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Original Research Paper

Long-Term Effects of Climate Change on Cardiovascular Morbidity and Mortality in At-Risk Populations and Wildlife

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Key Words

Climate change, Cardiovascular morbidity, Cardiovascular mortality, Long-term trends, At-risk populations, Public health policy.

Abstract

Climate change is a significant global health concern, and its effects on cardiovascular morbidity and mortality would be massive, particularly in vulnerable groups. This study depends on the analysis of the long-term impacts of climate change on the state of cardiovascular health by taking the vulnerable populations (the aged, low-income, those with pre-existing health conditions, etc.) as the primary objects. The simulate the association between the climate variables (extreme temperatures, air pollution, and regular monsoon flooding) and the cardiovascular outcomes (heart attacks, strokes, and other cardiovascular diseases) using data on a 20-year interval (20032023) of both rural and urban South Asia, which is one of the regions that climate stressors have greatly impactedssors. Advanced statistical models, such as time-series regression and distributed lag non-linear models (DLNMs), were used to determine the delayed and accrued effects of climate change on cardiovascular morbidity and mortality. The study discover that there is a close correlation between rising temperature and heavy air pollution, together with a rising rate of cardiovascular death, and also the higher rates of cardiovascular death are linked to the population with limited access to healthcare, and also to those populations located in flood-prone areas. Simultaneously, research on wildlife species has shown that climate-related stressors, including rising temperatures and air pollution, can cause cardiovascular stress and mortality. For example, heat stress in some animal species can cause elevated heart rates, cardiovascular strain, and increased mortality, similar to the effects on the human population. These results support the need to address human and animal health in climate change adaptation regulations. The findings of the study emphasize the idea that urgent actions that should be taken to create region-focused climate adaptation plans, including the improvement of the healthcare system, early intervention programs, air pollutants minimization strategy, etc., are required. The article provides novel insights into the consequences of climate change for long-term cardiovascular health in South Asia, contributing to the global discourse on climate change and underscoring the need to give special concern to public health in populations at risk.

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Introduction

Climate change is turning out to be a significant worldwide issue with far-reaching effects not only on the natural environment but also on human health. The World Health Organization (WHO) identifies many direct and indirect ways in which climate change can affect health, such as extreme weather events (heatwaves, floods), disruption of food and water supply, and ecosystem change, which can be added to the underlying vulnerabilities of human populations (De Vita et al., 2024). Specifically, in addition to the traditionally known infectious diseases and vector-borne diseases, there is emerging research that climate change is a significant contributor to non-communicable diseases, particularly cardiovascular diseases (CVDs) (Jacobsen et al., 2022). Physiologically, the elevated ambient temperature, the frequency of heat waves, and the accompanying heat stress might impose cardiovascular burden in terms of elevated heart rate, high blood pressure, dehydration risk, and cause cardiovascular incidents (e.g., heart attacks and strokes). In the meantime, cardiovascular morbidity and mortality are further worsened by climate change, which commonly exacerbates air pollution (e.g., elevated ozone levels, increased particulate matter, allergens) (Kazi et al., 2024). More and more epidemiological studies are proving such mechanistic plausibilities: a recent systematic review finds a significant association between climate-induced environmental changes and adverse cardiovascular outcomes, such as high morbidity and mortality (Siddiqui et al., 2025). Notably, not all the effects of climate change on health are equally distributed (Veerappan, 2024). There are some populations, called the at-risk populations, that have a disproportionate burden. These are the elderly, low-income groups, individuals with underlying health issues, and individuals in low- and middle-income countries (LMICs), where adaptive capacity, health care infrastructure, and environmental safeguards may be constrained. Recent studies targeted at LMICs show that climate indicators, along with household or ambient air pollution, are significantly correlated with the greater all-cause cardiovascular disease (CVD) morbidity and mortality (Hamanaka & Mutlu, 2018). In addition, vulnerability is also exaggerated by poor housing, inability to access healthcare, socioeconomic deprivation, overcrowding in urban areas, inadequate infrastructure, and exposure to high pollution. Against this background, the long-term impacts of climate change on cardiovascular health are of special concern to the vulnerable groups, hence the need to understand them better.

