



## The Cardiovascular Mortality Risk Factors in the Northeast of Iran: A Four-Year Cohort Study

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**Introduction:** Cardiovascular diseases (CVD) have been recognized as the leading causes of death worldwide and in Iran. Deaths from CVD diseases accounted for approximately 39.42% of Razavi Khorasan Province (RKP). This study aimed to evaluate the risk factors associated with CVD mortality in the residents of RKP.

**Method:** This retrospective cohort study was conducted based on recorded information from the Vic Chancellery of Health Questionnaires of KRP (2016–2019).

**Results:** This study was conducted on 2,304,156 participants. CVD deaths made up about 50% of total deaths. The opium use, history of heart attack, BMI  $\geq 40\text{kg/m}^2$ , homemade alcohol, FBS  $\text{mg/dL} > 126$ , diabetes, BMI  $\geq 30\text{kg/m}^2$ , permanent use of salt, Systolic blood pressure, Framingham risk score, and age were CVD risk factors, respectively (OR 6.59, 4.91, 3.25, 2.64, 2.00, 1.99, 1.89, 1.80, 1.09, 1.04, and 1.03,  $P = 0.001$ ). In addition, higher educational level, female gender, BMI 25-27kg/m, healthier eating habits (higher consumption of dairy, fruits, and vegetables), moderate exercise, and aspirin use were identified as protective factors.

**Conclusion:** This study identified the demographic, behavioral, anthropometric and biochemical risk factors and preventive factors of CVD in RKP. These findings might justify the high incidence of sudden death in some cities of RKP like Dargaz.

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### Introduction

Cardiovascular disease (CVD) is the essential cause of death (1). CVD prevalence has increased from 271 million in 1990 to 523 million in 2019, almost double (1). In addition, increasing cardiovascular mortality below the age of 30, indirect (loss of productivity) and direct (medical) costs (2), and disability-adjusted life years related to cardiovascular disease are other worrying issues (3). The Middle East region (4), especially Iran, is also involved in rising CVD incidence and mortality (5). CVD mortality accounts for almost 50% of all-cause mortality, 20-23% of the burden of disease, and about a quarter (24%) of all lost years of life (YLL) in Iran (6, 7).

Cardiovascular risk factors, including high blood pressure, obesity, diabetes, dyslipidemia, unhealthy diet, sedentary lifestyle, and smoking, have risen in Iran over the last 40 years (8). Medical risk factors for cardiovascular disease have received the most attention in recent decades (9), while lifestyle risk factors have received less attention (10). It has been shown that controlling modifiable CVD risk factors can prevent up to 80% of CVD occurrences (11). As part of the pyramid to prevent CVD disease from developing, it is essential to identify the risk level of each factor at the levels of primary prevention (control of disease risk factors) and secondary prevention (control of disease severity and prevention of further death) (12). This study was conducted to investigate the most critical CVD

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mortality risk factors among the northeast Iranian population.

## Methods

This retrospective cohort study was implemented using the data received from the residents of KRP in the Sina health information system from 2016–2020.

A total of 2304156 adults (30–90 years) were admitted to Deputy of Health and participated based on a representative sample of adults residing in Northeast Iran. This commissioned project of Deputy of Health aimed to investigate the risk factors of cardiovascular death in all populations covered by Deputy of Health. The participants were selected by census sampling method. The exclusion criteria were adults with more than 30% incomplete information. Sex, nationality, educational attainment, anthropometric and sociodemographic data, lipid profile, fasting, and non-fasting blood sugar, creatinine, and the habitual frequency of fast food, fruit, vegetables, and dairy products were evaluated.

