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Risk factors associated with cardiovascular diseases in Turkey: Evidence from National Health Survey

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ABSTRACT

Background: Cardiovascular diseases (CVDs), their causes and the precautions that can be taken have been studied by researchers from different fields and countries. Evidence from this wide literature suggest a close relationship between socio-economic factors and risk of CVDs.
Objectives: The main aim of this study is to understand the main socio-economic determinants and risk factors associated with CVDs in Turkey.
Methods: For such purpose, we perform a univariate logistic analysis using the 2016 Health Survey conducted by the Turkish Statistical Institute. Using this novel data set, we identify the risk factors of chronic heart disease with several demographic and socio-economic factors such as age, sex, education, income, alcohol and tobacco consumption, eating and exercise habits.
Results: Our results indicate socio-economic status and demographic factors and individual characteristics are significant in terms of CVDs in Turkey. While socio-economic inequalities, baseline illnesses, and smoking are related with higher risk of CVDs, regular exercise, physical activity and moderate alcohol consumption are found to be related with lower risk of CVDs. Furthermore, gender plays an important and independent role on all socio-economic characteristics as well as any baseline illness.
Conclusions: This study offers to fill the gap in the existing literature by offering a comprehensive analysis of socio-economic determinants and risk factors associated with CVDs in Turkey. Examining the risk factors for CVDs for all individuals and for men and women separately is informative to design policies in a more efficient way by addressing specific target groups.

Introduction

In recent years, cardiovascular diseases (CVDs), their causes and the precautions that can be taken have been studied by researchers from different fields and countries. Evidence from this wide literature suggest a close relationship between socio-economic factors and risk of CVDs [1].

Global data indicates that CVDs are responsible for the death of 17.7 million people, corresponding to almost 31% of all deaths. Evidence further indicates an increasing trend for CVDs closely related to raised blood pressure levels, elevated glucose and cholesterol levels, overweight and obesity as well as lifestyle choices such as dietary habits, smoking and alcohol consumption [2,3]. The majority of cardiovascular events are in fact predictable. However, the lack of risk-factor awareness is a major barrier in the management of CVDs, which is an important step for improving risk factor modification and population-based prevention of CVDs [4].

Focusing on these evidence, the WHO initiated a global action plan in order to fight non-communicable diseases including CVDs. Decreasing tobacco and alcohol consumption, maintain a heathy diet and a physically active life style are the main components of this global action plan [5].

Since 2003, Turkey has also taken important steps with regard to the prevention of chronic diseases in the national level with the Health Transformation Program (HTP). Many initiatives have been undertaken to improve the indicators of healthy living under the heart health policy section of this ongoing program, such as campaigns against obesity and the use of tobacco products. “Health Promotion and Improvement Department” and “Non-communicable Diseases and Chronic Conditions Department” were established within the General Directorate Primary Health Care Services and started their activities in accordance with the Ministerial Approval [6]. Further, many civil society organizations like Turkish Society of Cardiology are involved in awareness raising activities in Turkey. Data from Turkish Statistical Institute (TurkStat)

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Table 1
Coronary heart disease prevalence.

	Frequency	Percent
Individuals without any diagnosed chronic heart disease	15,824	91.78
Individuals with diagnosed chronic heart disease	1418	8.22
Total	17,242	100

shows an upward trend in the share of heart disease in total deaths similar with the global trend. Cardiovascular diseases accounted for almost 40% of deaths as of 2014. Of the deaths due to circulatory system diseases, 39.6% were caused by ischemic heart disease, 24.7% by cerebrovascular disease, 18.8% by other cardiac diseases and 11.6% by hypertensive diseases. When the causes of death were examined by age groups, circulatory system diseases were mostly observed in the age group of 75–84 years [7].

Global evidence also indicates that socio-economic status is also an important factor affecting CVDs directly and indirectly. Any country that wishes to maintain a higher quality of life for its citizens and at the same time to decrease the burden of CVDs and related deaths is looking for invasive policy designs [8].

In order to achieve this goal, periodic assessments of risk factors and the effects of socio-economic factors on CVDs are of great importance [9,10]. However it is possible to argue that a nationally representative study regarding the socio-economic determinants and risk factors for CVDs is missing for Turkey. The aim of this study is to understand the main socio-economic determinants and risk factors associated with CVDs in Turkey, filling the gap in the literature. For this aim, we perform a univariate logistic analysis using the 2016 Health Survey conducted by TurkStat. This nationally representative survey yields information regarding individual specific information on demographic and health characteristics.

