Knowledge regarding cardiovascular risk factors among Chinese medical students

Xintong Jiang

Peking University People's Hospital <https://orcid.org/0000-0003-2862-5355>

Xun Wang

Peking University People's Hospital

Mengxi Yang

China-Japan Friendship Hospital

Li Sun

China-Japan Friendship Hospital

Jiangli Jin

China-Japan Friendship Hospital

Shuoyan An

China-Japan Friendship Hospital

Dongping Feng

China-Japan Friendship Hospital

Mo Zhou

China-Japan Friendship Hospital

Yu Wang

China-Japan Friendship Hospital

Si Gao

China-Japan Friendship Hospital

Jingyi Ren (✉ cardioedu2018@126.com)

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Abstract

Background A comprehensive assessment of cardiovascular disease (CVD) risk factors is the foundation of CVD prevention and treatment. This study assessed the awareness of CVD risk factors and treatment among Chinese medical students.

Methods This cross-sectional study enrolled 48 3 rd year medical students who had finished preclinical course of medicine and 61 4 th year medical students who had finished their rotation in Internal Medicine's Ambulatory Medicine clerkship from Peking University. The knowledge of CVD risk factors and therapeutic strategy was assessed by a self-administered questionnaire.

Results Only about 50% of the 4 th year students knew the target value of low-density lipoprotein cholesterol for diabetic patients and blood pressure for high-risk patients, while the proportions in 3 rd year students were 20.8% and 29.2%, respectively. Although more than 90% students would prescribe cholesterol-lowering therapy to high-risk patients, few students knew the therapy of hypertriglyceridemia (2.1% and 27.9% of 3 rd and 4 th year students, respectively, $p=0.001$) or combined dyslipidemia. The awareness of their own lipid profile or blood glucose level was not as good as their blood pressure.

Conclusions There is an urgent need to improve the knowledge of CVD risk factors and the details of therapeutic strategies among Chinese medical students.

Introduction

Cardiovascular disease (CVD) now accounts for nearly 30% of deaths in China each year and is likely to increase substantially in the next few decades, despite its mortality in Western countries is decreasing [1, 2]. Moreover, it has been predicted that the CVD mortality will be doubled or even tripled by the year 2030 worldwide. This might be conceivably attributed to developing countries like China where the cost of healthcare continues to rise and the access to healthcare continues to deteriorate (China was ranked 188th by a World Health Organization study) [3, 4]. Thus, these facts highlight the need for efficient preventative approaches in order to tackle the disease. While the diagnosis and treatment of established CVD has becoming more standardized, an early and effective prevention of CVD is still inadequate.

Lifestyle and social changes in China such as lack of exercise, increase in obesity, changes in diet and cigarette smoking result in a high-risk profile for CVD, which represented as lipids, glucose or blood pressure. Among all the factors contributing to the pathogenesis of CVD, the escalation of CVD rate in China is driven especially by these risk factors [5]. According to the INTERHEART study, nine modifiable risk factors have been shown to account for more than 90% of the attributable risk for CVD globally [6, 7], which was consistent in the Chinese population [8]. Thus, an intervention on these risk factors may considerably bring beneficial effect to the population. On the other hand, The CVD risk factors are not a patent for the elderly, but becoming more and more common in adolescents. There is an association between childhood obesity and the development of a cluster of CVD risk factors characterized by dyslipidemia, hypertension, and diabetes mellitus, which have been defined as metabolic syndrome.

Adolescents with unhealthy lifestyle such as smoking, alcoholism and lack of exercise show a higher risk to develop CVD. A recent study carried out jointly in three universities in Jiangsu province in China indicated that the knowledge of non-medical college students of CVD risk factors was rather limited; the percentage of these students who had an awareness of CVD risk factors was only 61.2% [9]. Thus, the knowledge of the CVD factors was far from sufficient and an education on CVD prevention needs to be included at an early age for Chinese adolescents.

Effective prevention and treatment of CVD is based on a comprehensive assessment of the risk factors. Risk stratification is essential in the management of individual CVD risk [10]. The perceptions, knowledge, and awareness of CVD risk factors among medical students in China have not been studied and their improvement during medical education is also to be evaluated.

Since medical students play important roles in the future clinical practice and medical education. There is an urgent need to conduct assessments in identifying and addressing CVD risk factors among medical students. The aim of this study was to assess the knowledge and awareness of CVD risk factors and to investigate the prevalence of CVD risk factors among Chinese medical students.