## Measurements

**Table 1.** Comparison of quantitative variables of two groups of cardiac death and living people in Khorasan Razavi province

Quantitative variable	Odds Ratio (95% confidence interval)	p-value	CVD death	Survived	p-value
Systolic blood pressure (mm Hg)	1.09(1.09-1.09)	0.001	122.01±17.8	112.70±14.7	0.001
Heart disease risk score	1.04(1.10-1/05)	0.001	23.17±25	13.3±8.7	0.001
age (years)	1.03(1.03-1.03)	0.001	69.8±16.1	40.1±13.6	0.001
Waist ( cm)	1.03(1.03-1.03)	0.001	94.3±14.2	89.2±12.9	0.001
creatinine (mg/dL)	1.00(1.00-1.00)	0.053	1.8±8.84	1.6±7.09	0.041
Cholesterol(mg/dL)	1.00(1.00-1.00)	0.09	192.68±7.38	191.34±6.37	0.09
fasting blood sugar (mg/dL)	1.87(1.80-1.94)	0.001	109.66±48.5	96.69±32.3	0.001
TG (mg/dL)	1.00(1.00-1.00)	0.001	147.29±72.2	140.27±7.79	0.001
Hard working (min/week)	1.00(1.00-1.00)	0.926	273.14±7.40	273.87±6.31	0.90
diastolic blood pressure (mg/dL)	1.00(1.00-1.00)	0.84	74.79±11.9	72.20±788.5	0.09
Non fasting blood sugar (mg/dL)	1.00(1.00-1.00)	0.91	180.52±71.4	179.19±83.5	0.92
HDL-c (mg/dL)	0.99(0.99-1.00)	0.17	8.37±8.15	5.85±4.15	0.16
LDL-c (mg/dL)	0.99(0.99-1.00)	0.66	46.74±8.12	46.98±5.12	0.19
Walking (min/week)	0.76(0.72-0.80)	0.001	139.3±142.7	180.68±119.7	0.001

\*Displaying data as mean and standard deviation, T-test was used for comparison

## Results

Ultimately, 2,304,156 people were included in this cohort study. Cardiovascular disease claimed the lives of 53,058 people, accounting for 2.3% of the population. The highest rate of cardiac death was observed in Dargaz, Qochan, Torbet Jam, Bakharz, and Bardeskan, respectively, compared to cardiovascular mortality. Dargaz, with 1.6% cardiovascular death among the population, was

The International Physical Activity Questionnaire short form (IPAQ) was used to evaluate physical activity. A 12-item food frequency questionnaire was approved by the Ministry of Health and Medical Education and was used to assess nutritional ratings.

## Data Analysis

This study reported the quantitative and qualitative variables as mean ± SD and frequency (%), respectively. Risk and protective factors for CVD death were compared in the population of KRP.

Chi-square and Fisher's exact tests were applied to measure the association between qualitative variables. Further, the means of quantitative variables between the alive and cardiovascular mortality groups were compared by an independent t-test. Univariate Logistic Regression (ULR) was also used to analyze data. All analyses were performed using SPSS software version 22 at a significant level of 0.05.

The study protocol was approved by the Mashhad University of Medical Sciences (MUMS) ethics committee (accepted ID: 990817).

identified as the city with the highest cardiac mortality. Non-cardiac death rates in this city did not differ significantly from those in other cities. In this study, opium use, a history of heart attack, BMI  $\geq 40\text{kg/m}^2$ , homemade alcohol, FBS mg/dL  $>126$ , diabetes, BMI  $\geq 30\text{kg/m}^2$ , permanent use of salt, beer consumption, systolic blood pressure, Framingham risk score, and age played a vital role in the risk of CVD, respectively (OR 6.59,

4.91, 3.25, 2.64, 2.00, 1.99, 1.89, 1.80, 1.63, 1.09, 1.04, and 1.03, P = 0.001). In addition, a higher educational level, female gender, BMI of 25–27kg/m<sup>2</sup>, healthier eating habits (higher

consumption of dairy products, fruits, and vegetables), moderate exercise, and using aspirin were identified as protective factors.

**Table 2.** Comparison of qualitative variables of two groups of cardiac death and living people in Khorasan Razavi Province