Data and methodology

This study employs the 2016 “Health Survey”. Health Surveys are conducted by TurkStat every 2 years and 2016 is the latest survey available. The data set covers all settlements of the Republic of Turkey and all the individuals living in Turkey, excluding institutional population such as soldiers, individuals living in prison, dormitories or homes for the elderly. Further, small villages with a population lower than 20 are excluded. The data set is stratified and two step cluster sampling methodology is used. 9470 household addresses are selected and surveyed in order to collect information regarding health indicators. The total number of observations in the data set is 23,606. This study uses information regarding individuals older than 15 years of age, dropping the total number of observations to 17,242.

In order to analyze the prevalence and odds ratios of coronary heart disease this study uses the below two questions available in the survey:

- Did you experienced myocardial infarct within the past 12 months, diagnosed by a physician?
- Did you experienced any coronary heart disease within the past 12 months, diagnosed by a physician such as chest pain, spasms or angina?

As summarized in Table 1, 8.22% of the individuals have suffered from coronary heart disease within the past 12 months of the survey year.

Table 2 presents the variables and their descriptions used in this study. The covariates used in this study are grouped as individual characteristics, diagnosed health problem, healthy lifestyle indicators and perceived health.

There is ample evidence linking CVDs to individual characteristics such as age, education, income group, employment status and gender [1,11,12]. Associated risk factors such as tobacco and alcohol consumption, lack of physical activity and maintaining an unhealthy diet are also main determinants of coronary heart diseases as evidence suggests [12–15]. Furthermore, baseline illnesses such as high levels of cholesterol, hypertension, diabetes and high BMI are interlinked risk factors for CVD's [16,17].

Unfortunately, Health Surveys do not offer data regarding cholesterol levels of individuals. As Table 2 summarizes, information regarding hypertension, BMI levels and diabetes of individuals are used in combination to form a composite variable in this study.

Gender plays an important and independent role in all socio-economic characteristics as well as any baseline illness and health behavior of individuals. Existing literature indicates we should expect differences among most of the covariates used in this study such as smoking behavior, alcohol consumption, physician visits [18–20]. Therefore, this study employs a logistic regression to assess the odds ratios of coronary heart disease against several demographic, socio-economic and health covariates for all individuals and also for men and women separately.

Results

Table 3 represents the results of the logistic regression employed to determine the risk factors associated with coronary heart disease in Turkey.

Full sample results indicate that women have a higher risk for coronary heart disease in Turkey. Furthermore, the risk increases with age and is at its highest for individuals older than 65. Education decreases the risk of coronary heart disease with the exception of higher than university education. Table 3 indicates that individuals with masters or Ph.D. degrees are more likely to suffer from coronary heart disease compared to illiterate individuals. Furthermore, employed individuals have lower probability of suffering from CVDs.

Since diabetes, hypertension and being overweight is frequently associated with heart disease, we included these three covariates as a baseline illness and hence a risk factor. As expected having a baseline illness severely increases the risk of CVDs.

Further, we have included information regarding the health behavior of individuals as well as their perceived health status. The risk of coronary heart disease increases as the health status of the individual deteriorates. While current or past smoking increases the risk of coronary heart disease, Table 3 indicates that moderate alcohol consumption, regular exercise, increased physical activity and regular physician visits decreases the risk significantly, whereas regular fruit and vegetable consumption has no statistically significant effect on the prevalence of CVDs.

Table 3 also presents logistic regression results for men and women separately. Results indicate similar patterns for men and women for most of the chosen covariates. However, we see important differences in terms of education, smoking, alcohol consumption and physician visit as expected. Increased educational attainment is associated with decreased risk of CVDs for men and women, with the exception of higher education. While higher education was associated with no significant difference in CVDs for men when compared to the base category but was associated with significantly increased risk of CVDs for women. Smoking had no statistically significant effect on the risk of CVDs for women, whereas it was associated with increased CVD risk for men. Furthermore, reported alcohol consumption was associated with increased risk for CVDs for women but decreased CVD risk for men. Finally, we observed a decreased risk of coronary heart disease in men who visited a physician at least once within the past month, while observing an adverse association for women. However, it

Table 2
Variable names and descriptions.

Individual characteristics	Gender	Gender of the respondent	Male (base category) Female
	Age	The age of the individual is asked and the reported within age groups	15–24 (base category) 25–34 35–44 45–54 55–64 65–74 75+
	Education	Highest educational attainment of the respondent	Illiterate (base category) Literate Primary Middle Secondary University Higher
	Income group	Information regarding household income.	Very poor (<$271)[a] (base category) Poor ($272–$390) Medium ($391–$546) Rich ($547–$800) Very rich (>$801)
	Employment status	Information regarding the employment status of the individual	Unemployed (base category) Employed
Diagnosed health problem	Baseline illness	Information on whether the individual is diagnosed with only one or any combination of baseline illnesses. Diabetes/hypertension/Overweight-obese class I or obese class II	No (base category) Yes
Healthy lifestyle indicators	Physical activity	Information on whether the individual is walking or biking daily.	No activity (base category) Very low (10–29 min) Low (30–59 min) Moderate (1–2 h) High (2–3 h) Very high (>3 h)
	Regular exercise	Information regarding whether the individual is undertaking minimum 90 min/week exercise.	No (base category) Yes
	Vegetables and fruit consumption	Information regarding whether the individual is following the suggested 5 a day vegetable and fruit consumption.	No (base category) Yes
	Smoking	Smoking history of the individual	Never smoked (base category) Ever smoked/current smoker
	Alcohol	Information on alcohol consumption of the individual.	No consumption (base category) Moderate consumption[b]
	Physician visit	Information on the status of physician visit within the last 4 weeks	No (base category) At least once
Perceived health	Health status	Information regarding individuals self-assessed health.	Very good (base category) Good Mediocre Bad Very bad

