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Prevalence of Cardiovascular Disease During Seasonal Temperature Changes

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ABSTRACT

Climate change poses a high risk to human health, both directly and indirectly, through various mechanisms.it is clear that climatic pressure is a hidden risk factor in sudden cardiovascular diseases. Our goal is to determine the prevalence of cardiovascular disease during seasonal temperature changes. We want to know the frequency of cardiovascular disease as the weather varies seasonally. This is a cross-sectional retrospective hospital-based study that This research lasted from 2023 to 2024.and was conducted at Nangarhar University Teaching Hospital in the internal medicine ward on patients who were admitted to the hospital. In this study, we reviewed 800 Patients files who were hospitalized with hypertension, cardiac ischemia, and heart failure. In this research, we only selected, conveniently, the patients from January and July as Sample months of the year. Because the coldest month of the year in Jalalabad is January, with a low temperature, and the hottest month is July, where the temperature is high. In this research, all the files of cardiovascular patients who were hospitalized in hot and cold seasons during one year have been processed. Gender, age, ischemic heart disease (IHD), heart failure (HF) and hypertension (HTN) are factors taken into account in this study. The analysis of this research was done by Excel and IBM-SPSS Version 26. Eight hundred patients with heart failure, hypertension, and myocardial ischemia were included in the study. There were 278 (34.75%) males and 522 (65.25%) females in this number. The patient's age statistics are as follows: mean age = 58.33±12.66, max age = 110 years, mod age = 60 years. 350 patients (43.75%) had ischemic heart disease (IHD), 250 patients (31.25%) had hypertension (HTN), and 200 patients (25%) had heart failure (HF). There were 130 patients in total in January (16.37%). The distribution of cardiovascular disease in January was IHD 50 (38%), HTN 44 (34%), and HF 36 (28%), in both sexes. 85 women (65%) and 45 men (35%).In January, the distribution of cardiovascular disease was as follows: 42.35% of females had IHD, 33.29% had HTN, and 22.35% had HF. 31.11% of men have IHD, 37.78% have HF, and 31.11% have HTN. In July, the number of female patients was 38(4.75%) and male was 27(3.37%), respectively. The mean age of patients in July in females was 56.93 and in males was 63.64 years. The prevalence of cardiovascular disease in female patients presented in July was as following: HTN=26.32%, IHD=23.68%, and HF=21.05%, and in male patients the prevalence of HF, HTN and IHD was13.16%, 10.53% and 5.25%, respectively. Given the global conversation around climate change, we aimed to assess the correlation between variations in temperatures and the prevalence of cardiovascular illnesses. Based to our research, the prevalence of cardiovascular disorders, such as ischemia, heart failure, and hypertension, is higher in the colder month of January and lower in the warmer month of July in Nangarhar. According to our research, patients should be kept warm and dressed in warm clothing all over the cold season in order to prevent cardiac diseases. Cold weather should also be taken care of in homes and hospital. It seems that cardiovascular diseases such as heart failure, hypertension, and cardiac ischemia are positively correlated with low temperatures. As there is no correlation between high body temperature and cardiovascular conditions such hypertension, myocardial ischemia, or cardiac insufficiency. Therefore, during the winter season, patients should be kept warm and dressed especially women warmly to prevent cardiac disorders. In addition, homes and hospitals should take precautions to keep their residents comfortable during the cold.

Keywords: Climate changes, Temperature, Cardiovascular disease, Sex, Age, Ischemic heart disease, Heart failure.

