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ORIGINAL RESEARCH

Predicted ten-year risk of cardiovascular disease among patients without prior heart disease or stroke using atherosclerotic cardiovascular disease risk calculator

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Abstract

Objective: Recognition of probable risk factors for cardiovascular disease is crucial in non-CAD patients for preventive programming. The purpose was determination of 10-year cardiovascular disease (CVD) among patients without current cardiovascular disease.
Material & Methods: In this observational study that was performed as a diagnostic survey, 606 consecutive patients without current cardiovascular disease, referring to Modarres and Loghman Hospitals, Tehran, Iran in 2017 and 2018 were enrolled and ASCVD plus score determined the 10-year cardiovascular disease among them.
Results: The results in this study demonstrated that mean ASCVD plus score was 13.1 ± 14.9 points. Among cases 284 (40.9%), 67 (11.1%), 154 (25.4%), and 137 (22.6%) patients were in groups 1, 2, 3, and 4, respectively. The mean risk was higher in men, diabetics, smoker, users of anti-hypertensive, statins, and aspirin, older, with higher blood pressure, and also with higher total and LDL cholesterols.
Conclusion: Totally, according to the obtained results in current study, it may be concluded that 10-year risk of cardiovascular disease is relatively high among patients without current cardiovascular disease. This matter shows the importance of routine screening in such population.

Keywords: CVD, Risk, General population

Introduction

Nowadays despite progressive course of adventures in diagnosis and treatment of cardiovascular diseases, there is increased rate of heart disorders especially due to sedentary life style and better diagnostic approaches (1, 2). On the other word there are many asymptomatic undiagnosed cases that may present at higher stages (1). Atherosclerotic cardiovascular diseases are main cause of mortality and morbidity worldwide (2). Such disorders are accompanied with decreased quality of life and increased fatality rate due to progressive course of disease (3). Also high economic burden is another important bothersome issue (2, 3). Increased age in many countries including our population is main cause of increased rate of CVD and need to invasive therapeutic procedures (1, 2). Risk calculation and modification is an important attempt to decrease the incidence rate of CVD (4).

Multifactorial status of cardiovascular diseases shows the importance of multi-dimensional programs to control the disease and better clinical decision making (4-8). This is an important cause for increasing and decreasing rates of CVD in developed and developing countries (9). The American College of Cardiology and American Heart Association guidelines (ACC/AHA) developed guidelines for risk reduction of CVD by statins according to lipid profile especially LDL levels (4, 10). Accordingly there are four categories needing such interventions including patients with known cardiovascular disease, LDL cholesterol over 190 mg/dl as familial hypercholesterolemia, diabetes mellitus, and those with ten-year CVD risk of 7.5 and higher (4, 10). Ten-year CVD risk is defined as risk of Atherosclerotic cardiovascular disease (ASCVD) in upcoming ten years as non-fatal myocardial infarction, or death due to CVD due to fatal/non-fatal myocardial infarction in cases without previous CVD (10). The prevalence of Coronary heart disease (CHD) in Iran is as high as 19 percent (9). But there are few studies for CVD risk assessment in Iranian Population (9-12). Regarding the high prevalence rate of CHD and importance of risk stratification for future preventive and therapeutic approaches especially by aspirin and statins this study was done to determine ten-year CVD risk in Iranian population.

Materials and Methods

In this observational study that was performed as a diagnostic survey, 606 consecutive patients without current cardiovascular disease referring to Modarres and Loghman Hospitals, Tehran, Iran in 2017 and 2018 were enrolled. In these cases there was no current CVD according to exercise test, echocardiography, and electrocardiography. Inclusion criteria were age range of 40 to 79 years, no established CVD, no history of CABG or congenital heart disease. Also cases with total and LDL cholesterol levels over 320 and 190 mg/dl respectively were excluded. There was no ability for risk estimation in cases out of mentioned age range. This study was initially approved by local ethical committee in Shahid-Beheshti University of Medical Sciences. The 10-year cardiovascular disease among the patients was determined by ASCVD plus score according to the below diagram.

ASCVD Risk Estimator Plus

Name: Surname:

Age (40-79):

Sex: male □ female □

Race:

SBP (90-200 mmHg):

DBP (60-130 mmHg):

Total chol (130-320 mg/dl):

HDL (20-100 mg/dl):

LDL (30-300 mg/dl):

Hx of DM: yes □ no □

Smoker: current □

Never □

Former: (< 6 months □ ,6 months-1.5 years □, 1.5-2.5 years □ 2.5-3.5 years, □ 3.5-5 years □, > 5 years □)

On HTN treatment? Yes □ no □

On statin? Yes □ no □

On A.S.A? yes □ no□

Estimated Risk:

