Original Article

Association between Nontraditional Risk Factors and Calculated 10-Year Risk of Atherosclerotic Cardiovascular Disease in a Large General Population: Based on the Pars Cohort Study

Seyyed Mojtaba Ghorashi, MD, MPH[1,2], Pooria Ahmadi, MD[2], Reza Shahnazar Nezhad Khalesi, MD[2], Amir Fazeli, MD[2], Hossein Molavi Vardanjani, PhD, MPH[1], Alireza Salehi, MD, MPH, PhD[1], Negar Omidi, MD[2], Mesbah Shams, MD, MPH[3*], Amirhossein Babaei, MD, MPH[4,5]

[1]*Department of MPH , Shiraz School of Medicine, Shiraz University of Medical Sciences, Shiraz, Iran.*
[2]*Cardiovascular Disease Research Institute, Tehran Heart Center, Tehran University of Medical Sciences, Tehran, Iran.*
[3]*Endocrinology and Metabolism Research Center, Shiraz University of Medical Sciences, Shiraz, Iran.*
[4]*Otolaryngology Research Center, Department of Otolaryngology, Shiraz University of Medical Sciences, Shiraz, Iran.*
[5]*Student Research Committee, Shiraz University of Medical Sciences, Shiraz, Iran.*

Received 21 July 2022; Accepted 07 November 2022

Abstract

Background: *While the traditional risk factors of atherosclerotic cardiovascular disease (ASCVD) have been well-established, the evolving role of nontraditional risk factors is not apparent. This study aimed to evaluate the association between nontraditional risk factors and the calculated 10-year ASCVD risk in a general population.*

Methods: *This cross-sectional study was conducted using the Pars Cohort Study data. All inhabitants of the Valashahr district in southern Iran, aged 40–75 years, were invited (2012-2014). Patients with a history of cardiovascular disease (CVD) were excluded. The demographic and lifestyle data were collected using a validated questionnaire. Multinomial logistic regression analysis was used to evaluate the association between the calculated 10-year ASCVD risk and the nontraditional risk factors of CVD, including marital status, ethnicity, educational level, tobacco and opiate consumption, physical inactivity, and psychiatric disorders.*

Results: *Of 9264 participants (mean age =52.2±9.0 y; 45.8% male), 7152 patients met the inclusion criteria. In total, 20.2%, 7.6%, 36.3%, 56.4%, and 46.2% of the population were cigarette smokers, opiate consumers, tobacco consumers, ethnically Fars, and illiterate, respectively. The prevalence rates of low, borderline, and intermediate-to-high 10-year ASCVD risks were 74.3%, 9.8%, and 16.2%, respectively. In multinomial regression, anxiety (adjusted odds ratio [aOR], 0.58; P<0.001) was significantly associated with a lower ASCVD risk, whereas opiate consumption (aOR, 2.94; P<0.001) and illiteracy (aOR, 2.48; P<0.001) were significantly associated with a higher ASCVD risk.*

Conclusion: *Nontraditional risk factors are associated with the 10-year ASCVD risk and, thus, might be considered besides traditional ones for ASCVD in preventive medicine and health policies.*

J Teh Univ Heart Ctr 2023;18(1):24-32

[*]**Corresponding Author:** ***Mesbah Shams,*** *Professor of Internal Medicine and Endocrinology, Endocrinology and Metabolism Research Center, Shiraz University of Medical Sciences, Shiraz, Iran. 7134814336. Tel: +98 71 32337589. Fax: +98 71 32338476. E-mail: shams@sums.ac.ir.*

This paper should be cited as: Ghorashi SM, Ahmadi P, Shahnazar Nezhad Khalesi R, Fazeli A, Molavi Vardanjani H, Salehi A, et al. Association between Nontraditional Risk Factors and Calculated 10-Year Risk of Atherosclerotic Cardiovascular Disease in a Large General Population: Based on the Pars Cohort Study. J Teh Univ Heart Ctr 2023;18(1):24-32.

Keywords: *Atherosclerotic; Cardiovascular Disease; Risk Factors; Opium; Educational Status*

Introduction

Atherosclerotic cardiovascular disease (ASCVD) is considered one of the most common causes of the burden of disease and death worldwide.[1] Cardiovascular disease (CVD) was responsible for about 17.9 million deaths in 2012,[2] and it is estimated to rise to more than 23 million (≈ 30.5% increase) deaths by 2030 worldwide.[3, 4] The global trends for disability-adjusted life years (DALYs) of CVD have increased significantly, and years lived with a disability nearly doubled from 17.7 million in 1990 to 34.4 million in 2019.[5] The mortality rate from CVD has decreased in high-income countries,[6] whereas CVD and its morbidity and mortality have increased in low and middle-income countries, primarily in the Eastern Mediterranean Region.[7, 8] Traditional risk factors have been incorporated into population-based risk calculators to determine CVD risk. However, nontraditional risk factors also impact CVD risk.[9] While 80% of the risk for future CVD can be predicted from traditional cardiovascular risk factors, such as old age, male sex, hypertension, dyslipidemia, smoking, and diabetes mellitus, the determinants for the remaining 20% risk remain unclear.[10, 11] Therefore, it is vital to determine the risk of CVD and the variables that affect it and apply it in community health strategies.

Nowadays, one of the most common methods for predicting the occurrence of CVD is the 10-year ASCVD risk. Several guidelines for managing CVD and its risk factors, such as dyslipidemia, were published 3 decades ago according to the 10-year coronary heart disease or 10-year ASCVD risk because of the correlation between lipid profile and coronary heart disease/ASCVD.[12-15] The 10-year risk of ASCVD was assessed in individuals using pooled cohort equations.[16] Decreasing low-density lipoprotein-cholesterol levels produce marked reductions in ASCVD; therefore, managing high blood cholesterol is one of the pivotal components of the primary and secondary prevention of ASCVD.[13, 17]

Not only traditional risk factors, including dyslipidemia and diabetes mellitus, but also nontraditional risk factors can impact CVD. Hence, determining ASCVD risk and managing patients according to them should be considered to reduce CVD incidence. Nontraditional variables that are probably associated with ASCVD include marital status, ethnicity, educational level, tobacco and opiate usage, physical activity, and psychiatric disorders (eg, anxiety, depression, and insomnia).[9, 18-26] The assessment of the mentioned risk factors in populations with an elevated CVD risk may help correctly identify people at the highest risk and lead to appropriate preventative strategies.

The current study aimed to assess the association between nontraditional risk factors and the calculated 10-year ASCVD risk in a large Iranian general population.