Quantitative variable	Odds Ratio (95% confidence interval)	p-value	CVD death %	Survived %	p-value
Opium	6.59(2.70-16.09)	0.001	1	0.2	0.001
History of heart attack	4.91(4.29-5.62)	0.001	3.9	0.8	0.001
<b>BMI Kg/m<sup>2</sup></b>					
40-50	3.25(2.9-3.65)	0.001	4.2	0.9	0.001
50-60	2.67(1.50-4.73)	0.001	13.4	19.1	0.001
30-40	1.89(1.90-2.07)	0.001	41.5	38.7	0.001
18-20	1.05(1.62-1.39)	0.001	8.6	4.8	0.001
27-30	1.30(1.24-1.36)	0.001	20.5	20.1	0.001
25-27	0.92(0.87-0.79)	0.001	11.8	16.4	0.005
<b>Alcohol consumption</b>					
Homemade alcohols	2.64(1.20-5.80)	0.001	0.3	0.2	0.015
Beer	1.63(1.14-2.23)	0.001	0.016	0.010	0.007
Wine	1.06(0.14-7.83)	0.99	0.1	0	0.95
Hookah	2.04(1.62-2.56)	0.001	3.2	4.4	0.001
Cigarettes	1.62(1.81-1.45)	0.001	4.3	2.7	0.001
Fasting blood sugar (mg/dL>126)	2.00(2.00-2.00)	0.001	17	7	0.001
Having diabetes	1.99(1.23-1.87)	0.001	17	7	0.001
Using salt shaker	1.80(1.00-2.76)	0.001	81.5	78	0.001
Fast food consumption (2Time≤ /Week)	1.48(1.40-1.57)	0.001	18.4	13.2	0.001
<b>Dyslipidemia risk factors</b>					
Family history	1.25(1.08-1.43)	0.001	7.1	5.5	0.002
Family history of high cholesterol	1.24(0.92-1.66)	0.002	1.6	1	0.015
Age over 45 men and 55 women	1.02(0.78-1.33)	0.88	21.3	11.5	0.88

\* Displaying the data as frequency and frequency percentage, chi square test was used for comparison

**Continuation of Table 3 Comparison of qualitative variables of two groups of cardiac death and living people in Khorasan Razavi Province**

Qualitative variable	Odds Ratio (95% confidence interval)	p-value	CVD death %	Survived %	p-value
CVD History	1.09(0.99-1.21)	0.001	7.8	7.2	0.05
VitaminD supplements	1.00(1.00-1.00)	0.001	78.6	71.9	0.001
Statin use	0.96(0.44-0.07)	0.92	70.2	66.1	0.09
female gender	0.94(0.92-0.96)	0.001	47	48.3	0.001
Liquid oil	0.83(0.79-0.87)	0.001	50.7	54.2	0.001
Consumption of dairy products ≥2 shares	0.79(0.75-0.83)	0.001	67.8	72.7	0.001
walking	0.77(0.74-0.80)	0.66	53.8	60	0.001
Vegetables ≥3 portions	0.72(0.69-0.75)	0.001	51.7	59.6	0.001
Fruit consumption ≥2 shares	0.66(0.64-0.69)	0.001	64.7	73.5	0.001
hard job	0.66(0.64-0.69)	0.15	30.3	39.4	0.001
Aspirin	0.39(0.31-0.50)	0.001	17.4	34.2	0.001
Dietary pattern score 6-9	0.80(0.60-1.06)	0.13	28.1	26.5	0.001
Dietary Pattern Score 9-12	0.74(0.56-0.98)	0.03	71.4	73.2	0.001
Severe exercise	0.26(0.21-0.32)	0.001	7	12.7	0.001
Moderate exercise	0.23(0.20-0.26)	0.001	27.4	55.8	0.001
Elementary education-guidance	0.13(0.13-0.14)	0.001	30	41.1	0.001

\* Displaying the data as frequency and frequency percentage, chi square test was used for comparison

**Table 3.** Comparison of risk factors and quantitative protective factors between Darghaz (highest cardiac death) with the whole province and Khoshab (lowest cardiac death) and Quchan (city similar to Darghaz in terms of cardiovascular death)