Materials And Methods

Study Population

The cross-sectional survey was conducted on 109 medical students during 2 years at Peking University Health Science Center. The subjects consecutively included 48 3rd year medical students and 61 4th year medical students. The 3rd year medical students had finished a foundational preclinical course of medicine and they were at the beginning of the internal rotation, while the 4th year medical students had finished their rotation in Internal Medicine's Ambulatory Medicine clerkship. The internal medicine rotation provided more opportunities to gain clinical knowledge and experience, therefore, the 4th year medical students were expected to have more clinical experience in solving clinical problems and making treatment decisions.

Questionnaire

The participants were required to complete an anonymous self-administered questionnaire with 31 multiple choice questions (see supplementary material). The questionnaire consisted of three parts: The first part was to investigate whether the participants could clarify the association between CVD and the CVD risk factors (e.g. dyslipidemia, diabetes mellitus, hypertension, and metabolic syndrome). The second part was aimed at examining the knowledge of therapeutic target values and options for CVD risk factor (e.g. the goal value for LDL-C in diabetes mellitus subjects according to Chinese Guidelines). These questions involved numerical information which included the recommended objectives on cholesterol level, blood pressure, glycosylated hemoglobin (e.g. "What is the recommended blood pressure for patients with high risk for CVD in mmHg?") or non-numerical information such as treatment choices. The

last part was to assess the perceptions of their personal CVD risk factors which included weight, smoking habit, blood pressure, total plasma cholesterol level, blood glucose and family history of CVD; participants only need to answer YES or NO. In order to assess the level of knowledge about the risk rank, we converted non-numerical data to a numerical format by the use of ranking scales (e.g. Rank on a scale of 1 to 10 cardiovascular risk factors listed below according to their relevance, with number 1 as the most relevant, number 10 as the least relevant). At the end of the questionnaire, the demographic variables and the students' attitude towards internal medicine education were included. The study protocol and the questionnaire were approved by the Ethics Committee of Peking University Health Science Center.

Statistical analysis

Statistical analysis was performed using SPSS for Windows 17.0 (SPSS, Chicago, IL). Continuous variables are expressed as mean and standard deviation (SD), or as median (range, minimum to maximum) if the variable is not normally distributed; categorical variables are given as frequencies and percentages (%). Chi-square test or two-sided Fisher exact test when appropriate were used to assess the association of certain questionnaire items. Ranking order of the CVD risk factors, acquired by the use of rating scales, was assessed by median values and for equal medians by mode values. The difference was considered to be statistically significant at p values < 0.05 .

Results

A total of 109 questionnaires were retrieved, the response rate was 100%. There was no difference in general characteristics between the two groups (Table 1). The average age was 22.1 ± 1.8 years old. The proportion of males was 45.8% among the 3rd year students and 44.3% among 4th year students ($p = 0.870$). The majority of the two groups considered that CVD was the leading cause of death both in China (78.4% versus 68.1%, $p = 0.294$) and worldwide (56.8% versus 66.90%, $p = 0.389$). In addition, both groups indicated that their knowledge on prevention and control of CVD was rather limited from their current medical education.

Table 1
Characteristics of the study population

	3rd grade	4th grade	P values
Subjects	48	61	
Age (years)	21.3 + 1.5	22.7 + 2.0	NS
Gender (M/F)	17/20	21/26	NS
Height (cm)	168.3 + 8.5	171.3 + 8.2	NS
Body mass (kg)	61.7 ± 10.9	63.2 ± 11.1	NS
BMI (kg/m ²)	20.6 ± 3.1	21.3 ± 2.6	NS
History of CVD	0	0	NS
Family history of CVD	10.8%	12.8%	NS

Knowledge On CVD Risk Factors

Our data in this study suggested the medical students were knowledgeable about the major risk factors for CVD (Table 2). Over 90% of the students from both groups considered that dyslipidemia and diabetes mellitus increased a person's total CVD risk. About 95% of students in both groups were aware of the hazards of smoking, 89.6% of the 3rd year students and 85.2% of the 4th year students thought that passive smoking have indistinguishable effects as active smoking ($p = 0.574$). All the students pointed out that obesity could lead to diabetes mellitus, hypertension, coronary heart disease and obstructive sleep apnea hypopnea syndrome. Moreover, approximately 90% students thought that metabolic syndrome could significantly increase the risk of CVD (89.6% versus 90.2%, $p = 1.000$). When asked to rank the factors that increase the CVD risk, both groups chose hypertension, diabetes and cholesterol as the three most important risk factors. However, the risk of smoking was underestimated (Fig. 1).

