person's caloric consumption is four times as high when being moderately active, and eight times as high when being vigorously active.[8]

Standardized equipment was used to measure height, weight and blood pressure. Height was measured to the nearest 0.1 cm using a stadiometer 'Microtoise' (CMS Weighing Equipment Ltd, London). Body weight was measured to the nearest 0.5 kg using a TANITA weighing scale (model 1535; TANITA, Arlington Heights, Illinois, USA). Blood pressure was measured through auscultatory technique by trained observers using Medicare Products Inc. mercurial sphygmomanometers (Medicare Products Inc., New Delhi, India).

Smoking was described as one cigarette per day. For the assessment of weight status BMI was used. Since the study population comprised of Pakistani students BMI ranges specific for South Asian population were used.[9] Statistical Package for the Social Sciences (SPSS) version 16.0 was used for data entry and statistical analysis.

Results

For this study, data was collected from 132 students out of which 57 (43.2%) and 75 (56.8%) were male and female respectively. The mean age of participants was 20.85 ± 1.21 years and mean height was 1.67 ± 0.09 m. The mean weight was 57.3 ± 11.2 kg. Majority of the participants (75.4%) were those whose families had migrated from India to Pakistan after partition in 1947.

Body mass index (BMI) was calculated using the measured height and weight. The mean BMI was 20.47 ± 3.02 kg/m^2. Overall 37 (28%) students were underweight and 23 (17.4%) were overweight.

Family history of CVD was present in 75 (56.8%) students and 46.5% of them had a father or mother suffering from CVD.

Blood pressure of the students was also measured. Majority (72.7%) had blood pressure within the normal range (i.e. systolic BP <120 mmHg and diastolic BP <80 mmHg). Elevated blood pressure was found in 27.3% of students. Among them 11.4% had blood pressure in the pre-hypertensive range (taken as systolic BP between 120 and 139 mmHg or diastolic pressure between 80 and 89 mmHg) and 15.9% had blood pressure in the hypertensive range (defined as systolic pressure ≥ 140 mmHg or diastolic BP

Table-1: Dietary modifications in medical students.

Food group	Consumption	Responses
Hydrogenated fat (banaspati ghee) and margarine	Increased or additional intake	4.5%
	Decreased or stopped intake	65.2%
	No change	30.3%
Milk fat (desi ghee)	Increased or additional intake	3.3%
	Decreased or stopped intake	66.7%
	No change	30.0%
Oil (olive canola, corn)	Increased or additional intake	46.9%
	Decreased or stopped intake	14.8%
	No change	38.3%
Oils (sunflower, Soya bean)	Increased or additional intake	22.4%
	Decreased or stopped intake	35.5%
	No change	42.1%
Palm oil (thick oil)	Increased or additional intake	5.8%
	Decreased or stopped intake	47.8%
	No change	46.4%
Butter	Increased or additional intake	7.6%
	Decreased or stopped intake	58.2%
	No change	34.2%
Tallow (animal fat)	Increased or additional intake	4.7%
	Decreased or stopped intake	66.7%
	No change	28.6%
Home cooked beef and mutton	Increased or additional intake	18.7%
	Decreased or stopped intake	44.0%
	No change	37.3%
Beef and mutton dishes from hotels/restaurants etc.	Increased or additional intake	9.1%
	Decreased or stopped intake	57.1%
	No change	33.8%
Salt	Increased or additional intake	13.9%
	Decreased or stopped intake	50.7%
	No change	35.4%
Chicken	Increased or additional intake	53.9%
	Decreased or stopped intake	10.5%
	No change	35.6%
Fish and fish oils	Increased or additional intake	50.0%
	Decreased or stopped intake	17.5%
	No change	32.5%
Fruits and vegetables	Increased or additional intake	61.6%
	Decreased or stopped intake	9.3%
	No change	29.1%

≥ 90 mmHg). Blood pressure readings of students are given in Table-2.

Cigarette smoking which is a major risk factor for cardiovascular diseases was prevalent in 9.4% of students. Out of these 33% were regular smokers while 66% reported that they smoked occasionally. Apart from these 21.3% students frequently used to remain in the company of smokers. Alcohol consumption was very low being reported by only 1.8% students.

