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Prevalence of Cardiovascular Disease Risk

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ABSTRACT

At the worldwide level, heart disease is the leading cause of death. The primary goals of this study were to look into cardiac risk variables in datasets available on Kaggle. The data included 303 people, 138 of whom had cardiac disease and 165 of whom did not. Age, gender, chest pain, resting blood pressure, cholesterol level, fast blood sugar, electrocardiogram at rest, maximum heart rate during the stress test, angina during exercise, old peak, slope of the ST segment, result of the blood flow observed with radioactive dye, and number of main blood vessels colored by the radioactive dye were all included in the dataset. Descriptive analysis includes means and standard deviations for non-classified variables, as well as frequencies and percentages for categorized variables. The independent T test was used to assess the associations between variables. If 0.05, significance was considered. Except for cholesterol and rapid blood sugar, all of the variables listed above were found to be strongly linked with heart disease. When rapid blood sugar and cholesterol readings are combined, they should be evaluated with caution due to their participation as risk factors for cardiovascular disease.

KEYWORDS: Cardiovascular disease, dataset, Kaggle, cholesterol, fast blood sugar

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INTRODUCTION

According to the World Health Organization (WHO), 17.5 million people will die in 2019 as a result of cardiovascular diseases (CVDs), accounting for 30% of all mortality worldwide (1). CVDs are the leading cause of death worldwide, killing more people each year than any other disease (1). Coronary heart disease accounts for 7.4 million CVDs, with stroke, hypertension, coronary artery disease, rheumatic heart disease, and heart failure accounting for the remaining 6.7 million. Low- and middle-income countries are disproportionately affected by CVDs. CVDs are expected to be the leading cause of mortality in the world's poorest countries, killing about 23.6 million people by 2030 (2). CVDs encompass a wide range of heart disorders. The most common is coronary heart disease, which can lead to heart attacks, which kill about 370,000 people each year. Heart failure is another CVD that causes morbidity and mortality, and it is one of the disease's first signs. The World Heart Federation recently published a list of risk factors for heart failure, including arterial hypertension, diabetes, smoking, defective heart valves, wounded heart muscles, and obesity (3). Because "traditional" CVD risk factors, such as hypertension, can now be successfully treated with medication, the balance of risk factors depending on age and gender, as well as their distribution in the general population, may change with time. Furthermore, new and lesser-known risk factors may emerge. Speed and precision are critical in CVD diagnosis, although they are not always assured. Despite the fact that early and accurate CVD detection helps medical practitioners determine appropriate and effective treatments to enhance patients' chances of survival, many developing countries and low-income regions lack specialists to undertake such diagnostic techniques. Furthermore, when CVD diagnoses are inaccurate and medical procedures are performed erroneously, the health of the patient may be threatened. In recent years, a number of organizations and academics have built massive databases of electronic health records (EHR). Such databases, in addition to delivering rapid and accurate diagnoses, contribute to ongoing efforts to improve CVD patient life quality throughout time and provide researchers with the ability to identify potential CVD risk factors across age- and gender-specific groups. Computing Through computer-assisted detection tools, sciences deliver valuable CVD projections to the healthcare business from this vantage point (1).

Several risk factors, including age, gender, chest pain, resting blood pressure, cholesterol level, fast blood sugar, electrocardiogram at rest, maximum heart rate during the stress test, angina during exercise, old peak, slope of the ST segment, result of the blood flow observed with radioactive dye, and number of main blood vessels colored by the radioactive dye, were evaluated using the existing dataset.

Age has been identified as a risk factor for the development of cardiovascular disorders since it leads to the deterioration of the circulatory system's function (4-6). Gender, particularly female gender, is also a risk factor for developing heart disease (7).

According to Nahar et al. (8), asymptomatic chest discomfort and the presence of exercise induced angina pectoris in both men and women were markers of cardiac disease. Hypertension is a substantial risk factor for the onset of cardiovascular disease (9).

Study objectives

The primary goals of this study were to look into risk factors for heart disease and their statistical significance in a group of heart patients.