Methods

The Pars Cohort Study is an ongoing prospective cohort study organized between 2012 and 2014 in the Valashahr district of Fars Province, located in Southern Iran, to identify the burden and significant risk factors for noncommunicable diseases among adults.[27] The district of Valashahr has an area of 1650 km^2 and consists of 5 counties and the city of Valashahr. The population of Valashahr is over 40 000 people. All 9721 residents of the district between 40 and 75 years old were invited during this period. Those who were unwilling to participate, as well as temporary residents, were excluded.

In addition to the aforementioned exclusion criteria of the Pars Cohort Study, the participants with an unacceptable range of total cholesterol (<130 mg/dL or >320 mg/dL), high-density lipoprotein-cholesterol (<20 mg/dL or >100 mg/dL), low-density lipoprotein-cholesterol (<30 mg/dL or >300 mg/dL), and systolic blood pressure (<90 mmHg or >200 mmHg) were excluded according to the 2013 AHA/ACC guideline on the Assessment of Cardiovascular Risk.[28] Also excluded were patients with a history of cardiovascular events, including coronary heart disease, cerebrovascular disease, peripheral arterial disease, rheumatic heart disease, congenital heart disease, deep vein thrombosis, and pulmonary embolism. Finally, 7152 participants were enrolled in this study after the exclusion of missing data (Figure 1). The participants were asked to visit the center while fasting, starting 12 hours previously. History taking, physical examinations, and laboratory tests, including lipid profile and fasting blood sugar, were performed while individual appointments were made.

The demographic and lifestyle data were collected using a validated questionnaire through an interview, which included age, gender, ethnicity (categorized as Fars, Turk,

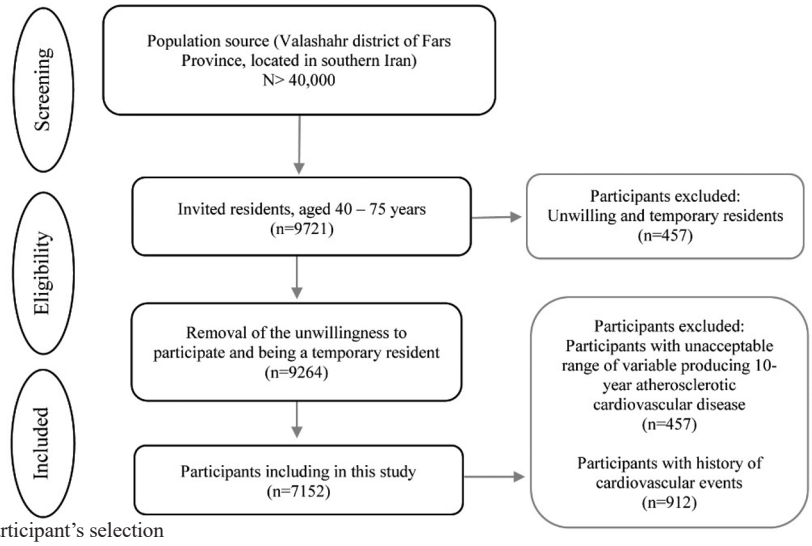

Figure 1. Flow chart of the participant's selection

and other minorities), educational level (classified as 3 levels: illiterate [unable to read or write], up to high school [considering primary school and high school together], and university education [considering college and graduate degree together]), marital status (categorized into married, and single [never-married, widower, and divorced]), and alcohol consumption. Tobacco (except cigarettes [pipes, hookahs, and naswar) consumers and opiate (teriak, heroin, sukhteh, and shireh) users were considered to be individuals with weekly usage of any kind of tobacco or opiate for at least 6 consecutive months at any point over the lifetime. Tobacco consumers, opiate users, cigarette smokers, and alcohol consumers were classified as never or ever-users.

Information regarding height; weight; waist and hip circumference (cm); systolic and diastolic blood pressures (mmHg), measured after 5 minutes of rest and twice from each arm with 10-minute intervals in a standard sitting position with a mercury sphygmomanometer and averaged; and pulse rate (bpm), was collected via simple physical examinations. An International Physical Activity Questionnaire was used to measure physical activity. The metabolic equivalent of the task score was computed for each participant and classified into 3 groups: low, medium, and high intensity.[29] The participants were asked, "Has your physician told you that you have a depression/anxiety/insomnia disorder and you need treatment for that during the last 12 months?". If their answer was in the affirmative, they were classified as having a recent history of depression/anxiety/insomnia. The race of all the participants was considered white.

Diabetes mellitus was defined as fasting blood glucose ≥126 mg/dL or 2-hour postprandial blood glucose ≥200 mg/dL or taking anti-diabetic medications.[30] Hypertension was defined as the mean systolic blood pressure ≥140 mmHg or the mean diastolic blood pressure ≥90 mmHg or the use of antihypertensive medications.[31] Renal failure or chronic kidney disease was defined based on the presence of kidney damage or a glomerular filtration rate <60 mL/min/1.73m^2 for ≥3 months at any time.[32] Body mass index (BMI), calculated as weight (kg) divided by the square root of height (meter), was grouped as underweight (BMI <18.5 kg/m^2), normal (18.5≤ BMI <25 kg/m^2), overweight (25≤ BMI <30 kg/m^2), and obese (BMI ≥30 kg/m^2) according to the World Health Organization recommendations.[33]

The 10-year risk of Hard ASCVD was assessed in the individuals using pooled cohort equations divided into 3 groups: low risk (<5%), borderline risk (5%–7.4%), and intermediate-to-high risk (≥7.5%).[34] In our population, those with a history of clinical ASCVD, diabetes mellitus, low-density lipoprotein-cholesterol ≥190 mg/dL, triglyceride ≥500 mg/dL, and the 10-year ASCVD risk ≥5% required treatment with lipid-lowering agents, especially statins.

All the participants provided written informed consent before their inclusion into the study, and the investigation conformed to the principles outlined in the 1975 Declaration of Helsinki. The study protocol was approved by the institutional ethics committees of Shiraz University of Medical Sciences and Tehran University of Medical Sciences.

Continuous data were described using the mean with the standard deviation (SD) or the median with 25th and 75th percentiles for variables with normal and skewed distributions, respectively. The normality of the variables was checked using histogram charts, descriptive measures, and the Kolmogorov test. Numbers and frequencies (%) were used to express categorical variables. The Brant test was applied to check the proportional odds assumption. Multinomial logistic regression analysis with robust variance estimation was utilized to evaluate the association between the covariates of interest and 10-year ASCVD. Crude and adjusted odds ratios (ORs) and 95% confidence intervals (CIs) were estimated. Multinomial logistic

regression analysis was utilized to assess the correlation between 10-year ASCVD and the nontraditional risk factors of CVD, including marital status, ethnicity, educational level, tobacco and opiate consumption, physical inactivity, depression, anxiety, and insomnia.

IBM SPSS Statistics for Windows, version 23.0 (Armonk, NY: IBM Corp) was employed to conduct all the statistical analyses. A *P* value <0.05 was considered statistically significant.