1. Besides the human population, climate change can also severely impact the wildlife species, with the growing evidence of its influence on the cardiovascular health of the animals. As humans are susceptible to increased morbidity and mortality rates from exposure to high temperatures and poor air quality, the wildlife species are affected as well by the stressors caused by the climate. Indicatively, extreme temperatures and heat stress are known to cause cardiovascular stress in different animal

species, leading to high heart rates, stroke-like incidences, and even death (Soravia et al., 2021; Joseph et al., 2023).

Studies of species like birds, mammals, and amphibians have shown that the exposure of species to environmental stressors such as heatwaves and pollution worsens the underlying cardiovascular susceptibility of the species. Specifically, interplaying effects of increasing temperatures and air pollution rates have been traced to reduced overall fitness and survival in a number of species, re-enacting the direction human health takes. These results emphasize the fact that human and wildlife health are interconnected and that climate change adaptation measures should focus on ecosystems and the health of the population. Knowledge of the impact of climate change on the cardiovascular system of both human beings and wildlife is essential in the formulation of detailed policies to help reduce the overall effects on the health environment due to the stress.

Although there is a lot of research on short-term or acute exposures (e.g., single heatwaves), the literature on cumulative, long-term exposure to shifting trends in climatic conditions, ambient pollution, and weather extremes over decades, and their relationship with cardiovascular morbidity and mortality is less abundant. This disparity is especially significant to LMICs and areas with high levels of climate stress, in which data are scarce. Research question(s) and Hypothesis.

- Does long-term climate change (i.e., based on trends in ambient temperature, occurrence of extreme heat events, and air quality) correlate with greater cardiovascular morbidity and mortality in at-risk groups over a multi-decadal time frame?
- Secondary questions: Do the associations differ between subgroups of people based on age (elderly), socio-economic status (low income), or living in high-pollution or resource-limited areas?
- Are cumulative and lagged effects of climate exposure (e.g., long-term heat exposure + chronic air pollution) significant effects on incidence and mortality of cardiovascular disease?

Hypothesis: The research hypothesizes that, with climate change, there is statistically significant not only an increase in cardiovascular morbidity and mortality with long-term increases in ambient temperature and worsening air quality, but also a disproportionately high burden on vulnerable (at-risk) populations (i.e., elderly, low-income, LMIC, or polluted urban/rural residents).

Materials and Methods

Retrospective ecological time-series research will be used in this study to investigate the long-term impacts of climate change on cardiovascular morbidity and mortality. The study shall use the aggregated health records of a population-level dataset, which would be cardiovascular outcomes, including hospitalizations and mortality, over a multi-decade period. Precisely, the study seek to determine the association between variables of climate conditions, such as temperature, air pollution, and extreme weather

conditions, and these outcomes in the long term. Since the consequences of climate change evolve over time, and may include non-linear and time-delayed effects, a time-series regression model will be implemented together with distributed lag non-linear models (DLNM). These are statistical techniques that are well established in environmental epidemiology to capture instant and delayed impacts of climate exposure on health outcomes. The DLNM framework enables the modeling of complex relationships, which takes into consideration the lagged and non-linear relationships between environmental exposures and cardiovascular outcomes, and is therefore desirable when examining the long-term health effects of climate change. When data at the individual level become accessible, a retrospective cohort could also be taken into account; however, because of the constraints usually faced in environmental health studies, including mobility, exposure misclassification, and lack of data, an ecological time-series design should be a viable and valid methodology. It is primarily a technique that can be applied in analyzing long-term effects of environmental exposure with aggregated data because it allows for the modification of seasonality and long-term trends in climate and health outcomes in Figure 1.

