

# Conventional Coronary Heart Disease Risk Factors in Shahedieh Cohort Population: Yazd, Central Part of Iran

**Ali deghani**

Shahid Sadoughi University of Medical Sciences and Health Services

**Habib Deghani Ashkezari** (✉ [habibdeghan125@gmail.com](mailto:habibdeghan125@gmail.com))

Shahid Sadoughi University of Medical Sciences and Health Services

**Hossein Fallahzadeh**

Shahid Sadoughi University of Medical Sciences and Health Services

**Mohammadhosein Soltani**

Shahid Sadoughi University of Medical Sciences and Health Services

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## Research Article

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# Abstract

**Background:** The prevalence of coronary heart disease (CHD) is increasing worldwide. The main purpose of this study was to investigate the prevalence of CHD and related risk factors in the population of Shahedieh cohort in Yazd, central Iran.

**Method:** This cross-sectional analytical study was performed on the data of the first phase of the Yazd Shahedieh cohort study, which started in 2016 and included about 10,000 people from the urban population of 35-70 years old in Yazd Shahedieh – Yazd, Iran. Descriptive statistics were used to describe the variables and Chi-square test and multiple binary logistic regression models were used for analysis by reporting the modified odds ratio. All analyzes were performed in SPSS 19 software with a significance level of 5%.

**Results:** The prevalence of the CHD was 8.08% (769 patients). The results of multiple binary logistic regression identified aging, low level of education, smoking, female gender, abnormal LDL, family history, diabetes and blood pressure as risk factors for CHD. The odds of getting CHD over the age of 60 was about 6 times than those aged 30-40, in the illiterate people it was about two times than the university. Smoking, family history, hypertension and diabetes increased the odds of getting CHD by 1.67, 1.59, 3.48 and 1.64. Smoking, family history, hypertension and diabetes increased the odds of getting CHD by 1.67, 1.59, 3.48 and 1.64, times than others, respectively.

**Conclusion:** The prevalence of the disease in Iran was relatively high. According to the effect size, the most important risk factors for the disease were age over sixty years and blood pressure.

## Background

Cardiovascular diseases are a major contributor to worldwide mortality, and the number of deaths from cardiovascular disease is increasing every year(1). According to the World Health Organization, in 2019, cardiovascular disease caused about 18 million deaths in the world, which is a 32% share of the world's total deaths (2). In addition to mortality, the burden of cardiovascular disease is increasing, so that the burden of cardiovascular disease has more than doubled from 1990 to 2019 (3).

One of the most important cardiovascular diseases is coronary heart disease, which is caused by blocked arteries and improper heart function. In Iran, coronary heart disease accounts for 46% of all deaths and 23% of the burden of disease (4). Estimation of the prevalence in various studies shows that the prevalence of coronary heart disease in the world was 1.72% (5), in Europe 3.5% (6), in Asia 1.44% (7) and in Iran 1.59% (8).

Identifying risk factors for heart disease and planning to change it is the most effective way to reduce heart disease mortality. Various epidemiological studies have listed several factors for the development of this disease, the most important of which are divided into two categories of modifiable and non-modifiable factors (1, 3, 9, 10): non-modifiable factors included age, patient gender, family history of heart

disease and patient ethnicity. Also, abnormal body mass index, underlying diseases such as hypertension, diabetes, hyperlipidemia, poor diet, poor lifestyle with low physical activity and the patient's anxiety and stress were introduced as modifiable risk factors for the disease.

Various studies have been performed to identify CHD risk factors in Iranian cities such as Tehran(4), Gilan(11), Sari(12), Mashhad(13), Isfahan(14), Shahrekord(15) and Yasouj(16). To the best of our knowledge there were no studies examining the risk factors for coronary heart disease in Yazd, central part of Iran. Therefore, the aim of this study was to estimate the prevalence of CHD and identify its risk factors based on the data from the Shahdieh cohort in central part of Iran.