Results

Overall, 9264 invitees accepted to participate in the Pars Cohort Study (2012–2014). Of these, 7152 patients met the inclusion criteria and were enrolled in the final analysis. The average age was 51.5±8.7 years, and 3312 (46.3%) were men. In total, 4032 participants (56.4%) were ethnically Fars, and 3301 (46.2%) were illiterate. Hypertension (26.0%) was the most frequent conventional risk factor for ASCVD. Cigarette smokers, opiate users, and tobacco consumers comprised 20.2%, 7.6%, and 36.3% of the study population, respectively. The most frequent psychiatric disorder was anxiety (27.1%). The demographic and clinical characteristics of the participants are presented in Table 1 and Table 2.

The calculated 10-year ASCVD risk varied from 0.10% to 54.49% (25th percentile =0.79% and 75th percentile =5.13%). The proportions of persons at low, borderline, and intermediate-to-high 10-year ASCVD risks were 74.3%, 9.5%, and 16.2%, respectively. Eleven percent of the participants (782/7152) should have been treated with lipid-

Table 1. Categorical characteristics of the participants*

Variable	Total	Calculated 10-Year ASCVD Risk Group (n=7152)			*P***
		<5% 10-year ASCVD risk Low-risk group 5312 (74.3%)	5-7.49% 10-year ASCVD risk borderline-risk group n=680 (9.5%)	≥ 7.5% 10-year ASCVD risk intermediate-to-high risk group n=1160 (16.2%)	
Gender					
Male	3312 (46.3)	1967 (59.4)	474 (14.3)	871 (26.3)	<0.001
Female	3840 (53.7)	3345 (87.1)	206 (5.4)	289 (7.5)	
Marital Status					0.121
Single	743 (10.4)	529 (71.2)	77 (10.4)	137 (18.4)	
Married	6407 (89.6)	4782 (74.6)	602 (9.4)	1023 (16.0)	
Ethnicity					0.188
Other	347 (4.9)	272 (78.4)	28 (8.1)	47 (13.5)	
Fars	4032 (56.4)	3004 (74.5)	366 (9.1)	662 (16.4)	
Turk	2773 (38.8)	2036 (73.4)	286 (10.3)	451 (16.3)	
Educational Level					<0.001
Illiterate	3301 (46.2)	2250 (68.2)	354 (10.7)	697 (21.1)	
School	3617 (50.6)	2878 (79.6)	301 (8.3)	438 (12.1)	
University	229 (3.2)	181 (79.0)	24 (10.5)	24 (10.5)	
Cigarette smoker	991 (13.9)	484 (48.8)	181 (18.3)	326 (32.9)	<0.001
Tobacco consumer	2597 (36.3)	1887 (72.7)	248 (9.5)	462 (17.8)	0.023
Opium consumer	546 (7.6)	310 (56.8)	86 (15.8)	150 (27.5)	<0.001
Alcohol consumer	148 (2.1)	86 (58.1)	29 (19.6)	33 (22.3)	<0.001
Physical Activity					0.002
Low	2201 (30.8)	1594 (72.4)	217 (9.9)	390 (17.7)	
Intermediate	2387 (33.4)	1841 (77.1)	197 (8.3)	349 (14.6)	
High	2564 (35.9)	1877 (73.2)	266 (10.4)	421 (16.4)	
BMI (kg/m^2)					<0.001
<18.5	244 (3.4)	173 (70.9)	24 (9.8)	47 (19.3)	
18.5-24.99	2804 (39.4)	1971 (70.3)	309 (11.0)	524 (18.7)	
25-29.99	2742 (38.5)	2066 (75.3)	245 (8.9)	431 (15.7)	
>30	1330 (18.7)	1080 (81.2)	94 (7.1)	156 (11.7)	
Hypertension	1858 (26.0)	1116 (60.1)	204 (11.0)	538 (29.0)	<0.001
Antihypertensive drug	867 (12.1)	506 (58.4)	99 (11.4)	262 (30.2)	<0.001
Diabetes mellitus	615 (8.6)	308 (50.1)	69 (11.2)	238 (38.7)	<0.001
Renal failure	75 (1.0)	53 (70.7)	9 (12.0)	13 (17.3)	0.710
Anxiety	1940 (27.1)	1558 (80.3)	141 (7.3)	241 (12.4)	<0.001
Depression	1240 (17.3)	934 (75.3)	114 (9.)	192 (15.5)	0.645
Insomnia	1275 (17.8)	952 (74.7)	122 (9.6)	201 (15.8)	0.889

* Dates are presented as n (%).
**The Fisher exact test
ASCVD, Atherosclerotic cardiovascular disease; BMI, Body mass index

lowering agents, but only 14.4% (113/782) of this group received appropriate treatment (*P*<0.001).

The associations between nontraditional risk factors and 10-year ASCVD are shown in Table 3. Marital status was not significantly associated with the 10-year ASCVD risk. Fars ethnicity (aOR, 1.65; 95% CI, 1.18 to 2.29; *P*=0.003) was associated with the worst ASCVD risk. Illiteracy (aOR, 2.48; 95% CI, 1.59 to 3.86; *P*<0.001) was significantly associated with a high 10-year ASCVD risk. Intermediate physical activity was associated with a lower 10-year ASCVD risk, especially in a population with borderline risk for ASCVD (aOR, 0.79; 95% CI, 0.65 to 0.96; *P*=0.020). Moreover, anxiety (borderline risk: aOR, 0.58; 95% CI, 0.46 to 0.73; *P*<0.001 and intermediate-to-high risk: aOR, 0.58; 95% CI, 0.49 to 0.70; *P*<0.001) was significantly associated with a lower likelihood of ASCVD risk, whereas opiate consumption (borderline risk: aOR, 2.54; 95% CI, 1.96 to 3.30; *P*<0.001 and intermediate-to-high risk: aOR, 2.94; 95% CI, 2.37 to 3.64; *P*<0.001) was significantly related to a higher ASCVD risk. Furthermore, tobacco (aOR, 1.11; 95%