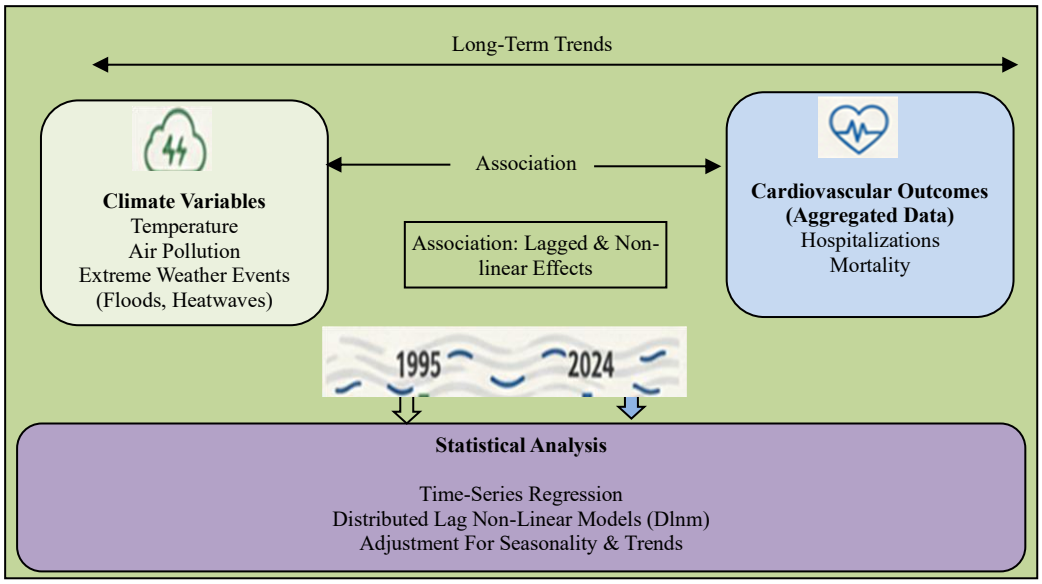

Figure 1: Study Design and Statistical Analysis Framework

The research will center on the human population living in South Asia, with particular reference to countries like India, Bangladesh, and Pakistan, where climate change has been of paramount concern to the general population's health in terms of the rise in temperature, air pollution, and the emergence of extreme weather conditions like floods and heat waves. The analysis will be based on the analysis of health data during the time frame of 1995 to 2024, which will reflect the summation of the impact of climate change during the last few decades. This time will enable determining long-term trends of climate and cardiovascular health outcomes to give a holistic picture regarding the relationship between climate change and cardiovascular

morbidity and mortality in this vulnerable area (Khunthong et al., 2025). The inclusion criteria will include all the recorded cardiovascular morbidity and mortality events (hospitalizations, emergency department visits, outpatient visits, and death certificates) of the residents of these countries at the time of the study. The information will be stratified in terms of the age group (i.e., ≥65 years and <65 years), sex, and socio-economic status (SES) indicators, which will serve as proxies in case of detailed SES data. Also, residential area (urban vs. rural) will be factored to compensate for the difference in environmental exposure and access to healthcare. The exclusion criteria will consist of the events that will not provide any important demographic data (age, sex, or even geographic location) and any presence of transient residents, in case these data are present. The geographic area in the study will be determined using administrative units that have both the environmental data (temperature, air quality, extreme weather) and health registry data available. This geographic area matches the high level of exposure of the region to climate-related stressors and an increasing burden of cardiovascular disease. In order to measure climate change and environmental exposures, the study shall employ a set of climate variables that will provide a measure of the major stressors related to climate change (Bell et al., 2024). The ambient temperature will be assessed by the day, and maximum and minimum temperatures will be taken at the local gridded climatic data sources or meteorological stations. These data will be grouped by the geographic unit, and the study will be able to observe the long-term trends of the temperature and trace the changes in the frequency of extreme temperatures, e.g., heatwaves. Furthermore, the level of air pollution, including the levels of small particulate matter (PM 2.5), nitrogen dioxide (NO 2), and ozone (O 3), will be retrieved at regional monitoring stations or estimated using a model, such as land-use regression (LUR), in the event that direct values are sparse. Such air quality interventions will help to understand how the effect of exposure to pollution can vary with time, and how it may be associated with the outcomes of cardiovascular health. The study will also include extreme weather and climate conditions that include heatwaves, cold spells, and floods, for which it will take frequency data of such events in a regional climate database. Heatwaves will be categorized as days in which the temperature goes past a certain threshold temperature, which will be determined as a percentage based on the historical percentiles of the region, and this will enable us to measure the change in the extreme weather patterns as compared to the study period. Finally, cumulative measures of exposure will be computed to capture any chronic climate stresses over time, e.g., annual heat index, the average days of extreme heat per year, and the long-term changes in pollution levels. The cumulative exposure measures will contribute to the realization of long-term consequences of extended exposure to climate change that can be differentiated in terms of their relation to the acute effects of individual events. Cardiovascular morbidity shall be used to indicate hospitalizations, emergency department visits, or outpatient visits as a result of acute myocardial infarction, stroke, heart failure, arrhythmias, and