Quantitative variable	OR	P-Value	Ghuchan	P-Value	Khushab	P-Value	Other	Dargaz	P-Value
fasting blood sugar (mg/dL)	1.87	0.001	95.24±48.20	0.0013	92.28±96.18	0.001	94.85±32.68	96.24±28.20	0.001
Systolic blood pressure (mmHg)	1.09	0.06	113.14 ±7.6	0.001	112.14±85.2	0.001	86.14±76.11	113.14±6.3	0.001
Framingham heart disease risk	1.04	0.001	9.15±37.39	0.001	4.2±16.78	0.001	8.14±13.73	11.16±90.36	0.001
age (years)	1.03	0.001	48.15±35.04	0.001	55.5±40.23	0.001	46.07±13.40	48.15±28.87	0.001
waist (cm)	1.03	0.48	89.11±12.46	0.03	89.03±12.20	0.001	90.01±11.90	88.55±37.11	0.001
creatinine (mg/dL)	1	0.4	0.4±91.1	0.004	1.01±4.08	0.001	1.08±7.89	0.81±0.10	0.041
cholesterol (mg/dL)	1	0.001	171.37±18.07	0.001	172.37±98.12	0.024	176.91±89.30	177.37±98.10	0.09
TG (mg/dL)	1	0.001	14.82±80.60	0.001	140.63±93.93	0.155	140.26±79.93	141.52±75.23	0.001
Walking (min/week)	0.76	0.05	181.34±122.59	0.006	178.90±107.25	0.001	180.23±120.86	185.117±77.70	0.001

\* Displaying the data as frequency and frequency percentage, chi square test was used for comparison

**Table 4.** Comparison of risk factors and qualitative variable protective factors between Darghaz (highest cardiac death) with the whole province and Khoshab (lowest cardiovascular death) and Quchan (city similar to Darghaz in terms of cardiovascular death)

Qualitative variable	OR	P-value	Ghuchan	P-value	Khushab	P-value	Other	Dargaz	P-value
opium use	6.59	0.001	0.2	0.001	3.4	0.001	1.3	3.7	0.001
History of heart attack	4.91	0.001	0.9	0.19	0.9	0.43	0.8	1	0.08
Body mass index ≤ 30 Kg/m2	1.30	0.001	1.9	0.001<	0.5	0.001	0.9	0.8	0.001
Homemade alcohol consumption	2.64	0.015	0.9	0.001	0.3	0.001	0.3	0.4	0.001
hookah consumption	2.04	0.001<	1.5	0.001	2.7	0.001	2.1	1.3	0.001<
having diabetes	1.99	0.001	12.3	0.001	22.1	0.001	16.5	12.2	0.001
Fasting blood sugar (<100 mg/dL)	1.87	0.001	16	0.001	13.2	0.001	18.6	19.1	0.001
Fasting blood sugar (<126 mg/dL)	2.00	0.001	5	0.001	7	0.001	8.1	5	0.001
Using a salt shaker	1.80	0.001<	31.7	0.001	23.2	0.001	21.7	38.4	0.001<
Beer	1.62	0.007	3.4	0.001	0	0.001	0.1	0.2	0.001
smoking	1.62	0.001	3.2	0.001	3.4	0.001	4.4	9.1	0.001
Fast food consumption (≤2 weeks)	1.48	0.001	19.2	0.001	16.8	0.001	18.1	13.1	0.001
Family history of dyslipidemia	1.25	0.002	4	0.07	2.4	0.001	2.4	3.6	0.001
Family history of high cholesterol	1.24	0.015	0.8	0.001	1	0.001	1	1.1	0.001
History of heart disease	1.09	0.001	2.9	0.001<	3.1	0.001	3.9	2.7	0.003

\* Displaying the data as frequency and frequency percentage, chi square test was used for comparison

Continuation of Table 4 Comparison of risk factors and qualitative protective factors between Darghaz (highest cardiac death) with the whole province and Khoshab (lowest cardiac death) and Quchan (city similar to Darghaz in terms of cardiovascular death)