METHODS AND SUBJECTS

Data Source

The dataset (Heart Disease UCI) was hosted on Kaggle and came from the UCI Machine Learning Repository. It contained information on 303 Cleveland patients (10). The dataset includes various characteristics, including whether or not the target subjects had heart disease. Age, gender, chest discomfort, resting blood pressure, cholesterol level, rapid blood sugar, ECG at rest, angina during activity, old peak, slope of the ST segment, blood flow measured via radioactive dye, and number of primary blood vessels colored by radioactive dye

Statistical Analysis

SPSS version 21 was used to analyze the data. For continuous data, descriptive statistics such as mean and standard deviation were utilized. Frequency and percentages were utilized for category variables. The independent T test was used to compute the associations between variables. The significance level was set at 0.005.

RESULTS

General characteristics of participants

Table (1) shows the general characteristics of participants, which included research variables. The average age was 54.379.1 years, and the majority of participants (68.3%) were men. Concerning chest pain, around 47% of patients were asymptomatic, approximately 17% had atypical angina, approximately 29% had discomfort unrelated to angina, and just 8% had conventional angina. At rest, the mean systolic blood pressure was 131.6217.54 mm Hg. The cholesterol level was 246.2651.83 mg/dl. The majority of the subjects (85.1%) had fasting blood sugar levels less than 120 mg/dl. The ECG results at rest revealed that half of the patients were normal, 49% had the potential to develop ventricular hypertrophy, and 1% had T wave or ST segment abnormalities. During the stress test, the average maximal heart rate was 149.6522.91. Angina during exercise was reported by around 33% of subjects. The average of the old peaks was 1.041.16. In 6.9% of participants, the slope of the ST segment was decreasing, flat (46.2%), or climbing (46.9%). The radioactive dye results revealed normal blood flow (54.8%), reversible defect (38.6%), fixed defect (5.9%), and null (0.7%). The findings revealed that the number of main blood vessels colored by radioactive dyes was 0 for 57.8% of participants, 1 for 21.5%, 2 for 12.5%, 3 for 6.6%, and 4 for 1.7%. The findings also revealed that 138 (45.5%) of participants had heart disease, while 165 (54.5%) did not.

Table 1. General characteristics of participants

Variable	Description
Age (M±SD) years	**54.37 ±9.1**
Gender (N, %):	
- Males	**207 (68.3%)**
-Females	**96 (31.7%)**
Chest pain (N, %):	
- Asymptomatic	**143 (47.2%)**
- Atypical angina	**50 (16.5%)**
- Pain without relation to angina	**87 (28.7%)**
- Typical angina	**23 (7.6%)**
Resting blood pressure (M±SD) mm Hg	**131.62±17.54**
Cholesterol (M±SD) mg/dl	**246.26±51.83**
Fast blood sugar (N, %):	
- Yes	**45 (14.9%)**
- No	**258 (85.1%)**

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Electrocardiogramon rest: - Probableleft ventricular hypertrophy - Normal - Abnormalities in the T wave or ST segment	 147 (48.5%) 152 (50.2%) 4 (1.3%)
Maximum heart rate during the stress test (M±SD)	**149.65±22.91**
Angina during exercise (N, %): **- Yes** **- No**	 **99 (32.7%)** **204 (67.3%)**
Old peak (M±SD)	**1.04±1.16**

Slope of the ST segment during the most demanding part of the exercise(N, %): **Descending** **Flat** **Ascending**	 **21 (6.9%)** **140 (46.2%)** **142 (46.9%)**
Results of the blood flow observed via the radioactive dye (N, %): - Null - Fixed defect (no blood flow in some part of the heart) - Normal blood flow - Reversible defect (a blood flow is observed but it is not normal)	 **2 (0.7%)** **18 (5.9%)** **166 (54.8%)** **117 (38.6%)**
Number of main blood vessels colored by the radioactive dye (N, %): - 0 -1 - 2 - 3 -4	 **175 (57.8%)** **65 (21.5%)** **38 (12.5%)** **20 (6.6%)** **5 (1.7%)**
Heart disease (N, %): **- Yes** **- No**	 **138 (45.5%)** 165 (54.5%)