INTRODUCTION

The literature has been widely studied and predicted that climate change has a long-term effect on human health and increases deaths due to respiratory and cardiovascular disease. Climate change has directly and indirectly increased the risk of human health through different mechanisms. The World Health Organization has estimated 150,000 deaths and 5 million disabilities in the last three decades, which are caused by climate change (Cheng, 2010). Hot and cold temperatures are favorable to cause cardiovascular disease (myocardial infarction risk), especially in old people (Cheng, 2010). For every 1 centigrade increase in annual temperature, 3% of hypertension and 6% of heart disease decrease (Chen, 2023). In general, high temperatures cause blood pressure to decrease, while low temperatures cause blood pressure to increase (Hu, 2021). In the Czech Republic, during the coldest days, when the temperature did not rise above -3.5°C, deaths from cardiovascular diseases were high. A study that was conducted in Italy in February 2021, when the temperature was less than the 10th percentile of normal, had 25% deaths, including 20% from cardiovascular diseases, 14% from IHD, and 33% from other diseases. In 2008, there was a study in south China showing that the temperature below normal, continuous precipitation, and thick snow in the past five decades have caused cardiovascular deaths (Liu & Yavar, 2015). Cold air increases cardiovascular diseases, unlike warm air, cardiovascular diseases decrease (Giang, 2014). Research on the relationship between seasonal changes and hypertension in the north and south of the equator has been investigated, and the result is that the incidence of hypertension is higher in the cold season than in the hot season. However, the cause of hypertension in the cold is not clear, but they think that the cause of hypertension in the cold is the over activity of the sympathetic nervous system (Fares, 2013). Another study that was done in France found that people 65 to 74 years old had high blood pressure in the cold season.(Fares, 2013). In cold weather, blood vessels narrow and blood pressure rises; thrombosis also occurs. Exercising in cold weather increases the risk of heart attack and causes acute coronary syndrome (Giang, 2014). The cardiovascular system is affected by daytime temperature changes for both sexes throughout the hot season, while females contend that the cold season has a greater effect than the hot one (Zheng & Wang, 2016).In contrast to high temperatures, a cold temperature was linked to a higher risk of death from cardiovascular illnesses (Lin & Chang, 2013) .We want to know how common cardiovascular illness is as the weather varies seasonally.

METHOD AND MATERIAL

Given that the weather changes periodically, we want to determine how prevalent cardiovascular disease is. This is a cross-sectional retrospective hospital based study that lasted from 2023 to 2024 and was conducted at Nangarhar University teaching Hospital internal medicine ward on patients who were admitted to the hospital. In this research, we studied 800 patients' files who were hospitalized with hypertension, cardiac ischemia, and heart failure. In this research, we only selected conveniently the patients from January and July as Sample months of the year. Because the coldest month of the year in Jalalabad is January, with an average low temperature, and the July is the hottest month in Jalalabad. In this research, all the files of cardiovascular patients who were hospitalized, both male and female adults, in hot and cold seasons during one year have been processed. Gender, age, ischemic heart disease (IHD), heart failure (HF) and hypertension (HTN) are factors that were taken into account in this study. The analysis of this research was done by Excel and IBM-SPSS Version 26.

RESULTS

The study included eight hundred people with myocardial ischemia, hypertension, and heart failure. Of this total, 522 (65.25%) were female and 278 (34.75%) were male. The mean age of the patient is 58.33±12.66, the maximum age is 110 years, and the median age is 60 years. 200 patients (25%) had heart failure (HF), 350 patients (43.75%) had ischemic heart disease (IHD), and 250 patients (31.25%) had hypertension (HTN) Table1. In January, there were 130 patients overall (16. 37%).In January, there was a distribution of cardiovascular illness in both sexes of IHD 50 (38%), HTN 44 (34%), and HF 36 (28%). 45 guys (35%), and 85 ladies (65%).The following is the distribution of cardiovascular disease in January: Of the female population, 22.35% had HF, 33.29% had HTN, and 42.35% had IHD. Men are divided into 31.11% with IHD, 37.78% with HF, and 31.11% with HTN table 2and 3.In July, there were 3.75% (38) female patients and 3.37% (27) male patients. In July, the mean age of the patients was 63.64% for males and 56.93 for females. Among female July residents,

the prevalence of cardiovascular disease was 26.32% for HTN, 23.68% for IHD and 21.05% for HF. There were 13.16% of HF, 10.53% of HTN, and 5.25% of IHD in males. Table 2

Table 1. Distribution of cardiovascular disease during the 2023–2024 year [N = 800].

