

## Original Article

### To evaluate the correlation between metabolic syndrome and risk factors of CVD among medical students

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#### ABSTRACT:

**Aim:** To evaluate the correlation between metabolic syndrome and risk factors of CVD among medical students. **Methods:** This retrospective study was carried out in the Department of Biochemistry, An anonymous self-administered questionnaire with 25 multiple choice questions composed for the purposes of this survey was answered by all 100 students were included in this study, as well as by 100 students on the day of their final graduation. **Results:** The proportion of women among 100 freshmen was 70% and among 100 graduating students it was 65%. A total of 72% freshmen knew their blood pressure (BP) but only 14% knew their total plasma cholesterol (TC). Of graduating students, 92% knew their BP ( $\chi^2_1 = 29.23$ ;  $P < 0.001$ ) and 40% their TC ( $\chi^2_1 = 41.10$ ;  $P < 0.001$ ). Only 15% of freshmen were smokers and 1% were past smokers, while 30% of graduating students were smokers and 5% were past smokers ( $\chi^2_2 = 26.52$ ;  $P < 0.001$ ). However, freshmen ranked AIDS second and CVD third and graduating students ranked CVD second and AIDS was significantly much less feared ( $P < 0.001$ , two-sided Fisher exact test). Freshmen perceived CVD as the leading cause of death and cancer and traffic accidents as the second. Graduating students significantly more often perceived CVD as the leading cause of death and significantly less often cancer and traffic accidents ( $P < 0.001$ ). Significantly more graduating students than freshmen reported either good or partial knowledge of the last Joint European Guidelines on CVD Prevention ( $\chi^2 = 81.65$ ,  $P < 0.001$ ). **Conclusion:** We concluded that medical education on CVD prevention, at least in India, must be substantially improved and should include strategies to increase not only knowledge but also perception of modifiable risk factors for CVD and strategies to reduce or eliminate them. Particular attention has to be paid to increase students' knowledge about obesity and low physical activity as important CVD risk factors, but also to the methods for increasing low HDL-cholesterol and smoking cessation.

**Keywords:** metabolic syndrome, cardiovascular disease, medical students

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#### INTRODUCTION

Metabolic syndrome (MS) has become one of the major challenges to public health worldwide due to its significant association with an increased risk of developing type 2 diabetes and cardiovascular disease among children, adolescents, and adults.<sup>1</sup> A diagnosis of MS is defined as the presence of abdominal obesity with two or more risk factors, such as high fasting triglycerides (TG), low high-density lipoprotein (HDL) cholesterol, elevated blood pressure (BP), and high fasting plasma glucose (FPG).<sup>2</sup> For example, an individual with abdominal obesity, along with elevated blood pressure and high FPG has an increased risk of cardiovascular disease (CVD) because of the combination of the risk factors than any factor presenting alone.<sup>3</sup> A prospective cohort

study including 6255 subjects indicated that those having one or two MS risk factors were at increased risk for mortality from coronary heart disease (CHD) and (CVD). The study also indicated that MS strongly predicts CHD, CVD, and total mortality as compared to its individual components.<sup>4</sup> According to the third United States National Health and Nutrition Examination Survey (NHANES III), MS is becoming increasingly common among children and adolescents particularly in obese and overweight populations.<sup>5</sup> The International Obesity Task Force (IOTF) estimated that approximately 10% of school-aged children (i.e., aged 5–17 years) worldwide—representing 155 million children—are obese and overweight.<sup>6</sup>

## MATERIAL AND METHODS

This retrospective study was carried out in the Department of Biochemistry, after taking the approval of the protocol review committee and institutional ethics committee. An anonymous self-administered questionnaire with 25 multiple choice questions composed for the purposes of this survey (web-extra material) was answered by all 100 students were included in this study, as well as by 100 students on the day of their final graduation. This second group consisted of all the students who took their final graduation exam. So, two different generations were interviewed, one at the beginning and one at the end of their medical education. The questionnaire involved numerical information (eg, "What is the recommended level for total plasma cholesterol in mmol/L in subjects without coronary heart disease?" or "What is the recommended blood pressure for subjects with high risk for cardiovascular diseases in mmHg?") or conversion of non-numerical data to a numerical format by the use of ranking scales (eg, "Rank on a scale of 1 to 10 cardiovascular risk factors listed below according to their relevance beginning with number 1 for the most relevant to number 10 for the least relevant.").

Collected data were described by frequencies and percentages. Ranking order of risk factors, obtained by the use of rating scales, was assessed by median values and for equal medians by mode values. Chi-square statistics, or two-sided Fisher exact test when appropriate, were used to assess the association of certain questionnaire items.