Table 2. Quantitative characteristics of the participants*

Variable	Total	Calculated 10-Year ASCVD Risk Group (N=7152)			P**
		<5% 10-year ASCVD risk low-risk group n=5312 (74.3%)	5- 7.49% 10-year ASCVD risk borderline-risk group n=680 (9.5%)	≥ 7.5% 10-year ASCVD risk intermediate-to-high risk group n=1160 (16.2%)	
Age (y)	51.51 (8.72)	48.27 (6.38)	56.82 (6.95)	63.2 (7.32)	<0.001
TG (mg/dL)	154.02 (89.27)	149.04 (86.38)	169.26 (93.79)	167.87 (96.88)	<0.001
Total cholesterol (mg/dL)	197.25 (36.23)	194.93 (35.72)	201.91 (35.71)	205.1 (37.5)	<0.001
HDL-C (mg/dL)	57.51 (12.23)	58.25 (12.23)	54.88 (11.95)	55.63 (11.95)	<0.001
LDL-C (mg/dL)	108.99 (29.96)	106.9 (29.43)	113.61 (29.48)	115.84 (31.28)	<0.001
FBS (mg/dL)	105.22 (35.97)	102.84 (31.27)	107.28 (36.66)	114.94 (50.89)	<0.001
SBP (mmHg)	113.33 (17.03)	110.29 (14.81)	116.77 (17.23)	125.25 (20.48)	<0.001
DBP (mmHg)	74.58 (10.78)	73.54 (10.25)	75.67 (11.18)	78.72 (11.81)	<0.001
Waist circumference (cm)	95.94 (7.93)	96.55 (8.06)	94.46 (7.21)	94.01 (7.29)	0.771
Hips circumference (cm)	95.94 (7.93)	96.55 (8.06)	94.46 (7.21)	94.01 (7.29)	<0.001
BMI (kg/m^2)	26.02 (4.62)	26.27 (4.67)	25.42 (4.58)	25.24 (4.24)	<0.001
10-year ASCVD risk (%), median [inrequantile range]	4.03 (5.21) 2.02 [0.79-5.13]	1.67 (1.30)	6.11 (0.74)	13.63 (6.26)	<0.001

*Date are presented as mean (SD).
**One-way ANOVA
TG, Triglycerides; TC, Total cholesterol; HDL-C, High-density lipoprotein-cholesterol; LDL-C, Low-density lipoprotein-cholesterol; FBS, Fasting blood sugar; SBP, Systolic blood pressure; DBP, Diastolic blood pressure; BMI, Body mass index; ASCVD, Atherosclerotic cardiovascular disease

Table 3. Correlates of nontraditional risk factors in the calculated-10 year ASCVD risk groups concerning the low-risk (<5%) group [5312 (74.3%)] according to multinomial regression analysis

	Borderline-Risk Group n=680 (9.5%)				Intermediate-to-High Risk Group n=160 (16.2%)			
	cOR (95% CI)	P	aOR (95% CI)	P	cOR (95% CI)	P	aOR (95% CI)	P
Marital Status								
Single vs Married	1.57 (0.90-1.49)	0.262	1.15 (0.89-1.50)	0.286	1.21 (0.99-1.48)	0.061	1.09 (0.89-1.35)	0.396
Ethnicity								
Fars vs other than Turk	1.18 (0.79-1.77)	0.413	1.49 (0.98-2.27)	0.061	1.27 (0.92-1.76)	0.137	1.65 (1.18-2.29)	0.003
Turk vs other than Fars	1.36 (0.91-2.05)	0.136	1.58 (1.04-2.40)	0.033	1.28 (0.92-1.78)	0.135	1.46 (1.05-2.04)	0.026
Education level								
School vs University	0.79 (0.51-1.23)	0.293	0.75 (0.48-1.17)	0.202	1.15 (0.74-1.78)	0.537	1.10 (0.71-1.72)	0.662
Illiterate vs University	1.19 (0.76-1.84)	0.446	1.20 (0.77-1.90)	0.413	2.34 (1.51-3.61)	<0.001	2.48 (1.59-3.86)	<0.001
Tobacco consumer	1.04 (0.88-1.23)	0.620	1.02 (0.86-1.21)	0.826	1.20 (1.05-1.37)	0.006	1.11 (0.96-1.27)	0.147
Opiate consumer	2.34 (1.81-3.01)	<0.001	2.54 (1.96-3.30)	<0.001	2.40 (1.95-2.95)	<0.001	2.94 (2.37-3.64)	<0.001
Physical Activity								
Intermediate vs High	0.75 (0.62-0.91)	0.005	0.79 (0.65-0.96)	0.020	0.84 (0.72-0.99)	0.034	0.89 (0.75-1.04)	0.139
Low vs High	0.96 (0.79-1.16)	0.681	1.00 (0.83-1.23)	0.934	1.09 (0.94-1.27)	0.266	1.15 (0.98-1.35)	0.089
Anxiety	0.63 (0.52-0.77)	<0.001	0.58 (0.46-0.73)	<0.001	0.63 (0.54-0.74)	<0.001	0.58 (0.49-0.70)	<0.001
Insomnia	1.00 (0.81-1.23)	0.990	1.04 (0.83-1.30)	0.721	0.96 (0.81-1.35)	0.632	0.96 (0.80-1.14)	0.634
Depression	0.94 (0.76-1.17)	0.597	1.20 (0.94-1.53)	0.151	0.93 (0.78-1.10)	0.401	1.15 (0.94-1.40)	0.165

The Brant test was used to check the proportional odds assumption (P value =0.2553).
ASCVD, Atherosclerotic cardiovascular disease; CI, Confidence intervals; aOR, Adjusted odds ratios; cOR, Crude odds ratio

CI, 0.96 to 1.27; *P*=0.147) had a statistically insignificant correlation with a higher ASCVD risk in patients with an intermediate-to-high 10-year ASCVD risk.

Discussion

The present study showed that three-quarters of the southern Iranian population had a low 10-year ASCVD risk, calculated using traditional risk factors. Moreover, this study illustrated that some nontraditional variables, such as opiate consumption, ethnicity, educational level, physical activity, and anxiety, were probably related to the calculated 10-year ASCVD risk. Opiate consumption and lower educational levels were the most potent nontraditional risk factors.

According to the results of 2 cohort studies, single participants were associated with a higher CVD risk[18, 35] than their married counterparts. In the present study, we did not find a statistically significant trend of high ASCVD risk in single participants compared with married ones.

South Asians have a higher CVD risk than Europeans and African Caribbeans.[19] A study by Abbasi et al[36] on the Iranian population demonstrated that Fars ethnicity had a lower vulnerability to coronary artery disease severity than Turk ethnicity (living in Azerbaijan provinces, Iran). However, our findings demonstrated that Fars ethnicity was associated with a higher aOR (1.65) than Turk ethnicity (living in Fars Province, Iran [aOR, 1.46]). This discrepancy can be attributed to genetic differences and environmental factors. This finding is in line with previous studies,[19, 36] either in developed or developing countries, which have also shown a disparity in CVD events among diverse ethnical groups.