Qualitative variable	OR	P-value	Ghuchan %	P-value	Khushab %	P-value	Other %	Dargaz %	P-value
Vitamin D supplements	1	0.001	44.1	0.001	43.6	0.001	27.9	38.5	0.001
Bachelor's degree	0.09	0.001	12.7	0.001	4.8	0.06	24	11.6	0.001
Elementary education-guidance	0.13	0.001	67.3	0.001	55.9	0.001	65.1	69.5	0.001
Graduate	0.64	0.001	3	0.001	1	0.001	14	3	0.001
Moderate exercise	0.23	0.001	58	0.001	51.7	0.001	55.4	48.1	0.001
Severe exercise	0.26	0.001	10.9	0.001	48.3	0.001	44.6	51.9	0.001
Taking aspirin	0.39	0.001	70.8	0.001	48.2	0.001	67.8	55.4	0.001
Fruit consumption (≤2 shares)	0.66	0.001	61.4	0.02	68	0.001	73.3	69.7	0.001
Consumption of vegetables (≤3	0.72	0.001	43.2	0.001	61.7	0.001	55.3	44.7	0.001
Nutritional score (9-12)	0.74	0.001	59.9	0.001	75.4	0.001	64.2	60.5	0.03
dairy Consumption (≤2 shares)	0.79	0.001	62.8	0.001	78.5	0.001	72.5	70.4	0.001
Liquid oil compared to solid	0.83	0.001	42.5	0.001	53.9	0.001	54.4	38.2	0.001
BMI Kg/m <sup>2</sup> 25-27	0.92	0.001	41.9	0.001	49.2	0.001	38.5	45.6	0.005
female gender	0.94	0.001	50.8	0.36	51.9	0.001	48.3	51.4	0.001

\* Displaying the data as frequency and frequency percentage, chi square test was used for comparison

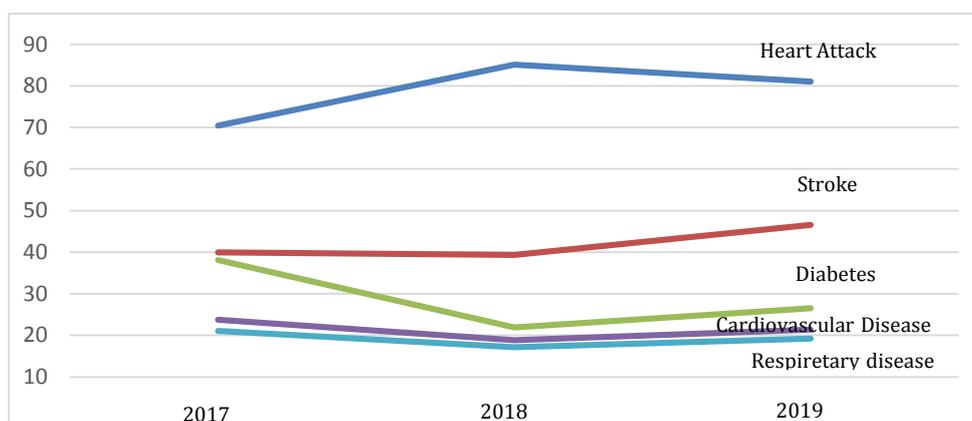


Figure 1. five major causes of death in Khorasan Razavi province years 2016-2019

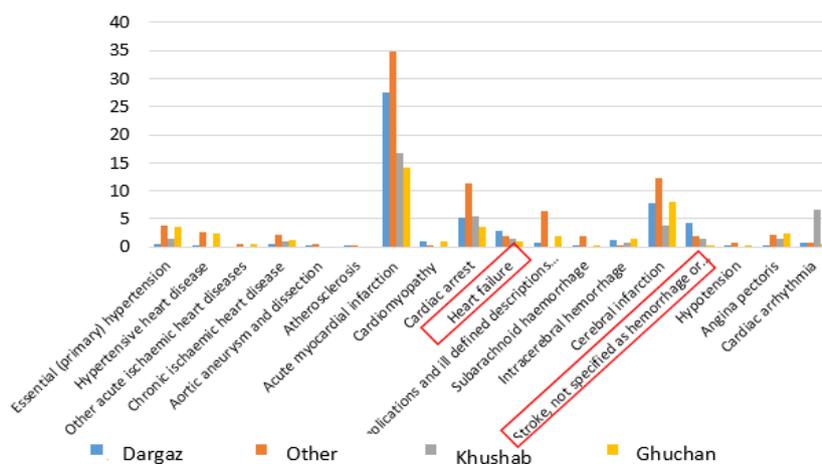


Figure 2. Cardiac death by cause in the cities of Khorasan Razavi province

## Discussion

According to the current study, modifiable risk factors had the most significant impact on CVD mortality. The opium use, a history of heart attack, BMI  $\geq 40\text{kg/m}^2$ , homemade alcohol, FBS mg/dL  $>126$ , diabetes, BMI  $\geq 30\text{kg/m}^2$ , permanent use of salt, beer consumption, systolic blood pressure, Framingham risk score, and age played a vital role in the CVD risk, respectively. A higher educational level, female gender, BMI of  $25\text{--}27\text{kg/m}^2$ , healthier eating habits (higher consumption of dairy products, fruits, and vegetables), moderate exercise, and aspirin use were identified as protective factors.