## RESULTS

The proportion of women among 100 freshmen was 70% and among 100 graduating students it was 65%. A total of 72% freshmen knew their blood pressure (BP) but only 14% knew their total plasma cholesterol (TC). Of graduating students, 92% knew their BP ( $\chi^2 = 29.23$ ;  $P < 0.001$ ) and 40% their TC ( $\chi^2 = 41.10$ ;  $P < 0.001$ ). Only 14% of freshmen were smokers and 1% were past smokers, while 30% of graduating students were smokers and 5% were past smokers ( $\chi^2 = 26.52$ ;  $P < 0.001$ ) (Table 1). Both groups of students perceived cancer as the most feared disease (Table 1). However, freshmen ranked AIDS

second and CVD third and graduating students ranked CVD second and AIDS was significantly much less feared ( $P < 0.001$ , two-sided Fisher exact test). Freshmen perceived CVD as the leading cause of death and cancer and traffic accidents as the second. Graduating students significantly more often perceived CVD as the leading cause of death and significantly less often cancer and traffic accidents ( $P < 0.001$ , two-sided Fisher exact test). Significantly more graduating students than freshmen reported either good or partial knowledge of the last Joint European Guidelines on CVD Prevention ( $\chi^2 = 81.65$ ,  $P < 0.001$ ). Still, 45% of graduating students did not answer correctly on the question about the Joint European Guidelines goal value for TC for clinically healthy persons. The same was true for the question on high density lipoprotein (HDL)-cholesterol, to which only half of the graduate students answered correctly ( $\chi^2 = 116.06$ ;  $P < 0.001$ ), as well as for the question on BP, where also only half of the students knew the target values for high-risk subjects ( $\chi^2 = 28.93$ ;  $P < 0.001$ ). Most of graduate students reported that they would prescribe lipid-lowering therapy to all the high-risk patients (66%), which is much more than among freshmen, only 10% of whom would prescribe such a treatment ( $\chi^2 = 217.54$ ,  $P < 0.001$ ). When asked to rank the factors that increase the CVD risk, graduating students least commonly reported excessive alcohol intake and physical inactivity but ranked obesity much lower than freshmen (Figure 1). Smoking was ranked equally by both groups. The knowledge on metabolic syndrome was significantly better among graduating students than among freshmen ( $\chi^2 = 191.01$ ;  $P < 0.001$ ). However, although the knowledge of the possibilities for raising the low HDL-cholesterol was significantly better among graduating students, than among freshmen ( $\chi^2 = 49.79$ ;  $P < 0.001$ ), still half of the graduating students reported that they would advise their patients only to decrease dietary saturated fat of animal origin to achieve this. Much more graduating students than freshmen reported that they would prescribe combined lipid-lowering therapy ( $\chi^2 = 154.52$ ;  $P < 0.001$ ). A total of 28% of graduating students believed that they had not learned enough about risk factors for CVD.

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**Table 1:**

Most feared disease	Beginning of education		End of education		
	Number	%	Number	%	
cancer	61	61	67	67	<0.001
cardiovascular diseases	14	14	21	21	
AIDS	19	19	8	8	
liver diseases	3	3	1	1	
lung diseases	2	2	1	1	
no answer	1	1	2	2	
Leading cause of death is:					
traffic accidents	17	17	4	4	
cancer	17	17	4	4	
cardiovascular diseases	65	65	91	91	

AIDS	0.0	0.0	1	1	<0.001
liver diseases	1	1	0	0	
no answer	0	0	0	0	
Smoking habits:					<0.001
smokers	14	14	30	30	
Non smokers	85	85	65	65	
past smokers	1	1	4	4	
no answer	0.0	0.0	1	1	
Knowledge of Joint European Guidelines on CVD Prevention (2):					<0.001
very good	3	3	8	8	
partial	22	22	59	59	
no knowledge at all	42	42	14	14	
just heard about it	32	32	18	18	
no answer	1	1	1	1	<0.001
Guidelines (2) goal value for total cholesterol in apparently healthy subjects					
<5 mmol/L	36	36	55	55	
<5.2 mmol/L	40	40	37	37	
<6.5 mmol/L	15	15	4	4	
<7.8 mmol/L	2	2	1	1	<0.001
no answer	7	7	3	3	
Guidelines-recommended value for high-density lipoprotein-cholesterol in women (2):					
<0.9 mmol/L	5	5	2	2	
>0.9 mmol/L	11	11	15	15	
>1 mmol/L	15	15	26	26	<0.001
<1 mmol/L	21	21	2	2	
>1.2 mmol/L	15	15	49	49	
<1.2 mmol/L	18	18	1	1	
no answer	15	15	4	4	
Guidelines-recommended blood pressure for high-risk subjects (2):					<0.001
<150/90 mm Hg	10	10	2	2	
<140/90 mm Hg	11	11	20	20	
<135/85 mm Hg	25	25	43	43	
<120/80 mm Hg	45	45	33	33	
no answer	4	4	2	2	<0.001
Would you prescribe lipid lowering therapy to high risk subjects					
yes	9	9	65	65	
no	12	12	26	26	
do not know	71	71	7	7	
no answer	8	8	2	2	<0.001
Metabolic syndrome:					
causes directly diabetes	3	3	6	6	
significantly increases coronary risk	16	16	75	75	
is a rare metabolic disease	7	7	4	4	
has low coronary risk. Causes some other diseases	10	10	7	7	<0.001
do not know anything about	52	52	2	2	
no answer	11	11	6	6	
Possibilities for raising HDL-cholesterol					
no carbohydrate and no alcohol intake	11	11	8	8	
moderate alcohol intake and regular physical activity	8	8	35	35	<0.001
low saturated animal fat diet	50	50	50	50	