The prevalence of illiteracy was noticeable (46.2%) in the Pars Cohort Study, perhaps due to the design of that study in a semi-urban area. We found that lower educational levels can increase cardiovascular risks. Chiming in with our findings, improved educational levels can produce better CVD outcomes.[37, 38]

Tobacco usage is a significant traditional risk factor for CVD and the leading preventable cause of death in this case.[39] Most tobacco consumption is related to cigarette smoking; nonetheless, we excluded cigarette smoking from tobacco consumption since cigarette smoking is a traditional factor and is considered in the 10-year ASCVD risk. Even though evidence for hookahs, pipes, and naswar is not as robust as the evidence for cigarette smoking, several studies have suggested that all 3 are risk factors for CVD.[20-22] The current study aimed to evaluate the association between ASCVD risk and tobacco usage (ie, hookahs, pipes, and Naswar). According to our univariate analysis, using tobacco had a borderline effect in the intermediate-to-high ASCVD risk group; still, this issue could not be confirmed in our multivariable analysis.

Opiate is regarded as the second most-commonly-used substance after tobacco in many developing Asian countries.[40] Old beliefs that opiates exert beneficial effects on CVD, in addition to easy access to opiates, are the likely causes of high opiate usage in Asia.[23, 41] Although the available evidence was controversial, it was suggested that opiates did not protect against CVD.[42, 43] In a prior study, opiate consumption raised cardiovascular death independent of the traditional risk factors.[44] Our results revealed that opiate consumption was significantly associated with higher ASCVD risks. Opiate usage is also deemed one of the most potent nontraditional risk factors for CVD.

The beneficial effects of physical activity on CVD have been well studied.[24] Each unit increase in the metabolic equivalent of the task score results in a 1.8% reduction in the 10-year ASCVD risk.[45] However, we found that low physical activity was not significantly associated with a higher 10-year ASCVD risk, while an intermediate level of physical activity could correlate with a lower 10-year ASCVD risk. This observation brings the hypothesis to mind that the best level of physical activity for the prevention of ASCVD is intermediate, not high, in the general population. Therefore, intermediate physical activity is suggested for persons with more than a 5% risk of calculated 10-year ASCVD, especially with a borderline risk of ASCVD.

Depression, anxiety, and short sleeping, especially when accompanied by poor quality of sleep, are associated with CVD incidence.[25, 26] Since this study identifies psychiatric disorders in patients based on their self-expression according to physicians' earlier diagnosis of psychiatric disorders, the results should be interpreted cautiously. Anxiety was the most prevalent psychiatric disorder and was significantly associated with a lower ASCVD risk. Thus, we hypothesized that anxiety in Iranian culture would lead to reduced high-risk behaviors and more medical investigations. On the other hand, insomnia and depression had no association with ASCVD risk. Iranians are usually reluctant to seek help from psychiatrists, partly because of the stigma attached to psychiatric illnesses.[46]

Only one-eighth of our study participants who needed cholesterol drug management were appropriately treated. This fact demonstrates the under-treatment of high cholesterol. This can be attributed to several baseline characteristics of our population, such as semi-urban life, educational level, and traditional beliefs. This finding, however, needs further investigation. Accordingly, preventive and therapeutic interventions should be revised accurately.

In conclusion, it is about time researchers considered opiate usage and educational level as valuable predictors of CVD, alongside the traditional risk factors, including age, diabetes mellitus, and cigarette smoking.

One of the limitations of our study is its observational design. Many confounding factors may have affected our results. The results should, therefore, be interpreted

cautiously and regarded as hypothesis-generating. In addition, several variables can influence cardiovascular outcomes based on our literature review and findings. The difference between the results of studies was caused by the variant methodology of studies and variables. Moreover, this study used a calculated 10-year ASCVD risk. Additional large-scale and long-term prospective studies at multiple centers are needed to determine the additional predictors of ASCVD accurately.

Conclusion

All in all, this study showed that Fars ethnicity, lower educational levels, and opiate usage were associated with a higher calculated 10-year ASCVD risk, whereas anxiety and intermediate physical activity correlated with a lower 10-year ASCVD risk. Accordingly, we suggest revising the prevention and treatment policies in the studied population, focusing on nontraditional risk factors alongside traditional risk factors. Further investigations are needed to evaluate the correlation between nontraditional risk factors and ASCVD in more extensive and diverse populations.

Acknowledgments

We wish to thank the participants and the staff of the Pars Cohort Study.