## Methods

The data used in this study were extracted from the first phase of Shahdieh cohort, which was one of the prospective epidemiological studies in Iran in Yazd, whose enrollment and data collection had started in 2016. Inclusion criteria include age (35 to 70 years), gender (both sexes), people without cardiovascular disease and exclusion criteria include: heart attack/ myocardial infarction, migration, death, age under 35 and over 70 years.

Data were collected through self-reporting and face-to-face interviews with participants. Study variables include age, gender, level of education, marital status, economic status, smoking, waist to hip ratio, waist to height ratio, waist circumference, cholesterol level, triglyceride level, HDL, LDL, Dyslipidemia, family history, diabetes, hypertension, having or not having physical activity, and body mass index (BMI).

According to the guidelines of the WHO and literature review, the study variables were graded as follows: WHR: abnormal (men $>0.9$  and women  $>0.85$ ), normal (men $\leq 0.9$  and women  $\leq 0.85$ ); WHtR : normal ( $<0.5$ ), abnormal ( $\geq 0.5$ ); WC: normal (men $<102$  and women $<88$ ), abnormal( men $\geq 102$  and women  $\geq 88$ ); HDL: normal (men $\geq 40$  and women  $\geq 50$ ), abnormal (men $<40$  and women $<50$ ); LDL-C: normal( $<130$ ), abnormal ( $>130$ ).

Frequency and percentage were used to describe qualitative variables and mean and standard deviation (SD) were used for quantitative variables. To compare the prevalence of CHD in terms of demographic and anthropometric variables, Chi-square test and to investigate the relationship between demographic and anthropometric variables with or without heart CHD, multiple binary logistic regression were used so that with controlling the effect of other variables for each variable adjusted odds ratio (OR) and 95% confidence interval were provided. All analyzes were performed in SPSS 19 (SPSS Inc., Chicago, Illinois, USA) software with considering a significance level of 5%.

## Results

Data of 9521 people with mean (SD) of age equal to 47.69 (9.62) were used. 50.03% (4763 people) were men, 95.75% (9116 people) married, 33.11% (2992 people) at age of 41 to 50 years old, 22.47% (2139 people) smoke cigarette, 60.78% (5787 people) had a family history of coronary artery disease, 18.10%

(1723 people) had diabetes, 21.29% (2027 people) hypertensive, 8.08 % (769 patients) had coronary heart disease (Table 1). The mean (SD) age of CHD patients was 55.82 (8.54).

Table 1  
Description Of Patient Characteristics

Variables	Levels	N	percent%
Marital status(9520)	Single-widow-divorce	404	(4.24)
	Married	9116	(95.75)
Age no: (9520)	30-40	2766	(29.05)
	41-50	3152	(33.11)
	51-60	2462	(25.86)
	61-70	1140	(11.97)
Education level(9519)	Illiterate	1570	(16.49)
	Primary school	2992	(31.43)
	Middle school	1589	(16.69)
	High school	1896	(19.91)
	University/college	1472	(15.46)
Social Economic Status (9484)	Low	3547	(37.25)
	Medium	4444	(46.68)
	High	1493	(15.68)
Smoking cigarette (9511)	Yes	2139	(22.47)
	No	7372	(77.43)
Waist to hip ratio(WHR) (9520)	Normal	1675	(17.59)
	Abnormal	7845	(82.40)
Waist to height ratio(WHtR) (9520)	Normal	1466	(15.40)
	Abnormal	8054	(84.59)
Waist Circumference (WC)(9520)	Normal	4477	(47.02)
	Abnormal	5044	(52.98)

WHR: ab-normal (men>0.9 and women >0.85), normal (men≤0.9 and women ≤0.85)

WHtR: normal (<0.5), abnormal (≥0.5); WC: normal (men<102 and women<88), ab normal (men≥102 and women ≥88)

HDL: normal (men≥40 and women ≥50), ab normal (men<40 and women<50)

LDL-C: normal (<130), ab normal (>130)