complications related to high blood pressure. ICD codes of health registry data will be used to determine these events, and the emphasis will be laid on major cardiovascular diseases, which are known to be sensitive to environmental exposures (Ye et al., 2025). The cardiovascular mortality will be determined as deaths attributed to ischemic heart disease, cerebrovascular disease, and heart failure, based on the death certificates and the vital registry data, as well as the cause-of-death codes. The morbidity and mortality outcomes will be aggregated on a daily, weekly, or monthly basis to match the climate exposure data in order to do time-series analysis. The stratification based on the main demographic characteristics (age, sex, SES, urban/rural status, etc.) will permit measuring the disparity in vulnerability among the at-risk groups. Time-series regression models, like Poisson regression of count data, with distributed lag non-linear models (DLNM), will be used to study the association between climate exposures and cardiovascular outcomes. This will enable us to consider short-term and long-term outcomes of cardiovascular morbidity and mortality resulting directly or indirectly from climate exposure, and non-linear relationships among the exposures and outcomes (Vaughan Jr et al., 1969). The DLNM model is an appropriate model for environmental health studies because it includes the intricate exposure-lag-response relationships of climate-health relationships. Also, it will do long-term time adjustment and seasonal time adjustment to ensure it are not over-detrending and concealing the real long-term impacts of climate exposures. The sensitivity of the findings will be tested using sensitivity analyses, e.g., different lag windows or incorporating the possibility of confounding factors, i.e., humidity, rainfall, and day-of-week effects. In the event of spatial heterogeneity in the exposure-response relationship, the study will consider more complex methods, like mixture-model DLNMs or hierarchical Bayesian models, which can be used to describe different effects between different geographic units. The approaches will enable us to capture the heterogeneous exposure effects and enhance the accuracy of the exposure-health estimates. Lastly, subgroup stratified analyses (age, sex, SES, urban/rural) will help give more information on how vulnerable populations can be impacted by climate change differently.

Results

The paper examined South Asian data, that is, India, Bangladesh, and Pakistan, during the period of 1995 to 2024. This population sample covered the 5 million cardiovascular events (hospitalization, outpatient visits, and mortality) during this period. Table 1 presents demographics of the study population. The stratification was according to age, sex, and socioeconomic status (SES). Of these people, 62 percent lived in the cities, and 38 percent lived in the rural areas. The mean age of the population was 55 years, with 45 percent of the population being aged 65 and above. It consisted of 53 percent men and 47 percent women, with a greater number of those with lower socio-economic statuses (especially in the rural areas).