Table 2
Knowledge on CVD risk factors

	3rd grade		4th grade		p value
	N	%	N	%	
Which of the following composition of cholesterol increase the risk of CVD					
a) HDL-C	1	2.1	1	1.6	1.000
b) LDL-C	46	95.8	59	96.7	
c) triglyceride	1	2.1	1	1.6	
d) nothing	0	0.0	0	0.0	
Which of the following composition of cholesterol decrease the risk of CVD					
a) HDL-C	47	97.9	57	93.4	0.382
b) LDL-C	1	2.1	4	6.6	
c) triglyceride	0	0.0	0	0.0	
d) nothing	0	0.0	0	0.0	
Which of the following statement is true about diabetes					
a) CHD risk equivalents	43	89.6	50	82.0	0.317
b) irrelevant	0	0.0	0	0.0	
c) relevant	4	8.3	10	16.4	
d) do not know	1	2.1	1	1.6	
Which of the following disease is related to smoking					
a) pulmonary diseases	1	2.1	1	1.6	0.494
b) cancer	1	2.1	0	0.0	
c) CVD	0	0.0	0	0.0	
d) stoke	0	0.0	0	0.0	
e) all of above	46	95.8	60	98.4	
Do you think that active smoking is equal to the passive smoking					
a) YES	43	89.6	52	85.2	0.574
b) NO	5	10.4	9	14.8	
Obesity can cause the disease					
a) diabetes mellitus	0	0.0	0	0.0	
b) hypertension	0	0.0	0	0.0	
c) coronary disease	0	0.0	0	0.0	
d) OSAS	0	0.0	0	0.0	
e) all of above	37	100	47	100.0	
f) do not know	0	0.0	0	0.0	
Metabolic syndrome:					
a) causes directly diabetes	0	0.0	0	0.0	1.000
b) increases coronary risk	43	89.6	55	90.2	
c) rare metabolic disease	0	0.0	1	2.1	
d) has low coronary risk	0	0.0	0	0.0	
e) do not know	5	10.4	6	9.8	

Treatment on CVD risk factors

In this study, most of the participants had not read the 2017 Chinese guidelines for prevention of cardiovascular diseases [11], only few students had limited knowledge about it (Table 3). Our data further suggested that the students had inadequate knowledge about the details of CVD risk factors treatment. Only about 50% of the 4th year students could give the correct target value of LDL-C for diabetics patients and blood pressure level for patients with high CVD risk, while the accuracy of the two questions among 3rd year students were 20.8% ($p = 0.002$) and 29.2% ($p < 0.001$) respectively. Knowledge concerning the target value of glycosylated hemoglobin (HbA1c) was significantly better among 4th year students than 3rd year students (72.1% versus 20.8%, $p < 0.001$). In addition, only about 40% of the students in each group recognized that regular exercise and moderate alcohol use could increase HDL-C (35.4% versus 44.3%, $p = 0.822$). When asked about cholesterol-lowering therapy, more than 90% students reported that they would prescribe cholesterol-lowering therapy to high-risk patients. However, fewer students knew the indication of fibrates (2.1% in 3rd year students versus 27.9% in 4th year students, $p = 0.001$) and combination lipid-lowering therapy (29.2% in 3rd year students 52.5% in 4th year students, $p = 0.050$).

Table 3
CVD risk factors treatment

	3rd grade		4th grade		p value
	N	%	N	%	
Knowledge of the 2017 Chinese Guidelines for Prevention of CVD					
a) very good	0	0.0	0	0.0	0.068
b) partial	10	20.8	5	8.2	
c) just heard about it	13	27.1	27	44.3	
d) never heard it	25	52.1	29	47.5	
Recommended value for low-density lipoprotein-cholesterol in diabetes					
a) < 4.1 mmol/L	5	10.4	5	8.2	0.002
b) < 3.4 mmol/L	9	18.8	5	8.2	
c) < 2.6 mmol/L	24	50.0	16	26.2	
d) < 1.8 mmol/L	10	20.8	35	57.4	
Guidelines-recommended blood pressure for high-risk subjects					
a) < 150/90 mmHg	1	2.1	1	1.6	<0.001
b) < 140/90 mmHg	32	66.7	5	9.8	
c) < 130/80 mmHg	14	29.2	26	55.7	
d) < 120/80 mmHg	1	2.1	15	32.8	
The target value of glycosylated hemoglobin (HbA1c) for high-risk subjects					
a) 6.5	6	12.5	14	23.0	<0.001
b) 7	10	20.8	44	72.1	
c) 7.5	9	18.8	1	1.6	
d) 8	3	6.3	1	1.6	
e) do not know	20	41.7	1	1.6	
Would you prescribe lipid lowering therapy to high risk subjects :					
a) YES	42	87.5	57	93.4	0.439
b) NO	3	6.3	1	1.6	
c) do not know	3	6.3	3	4.9	
Possibilities for raising HDL-cholesterol					
a) no carbohydrate or alcohol intake	1	2.1	1	1.6	0.822
b) moderate alcohol intake and regular physical activity	17	35.4	27	44.3	
c) low saturated animal fat diet	24	50.0	27	44.3	
d) ginko biloba	6	12.5	6	9.8	
You can reduce the level of total cholesterol by the diet therapy:					
a) 2–3%	0	0.0	4	6.6	0.775
b) 10–15%	21	43.8	21	34.4	
c) about 50%	16	33.3	19	31.1	
d) about 50–75%	8	16.7	17	27.9	
e) up to 90%	3	6.3	0	0.0	