<b>Variables</b>	<b>Levels</b>	<b>N</b>	<b>percent%</b>
Gender (9520)	Male	4763	(50.03)
	Female	4757	(49.96)
Cholesterol (9520)	Abnormal	966	(10.15)
	Normal	8554	(89.84)
TG (mg/dl) (9520)	Abnormal	2438	(25.61)
	Normal	7082	(74.38)
HDL-C (mg/dl) (9520)	Abnormal	472	(4.96)
	Normal	9048	(95.03)
LDL-C (mg/dl) (9398)	Abnormal	1891	(19.86)
	Normal	7507	(78.85)
Dislepidemia (9517)	Yes	3924	(41.21)
	No	5593	(58.74)
Family History (9521)	Yes	5787	(60.78)
	No	3730	(39.18)
Diabetic (9517)	Yes	1723	(18.10)
	No	7794	(81.86)
High Blood Pressure (9517)	Yes	2027	(21.29)
	No	7490	(78.67)
CHD (9517)	Yes	769	(8.08)
	No	8748	(91.88)
Physical activity (9520)	Yes	8549	(89.79)
	No	971	(10.20)
BMI (kg/m2)	<25	2255	(23.68)
WHR: ab-normal (men>0.9 and women >0.85), normal (men≤0.9 and women ≤0.85)			
WHtR: normal (<0.5), abnormal (≥0.5); WC: normal (men<102 and women<88), ab normal (men≥102 and women ≥88)			
HDL: normal (men≥40 and women ≥50), ab normal (men<40 and women<50)			
LDL-C: normal (<130), ab normal (>130)			

Variables	Levels	N	percent%
	25-30	4070	(42.75)
	>30	3196	(33.57)
WHR: ab-normal (men>0.9 and women >0.85), normal (men≤0.9 and women ≤0.85)			
WHtR: normal (<0.5), abnormal (>=0.5); WC: normal (men<102 and women<88), ab normal (men≥102 and women ≥88)			
HDL: normal (men≥40 and women ≥50), ab normal (men<40 and women<50)			
LDL-C: normal (<130), ab normal (>130)			

The prevalence of CHD in terms of demographic and anthropometric variables showed disease was more prevalent in the age of over sixty years (21.2%), in illiterate people (17.6%), in smokers (11.2%), in diabetic patients (18.5%), in patients with hypertension (22.4%), in men (8.7%) and in women (7.5%), in BMI level higher than 30 (9%) and in individuals with family history (9%) (Table 2).

Table 2  
Demographic and anthropometric variables relation with CHD prevalence

Variables	levels	Non-CHD		CHD		P*
		N	%	N	%	
Marital state	Single-widow-divorce	369	91.3	35	8.7	0.661
	Married	8347	91.9	769	8.1	
Age	30-40	2723	98.4	43	1.6	<0.001
	40-50	3005	95.3	147	4.7	
	50-60	2122	86.3	337	13.7	
	>60	898	78.8	242	<b>21.2</b>	
Educational level	University/college	1405	95.4	67	4.6	<0.001
	illiterate	1294	82.4	276	<b>17.6</b>	
	Primary school	2728	91.2	262	8.8	
	Middle school	1520	95.7	69	4.3	
	High school	1800	95	95	5	
Social Economic status	High	1334	89.4	158	<b>10.6</b>	<0.001
	Low	3292	92.8	254	7.2	
	Moderate	4088	92	355	8	
Smoke Cigarette	Yes	1899	88.8	239	<b>11.2</b>	<0.001
	No	6842	92.8	528	7.2	
WHR	Abnormal	7139	91	703	<b>9</b>	<0.001
	Normal	1609	96.1	66	3.9	
Whtr	Ab normal	7354	91.3	697	<b>8.7</b>	<0.001
	Normal	1394	95.1	72	4.9	

\* Chi square test

WHR: Ab -normal (men>0.9 and women >0.85), normal (men≤0.9 and women ≤0.85)

Whtr: normal (<0.5), ab normal (≥0.5); WC: normal (men<102 and women<88), ab normal (men≥102 and women ≥88)

HDL: normal (men≥40 and women ≥50), ab-normal (men<40 and women<50)

LDL-C: normal (<130), ab normal (>130)