Variables	Frequency	Percentage
IHD*	350	43.75 %
HTN*	250	31.25 %
HF*	200	25 %

Notes: *Data presented as number, percentage;
Abbreviations: IHD, Ischemic Heart Disease; HTN, Hypertension; HF, Heart Failure

Table 2. Distribution of cardiovascular disease according to gender in hot and cold seasons

Variables	Frequency n (%)	Frequency n (%)
	January	July
IHD* - Female - Male	 36 (42.35) 14 (31.11)	 37 (32.68) 14 (5.25)
HTN* - Female - Male	 30 (33.29) 14 (31.11)	 31 (26.32) 14 (10.53)
HF* - Female - Male	 19 (22.35) 17 (37.76)	 19 (21.05) 17 (13.16)

Notes: *Data presented as number, percentage;
Abbreviations: IHD, Ischemic Heart Disease; HTN, Hypertension; HF, Heart Failure

DISCUSSION

The study included eight hundred people with myocardial ischemia, hypertension, and heart failure. Of this total, 65.25% were female and 34.75% were male. 25% had heart failure (HF), 43.75% had ischemic heart disease (IHD), and 31.25% had hypertension (HTN). In January, there was a distribution of cardiovascular illness in both sexes as following: IHD=38%, HTN=34%, and HF=28%. According to gender, the following is the distribution of cardiovascular disease in January: Of the female population, 22.35% had HF, 33.29% had HTN, and 42.35% had IHD. Men are divided into 31.11% with IHD, 37.78% with HF, and 31.11% with HTN. In July, there were 3.75% female patients and 3.37% male patients. In July, among female, the prevalence of cardiovascular disease was 26.32% for HTN, 23.68% for IHD, and 21.05% for HF. There were 13.16% of HF, 10.53% of HTN, and 5.25% of IHD patients in males. The result of our research is that changes in temperature have effects on the prevalence of heart diseases and as, Nangarhar is cold in January, the cases of ischemic heart diseases, heart failure, and hypertension are high, especially in women. On the other hand, in July, Nangarhar is very hot, ischemic heart diseases, heart failure and hypertension are low in both sexes. The reason for the increase in heart diseases in January can be due to sympathetic nervous system and angiotensin system activation, causing high blood pressure and heart disease. Thus, patients especially females should be kept warm and dressed warmly throughout the winter season to prevent cardiac disorders, and care should be given to keep them warm in homes and hospitals. According to (Hu and He, 2021) blood pressure typically decreases in high temperatures and rises in low temperatures. A study conducted in the Czech Republic revealed that the number of deaths from cardiovascular diseases was higher on the coldest days. In emerging nations, the rise in cardiovascular mortality is positively correlated with cold. (Yavar & Liu, 2015). A study conducted in south China in 2008 revealed that cardiovascular fatalities had been linked to temperatures below average (Yavar & Liu, 2015). According to (Giang & Dung, 2014), warm air reduces cardiovascular illnesses while cold air worsens them. In the north and south of the equator, research on the connection between seasonal changes and

hypertension has been done, and the findings show that the incidence of hypertension is higher in the cold season than in the hot season. Although the exact origin of hypertension in the cold is unknown, it is believed that the sympathetic nervous system's excessive activity is to blame (Fares, 2013) According to US studies, a 5°C drop in temperature led to an increase in the incidence of hypertension of 1.01% to 2.09% and 1.55% to 2.49% (Fares, 2013). According to a study done on 8801 elderly people in three French provinces, hypertension was more prevalent in the colder months (Fares, 2013). Blood arteries constrict, blood pressure increases, and thrombosis also happens in cold conditions. Exercise in chilly conditions raises heart attack risk and triggers acute coronary syndrome (Giang, 2014). A cool temperature, as opposed to a high one, was associated with a higher risk of dying from cardiovascular diseases (Lin and Chang, 2013).

CONCLUSION

Given the global conversation around climate change, we aimed to assess the correlation between variations in temperatures and the prevalence of cardiovascular illnesses. Based to our research, the prevalence of cardiovascular disorders, such as ischemia, heart failure, and hypertension, is higher in the colder month of January and lower in the warmer month of July in Nangarhar. According to our research, patients should be kept warm and dressed in warm clothing all over the cold season in order to prevent cardiac diseases. Cold weather should also be taken care of in homes and hospital. It seems that cardiovascular diseases such as heart failure, hypertension, and cardiac ischemia are positively correlated with low temperatures. As there is no correlation between high body temperature and cardiovascular conditions such hypertension, myocardial ischemia, or cardiac insufficiency. Therefore, during the winter season, patients should be kept warm and dressed warmly to prevent cardiac disorders. In addition, homes and hospitals should take precautions to keep their residents comfortable during the cold.

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