

THE IMPACT OF AIR POLLUTION FROM THERMAL POWER PLANTS ON THE HEALTH OF PEOPLE LIVING NEARBY

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Annotation: Air pollution from thermal power plants poses a serious public health threat to nearby populations. This study aims to evaluate the correlation between emissions from thermal power plants and the prevalence of respiratory and cardiovascular diseases among residents living within a 5-kilometer radius of such facilities. Using a cross-sectional survey combined with air quality monitoring and medical record analysis, the study found significantly higher rates of chronic bronchitis, asthma, and ischemic heart disease among exposed populations. Findings highlight the urgent need for stricter emission control and public health interventions in affected areas. In addition to this the article analyzes hygienic factors that influence the working conditions of thermal power plant (TPP) workers and shows ways to optimize them.

Key words: occupational hygiene, thermal power plant, industrial hygiene, microclimate, working conditions, optimization, labor protection, noise, temperature, high pressure

1. Introduction

Thermal power plants are an important branch of industry and play a very important role in the country's energy system. Production processes in such enterprises are associated with noise, high temperature, high pressure, vibration, harmful substances in the air, and high energy consumption, which creates certain hygienic risks to working conditions.

Therefore, it is an important and urgent issue to create a healthy and safe working environment in the TPP by conducting regular hygienic assessments of the working environment and eliminating identified problems. A healthy workforce is essential for sustainable social and economic development at the global, national and local levels.

One of the main indicators of the natural movement of the world's population is the mortality rate and life expectancy (LIFE). It has been noted that air pollution in residential areas can cause premature death of a large number of people in the world. Air pollution is one of the major concerns for people all around the world, with various sources contributing to the menace globally. Among these, Thermal power plants is one of the chief point sources of air pollution all over the world. Unfortunately, with the ever-growing capacity of these power plants, our country is also witnessing extreme contaminations of air around their vicinities. Release of these hazardous emissions in the atmosphere contributed by the electricity generation in the thermal power plants is a serious concern and possesses threat to a large percentage of human life, biodiversity and environment. Thermal power plants (TPPs) are among the largest stationary sources of air pollution worldwide. These plants release substantial quantities of pollutants, including sulfur dioxide (SO₂), nitrogen oxides (NO_x), carbon monoxide (CO), and particulate matter PM₁₀ and PM_{2.5}), which have been linked to various health problems. The literature emphasizes that oxygen, the most vital component of air, has a volume fraction of 20.9% and its reduction to 14% leads to significant negative changes in the body; the nitrogen content of breathing air is 78% by volume; carbon dioxide (CO₂) should not exceed 0.03%; sulfur dioxide (SO₂)

at 0.002-0.003 mg/l can damage the eyes and upper respiratory tract and, in chronic cases, cause inflammation of the upper respiratory tract.

Residents living near TPPs are continuously exposed to these pollutants, raising concerns about long-term health effects. Previous studies have reported increased incidences of respiratory and cardiovascular diseases in such populations. However, limited localized research exists to quantify these effects, particularly in developing countries.

2.Objectives

To measure air pollutant levels in communities near thermal power plants. To assess the prevalence of respiratory and cardiovascular diseases among nearby residents. To determine the correlation between pollutant exposure and health outcomes.

3. Methods

The study was conducted in two regions:

Exposed area: within a 5 km radius of a coal-fired thermal power plant.

Control area: a demographically similar area located 30 km away from any industrial activity.

Ambient air quality was measured for pollutants including SO₂, NO_x, PM_{2.5}, and PM₁₀ using portable analyzers over a three-month period.

A structured health survey was conducted among 600 participants (300 from each area). Additionally, medical records from local clinics were reviewed for a 5-year period to identify chronic disease trends.

Statistical Analysis: Prevalence rates were compared using chi-square tests. Logistic regression was used to determine the odds ratios of disease occurrence associated with pollutant exposure, controlling for smoking, age, and occupation.

4.Results

Chronic bronchitis: 14% (exposed) vs. 5% (control)

Asthma: 10% (exposed) vs. 3% (control)

Ischemic heart disease: 8% (exposed) vs. 2% (control)

Odds of chronic bronchitis: 3.1x higher in exposed group (p<0.01)

Odds of asthma: 3.7x higher (p<0.05)

Odds of ischemic heart disease: 4.0x higher (p<0.01)

Pollutant Exposed Area Avg. Control Area Avg. WHO Limit

PM_{2.5} 68 µg/m³ 28 µg/m³ 15 µg/m³

PM₁₀ 122 µg/m³ 53 µg/m³ 45 µg/m³

SO₂ 46 µg/m³ 12 µg/m³ 20 µg/m³

NO_x 62 µg/m³ 18 µg/m³ 40 µg/m³

Pollutant levels in the exposed area exceeded WHO guidelines significantly.

5. Discussion

The study confirms a strong association between air pollution from thermal power plants and negative health outcomes among nearby residents. The significantly higher concentrations of PM_{2.5} and SO₂ in the exposed area align with the increased prevalence of respiratory diseases. These findings support previous research in similar contexts and emphasize the importance of environmental health policy. Current emission standards appear insufficient to protect public health, particularly for vulnerable populations such as children and the elderly.

6. Conclusion

Living near thermal power plants significantly increases the risk of respiratory and cardiovascular diseases due to prolonged exposure to air pollutants. Urgent action is needed from policymakers to mitigate these health impacts through stricter regulations and sustainable energy transitions.

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