References

1. WHO. Cardiovascular Diseases [Internet]. Geneva: World Health Organization; c2021. https://www.who.int/health-topics/cardiovascular-diseases#tab=tab_2 (01 July 2022).
2. GBD 2015 Mortality and Causes of Death Collaborators. Global, regional, and national life expectancy, all-cause mortality, and cause-specific mortality for 249 causes of death, 1980-2015: a systematic analysis for the Global Burden of Disease Study 2015. Lancet 2016;388:1459-1544.
3. Mozaffarian D, Benjamin EJ, Go AS, Arnett DK, Blaha MJ, Cushman M, de Ferranti S, Després JP, Fullerton HJ, Howard VJ, Huffman MD, Judd SE, Kissela BM, Lackland DT, Lichtman JH, Lisabeth LD, Liu S, Mackey RH, Matchar DB, McGuire DK, Mohler ER 3rd, Moy CS, Muntner P, Mussolino ME, Nasir K, Neumar RW, Nichol G, Palaniappan L, Pandey DK, Reeves MJ, Rodriguez CJ, Sorlie PD, Stein J, Towfighi A, Turan TN, Virani SS, Willey JZ, Woo D, Yeh RW, Turner MB; American Heart Association Statistics Committee and Stroke Statistics Subcommittee. Heart disease and stroke statistics--2015 update: a report from the American Heart Association. Circulation 2015;131:e29-322.
4. Lozano R, Naghavi M, Foreman K, Lim S, Shibuya K, Aboyans V, Abraham J, Adair T, Aggarwal R, Ahn SY, Alvarado M, Anderson HR, Anderson LM, Andrews KG, Atkinson C, Baddour LM, Barker-Collo S, Bartels DH, Bell ML, Benjamin EJ, Bennett D, Bhalla K, Bikbov B, Bin Abdulhak A, Birbeck G, Blyth F, Bolliger I, Boufous S, Bucello C, Burch M, Burney P, Carapetis J, Chen H, Chou D, Chugh SS, Coffeng LE, Colan SD, Colquhoun S, Colson KE, Condon J, Connor MD, Cooper LT, Corriere M, Cortinovis M, de Vaccaro KC, Couser W, Cowie BC, Criqui MH, Cross M, Dabhadkar KC, Dahodwala N, De Leo D, Degenhardt L, Delossantos A, Denenberg J, Des Jarlais DC, Dharmaratne SD, Dorsey ER, Driscoll T, Duber H, Ebel B, Erwin PJ, Espindola P, Ezzati M, Feigin V, Flaxman AD, Forouzanfar MH, Fowkes FG, Franklin R, Fransen M, Freeman MK, Gabriel SE, Gakidou E, Gaspari F, Gillum RF, Gonzalez-Medina D, Halasa YA, Haring D, Harrison JE, Havmoeller R, Hay RJ, Hoen B, Hotez PJ, Hoy D, Jacobsen KH, James SL, Jasrasaria R, Jayaraman S, Johns N, Karthikeyan G, Kassebaum N, Keren A, Khoo JP, Knowlton LM, Kobusingye O, Koranteng A, Krishnamurthi R, Lipnick M, Lipshultz SE, Ohno SL, Mabweijano J, MacIntyre MF, Mallinger L, March L, Marks GB, Marks R, Matsumori A, Matzopoulos R, Mayosi BM, McAnulty JH, McDermott MM, McGrath J, Mensah GA, Merriman TR, Michaud C, Miller M, Miller TR, Mock C, Mocumbi AO, Mokdad AA, Moran A, Mulholland K, Nair MN, Naldi L, Narayan KM, Nasseri K, Norman P, O'Donnell M, Omer SB, Ortblad K, Osborne R, Ozgediz D, Pahari B, Pandian JD, Rivero AP, Padilla RP, Perez-Ruiz F, Perico N, Phillips D, Pierce K, Pope CA 3rd, Porrini E, Pourmalek F, Raju M, Ranganathan D, Rehm JT, Rein DB, Remuzzi G, Rivara FP, Roberts T, De León FR, Rosenfeld LC, Rushton L, Sacco RL, Salomon JA, Sampson U, Sanman E, Schwebel DC, Segui-Gomez M, Shepard DS, Singh D, Singleton J, Sliwa K, Smith E, Steer A, Taylor JA, Thomas B, Tleyjeh IM, Towbin JA, Truelsen T, Undurraga EA, Venketasubramanian N, Vijayakumar L, Vos T, Wagner GR, Wang M, Wang W, Watt K, Weinstock MA, Weintraub R, Wilkinson JD, Woolf AD, Wulf S, Yeh PH, Yip P, Zabetian A, Zheng ZJ, Lopez AD, Murray CJ, AlMazroa MA, Memish ZA. Global and regional mortality from 235 causes of death for 20 age groups in 1990 and 2010: a systematic analysis for the Global Burden of Disease Study 2010. Lancet 2012;380:2095-2128.
5. Roth GA, Mensah GA, Johnson CO, Addolorato G, Ammirati E, Baddour LM, Barengo NC, Beaton AZ, Benjamin EJ, Benziger CP, Bonny A, Brauer M, Brodmann M, Cahill TJ, Carapetis J, Catapano AL, Chugh SS, Cooper LT, Coresh J, Criqui M, DeCleene N, Eagle KA, Emmons-Bell S, Feigin VL, Fernández-Solà J, Fowkes G, Gakidou E, Grundy SM, He FJ, Howard G, Hu F, Inker L, Karthikeyan G, Kassebaum N, Koroshetz W, Lavie C, Lloyd-Jones D, Lu HS, Mirijello A, Temesgen AM, Mokdad A, Moran AE, Muntner P, Narula J, Neal B, Ntsekhe M, Moraes de Oliveira G, Otto C, Owolabi M, Pratt M, Rajagopalan S, Reitsma M, Ribeiro ALP, Rigotti N, Rodgers A, Sable C, Shakil S, Sliwa-Hahnle K, Stark B, Sundström J, Timpel P, Tleyjeh IM, Valgimigli M, Vos T, Whelton PK, Yacoub M, Zuhlke L, Murray C, Fuster V; GBD-NHLBI-JACC Global Burden of Cardiovascular Diseases Writing Group. Global Burden of Cardiovascular Diseases and Risk Factors, 1990-2019: Update From the GBD 2019 Study. J Am Coll Cardiol 2020;76:2982-3021.
6. Roth GA, Johnson C, Abajobir A, Abd-Allah F, Abera SF, Abyu G, Ahmed M, Aksut B, Alam T, Alam K, Alla F, Alvis-Guzman N, Amrock S, Ansari H, Ärnlöv J, Asayesh H, Atey TM, Avila-Burgos L, Awasthi A, Banerjee A, Barac A, Bärnighausen T, Barregard L, Bedi N, Belay Ketema E, Bennett D, Berhe G, Bhutta Z, Bitew S, Carapetis J, Carrero JJ, Malta DC, Castañeda-Orjuela CA, Castillo-Rivas J, Catalá-López F, Choi JY, Christensen H, Cirillo M, Cooper L Jr, Criqui M, Cundiff D, Damasceno A, Dandona L, Dandona R, Davletov K, Dharmaratne S, Dorairaj P, Dubey M, Ehrenkranz R, El Sayed Zaki M, Faraon EJA, Esteghamati A, Farid T, Farvid M, Feigin V, Ding EL, Fowkes G, Gebrehiwot T, Gillum R, Gold A, Gona P, Gupta R, Habtewold TD, Hafezi-Nejad N, Hailu T, Hailu GB, Hankey G, Hassen HY, Abate KH, Havmoeller R, Hay SI, Horino M, Hotez PJ, Jacobsen K, James S, Javanbakht M, Jeemon P, John D, Jonas J, Kalkonde Y, Karimkhani C, Kasaeian A, Khader Y, Khan A, Khang YH, Khera S, Khoja AT, Khubchandani J, Kim D, Kolte D, Kosen S, Krohn KJ, Kumar GA, Kwan GF, Lal DK, Larsson A, Linn S, Lopez A, Lotufo PA,

El Razek HMA, Malekzadeh R, Mazidi M, Meier T, Meles KG, Mensah G, Meretoja A, Mezgebe H, Miller T, Mirrakhimov E, Mohammed S, Moran AE, Musa KI, Narula J, Neal B, Ngalesoni F, Nguyen G, Obermeyer CM, Owolabi M, Patton G, Pedro J, Qato D, Qorbani M, Rahimi K, Rai RK, Rawaf S, Ribeiro A, Safiri S, Salomon JA, Santos I, Santric Milicevic M, Sartorius B, Schutte A, Sepanlou S, Shaikh MA, Shin MJ, Shishehbor M, Shore H, Silva DAS, Sobngwi E, Stranges S, Swaminathan S, Tabarés-Seisdedos R, Tadele Atnafu N, Tesfay F, Thakur JS, Thrift A, Topor-Madry R, Truelsen T, Tyrovolas S, Ukwaja KN, Uthman O, Vasankari T, Vlassov V, Vollset SE, Wakayo T, Watkins D, Weintraub R, Werdecker A, Westerman R, Wiysonge CS, Wolfe C, Workicho A, Xu G, Yano Y, Yip P, Yonemoto N, Younis M, Yu C, Vos T, Naghavi M, Murray C. Global, Regional, and National Burden of Cardiovascular Diseases for 10 Causes, 1990 to 2015. J Am Coll Cardiol 2017;70:1-25.