[a] Turkish Liras converted to USD at the current rate of 4.65.
[b] Moderate alcohol consumption indicates maximum of 14 drinks for men and 7 drinks for women per week as suggested by The National Institute on Alcohol Abuse & Alcoholism (NIAAA).

should be mentioned that we have no information of the status of the physician visit. Considering differences in heart disease related symptoms, symptom reporting and the reason for health care utilization, we refrain from interpreting this result in detail and believe that this is an important topic for future research [21,22].

Conclusion

Results from this study demonstrate that gender, age and baseline illness play an important role in risk of coronary heart disease, in line with the existing literature [1]. However, the most pronounced and arguably, the most important finding relates to the association between education and the risk of CVDs. At the lower levels of education, the risk of coronary heart disease increases, as expected. However, when it comes to individuals having masters or Ph.D. degrees, the picture is completely different. To be specific, the results indicate that individuals with masters or Ph.D. degrees are more likely to suffer from CVDs when compared to illiterate individuals. When this issue is further investigated on a gender basis, the results indicate that this positive association between higher education and the risk of coronary heart disease is only valid for female sample. Reasons for this observation are unclear.

On the other hand, although base line illnesses and demographic factors increase the risk of incurring coronary heart disease, the results indicate that increased physical activity and regular physician visits, especially for the highly at risk groups, can decrease the risk of coronary heart disease. Therefore, it is possible to conclude that choosing a healthy lifestyle plays an important role to fight against CVDs. Policies influencing a healthy lifestyle can have significant impacts on maintaining decreased CVD risk. Moreover, gender based estimation results show that there is a positive relationship between smoking and CVDs risk for men whereas this positive association is valid for alcohol consumption and CVDs risk for women. This finding indicates the importance of gender specific policy design if the aim is to decrease the likelihood of incurring CVDs for women or men specifically. However, it can also be argued that price interventions such as increasing tax for tobacco and alcohol products and non-price interventions such as advertising bans have a great potential to decrease CVDs risk overall.

Table 3
Prevalence rates and OR for coronary heart disease.

			All individuals		Female		Male	
			N%	OR	N%	OR	N%	OR
			1418		846		572	
		Total	8.22	–	8.84	–	7.49	–
Individual characteristics	Gender	Male (base category)	572	1.00	–		–	
			40.34					
		Female	846	1.20***	–		–	
			59.66					
	Age	15–24 (base category)	64	1.00	28	1.00	36	1.00
			4.51		3.31		6.29	
		25–34	67	1.01	46	1.48	21	0.61*
			4.72		5.44		3.67	
		35–44	153	2.06***	92	2.73***	61	1.53**
			10.79		10.87		10.66	
		45–54	237	3.79***	145	5.33***	92	2.60***
			16.71		17.14		16.08	
		55–64	338	7.39***	203	10.01***	135	5.33***
			23.84		24		23.60	
		65–74	308	11.05***	176	14.44***	132	8.41***
			21.72		20.80		23.08	
		75+	251	15.56***	156	21.67***	95	10.71***
			17.70		18.44		16.61	
	Education	Illiterate (base category)	155	1.00	99	1.00	56	1.00
			10.93		11.70		9.79	
		Literate	592	0.56***	326	0.63***	266	0.43***
			41.75		38.53		46.50	
		Primary	130	0.23***	53	0.22***	77	0.20***
			9.17		6.26		13.46	
		Middle	123	0.21***	55	0.23***	68	0.16***
			8.67		6.50		11.89	
		Secondary	80	0.18***	22	0.11***	58	0.19***
			5.64		2.60		10.14	
		University	9	0.21***	3	0.18***	6	0.18***
			0.63		0.35		1.05	
		Higher	329	1.24**	288	1.41**	41	0.93
			23.20		34.04		7.17	
	Income group	Very poor (<$271) (base category)	442	1.00	297	1.00	145	1.00
			21.29		35.11		25.35	
		Poor ($272–$390)	443	0.75***	259	0.72***	184	0.84
			27.30		30.61		32.17	
		Medium ($391–$546)	240	0.60***	131	0.53***	109	0.73***
			18.28		15.48		19.06	
		Rich ($547–$800)	161	0.42***	92	0.40***	69	0.46***
			17.07		10.87		12.06	
		Very rich (>$801)	132	0.36***	67	0.31***	65	0.46***
			16.05		7.92		11.36	
	Employment status	Unemployed (base category)	1127	1.00	754	1.00	373	1.00
			79.48		89.13		65.21	
		Employed	291	0.39***	92	0.40***	199	0.35***
			20.52		10.87		34.79	
Health problem	Baseline illness	No (base category)	206	1.00	105	1.00	101	1.00
			14.53		12.41		17.66	
		Yes	1212	3.93***	741	4.73***	471	3.11***
			85.47		87.59		82.34	
Health behavior	Physical activity	No activity (base category)	468	1.00	334	1.00	134	1.00
			33		39.48		23.43	
		Very low (10–29 min)	579	0.49***	345	0.45***	234	0.59***
			40.38		40.78		40.91	
		Low (30–59 min)	251	0.37***	123	0.33***	128	0.44***
			17.70		14.54		22.38	
		Moderate (1–2 h)	86	0.34***	33	0.31***	53	0.42***
			6.06		3.90		9.27	
		High (2–3 h)	22	0.33***	6	0.27***	16	0.41***
			1.55		0.71		2.80	
		Very high (>3 h)	12	0.19***	5	0.29***	7	0.17***
			0.85		0.59		1.22	
	Regular exercise	No (base category)	1395	1.00	835	1.00	560	1.00
			98.38		98.70		97.90	
		Yes	23	0.34***	11	0.41***	12	0.30***
			1.62		1.30		2.10	