Physical activity level was calculated using standardized analysis techniques as per WHO recommendations using Metabolic Equivalent (MET) to express physical activity levels. It was found that 29.5% students were highly active, 32.7% were moderately active

Table-2: Blood pressure readings of medical students.

Blood Pressure	No. of students (%)
<120/80 mmHg	96 (72.7%)
120/80 - 139/89 mmHg	15 (11.4%)
≥ 140/90 mmHg	21 (15.9%)

while 37.9% had low physical activity level. According to Metabolic Equivalent (MET) the median physical activity of students was 1920 MET-minutes per week.

Analysis of the respondents answers revealed that 115 (87.1%) students had changed their diet on account of the beneficial or harmful effect of different food substances in development of cardiovascular disease. The students who reported that they had reduced or completely stopped consumption of some food product due to its role in developing CVD were 52 (39.4%) and 31 (23.5%) students reported that they had increased or started additional intake of a food product due to its beneficial role in preventing CVD.

Food groups in which major dietary changes were seen included hydrogenated fat (banaspati ghee), milk fat (desi ghee), tallow (animal fat), and fruits and vegetables. Reduction or complete stoppage of consumption in hydrogenated fat (banaspati ghee) and margarine, milk fat (desi ghee), and tallow (animal fat) was seen in 65.25%, 66.7% and 66.7% students respectively. Increase in or additional consumption of fruits and vegetables was reported by 61.6% students. Table-1 shows the dietary modifications adopted by the students.

Overall 26 (20.2%) students thought they were overweight but 23 (17.4%) were actually found to be overweight according to their BMI.

According to the responses 88 (71%) students were able to calculate their own BMI. A small quiz was given to test the knowledge of students regarding interpretation of BMI. Majority of the students (56.1%) were able to correctly answer at least 5 out of the 6 questions given. Majority of the students knew the correct range for normal BMI (68.2%), underweight (78%), overweight (64.4%), obese (62.9%), and morbidly obese (70.5%).

According to answers received 75.2% said low-molecular unsaturated fats have antiatherogenic activity, 93.7% said salt results in high blood pressure, 86% said high-density lipoprotein (HDL) plasma levels protect against atherosclerosis, and 52% claimed that vitamin C decreases risk of hypertension.

Discussion

We surveyed the prevalence of risk factors of cardiovascular diseases in medical students, their awareness

regarding risk factors, prevention, and lifestyle practices they adopt. This study suggests a high prevalence of risk factors like family history and elevated blood pressure in medical students of Karachi.

In our study 17.45% students were overweight. Similar studies that calculated BMI of medical students have been conducted in Poland, United Arab Emirates (UAE) and Greece.[4,10,11] Prevalence of overweight in our study was greater than the Polish study but less than the studies conducted in UAE and Greece. Self-reported prevalence of overweight in US medical students was much higher than that found in our study.[12] Dodani et al report a 52.2% prevalence of overweight and obesity in middle class urban population of Karachi.[13] We found a much lower prevalence of overweight in our study. A study conducted in US also found that medical students both male and female were less likely to be overweight.[14] This could be attributed to the young age of students.

Although our study was on a small scale we found interesting results for blood pressure measurement in medical students. Majority of the students were normotensive. Fraction of population having blood pressure in the hypertensive range was low. Since hypertension is defined as sustained blood pressure of $\geq$ 140/90 mmHg these students could not be diagnosed hypertensive as only one reading of blood pressure was obtained. The range of definitions complicates comparison with other studies on medical students and young adults. Grouping the students in two categories: those with normal and those with elevated blood pressure; we found that prevalence of elevated blood pressure was also high.

Diet modification plays a vital role in prevention of cardiovascular disease. Compared to a study conducted on people not having a background of medical education[15] medical students in general adopted healthy dietary practices. The breakdown of changes in consumption of specific food groups given in Table-1 reveals interesting facts. In general positive changes were taken by the students in that they either completely stopped or reduced consumption of food product/s due to its role in developing CVD or they increased consumption or started additional intake of food product/s due to its beneficial role in preventing CVD.