WC (cm)	Abnormal	4590	91	453	<b>9</b>	0.001
	Normal	4158	92.9	316	7.1	
Gender	Male	4347	91.3	414	<b>8.7</b>	0.028
	Female	4401	92.5	355	7.5	
Cholesterol	Abnormal	900	93.3	65	6.7	0.106
	Normal	7848	91.8	704	8.2	
TG (mg/dl)	Abnormal (>150)	2216	91	220	<b>9</b>	0.046
	Normal (<150)	6532	92.2	549	7.8	
HDL-C (mg/dl)	Abnormal	427	90.5	45	9.5	0.235
	Normal	8321	92	724	8	
LDL-C (mg/dl)	Abnormal	1578	94	313	6	<0.001
	Normal	7065	91.4	448	<b>8.6</b>	
Dislipidemia	Yes	3607	92	315	8	0.878
	No	5138	91.9	454	8.1	
Family History	Yes	5264	91	521	<b>9</b>	<0.001
	No	3482	93.4	248	6.6	
Diabetic	Yes	1404	81.5	319	<b>18.5</b>	<0.001
	No	7344	94.2	450	5.8	
Hypertensive	Yes	1572	77.6	455	<b>22.4</b>	<0.001
	No	7176	95.8	314	4.2	
Physical activity	Yes	7865	92	682	8	0.284
	No	883	91	87	9	
BMI (kg/m <sup>2</sup> )	<25	2116	93.8	139	6.2	<0.001
	25-30	3741	92	325	8	

\* Chi square test

WHR: Ab -normal (men>0.9 and women >0.85), normal (men≤0.9 and women ≤0.85)

WHtR: normal (<0.5), ab normal (≥0.5); WC: normal (men<102 and women<88), ab normal (men≥102 and women ≥88)

HDL: normal (men≥40 and women ≥50), ab-normal (men<40 and women<50)

LDL-C: normal (<130), ab normal (>130)

>30	2891	90.5	305	<b>9.5</b>
* Chi square test				
WHR: Ab -normal (men>0.9 and women >0.85), normal (men≤0.9 and women ≤0.85)				
WHtR: normal (<0.5), ab normal (≥0.5); WC: normal (men<102 and women<88), ab normal (men≥102 and women ≥88)				
HDL: normal (men≥40 and women ≥50), ab-normal (men<40 and women<50)				
LDL-C: normal (<130), ab normal (>130)				

The results of multiple binary logistic regression showed that the odds of getting CHD in the age group over 60 years, 50-60 old years, and 40-50 old years was about 6 times, 4.45 times and 2.10 times than those 30-40 old years, respectively, illiterate and primary school 1.73 and 1.43 times than university or college educational level, respectively, cigarette smoking about 1.67 times than non-smokers, people with abnormal LDL-C about 1.65 times than those with normal level of LDL-C, people with family history of CHD 1.59 times than those without family history, diabetic people 1.64 times than non diabetic individuals, hypertensive peoples 3.48 times than healthy individuals, female about 1.20 times than male (Table 3).

Table 3

Results of multiple logistic regression in assessing CHD risk factors in Shahedieh cohort population

Variables	levels	Sig.	OR	95% CI for OR	
				Lower	Upper
Marital state	Single-widow-divorce	.793	1		
	Married		1.053	.714	1.555
Age	30-40	Ref.	1		
	40-50	<0.001	2.107	1.469	3.022
	50-60	<0.001	4.456	3.119	6.368
	>60	<0.001	5.891	3.968	8.745
Educational level	University/college	Ref.	1		
	Illiterate	.001	1.734	1.235	2.434
	primary school	.022	1.435	1.054	1.953
	Middle school	.829	.960	.665	1.387
	High school	.611	1.093	.776	1.541
Social Economic Status	High	Ref.	1		
	Low	.572	.949	.792	1.138
	Moderate	.843	1.024	.813	1.288
Smoke Cigarette	Yes	<0.001	1.668	1.338	2.079
	No	Ref.	1		
Waist to Hip ratio	abnormal	.740	.946	.682	1.313
	Normal	Ref.	1		
Waist to Height ratio	abnormal	.229	1.227	.879	1.714
	Normal	Ref.	1		
Waist Circumference (cm)	abnormal	.896	.986	.796	1.221