apple vinegar	9	9	2	2	
ginco biloba	6	6	2	2	
no answer	15	15	3	3	
Opinion on combined lipid-lowering therapy (life-style +2 or more drugs):					<0.001
must not be given because too high risk of side-effects	4	4	3	3	
appropriate for high hypercholesterolemia and high hypertriglyceridemia	8	8	62	62	
only for high hypercholesterolemia and low HDL cholesterol	14	14	14	14	
do not know	64	64	16	16	
no answer	10	10	5	5	

## DISCUSSION

This study showed that perception and knowledge of some CVD risk factors was significantly better among graduating students than among freshmen but was still not sufficient. Freshmen's knowledge and attitudes did not differ much from those of other young people of their age.<sup>6</sup> It was better than, for example, the knowledge of students of Michigan high schools, who although rated accidents as the greatest perceived lifetime health risk, identified CVD as the greatest cause of death.<sup>6</sup> However, it was about the same as the Croatian general population's knowledge about causes of death.

Although the knowledge on CVD risk factors in our students, as expected, was significantly better at the end of university medical education, the results of this survey suggest insufficient awareness of CVD risk factors and indicate an urgent need for an improved promotion of CVD prevention during medical education. This might be a problem of the curriculum, which comprises mandatory courses in family medicine, epidemiology, and public medicine as well as internal medicine, during which students have only about 4 hours of lectures, 6 hours of seminars, and 12 hours of practicals and clinical audits on CVD risk factors and prevention. However, they discuss CVD risk factors in a number of other clinical audits. Despite the fact that most of graduating students believed they were familiar with last Joint European guidelines on CVD prevention (2), too many of them did not know the target values for TC, HDL-cholesterol, and BP, and only 64% reported that they would prescribe lipid-lowering therapy to high-risk subjects. Therefore, if medical education is like this, it is not surprising that several recent studies have shown a failure to achieve the recommended risk factor targets in patients with CVD and those without CVD but with CVD risk factors not only in Croatia but in many other European countries.<sup>7-12</sup>

A very disturbing fact is that many students were smoking at the end of their medical education in spite of sufficient knowledge about harmful effects of smoking (14% vs 30%). This is in accordance with the data from two Spanish surveys. One of them showed that 27% of final year medical students were

smokers and 33% of them had started smoking during their medical studies.<sup>13</sup> The other showed that the prevalence of smokers among Spanish medical students increased between the first study year and the beginning of the third year from 20% to 31%.<sup>14</sup> A survey performed in 2010 on students of four Italian medical schools showed that they had limited knowledge about tobacco dependence, how to treat it, and the critical role of the physician in promoting smoking cessation.<sup>15</sup>

Similarly disappointing is graduating students' low awareness of obesity as an important CVD risk factor. Namely, recent data show that the prevalence of obesity is increasing and reaching epidemic proportions, particularly in the high-risk group of patients with CVD all over Europe and that management of excessive body weight, which is at the moment inadequate, should be given the highest priority.<sup>16</sup>

It is encouraging that graduating students had relatively good knowledge on metabolic syndrome and atherogenic dyslipidaemia characterized by low HDL-cholesterol and elevated triglycerides. These are typically encountered in high-risk patients with metabolic disorders like diabetes and/or obesity, which have an increasing prevalence but are largely under-diagnosed and under-treated.<sup>17-18</sup> In fact, their knowledge of HDL-cholesterol was not much worse than the knowledge of Croatian general practitioners and/or family doctors, although this was also not satisfactory.<sup>19</sup> However, students' knowledge on increasing low HDL-cholesterol was clearly not sufficient. Another encouraging finding is graduating students' quite positive attitude toward combined lipid-lowering treatment consisting of two or more different lipid-lowering drugs, which was feared by many physicians until very recently, mainly because of adverse effects.

The major limitation of the study is that it compared two different generations of students, so no clear conclusion about the success of medical education can be made. For this purpose, the same population of medical students should be evaluated at the beginning and at the end of their education.

## CONCLUSION

We concluded that medical education on CVD prevention, at least in India, must be substantially improved and should include strategies to increase not only knowledge but also perception of modifiable risk factors for CVD and strategies to reduce or eliminate them. Particular attention has to be paid to increase students' knowledge about obesity and low physical activity as important CVD risk factors, but also to the methods for increasing low HDL-cholesterol and smoking cessation.

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