7. Assadi SN. Cardiovascular disorders risk factors in different industries of iran. Int J Prev Med 2013;4:728-33.
8. Alwan A. Global status report on noncommunicable diseases 2010: World Health Organization; 2011. https://apps.who.int/iris/handle/10665/44579 (01 July 2022).
9. Schultz WM, Kelli HM, Lisko JC, Varghese T, Shen J, Sandesara P, Quyyumi AA, Taylor HA, Gulati M, Harold JG, Mieres JH, Ferdinand KC, Mensah GA, Sperling LS. Socioeconomic Status and Cardiovascular Outcomes: Challenges and Interventions. Circulation 2018;137:2166-2178.
10. Wu Y, Liu X, Li X, Li Y, Zhao L, Chen Z, Li Y, Rao X, Zhou B, Detrano R, Liu K; USA-PRC Collaborative Study of Cardiovascular and Cardiopulmonary Epidemiology Research Group; China Multicenter Collaborative Study of Cardiovascular Epidemiology Research Group. Estimation of 10-year risk of fatal and nonfatal ischemic cardiovascular diseases in Chinese adults. Circulation 2006;114:2217-2225.
11. Grundy SM, D'Agostino RB Sr, Mosca L, Burke GL, Wilson PW, Rader DJ, Cleeman JI, Roccella EJ, Cutler JA, Friedman LM. Cardiovascular risk assessment based on US cohort studies: findings from a National Heart, Lung, and Blood institute workshop. Circulation 2001;104:491-496.
12. Arnett DK, Blumenthal RS, Albert MA, Buroker AB, Goldberger ZD, Hahn EJ, Himmelfarb CD, Khera A, Lloyd-Jones D, McEvoy JW, Michos ED, Miedema MD, Muñoz D, Smith SC, Jr, Virani SS, Williams KA Sr, Yeboah J, Ziaeian B. 2019 ACC/AHA Guideline on the Primary Prevention of Cardiovascular Disease: Executive Summary: A Report of the American College of Cardiology/American Heart Association Task Force on Clinical Practice Guidelines. J Am Coll Cardiol 2019;74:1376-1414.
13. Stone NJ, Robinson JG, Lichtenstein AH, Bairey Merz CN, Blum CB, Eckel RH, Goldberg AC, Gordon D, Levy D, Lloyd-Jones DM, McBride P, Schwartz JS, Shero ST, Smith SC, Jr, Watson K, Wilson PW; American College of Cardiology/American Heart Association Task Force on Practice Guidelines. 2013 ACC/AHA guideline on the treatment of blood cholesterol to reduce atherosclerotic cardiovascular risk in adults: a report of the American College of Cardiology/American Heart Association Task Force on Practice Guidelines. J Am Coll Cardiol 2014;63:2889-2934.
14. Mach F, Baigent C, Catapano AL, Koskinas KC, Casula M, Badimon L, Chapman MJ, De Backer GG, Delgado V, Ference BA, Graham IM, Halliday A, Landmesser U, Mihaylova B, Pedersen TR, Riccardi G, Richter DJ, Sabatine MS, Taskinen MR, Tokgozoglu L, Wiklund O; ESC Scientific Document Group. 2019 ESC/EAS Guidelines for the management of dyslipidaemias: lipid modification to reduce cardiovascular risk. Eur Heart J 2020;41:111-188.
15. Grundy SM, Cleeman JI, Merz CN, Brewer HB Jr, Clark LT, Hunninghake DB, Pasternak RC, Smith SC, Jr, Stone NJ; Coordinating Committee of the National Cholesterol Education Program. Implications of recent clinical trials for the National Cholesterol Education Program Adult Treatment Panel III Guidelines. J Am Coll Cardiol 2004;44:720-732.
16. Goff DC Jr, Lloyd-Jones DM, Bennett G, Coady S, D'Agostino RB Sr, Gibbons R, Greenland P, Lackland DT, Levy D, O'Donnell CJ, Robinson JG, Schwartz JS, Shero ST, Smith SC, Jr, Sorlie P, Stone NJ, Wilson PWF. 2013 ACC/AHA guideline on the assessment of cardiovascular risk: a report of the American College of Cardiology/American Heart Association Task Force on Practice Guidelines. J Am Coll Cardiol 2014;63:2935-2959.
17. Silverman MG, Ference BA, Im K, Wiviott SD, Giugliano RP, Grundy SM, Braunwald E, Sabatine MS. Association Between Lowering LDL-C and Cardiovascular Risk Reduction Among Different Therapeutic Interventions: A Systematic Review and Meta-analysis. JAMA 2016;316:1289-1297.
18. Alviar C, Rockman C, Guo Y, Adelman M, Berger J. Association of marital status with vascular disease in different arterial territories: a population based study of over 3.5 million subjects. J Am Coll Cardiol 2014;63:(12_Supplement) A1328.
19. Chaturvedi N. Ethnic differences in cardiovascular disease. Heart 2003;89:681-686.
20. Bhatnagar A, Maziak W, Eissenberg T, Ward KD, Thurston G, King BA, Sutfin EL, Cobb CO, Griffiths M, Goldstein LB, Rezk-Hanna M. Water Pipe (Hookah) Smoking and Cardiovascular Disease Risk: A Scientific Statement From the American Heart Association. Circulation 2019;139:e917-e936.
21. Streppel MT, Boshuizen HC, Ocké MC, Kok FJ, Kromhout D. Mortality and life expectancy in relation to long-term cigarette, cigar and pipe smoking: the Zutphen Study. Tob Control 2007;16:107-113.
22. Sajid F, Bano S. Effects of smokeless dipping tobacco (Naswar) consumption on antioxidant enzymes and lipid profile in its users. Pak J Pharm Sci 2015;28(5 Suppl):1829-33.
23. Roayaei P, Aminorroaya A, Vasheghani-Farahani A, Oraii A, Sadeghian S, Poorhosseini H, Masoudkabir F. Opium and cardiovascular health: A devil or an angel? Indian Heart J 2020;72:482-490.
24. Hamer M, O'Donovan G, Stamatakis E. Association between physical activity and sub-types of cardiovascular disease death causes in a general population cohort. Eur J Epidemiol 2019;34:483-487.
25. Hoevenaar-Blom MP, Spijkerman AM, Kromhout D, van den Berg JF, Verschuren WM. Sleep duration and sleep quality in relation to 12-year cardiovascular disease incidence: the MORGEN study. Sleep 2011;34:1487-1492.
26. Kyrou I, Kollia N, Panagiotakos D, Georgousopoulou E, Chrysohoou C, Tsigos C, Randeva HS, Yannakoulia M, Stefanadis C, Papageorgiou C, Pitsavos C; ATTICA Study investigators. Association of depression and anxiety status with 10-year cardiovascular disease incidence among apparently healthy Greek adults: The ATTICA Study. Eur J Prev Cardiol 2017;24:145-152.
27. Gandomkar A, Poustchi H, Moini M, Moghadami M, Imanieh H, Fattahi MR, Ayatollahi SM, Sagheb MM, Anushiravani A, Mortazavi R, Sepanlou SG, Malekzadeh R. Pars cohort study of non-communicable diseases in Iran: protocol and preliminary results. Int J Public Health 2017;62:397-406.
28. Lloyd-Jones DM, Huffman MD, Karmali KN, Sanghavi DM, Wright JS, Pelser C, Gulati M, Masoudi FA, Goff DC Jr. Estimating Longitudinal Risks and Benefits From Cardiovascular Preventive Therapies Among Medicare Patients: The Million Hearts Longitudinal ASCVD Risk Assessment Tool: A Special Report From the American Heart Association and American College of Cardiology. J Am Coll Cardiol 2017;69:1617-1636.
29. Ainsworth BE, Haskell WL, Leon AS, Jacobs DR Jr, Montoye HJ, Sallis JF, Paffenbarger RS Jr. Compendium of physical activities: classification of energy costs of human physical activities. Med Sci Sports Exerc 1993;25:71-80.
30. Executive summary: Standards of medical care in diabetes--2013. Diabetes Care 2013;36(Suppl 1):S4-10.
31. Williams B, Mancia G, Spiering W, Agabiti Rosei E, Azizi M, Burnier M, Clement DL, Coca A, de Simone G, Dominiczak A,