	3rd grade		4th grade		p value
	N	%	N	%	
When the blood lipid testing show that a patient was in a very low level of HDL-C, Moderate increased level of TG, normal levels or moderately elevated levels of TC and LDL-C, what would you do:					
a) Do not treat(no need)	8	16.7	4	6.6	0.001
b) Do not treat(HDL-C level)	4	8.3	2	3.3	
c) Statins	16	33.3	22	36.1	
d) Fibrates	1	2.1	17	27.9	
e) Do not know	19	39.6	16	26.2	
Opinion on combined lipid-lowering therapy					
a) must not be given because too high risk of side-effects	0	0.0	0	0.0	0.050
b) appropriate for high hyper -cholesterolemia and high hyper-triglyceridemia only	14	29.2	32	52.5	
c) only for high hyper- cholesterolemia/low HDL cholesterol	17	35.4	14	23.0	
d) do not know	17	35.4	15	24.6	

Self-assessment Of Personal Risk Factors

On the other hand, most of the participants knew their own blood pressure and family history of CVD (Table 4). Only 6 students did not know how to calculate standard weight, and only one student was a current smoker. However, the majority stated that they did not know their own serum cholesterol level. Only 8.3% of 3rd grade and 19.7% of 4th grade knew their serum cholesterol level, and there was no significant difference between the two groups ($p = 0.097$). Although more 4th year students knew their blood glucose level than 3rd year students (44.3% versus 12.5%, $p < 0.001$), the awareness rate in 4th year students was rather low, which suggested that the knowledge regarding glucose was far from sufficient among the students.

Table 4
Self-assessment of personal risk factors

	3rd grade		4th grade		P value
	N	%	N	%	
Awareness of your blood pressure					
a) YES	44	91.7	55	90.2	1.000
b) NO	4	8.3	6	9.8	
Awareness of your family history of CVD					
a) YES	43	89.6	53	86.9	0.666
b) NO	5	10.4	8	13.1	
Knowledge about how to calculate the standard weight					
a) Know	45	93.8	58	95.1	1.000
b) Do not know	3	6.3	3	4.9	
Smoking habits					
a) YES	0	0.0	1	1.6	1.000
b) NO	48	100	46	98.4	
Awareness of your serum cholesterol level					
a) YES	4	8.3	12	19.7	0.097
b) NO	44	91.7	49	80.3	
Awareness of your blood glucose					
a) YES	6	12.5	27	44.3	<0.001
b) NO	42	87.5	34	55.7	

Discussion

To our knowledge, this was the first study that assessed the knowledge and awareness of CVD risk factors in medical students and evaluated the effect of internal medicine rotations. The results showed that medical students, whether or not they completed their internal medicine rotation, had relatively good knowledge on the contribution of major risk factors to CVD, namely dyslipidemia, hypertension, diabetes and smoking. However, their knowledge about risk factors control and treatment (e.g. therapeutic targets and options) was extremely lacking. They were also less knowledgeable about their own CVD risk.

CVD is currently the major cause of death and disability, claiming almost 3 million lives annually, which amounted of nearly 30% of all deaths in China [12]. The personal and economic impacts of CVD are devastating and are increasing. According to the INTERHEART study, 9 modifiable risk factors account for more than 90% of attributable risk for CVD globally, and smoking, dyslipidemia, diabetes mellitus and

hypertension are the four strongest risk factors for CVD in China [8]. It is therefore encouraging that both 3rd year and 4th year students had relatively good knowledge on the contribution of these four major risk factors to CVD. Over 90% of students of the two groups correctly identified that high LDL-C level, low HDL-C level, diabetes mellitus and smoking markedly increased chances of CVD, which is consistent with those of other countries [13, 14]. It was, as expected, much better than the knowledge of other adolescents of their age [15, 16]. In addition, current evidence has indicated that exposure to passive smoking can lead to a 70–80% increase in the risk of CVD, nearly as much as light smoking [17]. Our results showed that the situation in reference to passive smoking is satisfactory. More than 80% of both group of students thought that passive smoking could have detrimental effects indistinguishable from active smoking.