Elevated blood glucose and diabetes mellitus are significant risk factors for CVD disease (13). This study observed a significant association between diabetes and cardiovascular mortality and a higher prevalence of diabetes mellitus among the CVD mortality group than alive individuals. Although the fasting blood sugar average was significantly higher in Dargaz, the diabetes prevalence was significantly lower than in other cities. Diagnosing and classifying diabetes in the screening stage is essential for timely treatment and secondary prevention of CVD death (14). According to the results, there may be people with undiagnosed (or "latent") diabetes in Dargaz, which can be one of the critical reasons for the increase in CVD deaths in this city compared to other cities in the province. The management of diabetes is effective in controlling CVD death (15). High blood pressure is one of the leading risk factors for stroke and myocardial infarction, the two leading causes of death (12). In the present study, the mean systolic blood pressure of  $9.3\text{mmHg}$  was significantly higher ( $P = 0.001$ ) among the people in the CVD mortality group compared to those alive. Dargaz also had higher average systolic and diastolic blood pressures. Hypertension is associated with unhealthy habits, including high salt consumption. The current study shows that regular consumption of salt shakers is one of the most important risk factors for CVD mortality in the studied population and can increase CVD mortality by 80%. The food consumption pattern score was significantly lower, and salt consumption was higher in Dargaz than other cities. As a result, an unhealthy diet can be one of the fundamental reasons for increased CVD mortality in this city.

The prevalence of abdominal obesity in CVD patients is high, and there is a close relationship between a larger waist circumference and cardiovascular diseases and mortality. (16) This study identified a larger waist size as a risk factor for CVD mortality. People who died from CVD had a larger average waist circumference than those alive. However, the waist circumference average was significantly lower in Dargaz underweight, and a BMI higher than  $30\text{kg/m}^2$  was a risk factor for cardiovascular mortality (17). A BMI  $\geq 30$  and  $18 < \text{BMI} < 20$  significantly increased cardiovascular mortality compared to  $20 < \text{BMI} < 25$ . Moreover, the BMI of  $25\text{--}27\text{kg/m}^2$  had a protective relationship. Even though a higher body mass index is a significant risk factor for CVD mortality in the entire province, it is not the main factor in Dargaz. Consuming fast food twice a week or more could increase the risk of CVD mortality by 48%. In addition, the percentage of fast food consumers in Dargaz was significantly higher than in other cities of the province. The results indicated that moderate and intense exercise (compared to slow exercise) are protective against cardiovascular mortality, which aligns with previous studies (18, 19). Further, the average walking duration per week was significantly lower in the cardiovascular mortality group compared to the living group ( $139\text{min/week}$  vs.  $180.68\text{min/week}$ ). Even though most previous studies have pointed to the protective effects of walking (20), reports claim that increased walking may increase the risk of cardiovascular mortality due to increased access to fast food outlets. When Dargaz was compared to the entire province, the percentage of people with moderate exercise was significantly lower. Therefore, moderate exercise is a better indicator of the level of physical activity of all members of society because intense exercise is not possible for all ages (20). In addition, the average walking distance of the residents of Dargaz was significantly higher than that of other cities in the province (21). The present study found a significant relationship between the use of opium, smoking, and hookah and cardiovascular mortality. Golestan and Rafsanjan cohort studies in Iran have stated that narcotics, including opium, and long-term use of substances containing tobacco, especially cigarettes, can be significant risk factors for