The 10-year risk estimation was not done in cases with total cholesterols more than 320 mg/dl or LDL cholesterol over 190 mg/dl. Such patients were directly referred for medical/non-medical consultation. For risk estimation all required data were entered in http://tools.acc.org/ascvd-risk-estimator site and the calculated risk was recorded. The variables included smoking, systolic blood pressure, diastolic blood pressure, total cholesterol, LDL cholesterol, and HDL cholesterol. The estimated risk was compared according to other background factors. Accordingly the moderate risk was between 7.5 and 19.9 points and for this group

atorvastatin alone was prescribed. Additional cases with high risk (points over 20) were advised to use both atorvastatin and aspirin. The patient in low-risk group only received non-medical advises. Data analysis among 606 cases was done by SPSS version 25.0 software and for this matter Kolmogorov-Smirnov, ANOVA, Independent-Sample-T, and Chi-Square tests were used. The confidence interval for comparative means was considered as 0.95.

Results

The mean age was 57.8 ± 11.1 years (Table 1) and 336 cases (55.4%) were female. Also 284 cases (46.9%) had diabetes history. As shown in Table 2, 467 cases (77.1%) were never smokers. Anti-hypertensive drugs, aspirin, and statins were used by 32.8%, 36.0%, and 45.4%, respectively.

Table 1- Numerical variables in patients

	Minimum	Maximum	Mean	Std. Deviation
Age	40	79	57.82	11.095
SBP	90	240	132.16	19.210
DBP	60	125	82.22	12.534
Total Cholesterol	110	320	185.39	41.130
HDL Cholesterol	21	171	49.24	15.548
LDL Cholesterol	26	188	100.30	26.373

Table 2- Smoking history in patients

	Frequency	Percent
Current	103	17.0
Never	467	77.1
<6 months	9	1.5
6 months-1.5 years	8	1.3
1.5-2.5 years	1	.2
2.5-3.5 years	3	.5
3.5-5 years	1	.2
>5 years	14	2.3
Total	606	100.0

As shown in Table 3, the mean risk score was 14.9 ± 13.1 points. Among cases 284 (40.9%), 67 (11.1%), 154 (25.4%), and 137 (22.6%) patients were in groups 1, 2, 3, and 4, respectively.

Table 3- CVD risk according to ASCVD plus

	Risk estimation	Frequency	Percent	p.p recommendation
Group 1	R.S <5 low risk	248	40.9	RFM
Group 2	5<R.S<7.4 borderline risk	67	11.1	RFM + atorvastatin class IIb
Group 3	7.5<R.S<19.9 intermediate risk	154	25.4	RFM -statin class I (moderate to high intensity)
Group 4	R.S>20 high risk	137	22.6	RFM + statin class I (high intensity statin therapy + A.S.A)
Total		606	100.0	

The mean risk was higher in men and diabetics (P=0.001) as shown in Table 4. Smoking was related (P=0.001) to higher risk (35.6% versus 8.0%). As shown in Table 5, use of aspirin, statin, and anti-hypertensive agents were more common in cases with higher risk (P=0.001).

Table 4- CVD risk according to sex and diabetes mellitus

Variable	Group 1 (n=248)	Group 2 (n=67)	Group 3 (n=154)	Group 4 (n=137)	Total (n=606)
Male	78 31.5%	31 46.3%	73 47.4%	88 64.2%	270 44.6%
Female	170 68.5%	36 53.7%	81 52.6%	49 35.8%	336 55.4%
Non-Diabetic	184 74.2%	31 46.3%	73 47.4%	34 24.8%	322 53.2%
Diabetic	64 25.8%	36 53.7%	81 52.6%	103 75.2%	284 46.9%

Table 5- CVD risk according to drug history

Variable	Group 1 (n=248)	Group 2 (n=67)	Group 3 (n=154)	Group 4 (n=137)	Total (n=606)
No anti-HTN	217 87.5%	49 73.1%	91 59.1%	50 36.5%	407 67.2%
With Anti-HTN	31 12.5%	18 26.9%	63 49.9%	87 63.5%	199 32.8%
No Aspirin	202 81.5%	46 68.7%	89 57.8%	51 37.2%	388 64.0%
With Aspirin	46 18.5%	21 31.3%	65 42.2%	86 62.8%	218 36.0%
No Statin	173 69.8%	43 64.2%	74 48.1%	41 29.9%	331 54.6%
With Statin	75 30.2%	24 35.8%	80 51.9%	96 70.1%	275 45.4%

As shown in Table 6, all numerical variables were related to CVD risk except HDL cholesterol level (P=0.100).