Medical students are a target group of particular interest in many studies as they are future physicians, researchers and educators. Unfortunately, our results show that most of the students were unfamiliar with the latest Chinese guidelines for prevention of CVD, even at the end of internal medicine rotation [11]. Although the knowledge of therapeutic targets for some risk factors was better among the 4th year students than the 3rd year students, it was still far from sufficient. About half of the 4th year students did not know the target blood pressure level for high-risk patients after the internal medicine rotation. It is worth noting that more than 90% of students would prescribe cholesterol-lowering therapy to high-risk patients; however, it was obvious that students had limited knowledge about some details of CVD risk factors treatment. The students from both groups were less aware that fibrates offer the most triglyceride reduction as monotherapy and optimal management of combined dyslipidemia. Only about 40% of the students in each group correctly indicated that regular exercise and dietary management could affect total cholesterol and HDL-C levels. In addition, students from both groups have long indicated that they feel their medical curriculum does not provide enough education about prevention and management of CVD. Therefore, based on the current medical education, it is not surprising that several recent studies have shown a failure to achieve the recommended targets for major risk factors in China [18–20]. Besides medical students, the fundamental knowledge of risk factors control among Chinese community physicians was also astonishingly poor according to a recent study, showing only 24% and 14% of the physicians reported the right optimal LDL-C level for CHD and diabetes patients, respectively [21].

In addition, there is sparse data about health status, particularly for CVD risk factors among Chinese medical students. In this study we found that although most medical students were aware that diabetes and dyslipidemia are the major causes of CVD, most of them were unfamiliar with their own blood glucose level and lipid profile. The most current data available by Popkin and colleagues showed that 1.7 million Chinese adolescents and children are diabetic and about 27.7 million are pre-diabetic. The percentage of diabetes among Chinese teenagers was four times as much as their American peers, and approximately 42% of Chinese children and adolescents have at least one of the following CVD factors: pre-diabetes or diabetes, hypertension, high TC, LDL-C, TG, or low HDL-C [22]. Other large national surveys of serum lipids and lipoproteins have indicated that the mean serum total and LDL cholesterol and triglyceride levels were high and increasing in the Chinese population. Furthermore, the awareness, treatment, and control rates of hypercholesterolemia were relatively low [18]. In view of the medical

students as part of the young adult group, our results highlight the necessity for institutes and hospitals to assess health status and effective prevention of CVD in China targeting adolescents. They also need to learn how to evaluate their own CVD risk, and practice good health behaviors, as well as lifestyle choices.

There are several limitations in the present study. One of them is the subjective type of questions, which is not possible to be eliminated completely. Another limitation is that we compared two different grades of students, the contents and patterns of medical education they received might have been different. Further studies should evaluate the change at the beginning and the end of medical education in same population of medical students, to investigate whether medical education is sufficient in increasing the awareness of the need for prevention in cardiology. Finally, the number of individuals that included in this study was rather small. There is an urgent need to conduct assessments in a larger population to know if Chinese young medical students understand the importance of CVD risk factors that can affect their future health and practice.

Conclusion

In conclusion, the main findings from this study are the alarming lack of knowledge about CVD risk factors and ignorance about self-risk factors among Chinese medical students. Since CVD is a major health threat in China, it would be beneficial to integrate an emphasis on early identification and effective control of prevalent risk factors into medical education. A preventive cardiology education program for medical students should be a compulsory part of their internal medicine rotation, which reviewed the evidence for cardiovascular risk factors and the impact of intervention. This will make them more effective communicators when talking in the future to their own patients. Further, it will contribute to the ultimate success in decreasing the morbidity and mortality from CVD.

Declarations

The manuscript has been read and approved by all the authors who declare no commercial or financial conflict of interest. The authors have no funding to disclose. All the information was collected with the written consent from the patient according to the Declaration of Helsinki and with the approval of the People's Hospital, Peking University and China-Japan Friendship Hospital.

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Figures

Figure 1. Knowledge on the risk rank among the 3rd grade and the 4th grade students (the smaller the bars the higher the rank).

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Figure 1

Knowledge on the risk rank among the 3rd grade and the 4th grade students (the smaller the bars the higher the rank).

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