Fruits and vegetables play an important role in improving general health. Fruit and vegetable consumption is inversely related to total and low density lipoprotein cholesterol and with risk of cardiovascular disease.[16] The consumption of fruits and vegetables by medical students in our study, although high, was lower than that observed in Polish medical students.[17]

More optimistic is the awareness of students regarding role of nutrition in cardiovascular disease. Majority of the students were aware of the anti-atherogenic effect of polyunsaturated fatty acids and the antihypertensive effects of high density lipoproteins and ascorbic acid. Awareness that a high level of salt in diet causes hypertension was present in 93.7% of the students. However, only 50.6% had actually decreased consumption of salt. This may highlight the fact that awareness of risk factors of CVD exists among medical students, but little effort is taken to modify their lifestyle.

Although knowledge on Body Mass Index and its interpretation was satisfactory 20% claimed to be overweight but only 17% were actually overweight when their BMI was calculated. One reason that could be responsible for the discrepancy in subjective and objective BMI is that BMI reference ranges are different for different ethnicities. We used BMI ranges specific for South Asians. The students on the other hand are not aware of the differences in these ranges and tend to calculate their BMI based on standard ranges that are used for people of western countries as their knowledge in this regard is obtained from their institute where most books are written by authors from western countries.

Alcohol consumption was very low in our study in accordance with religious trends of the society. Overall 9.4% students claimed to have smoked a cigarette at some time in their life while 21.3% frequently used to remain in the company of smokers. The incidence is lower than that in students of western countries.[4,12,14] Most of them (66%) were occasional smokers as compared to a study in Poland where most were regular smokers (68%). Two previous studies conducted on smoking in medical students report incidences of 11% and 14%[18,19] higher than that observed in our study. It was however, higher than in the study conducted in Karachi in 2004.[20]

Physical activity is a major determinant of health. Physical activity exceeding the minimum recommended amounts helps improve physical fitness, reduces the risk of chronic diseases and disability and helps prevent unhealthy weight gain.[21] We found a high proportion of students (37.9%) with low level of physical activity. Physical activity of a population is expressed in terms of median MET-minutes per week as per WHO standards. According to the World Health Survey, Pakistan, 2003 median physical activity in the urban population was found to be 2272 MET-minutes per week in people between 18 and 29 years of age.[22] In our study the median physical activity of students was 1920 MET-minutes per week. This significantly low level of physical activity can be attributed to the lifestyle of a medical student that requires long hours of sitting due to study. In a study on American medical students it was found

that their personal physical activity levels were higher than those of age-matched peers in the general population.[23] Medical students are expected to adhere better to health principles than the general population however; with regard to physical activity their practices are poor as compared to the general population. The factors responsible for this need to be studied in detail and adequate measures should be taken by the medical schools/college to increase the number of students engaging in and maintaining regular physical activity habits to increase health in general and also to decrease the risk of developing cardiovascular disease.

Physical activity of doctors and medical students is not only important from a personal point of view but it also affects their counseling of patients. It has been shown that doctors who act on the advice they give themselves provide better counseling and motivation of their patients to adopt such health advice.[24] According to a study in U.S., physical activity counseling of patients was related to physical activity practices of medical students.[23] It is therefore imperative that medical schools/colleges increase the proportion of students adopting and maintaining regular physical activity habits in order to increase the rates and quality of future physical activity counseling delivered by doctors.

This study highlights a need to promote better lifestyle practices in terms of implementation of knowledge to promote health, better dietary practices and improved physical activity in medical students. The attitude and behaviour of medical students influences their manner and approach to practice of medicine in the future.[25] Thus it is imperative that medical students should be educated regarding knowledge of risk factors of CVD, to enable them to practice and adopt a healthy lifestyle and hence become prevention-oriented and more productive physicians.

Conclusion

Majority of medical students had normal BMI, high prevalence of cardiovascular risk factors like family history and elevated blood pressure. They had substantial knowledge regarding risk factors and measures required to reduce them but little effort is made by them to modify their lifestyle as evident from lack of implementation of healthy diet modification and low physical activity level.

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