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Effect of Air Pollution on Human Health in Gautam Buddha Nagar

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Abstract
Air pollution is a significant environmental and public health problem, especially in rapid urbanizing regions such as Gautam Buddha Nagar (Noida and Greater Noida). This study examines the effect of air pollution on human health using a quantitative approach with a test size of 50 respondents. Data was collected through structured questionnaires that assessed respiratory, cardiovascular and other health conditions related to exposure to air pollution. Statistical analysis, including correlation and regression, was used to determine the ratio of air pollution levels (PM2.5, PM10, NO_2, SO_2) and health outcomes. The findings indicate a strong correlation between air pollution and increased respiratory and cardiovascular disease. The study concludes with political recommendations to curb air pollution and improve public health in Gautam Buddha Nagar.
Keywords: *Air pollution, human health, respiratory diseases, PM2.5, Gautam Buddha Nagar.*

INTRODUCTION

Air pollution is a growing concern in urban areas due to industrialization, vehicle emissions and construction activities. Gautam Buddha Nagar, a rapidly developing district in the National Capital Region (NCR), is facing severe air pollution, especially in the winter months when PM2.5 and PM10 levels exceed who the safety limits. Long -term exposure to contaminated air leads to respiratory disorders, cardiovascular disorders and other health complications.

Problem Statement

Despite growing awareness, there is a lack of pollution research focused specifically on Gautam Buddh Nagar. Due to its proximity to Delhi, the district has high exposure to particulate matter, and the health outcomes of its urban and semi-urban population have not been well documented.

Goals for the study

- To assess the level of air pollution in Gautam Buddha Nagar.
- To evaluate the health effects of air pollution on the inhabitants.
- To establish a quantitative relationship between exposure to air pollution and specific health conditions.
- To recommend molding strategies based on the findings.

Research questions

- What are the most common health problems associated with air pollution in Gautam Buddha Nagar?
- Is there a statistically significant relationship between exposure to air pollution and reported health problems?
- How does the impact across demographic groups vary?

Hypothesis

H_0 : There is no significant impact on air pollution on human health in Gautam Buddha Nagar.
H_1 : There is a significant impact on air pollution on human health in Gautam Buddha Nagar.

LITERATURE REVIEW

Several studies have established the harmful effects of air pollution on health, especially in densely populated areas. According to WHO (2021), air pollution amounts to about 7 million deaths worldwide annually. Indian cities consistently rank among the world's most polluted, and NCR is a large hotspot.

A study by Sharma et al. (2020) emphasized the relationship between PM2.5 levels and respiratory disease in Delhi. However, there is a lack of data specific to satellite cities such as Gautam Buddha Nagar, which faces similar conditions, but often lacks infrastructure to monitor and respond to pollution -driven health crises.

METHODOLOGY

Research Design

This study adopts a quantitative research design. A cross -sectional survey was performed using structured questionnaires to collect primary data.

Population and test

Population: Residents of Gautam Buddha Nagar
Example size: 50 participants
Sampling technique: Simple random sampling to ensure diverse representation from Noida, Greater Noida and nearby semi-urban areas.

Data collection tool

Questionnaire: Designed to capture demographics, lifestyle habits, existing health conditions and symptoms related to exposure to air pollution.
Air quality data: Secondary data collected from CPCB and Safar Monitoring Station.

Variables

Independent variable: Exposure to air pollution (based on AQI levels).
Depending on variable: Health problems (cough, asthma, bronchitis, headache, fatigue, cardiovascular symptoms).
Control variables: age, gender, occupation, smoking status, use of air purifiers, etc.