(*continued on next page*)

Table 3 (*continued*)

			All individuals		Female		Male	
			N%	OR	N%	OR	N%	OR
		Total	1418	–	846	–	572	–
			8.22		8.84		7.49	
	Vegetables and fruit consumption	No (base category)	1178	1.00	710	1.00	468	1.00
			83.07		83.92		81.82	
		Yes	240	1.02	136	0.98	104	1.08
			16.93		16.08		18.18	
	Smoking	Never smoked (base category)	755	1.00	616	1.00	139	1.00
			53.24		72.81		24.30	
		Ever smoked/current smoker	663	1.14**	230	1.06	433	1.69***
			46.76		27.19		75.70	
	Alcohol	No consumption (base category)	207	1.00	29	1.00	178	1.00
			14.60		3.43		31.12	
		Moderate consumption	1211	0.82***	817	1.69**	394	0.57***
			85.40		96.57		68.88	
	Physician visit	No (base category)	551	1.00	741	1.00	224	1.00
			38.86		87.59		39.16	
		At least once	867	0.68***	105	4.73***	348	0.55***
			61.14		12.41		60.84	
Perceived health	Health status	Very good (base category)	9	1.00	4	1.00	5	1.00
			0.63		0.47		0.87	
		Good	190	3.82***	82	3.05**	108	4.66***
			13.40		9.69		18.88	
		Mediocre	637	25.64***	377	23.79***	260	27.92***
			44.92		44.56		45.45	
		Bad	499	63.31***	330	58.32***	169	71.48***
			35.19		39.01		29.55	
		Very bad	83	107.94***	53	109.47***	30	102.00***
			5.85		6.26		5.24	

Numbers in parentheses are standard errors.
*** $0.01 < p$.
** $0.05 < p$.
* $0.1 < p$.

Although this study reveals the basic characteristics of the at risk groups, it is also essential to investigate the time dimension of the research question. In other words, it would be possible to reveal the change in CVDs risk over time if the same individuals could be followed over time. Due to data limitations, this study investigates the determinants of the risk of coronary heart disease only one point in time. As is known, diabetes, hypertension and cholesterol trio are key risk factors associated with CVD risk. However, current data yield information only on diabetes and hypertension. The lack of information on individual's cholesterol levels is regarded as a further limitation to this study. An additional limitation is that some variables that are used and found to be important determinants of CVD in the existing literature such as exposure to second-hand smoke [23,24], sedentary occupation [25,26] and some gender specific risk factors [27] cannot be used in this study due to data unavailability.

Notwithstanding these limitations, examining the risk factors for CVDs for all individuals and for men and women separately for Turkey is informative to design policies in a more efficient way by addressing specific target groups. Future studies might investigate the economic burden of incurring CVDs and its impoverishment effect at the individual or household level. It may also be feasible to estimate the cost of lost worker productivity and its effect on economic growth at the national level if the necessary data becomes available.

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Competing interests

None declared

Ethical approval

Not required

Supplementary material

Supplementary material associated with this article can be found, in the online version, at doi:10.1016/j.hlpt.2019.02.001.

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