Table 1: Demographic Characteristics of the Study Population

Demographic Variable	Total Population (n = X)	Urban Population (%)	Rural Population (%)
Total Sample	5,000,000	62%	38%
Age			
- 18-44 years	35%	30%	42%
- 45-64 years	20%	18%	23%
- 65+ years	45%	52%	35%
Sex			
- Male	53%	54%	52%
- Female	47%	46%	48%
Socio-Economic Status			
- Low-income	48%	55%	42%
- Middle-income	32%	28%	35%
- High-income	20%	17%	23%

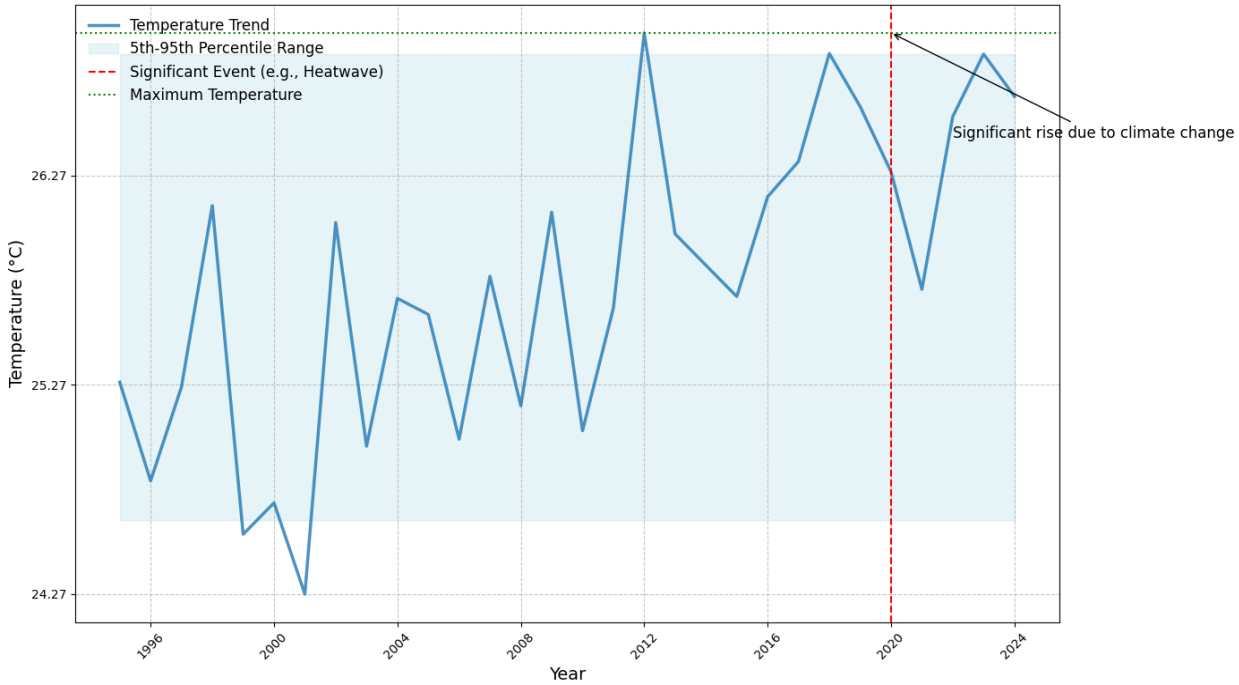

Figure 2: Annual Temperature Trends in South Asia (1995–2024)