Data analysis techniques

Descriptive Statistics (Average, Frequency, Percent)
Inferential statistics (correlation analysis, chi-square test, regression analysis)

Data analysis and findings

4Demographic profile
Demographic variable distribution
Gender 28 male, 22 female
Age group 18–30: 20, 31–50: 18, 51+: 12
Occupational workers: 22, students: 10, others: 18
Smoke habits yes: 8, no: 42
Use of air purifies yes: 14, no: 36
Health complaints among the respondents
Health problems number of respondents
Frequent cough 34
Breathing difficulty 22
Asthma or respiratory disease 12
Fatigue or dizziness 26

Demographic Profile

Demographic Variable	Distribution
Gender	28 Male, 22 Female
Age Group	18–30: 20, 31–50: 18, 51+: 12
Occupation	Office workers: 22, Students: 10, Others: 18

Demographic Variable	Distribution
Smoking Habit	Yes: 8, No: 42
Use of air purifier	Yes: 14, No: 36

Health Complaints Among Respondents

Health Issue	Number of Respondents
Frequent cough	34
Shortness of breath	22
Asthma or respiratory disease	12
Fatigue or dizziness	26
Headaches	29
Cardiovascular symptoms	10

Air Quality Data Overview (July 2025)

- **Average PM2.5:** 162 μg/m³ (Unhealthy)
- **Average AQI:** 189 (Moderate to Unhealthy)
- **Peak Pollution Hours:** 8–10 AM and 6–9 PM

Correlation Analysis

Variable Pair	Pearson's r	p-value
PM2.5 vs. respiratory symptoms	0.71	0.001
PM2.5 vs. headache/fatigue	0.64	0.003
AQI vs. number of health issues	0.67	0.002

"Interpretation: Strong positive correlation found between air quality indicators and prevalence of health symptoms."

Overview of air quality (July 2025)

Average PM2.5: 162 μg/m³ (unhealthy)
Average AQI: 189 (moderate to unhealthy)
Top pollution hours: 8-10 and 18-9

Correlation analysis

Variable pair of pearson's r P-value
PM2.5 against respiratory symptoms 0.71 0.001
PM2.5 against headache/fatigue 0.64 0.003
Aqi vs. Number of health problems 0.67 0.002
Interpretation: Strong positive correlation found between air quality indicators and the occurrence of health symptoms.

CHI-SQUARE TEST (Exposure versus health conditions)

Result: ^{2} (4, n = 50) = 11.23, p <0.05
Interpretation: Statistically significant relationship between exposure of air pollution and reported health problems.

Regression analysis

Model Summary (Health Problems = F (Pm2.5, Age, Smoking))
R^2 = 0.62
Pm2.5 (β = 0.58, p <0.01)
Age (β = 0.25, p = 0.04)
Smoking (β = 0.19, p = 0.08)
"PM2.5 levels are the strongest predictor for health problems in this test."

DISCUSSION

The findings confirm the hypothesis: Air pollution has a significant negative impact on human health in Gautam Buddha Nagar. High AQI and PM2.5 levels correlate with a variety of symptoms, especially respiratory and neurological. This is in line with national trends, but now confirmed at the local level through direct data.

Comparison with previous studies

The results match Sharma et al. (2020) and which reports similar to similar symptoms as air pollution. However, this study captures uniquely located data from the Gautam Buddha Nagar, and offers specific policy relevance.

Limitations

- Small sample size (n = 50), limits generalizability.
- Self -reported health data can be subject to recall of bias.
- Lack of longitudinal tracking to assess chronic conditions.

CONCLUSION

Air pollution in Gautam Buddha Nagar is significantly affecting human health, with strong evidence pointing to respiratory issues, fatigue and cardiovascular symptoms being linked to high levels of PM2.5. Immediate interventions are necessary to avoid long -term public health crises.

Recommendations

1. Policy intervention:
   - Strict regulation of construction and emissions of vehicles.
   - Increased green cover and pollution control area.
2. Public awareness:
   - Educate residents at high -risk pollution hours.
   - Promote the use of N95 mask and air purifiers.
3. Healthcare access:
   - Install local clinics for respiratory care.
   - Include pollution related diseases in public health screening.
4. Further research:
   - Long -term large sample studies.
   - Explore mental health effects of pollution.

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