Kahan T, Mahfoud F, Redon J, Ruilope L, Zanchetti A, Kerins M, Kjeldsen SE, Kreutz R, Laurent S, Lip GYH, McManus R, Narkiewicz K, Ruschitzka F, Schmieder RE, Shlyakhto E, Tsioufis C, Aboyans V, Desormais I; ESC Scientific Document Group. 2018 ESC/ESH Guidelines for the management of arterial hypertension. Eur Heart J 2018;39:3021-3104.

32. National Kidney Foundation. K/DOQI clinical practice guidelines for chronic kidney disease: evaluation, classification, and stratification. Am J Kidney Dis 2002;39:S1-266.
33. Physical status: the use and interpretation of anthropometry. Report of a WHO Expert Committee. World Health Organ Tech Rep Ser 1995;854:1-452.
34. Grundy SM, Stone NJ, Bailey AL, Beam C, Birtcher KK, Blumenthal RS, Braun LT, de Ferranti S, Faiella-Tommasino J, Forman DE, Goldberg R, Heidenreich PA, Hlatky MA, Jones DW, Lloyd-Jones D, Lopez-Pajares N, Ndumele CE, Orringer CE, Peralta CA, Saseen JJ, Smith SC, Jr, Sperling L, Virani SS, Yeboah J. 2018 AHA/ACC/AACVPR/AAPA/ABC/ACPM/ADA/AGS/APhA/ASPC/NLA/PCNA Guideline on the Management of Blood Cholesterol: A Report of the American College of Cardiology/American Heart Association Task Force on Clinical Practice Guidelines. J Am Coll Cardiol 2019;73:e285-e350.
35. Chen R, Zhan Y, Pedersen N, Fall K, Valdimarsdóttir UA, Hägg S, Fang F. Marital status, telomere length and cardiovascular disease risk in a Swedish prospective cohort. Heart 2020;106:267-272.
36. Abbasi SH, Sundin Ö, Jalali A, Soares J, Macassa G. Ethnic Differences in the Risk Factors and Severity of Coronary Artery Disease: a Patient-Based Study in Iran. J Racial Ethn Health Disparities 2018;5:623-631.
37. Suhadi R, Virginia DM, Setiawan CH. The Effect of Health Education by Pharmacists on 10-Year Atherosclerotic Cardiovascular Disease Risk: A Cluster-Randomized Control Study in a Low Socioeconomic Status Javanese Population. J Prim Care Community Health 2018;9:2150132718773674.
38. Abbasi SH, De Leon AP, Kassaian SE, Karimi A, Sundin Ö, Jalali A, Soares J, Macassa G. Socioeconomic Status and in-hospital Mortality of Acute Coronary Syndrome: Can Education and Occupation Serve as Preventive Measures? Int J Prev Med 2015;6:36.
39. GBD 2015 Tobacco Collaborators. Smoking prevalence and attributable disease burden in 195 countries and territories, 1990-2015: a systematic analysis from the Global Burden of Disease Study 2015. Lancet 2017;389(10082):1885-1906.
40. Kulsudjarit K. Drug problem in southeast and southwest Asia. Ann N Y Acad Sci 2004;1025:446-57.
41. Farahani MA, Mohammadi E, Ahmadi F, Maleki M, Hajizadeh E. Cultural barriers in the education of cardiovascular disease patients in Iran. Int Nurs Rev 2008;55:360-366.
42. Nakhaee S, Ghasemi S, Karimzadeh K, Zamani N, Alinejad-Mofrad S, Mehrpour O. The effects of opium on the cardiovascular system: a review of side effects, uses, and potential mechanisms. Subst Abuse Treat Prev Policy 2020;15:30.
43. Omidi N, Sadeghian S, Salarifar M, Jalali A, Abbasi SH, Yavari N, Ghorashi SM, Alidoosti M, Poorhosseini H. Relationship between the Severity of Coronary Artery Disease and Cardiovascular Risk Factors in Acute Coronary Syndrome: Based on Tehran Heart Center's Data Registry. J Tehran Heart Cent 2020;15:165-170.
44. Nalini M, Shakeri R, Poustchi H, Pourshams A, Etemadi A, Islami F, Khoshnia M, Gharavi A, Roshandel G, Khademi H, Zahedi M, Abedi-Ardekani B, Vedanthan R, Boffetta P, Dawsey SM, Pharaoh PD, Sotoudeh M, Abnet CC, Day NE, Brennan P, Kamangar F, Malekzadeh R. Long-term opiate use and risk of cardiovascular mortality: results from the Golestan Cohort Study. Eur J Prev Cardiol 2021;28:98-106.
45. Tu R, Hou J, Liu X, Li R, Dong X, Pan M, Mao Z, Huo W, Chen G, Guo Y, Li S, Wang C. Physical activity attenuated association of air pollution with estimated 10-year atherosclerotic cardiovascular disease risk in a large rural Chinese adult population: A cross-sectional study. Environ Int 2020;140:105819.
46. Taghva A, Farsi Z, Javanmard Y, Atashi A, Hajebi A, Khademi M. Stigma Barriers of Mental Health in Iran: A Qualitative Study by Stakeholders of Mental Health. Iran J Psychiatry 2017;12:163-171.