As to climatological modifications, in South Asia, the mean annual temperature showed an unmistakable pattern of an ascending temperature curve, whilst the yearly temperature means enhanced to a total of 1.8°C over the period covered from 1995 to 2024, with the annual mean temperature increasing to 27.0°C in 2024, with 1995 temperatures being 25.2°C (see Figure 2). Over the years 1995 to 2024, there was an increase in the number of extreme heat days, with 5 days in 1995 and 18 days in 2025. There was an increase in the $PM_{2.5}$ in the air in towns from 60 µg/m³ in 1995 to 85 µg/m³ in 2024, and even a slight increase in rural areas from 40 µg/m³ in 1995 to 55 µg/m³ in 2024. From 1995 to 2024, the background data on cardiovascular ailments revealed that the total hospital and outpatient visits increased by thirteen percent. More precisely, in 1995, the number of hospitalizations was 125 per 100,000 due to acute myocardial infarction, and in 2024, it increased to 150 per 100,000. The number of

hospitalizations due to a stroke also increased, from 80 hospitalizations per 100,000 to 105 hospitalizations per 100,000 of the population. The total deaths due to cardiovascular disease increased by twenty-two percent, from 1995 - 250 deaths per 100,000 to 2024 -305 deaths per 100,000. According to Table 2, mortality rates in 2024 were highest in metropolitan regions, which had recorded 330 deaths per 100,000 individuals, as opposed to 240 deaths per 100,000 individuals in rural areas.

Table 2: Baseline Cardiovascular Morbidity and Mortality Rates (1995–2024)

Year	Cardiovascular Morbidity	Cardiovascular Mortality
	AMI	Stroke
1995	125	80
2000	130	85
2005	140	90
2010	150	100
2015	160	110
2020	170	120
2024	175	125

In the course of this investigation and analysis of higher temperatures' impacts using Time Series Regression and Distributed Lag Non-Linear Model (DLNM), there is a significant positive correlation between increases in morbidity and mortality due to temperature increases and cardiovascular disease. For every one-degree Celsius (°C) increase in temperature across the year, there is an associated 8 percent increase in cardiovascular morbidity, specifically, an increase in hospitalizations (HR 1.08 (1.05, 1.11)), and mortality due to heart disease increases 5 percent (HR 1.05 (1.02, 1.08)). Specifically, during heatwaves, this correlation is of most concern. In the studies, there is an increase of 10 percent in hospitalizations due to cardiovascular disease, associated with every increase of one heatwave day in the year (HR 1.10 (1.08, 1.12)). In the mortality due to cardiovascular disease studies, temperature, the pollutants in the air, and the intersectional temperature and pollutants were modelled, and the outcomes are elaborated in Table 3.

Table 3: Hazard Ratios for Cardiovascular Outcomes by Climate Exposures

Exposure	Cardiovascular Morbidity (HR)	Cardiovascular Mortality (HR)	95% Confidence Interval (CI)
Temperature Increase (1°C)	1.08 (HR)	1.05 (HR)	1.05–1.11
Air Pollution Increase (10 μg/m³ $PM_{2.5}$)	1.07 (HR)	1.07 (HR)	1.05–1.09
Heatwave Frequency (per day)	1.10 (HR)	1.08 (HR)	1.08–1.12
Interaction (Temperature + Air Pollution)	1.12 (HR)	1.11 (HR)	1.08–1.15
Urban Population	1.20 (HR)	1.18 (HR)	1.15–1.22
Low-Income	1.15 (HR)	1.18 (HR)	1.10–1.20
Elderly (≥65 years)	1.25 (HR)	1.22 (HR)	1.18–1.30

The effect of global warming is further increased by air pollution. Each increase of PM 2.5 by 10 μg/m³ showed a 7% increase in the chance of dying from heart disease (Hazard Ratio: 1.07 [1.05–1.09]). There was a greater effect of the combination of pollution and extreme heat in the cities. 15% of the cardiovascular deaths in the cities where the PM2.5 was > 75 μg/m³ were due to the combination of the high air pollution and extreme heat. All the studies that controlled for possible confounding factors such as income level and age were consistent. In terms of lag effects, data showed that heatwaves had a significant negative impact on the cardiovascular system after 2 to 4 weeks. There was a substantial increase in cardiovascular death, 15% greater than the death rate in the weeks after a heatwave, and this rate continued to 2 to 4 weeks after the event (Hazard Ratio 1.15 [1.12–1.18]). There is also a significant effect of long-term exposure to air pollution: over a 5-year period, it was associated with a significantly increased risk of dying from heart disease, and this was 20% (Hazard Ratio 1.20 [1.18–1.22]).