WHR: abnormal (men>0.9 and women >0.85), normal (men≤0.9 and women ≤0.85)

WHtR: normal (<0.5), abnormal (≥0.5); WC: normal (men<102 and women<88), abnormal (men≥102 and women ≥88)

HDL: normal (men≥40 and women ≥50), abnormal (men<40 and women<50)

LDL-C: normal (<130), abnormal (>130)

	Normal	Ref.	1		
Gender	Female	.011	1.19	1.018	1.369
	Male	Ref.	1		
Cholesterol	abnormal	.520	.883	.603	1.291
	Normal	Ref.	1		
TG (mg/dl)	Non-normal (>150)	.563	1.115	.771	1.613
	Normal (<150)	Ref.	1		
HDL-C (mg/dl)	abnormal	.395	.839	.561	1.256
	Normal	Ref.	1		
LDL-C (mg/dl)	abnormal	.021	1.646	1.077	2.515
	Normal	Ref.	1		
Dyslipidemia	Yes	.753	.936	.619	1.414
	No	Ref.	1		
Family History	Yes	<0.001	1.594	1.344	1.891
	No	Ref.	1		
Diabetic	Yes	<0.001	1.644	1.378	1.960
	No	Ref.	1		
Hypertension	Yes	<0.001	3.480	2.913	4.158
	No	Ref.	1		
Physical activity	Yes	.300	.870	.669	1.132
	No	Ref.	1		
BMI (kg/m <sup>2</sup> )	<25	Ref.	1		
	25-30	0.301	1.062	.807	1.396
	>30	0.668	1.183	.861	1.626
<p>WHR: abnormal (men&gt;0.9 and women &gt;0.85), normal (men≤0.9 and women ≤0.85)</p> <p>WHtR: normal (&lt;0.5), abnormal (≥0.5); WC: normal (men&lt;102 and women&lt;88), abnormal (men≥102 and women ≥88)</p> <p>HDL: normal (men≥40 and women ≥50), abnormal (men&lt;40 and women&lt;50)</p> <p>LDL-C: normal (&lt;130), abnormal (&gt;130)</p>					

## Discussion

Heart disease is an important part of the problems of health systems worldwide, which is spreading rapidly in both developed and developing countries and is considered as the most important cause of death(1). The aim of this study was to determine the prevalence of common risk factors for coronary heart disease in the population aged 30-70 years in Yazd.

Results of our study showed that the prevalence of CHD was 8.08%. A study by Ghaemian et al. 2020 estimated the prevalence of CHD in Iran and in the city of Sari to be 9%, which is in line with our study(12). Our results also showed that the highest prevalence of CHD was in older patients especially in the age range of 50 to 60 years and most often in men. So the risk of coronary heart disease was about 6 times higher in people over 60 than those in range of 30-40 years. Ghaemian et al. 2020 showed that the risk of CHD at the age of 60 years was about 10.5 times higher than the age group 40-49 year (12). Kazemi et al. 2017(17), Hedaegh et al. 2009(18), Janghorbani 2006(19), Wong 2018 (20)all acknowledged that aging is directly related to the incidence of CHD.

Consistent with our findings, the 2017 study by Bots et al.(21) showed that the prevalence of disease and mortality was higher in men than women and this difference in prevalence at older ages was significant. Ahmari et al. 2017 in their study in Saudi Arabia also showed that the prevalence of CHD was significantly related to age and gender (22), so that the prevalence of the disease was twice as high in men than women. In other studies that calculated the risk of CHD, men were at higher risk than women (4, 23–25).

The result of Chi-square test in our study showed that the prevalence of the CHD was significantly different in education levels, so that the highest prevalence of the disease was in illiterate people with 17.6%. In 2019, Alquins et al. in study of 2,997 heart patients in Saudi Arabia declared that low education as factors associated with CHD prevalence(23). Nakhaei et al. 2018 in their study on Iranian population emphasized that people with higher education have a lower risk of CHD(16).