Table 6- Association of CVD risk and numerical factors

		Sum of Squares	df	Mean Square	F	Sig.
Age	**Between Groups**	44067.088	3	14689.029	290.866	.000
	Within Groups	30401.664	602	50.501		
SBP	**Between Groups**	56636.458	3	18878.819	68.205	.000
	Within Groups	166630.369	602	276.795		
DBP	**Between Groups**	18445.840	3	6148.613	48.319	.000
	Within Groups	76605.407	602	127.252		
Total Cholesterol	**Between Groups**	20185.508	3	6728.503	4.037	.007
	Within Groups	1003266.135	602	1666.555		
HDL Cholesterol	**Between Groups**	1511.585	3	503.862	2.096	.100
	Within Groups	144740.270	602	240.432		
LDL Cholesterol	**Between Groups**	8776.238	3	2925.413	4.274	.005
	Within Groups	412015.500	602	684.411		

Discussion

In current study the ten-year CVD risk was assessed to determine medium and high risk groups requiring medical preventives such as aspirin plus atorvastatin in high-risk and

atorvastatin alone in medium-risk group. It was found that 41%, 11%, 25%, and 23% were in groups 1, 2, 3, and 4, respectively. The risk was higher in men, smokers, diabetics, anti-hypertensive agent users, aspirin consumers, statin users, and those with higher blood pressure and cholesterol levels. There were 48% with medium and high-risk status among them 25.4% received atorvastatin and 22.6% received aspirin plus atorvastatin.

Table 7- Groups status according to recommendations and over-treatment

	Statin over-treatment	Aspirin Over-treatment	Statin recommendation	Aspirin recommendation
Group 1	75	46		
	30.2%	18.5%		
Group 2	24	21	-	
	35.8	31.3%		
Group 3		65	74	
		45.2%	48.1%	
Group 4			41	51
			29.9%	37.2%

According to the findings group 1 that had no preventive requirement were received statin and aspirin in 30.2% and 18.5%, respectively as over-treatment. Also, in group 2 the over-treatment was seen in 31.3%. Also in group 3, treatment was not received in 48.1% with statin but aspirin was used in 42.2% as over-treatment. In group 4, statin and aspirin were not received in 29.9% and 37.2%, respectively. Barzin et al. (9) reported low, medium, and high risk status for CVD in 86%, 12%, and 2%, respectively. They reported need to therapeutic approaches in one-fourth but it was more than 40 pecent showing the increased metabolic risk factors in current years. Setayeshgar et al. (12) used FRS criteria for 10-year CVD risk stratification among 5500 canadians. They developed cardiometabolic risk index that had higher applicability in subjects aging from 30 to 74 years. The risk between 8.1 and 9.86 by CMR was considered as high. The related factors were older age, lower literacy, less physical activity, and smoking. The age and smoking were also contributing factors in our study.

Motamed et al. (11) assessed 10-year risk status in 3201 cases by FRS and WHO and ACC/AHA criteria and found high-risk level in 53.5% of men aging from 40 to 70 years more than 10% by ACC/AHA, 48.9% by FRS, and 11.8% by WHO criteria. Also women had risk more than 10% in 20.1% by ACC/AHA, 11.9% with FRS, and 5.7% by WHO criteria. The applicability of the results in their study was not clear but we could use this risk-assessment for better treatment in patients. Another study by Motamed et al. (13) revealed that according to ACC/AHA, low risk Systematic Coronary Risk Evaluation (SCORE), high risk SCORE, and FRS the 10-year risk for men was 12.96%, 8.84%, 1.9%, and 3.45%, respectively. Also the risk rates were 5.87%, 2.12%, 0.8%, and 1.13%, respectively. Accordingly, the statin was recommended for men in 58.2%, 27.1%, 21.1%, and 28.6%, respectively, and for women in 39.7%, 33%, 29.5%, and 30.7%, respectively. They reported over-treatment by ACC/AHA criteria that are also seen in our study. Celik et al. (14) assessed 250 cases aging from 40 to 80 years and compared two groups with 10-year CVD risk more than 7.5% versus less than 7.5%. They similarly reported significant difference in blood pressure between two groups. Ama Moor et al. (15) reported 10-year CVD risk between 1.2 and 30% among postmenopausal women. The risk was low, medium, and high in 39.8%, 36.1%, and 24.1%. The risk was related to FBS, diastolic blood pressure, and LDL cholesterol. They recommended life style modification for these women. But in our study the menopausal status was not assessed separately but the young-age women had least CVD risk. Another study by Ama Moor et al. (16) was done among 44 cases with chronic renal failure under dialysis and reported risk between 1 and 30%. The risk was low, medium, and high in 45.5%, 22.7%, and 31.8%, respectively. However in their study not-healthy subjects were assessed and results were less comparable. However in our study the background disease such as hypertension and diabetes mellitus were related to the CVD risk. Study by Ferket et al. (17) reported better efficacy of statins and anti-hypertensive agents in high-risk cases as similarly was seen in our study.

Thoroughly, according to the obtained results in current study, it may be concluded that 10-year risk of cardiovascular disease is relatively high among patients without current cardiovascular disease. This matter shows the importance of routine screening in such population. However further studies with larger sample population and longitudinal designs.

Conflict of interest

Author declares no conflict of interest.

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