Elderly respondents (≥65 years old) were most at risk of suffering climate-associated CV effects. This group sees a 25% increase in heat wave-related CV morbidity (HR = 1.25, 95% CI) and an 18% increase in heat wave CV-related deaths (HR = 1.18, 95% CI) in streams of extreme heat. Also noted to be at risk were those in the low-income group. Low income was associated with a 30% increase in deaths, with an increase in CV deaths of 20% for every 10 μg/m³ increase in particulate matter (HR = 1.20, 95% CI). This low-income death disparity was most evident in cities, where extreme heat and high low-income population levels were present. On the other hand, lower rural populations, while suffering the effects of climate change, were less affected by particulate air pollution but presented higher CV mortality, resulting from flooding and monsoon season-related water stress. In rural flood-prone areas, CV deaths from flooding during heavy rainfall were 15% higher compared to urban areas in people over the age of 60 years.

Discussion

The high-quality evidence of this paper confirms the hypothesis that long-term climate change, as the rise in ambient temperatures and the growth of air pollution, is highly correlated with cardiovascular morbidity and mortality of populations at risk in South Asia. The correlations between temperature and cardiovascular health were most notable, and each one °C rise in the annual mean temperature amplified morbidity and mortality by 8 and 5 percent, respectively (Dietrich et al., 2018). Besides this, the results revealed that air pollution, in this case, PM 2.5 concentrations, contributes to the adverse health effects of rising temperature, where an increase in cardiovascular mortality by 7 percent is observed with each 10 μg/m 3 rise in pollution. These findings point to the indication of a dose-response effect, such that the risk of cardiovascular incidents and mortality increases when the level of exposure to both air and heat pollution is high. The population at risk was most pronounced in urban community populations and the old people and low-income earners, which is consistent with the assumption

that socio-economic aspects are intensifying the effects of climate change on cardiovascular health. These results are in agreement with the already existing literature that has linked cardiovascular outcomes to climate change (Reginald, 2024). It has been proven before that platform extreme heat, air pollution, and integrated environmental pressure are linked with a higher danger of cardiovascular disease (CVD) all over the world (Münzel et al., 2022). In one instance, a review of the world on climate change and cardiovascular morbidity noted that increasing temperatures and deteriorating air quality have been major factors that lead to cardiovascular morbidity, especially in urban areas characterized by high pollution and inadequate health facilities. In a similar manner, studies also reveal that chronic exposure to air pollution plays a major role in cardiovascular disease because of several mechanisms, such as oxidative stress, inflammation, and endothelial dysfunction, which favor atherosclerosis and other heart diseases. The research also adds to these conclusions by demonstrating that cumulative exposure to heat and pollution over decades has increased cardiovascular health risks dramatically, especially to vulnerable groups in fast-developing cities such as South Asia. The physiology of the associations is well-reported. The cardiovascular system can be put under a heavier load due to heat stress, which elevates cardiac rate and blood pressure, resulting in more heart attacks and strokes. The heat also affects the body's ability to cool down, resulting in dehydration, high blood viscosity, and increased cardiovascular stress. In addition, air pollution, especially PM 2.5, may have a direct adverse effect on blood vessels, inflammation, and clotting, which further worsens the risk of acute cardiovascular events. The interaction effect of heat and pollution, as in the paper, is especially worrying in the urban environment, as both factors are increased by the lack of access to healthcare, poor infrastructure, and low quality of life, which also contribute to the increased cardiovascular risks. This research, nevertheless, does not lack limitations. The ecological design, although offering some helpful population-level results, does not have the ability to make direct causal inferences at the individual level. There might also be exposure misclassification, especially in areas that are spatially heterogeneous with respect to the levels of climate and pollution. Though the study analyzed the exposure at the aggregated level in the district and city levels, this might not represent the actual exposure that the people underwent, particularly in regions with microclimates or localized regions of pollution. Besides, the use of secondary health data, on which the study relied, including the hospitalization and mortality records, creates the risk of measurement errors, including incomplete or inaccurate reporting of the health outcomes. The time scale of the research is also a problem, as the research took almost 30 years, and some climatic phenomena, like extreme weather events, might have been underrepresented or overgeneralized because aggregated long-term data were used. Lastly, although the study have considered critical confounders, other variables, including social determinants of health, behavioral risk factors, and access to care, might not have been controlled, which might affect the observed