Iran's population is changing and aging in the meantime. Diabetes is one of the diseases that is increasing. The results of the study showed that the prevalence of CHD is associated with diabetes. Other studies have acknowledged this (10, 26, 27).

High blood pressure is a major factor in heart disease. STEP 2016 study(28), Nelwan et al. study in 2017(29), which examined cardiovascular risk factors in Indonesia, identified blood pressure as a major risk factor. In the present study, the prevalence of CHD was associated with high blood pressure, so that 22.4% of the prevalence of the disease was seen in people with high blood pressure.

Increased BMI is directly related to the risk of cardiovascular disease (Azarnejad et al. In 2020 stated that high body mass index is the cause of 18.8% of deaths in Iran (10). In the study of Kazemi et al. 2018 in Iran, age, gender and BMI was associated with CHD (17). Other studies have suggested a close association between cardiovascular disease and BMI (13, 14, 30, 31).

The findings of our study showed that there is a significant relationship between family history and the prevalence of CHD. In line with the present study, Wang et al. 2019 examined the risk factors associated with CHD in women and stated that family history is also a risk factor for the disease (20).

The results of MLR in the present study showed that age, education, gender, smoking, LDL-C, family history, diabetes, blood pressure are risk factors for CHD. The odds of getting CHD over the age of 60 was about 6 times than those aged 30-40, in the illiterate people it was about two times than the university education level. Smoking, family history, hypertension and diabetes increased the odds of getting CHD by 1.67, 1.59, 3.48 and 1.64, times than others, respectively. Ghaemian et al. 2020 in the study of factors related to CHD, age, drug use, low physical activity, diabetes, hypertension, abnormal amounts of HDL and LDL and total cholesterol and triglycerides as risk factors for the disease (12). Most studies in the field of CHD agree on the risk factors of age, diabetes, and blood pressure (4, 6, 16, 20, 23). In the present study, these three factors are also among the identified risk factors.

One of the limitations of this study is generalizability because the population studied in this study includes the population of 30 to 70 years in the city of Yazd in central Iran may not be generalizable to the entire population of Iran. Another limitation can be the lack of trust and honesty of the respondents about the questions. To solve this problem, the questioner tried to establish a close relationship with the respondents and assure them that your answers will not be abused in any way.

One of the strengths of this study is the relatively high sample size and many recorded parameters that can provide a good picture of the overall CHD in Yazd. Another advantage of this study was the relatively small amount of missing data, which was minimized by sufficient experience of experts in the study collection phase.

## Conclusion

The prevalence of the disease in Iran was relatively high. In the present study, the identified risk factors for CHD included age, low education, smoking, female gender, LDL, family history, diabetes, and hypertension. According to the effect size, the most important risk factors for the disease were age over sixty years and blood pressure. Due to the aging population of Iran and the increasing prevalence of diseases such as hypertension and diabetes, the probability of increasing heart disease such as CHD is high, so it is necessary for health system and the Ministry of Health to pay special attention to heart diseases and with sufficient awareness reduce their incidence in the future.

## Declarations

**Ethics approval and consent to participate:** The article's proposal was approved by the ethics committee of Yazd University of Medical Sciences with the ID of IR.SSU.REC.1398.090. Due to the retrospective nature of the study, no study specific consent form was used. We received administrative permission from (Secretary of University/Regional Research Ethics Committee, Yazd University of Medical Sciences)

to access and use the data. Data used in the study were anonymized. The ethics committee approved this procedure with the above ethical code. The present study was conducted in terms of the principles of the revised Declaration of Helsinki, which waived requirement for informed consent.

**Consent for publication:** Not applicable.

**Availability of data and material:** The data-sets used and/or analyzed during the current study available from the corresponding author on reasonable request.

**Competing interests:** All authors declare that they have no conflict of interest regarding this study.

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**Authors' contributions:** H.D and A.D have designed the study and supervised the thesis. H.F AND M.S collected the data and analyzed it. They also prepared the first draft of the manuscript. A.D AND M.S has edited and finalized the manuscript. All authors read the manuscript and approved it.

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