ischemic cardiovascular diseases and mortality (22). The percentage of opium users and smokers in Dargaz was significantly higher than in other cities of the province. These results may be due to the analgesic effect of opium. People taking opioids may have seen a doctor later with more severe symptoms (23). In addition, the percentage of people consuming alcoholic substances (except wine and sweat) and beer was significantly higher in Dargaz, which had the highest CVD death rate than in other cities in the province. Based on the reports, the most popular alcoholic beverages in Iran are homemade alcoholic beverages (46%), wine (22%), beer (14%), distilled alcohol (11%), and medical alcohol (7%) (24). In the current study, aspirin was significantly more frequent in the alive group than in the cardiovascular mortality group. So far, studies have recommended using this drug as the first line of defense against CVD in diabetics (25). According to reports, using aspirin for an average of seven years can reduce the risk of cardiovascular mortality. Opium use, a history of heart attacks, a BMI of  $\geq 30\text{kg}/\text{m}^2$ , homemade alcohol, diabetes, and permanent use of salt shakers are identified as cardiovascular mortality risk factors. In addition, higher educational level, female gender, BMI of 25–30 $\text{kg}/\text{m}^2$ , healthier eating habits (higher consumption of dairy products, fruits, and vegetables), moderate exercise, and aspirin were considered as protective factors by 12% (15). In this study, a lower percentage of people used aspirin than the whole province. Therefore, there is a lack of proper access or sufficient health literacy to know the protection of aspirin consumption against cardiovascular mortality among the population. The people with a higher education level showed a significantly lower frequency in the cardiovascular mortality group. The diploma-bachelor literacy levels showed the most significant protection against cardiovascular mortality. According to the (PURE) study, people's level of education influenced CVD mortality (26). The mechanism explaining the association between higher literacy levels and lower cardiovascular mortality was probably related to adherence to a healthier lifestyle. Maybe more literacy leads to a better self-understanding of a healthier lifestyle (27). The comparison of Dargaz with other parts of the province showed that primary and secondary education levels were significantly

lower than in other cities. According to the results, one of the reasons for higher CVD death in Dargaz was lower literacy compared to other cities in the province. Although the literacy level in Khoshab (with the lowest rate of CVD death) is significantly lower than in Dargaz, other factors have affected the aggravation of CVD death and the lack of access to prevention and treatment facilities for the city residents.

According to the results, since lifestyle has a more significant effect on the mortality caused by cardiovascular disease, physicians should pay attention to modifiable risk factors in the follow-up of patients. In addition, health policymakers should apply the required training to improve lifestyles.

#### ***Unmodifiable Risk Factors for Cardiovascular Death in Razavi Khorasan Province***

The unmodifiable risk factors of this study were gender and age at CVD death in Razavi Khorasan Province. The results revealed that the average age of people who died from CVD disease was significantly higher ( $69.8\pm 16.1$  versus  $40.1\pm 13.6$ ) than that of those who lived. The average age of the population of Dargaz was significantly higher than that of the whole province (28). Regarding CVD death related to gender, the female gender acted as a protective factor against CVD death. The probability of CVD disease was higher in men than in women. In this study, the percentage of women in the Dargaz population was significantly higher than in other parts of the province. However, this city had the highest number of CVD deaths.

#### ***Advantages and Limitations of the Study***

This was the first focused study on the various causes of cardiovascular mortality in all the cities of Khorasan Razavi Province, with a large sample size. A multi-center study was conducted with the cooperation of the Khorasan Razavi Provincial Health Deputy, the death registration system, an experienced team, and experts in nutrition and social medicine at Mashhad University of Medical Sciences. However, there were some limitations, like other similar studies, including missing data in the recorded information.

#### **Conclusion**

In this study, opium use, a history of heart attack, BMI  $\geq 40\text{kg}/\text{m}^2$ , homemade alcohol, FBS  $\text{mg}/\text{dL} > 126$ , diabetes, BMI  $\geq 30\text{kg}/\text{m}^2$ , and

permanent use of salt, beer consumption, Systolic blood pressure, Framingham risk score, and age played a vital risk role in CVD, respectively. In addition, a higher educational level, female gender, BMI 25-27kg/m<sup>2</sup>, healthier eating habits (higher consumption of dairy products, fruits, and vegetables), moderate exercise, and using aspirin were identified as protective factors in RKP. Dargaz has the highest number of sudden deaths caused by heart failure and stroke, especially heart attacks, due to more risk factors and fewer protective factors.

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### Conflict of Interest

The authors declare no conflict of interest.

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