The relationship between patients with heartdiseases and those without heart diseases forstudy variable and their statistical significance

The mean age of heart patients was 56.607.96 years, as shown in table (2), and 52.509.55 years for those without heart disease. The mean difference was statistically significant (p=0.000). Gender was also found to be substantially related to heart disease (p+=0.000). Chest pain was also found to be substantially related to heart disease (p=0.000). Resting blood pressure was 129.3016.17 mm Hg among those who did not have heart disease and 134.40 mm Hg in those who had. The mean difference was statistically significant (p=0.012). Both cholesterol and fasting blood sugar levels were not related with heart disease (p>0.05). All of the remaining variables were significantly related to heart disease (p0.05)

Table 2. The relationship between patients with heart diseases and those without heart diseases forstudy variable and their statistical significance

Variable	**group**	**N**	**Mean**	**Std. Deviation**	**Significance**
Age	No	165	52.4970	9.55065	0.000
	Yes	138	56.6014	7.96208	
Gender	No	165	.5636	.49744	0.000
	Yes	138	.8261	.38042	
Chest pain	No	165	1.3758	.95222	0.000
	Yes	138	.4783	.90592	
Resting blood pressure (M±SD) mm Hg	No	165	129.3030	16.16961	0.012
	Yes	138	134.3986	18.72994	

Cholesterol (M±SD) mg/dl	No	165	242.2303	53.55287	0.139
	Yes	138	251.0870	49.45461	
Fast blood sugar (N, %)	No	165	.1394	.34741	0.627
	Yes	138	.1594	.36740	
Electrocardiogram on rest	No	165	.5939	.50482	0.017
	Yes	138	.4493	.54132	
Maximum heart rate during the stress test (M±SD)	No	165	158.4667	19.17428	0.000
	Yes	138	139.1014	22.59878	
Angina during exercise	No	165	.1394	.34741	0.000
	Yes	138	.5507	.49923	
Old peak	No	165	.5830	.78068	0.000
	Yes	138	1.5855	1.30034	
Slope of the ST segment during the most demanding part of the exercise	No	165	1.5939	.59363	0.000
	Yes	138	1.1667	.56132	
Results of the blood flow observed via the radioactive dye	No	165	.3636	.84889	0.000
	Yes	138	1.1667	1.04346	
Number of main blood vessels colored by the radioactive dye	No	165	2.1212	.46575	0.000
	Yes	138	2.5435	.68476	
Heart disease	No	165	1.0000	.00000[a]	
	Yes	138	.0000	.00000[a]	
a. t cannot be computed because the standard deviations of both groups are 0.					

DISCUSSION

The current investigation found that various risk factors were present in a sample of heart patients. Age was found to be a substantial risk factor for developing heart disease, and this is likely to have an impact on the heart's functionality as an organ. This is consistent with other investigations (4-6). Gender was found to be substantially related to heart disease. Previous research has shown that women are more prone than men to suffer cardiac disease (7).

Chest pain was found to be significantly related to heart disease. This is consistent with past studies that found asymptomatic chest discomfort and exercise-induced angina pectoris in both men and women to be indications of cardiac disease (8).

According to the findings of this investigation, hypertension is highly related with cardiovascular disease. This is consistent with earlier studies that have shown hypertension as a substantial risk factor for the onset of cardiovascular disease. (9).

The level of cholesterol was not substantially related with heart disease in this investigation, although this result contradicts prior studies in which cholesterol was a strong predictor of heart disease (11, 12). In his study, fasting blood sugar levels were not substantially connected with heart disease.

Other research found that fasting glucose levels were a major predictor of heart disease, but the data were contradictory (13). The ECG at rest, which included ventricular hypertrophy, was found to be substantially related to heart disease.

The electrification According to Gosse et al, (14) left ventricular hypertrophy is a risk factor for cardiovascular disease. The remaining risk factors are consistent with previous research.

CONCLUSIONS

Except for cholesterol level and rapid blood sugar, the current study found that traditional risk factors for developing cardiovascular diseases are consistent across studies in the literature.

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