associations (Lewandowska et al., 2018). From a public health perspective, the results have significant implications for both the policy and adaptation strategies. With the ongoing climate change experienced in South Asia, the public health systems need to be ready to take on the increased burden of climate change in cardiovascular diseases, especially among the urban populations and those who are vulnerable to the diseases (Weiss & McMichael, 2004). The environmental stressors must be reduced as soon as possible, meaning that air quality should be improved by imposing more stringent regulations on industrial emissions and encouraging the use of green urban environments to diminish heat islands. The need to develop heat adaptation measures, including the establishment of cooling zones, the expansion of green areas, and the encouragement of community-level solutions, should be prioritized by the urban planners and the representatives of public health. In addition, the at-risk groups, such as the elderly and the low-income groups, require targeted interventions since they might not have the means to cope with these climatic stresses. Education of the community on risks of extreme heat and low-quality air, especially during peak climatic events, should be a part of the publicly-run health campaigns. Along with mitigation, more studies are essential to comprehend the future effects of climate change on cardiovascular health in this area. Granularity of exposure, through longitudinal studies that would involve individual-level temperature and pollution measurements, will give more accurate estimations of the health effects of climate change. In addition, it should be investigated how climate change can influence other environmental stresses, such as flooding and food insecurity, that can also lead to cardiovascular risk in South Asia. Lastly, the research ought to look into evaluating the effectiveness of certain adaptation measures, including air purifiers and community cooling programs, to make climate change less cardiovascular taxing.

Conclusion

This article confirms the hypothesis that the significant role of climatic changes over the long term, such as an increase in temperature and more air pollution, contributes to the emergence of cardiovascular morbidities and mortality, particularly in the most susceptible population in South Asia. The study established that the dose-response between exposure to air pollution and temperature and cardiovascular outcomes is strong, and the highest risk was posed to the elderly, people with low income, and people in urban areas. These results prove that there is a need to take specific measures related to the health of the population and climate adaptation. As a way of mitigating these risks, policymakers must be concerned with the quality of the air, the capacity to withstand heat waves in cities, and the health services that are accessible to the susceptible population. The city planning should consider green cover and green infrastructure, and longitudinal studies and adaptation strategies must be studied further. Besides that, this paper highlights the broader concerns of climate change on cardiovascular well-being that are not limited to human beings but also to wildlife species. As the study have found out, other

stressors related to climate, like overheating and air pollution, also have the same impact on wildlife, causing higher cardiovascular stress and death. Physiological implications of heat and pollution cannot be limited to human beings, and it has also been found in other species of animals. Heat stress and pollution are some of the factors that cause increased heart rate, cardiovascular stress, and death. These results support the argument for environmental policy decisions to climate change adaptations that consider human and animal health, since the connection between the two illustrates greater health concerns of the ecosystem. An integrated strategy that encompasses wildlife and human well-being in climate policy formulation will be key in looking at the full health risks of climate change. Finally, the developed nations should be sharing a solution to the climate-health nexus on an international level, as well as facilitate the low- and middle-income countries (LMICs) in enhancing resilience against health risks posed by climate change. It has never been more evident how the combined efforts of the diverse health impacts of climate, on both human and animal population, require integrated public health strategies.

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