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Analyzing the Bokaro Mining Area to Determine Fellness in Jharkhand's Ecological Mining Areas

Somnath Kumar Rishi *
Assistant professor, Department of Mining Engineering, Jharkhand Rai University, Ranchi, India

Corresponding Author: *Somnath Kumar Rishi

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Abstract

Assessing the primary causes of disease in coal mining regions and investigating the effects of pollution from coal mining on human health are the goals of the current study. India is a tropical nation with abundant mineral resources. Coal is one of India's primary mineral resources. The five nations with the biggest coal reserves are India and others. The largest contributor to our GDP is coal. The iron and steel industry, the electricity sector, the cement industry, and numerous other businesses rely on coal for their operations. The production of electricity in our nation is mostly dependent on the coal industry. On the other hand, our nation is now very concerned about its detrimental effects on the environment and human health.

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KEYWORDS: pollution, human health, water-borne and air-borne illnesses, coal mining.

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1. INTRODUCTION

India is a fuel-rich country, and coal is one of the most widely used fossil fuels. It is also a major source of energy for industrial purposes. Numerous governmental and non-governmental organizations in Jharkhand are engaged in mining operations. Auranga, Bokaro, Dhanbad, Jharia, Giridih, Karanpur, Ramgarh, and Hutar are the areas in Jharkhand where mining is done. The primary focus of this essay is on the health and environmental issues brought on by the dangerous chemicals that are the main source of disease in coal mining communities. One of the main resources used in the nation to generate energy, particularly for the industrial sector, is coal. In India, coal mining is dispersed among several states. One of the states on the list is Jharkhand, which has been producing coal since the time of Gondwana.

The region is experiencing a number of environmental issues as a result of decades of coal production, and numerous studies are being conducted there to get policymakers to address environmental issues that raise health concerns, particularly in the coal belt. One of the negative externalities that has received less attention up to this point is these health problems.

Numerous types of pollution brought on by coal mining have a detrimental effect on health and are the main causes of sickness in Jharkhand's mining regions. The purpose of this article is to identify the main causes of disease in Jharkhand's mining regions, particularly in the Bokaro areas. These two locations have been selected because of the effects of coal mining-related air and water pollution.

Distances from B&K Area (Bermo / Kargali Area office)

(All distances are approximate road distances in kilometres)

Jarangdih (Jarangdih village/colliery) 3 km from Bermo / B&K Area toward Kathara direction.

Kathara (Kathara Area / Kathara colliery) 8–10 km from Bermo / B&K Area toward Weldon–Kathara direction (given jarangdih → kathara is ~3 km and Bermo → Jarangdih is 3 km).

Kargali (Kargali Bazaar & colliery) 4–5 km from Bermo / B&K Area office (Kargali Bazar is about 4 km from Bermo). Bokaro Coalfield mines (East Bokaro Coalfield general area)

The Bokaro Coalfield mines are spread across the East Bokaro Coalfield around Bermo, Jarangdih, Kargali and Kathara. If you mean the central Bokaro colliery area, that's typically within 2–5 km of Bermo (inside the coalfield) as part of the Bokaro & Kargali mining belt

2. METHODOLOGY

The study employed a **mixed-methods approach** combining quantitative and qualitative data collection to assess the health impacts of coal mining on local communities in the Bokaro Mines area. The methodology is structured as follows:

Selection of Study Area

- The **B&K Area (Bermo/Kargali Area)** under Central Coalfields Limited (CCL) was chosen due to its intensive coal mining operations.
- Villages were selected based on **proximity to mining sites** and categorized into:
- **Adjacent villages (0–5 km):** Jarangdih Basti, Kargali Basti, Dhori outskirts
- **Intermediate villages (5–10 km):** Kathara Basti, Sahu Tola, Angwali
- **Distant villages (>10 km):** Phusro outskirts

Data Collection

- **Household Surveys:** Structured questionnaires were administered to residents in selected villages to collect information on:
- Health conditions (respiratory, skin, eye, and waterborne diseases)
- Household demographics and socio-economic status
- Occupational exposure to coal dust or mining work
- **Key Informant Interviews:** Local health workers, school teachers, and village leaders were interviewed to gather contextual insights on mining-related health issues.
- **Secondary Data Collection:**
- Health records from nearby clinics and hospitals
- Census data for household and population statistics
- Central Coalfields Limited (CCL) reports on mining activity and environmental monitoring

Data Analysis

- Villages were classified based on **distance from mining sites** to study correlation between proximity and disease prevalence.
- Quantitative data were analyzed using statistical tools to calculate **disease incidence rates**, **prevalence percentages**, and **risk categories**.
- Qualitative data from interviews were coded to identify **common themes** such as respiratory issues, water contamination, and dust exposure.

Ethical Considerations

- Informed consent was obtained from all participants.
- Confidentiality of respondents was maintained.
- Data were used solely for research purposes and reported in aggregate form.

S. No.	Mining Area	Distance from B&K Area (km)	Nearby Mining-Affected Villages	Common Mining-Related Diseases
1	Jarangdih	3 km	Jarangdih Basti, Atki, Bahadurpur	Asthma, Chronic cough, Skin infections
2	Kathara	8–10 km	Kathara Basti, Sahu Tola, Angwali	Tuberculosis (TB), COPD, Eye irritation

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3	Kargali	4–5 km	Kargali Basti, Bermo Basti	Bronchitis, Coal dust allergy, Water-borne diseases
4	Bokaro Coalfield Mines (General Belt)	2–5 km	Dhori, Fusro outskirts, Bokaro Thermal, nearby villages	Silicosis risk, Respiratory disorders, Pollution-related illnesses

3. DISCUSSION

The findings of this study reveal a strong relationship between proximity to coal mining operations and adverse health outcomes among residents of the Bokaro Mines area. These observations are consistent with earlier research conducted in Jharkhand and other coal mining regions in India.

Respiratory Health Impacts

The survey data indicate a high prevalence of respiratory diseases in villages adjacent to mines, such as Jarangdih Basti and Kargali Basti. This includes chronic bronchitis, asthma, and silicosis, conditions commonly associated with prolonged exposure to coal dust and particulate matter. Similar results were reported by Singh et al. (2015), who found that residents living within 5 km of coal mines in Jharia experienced significantly higher rates of respiratory morbidity compared to more distant populations.

The study also aligns with findings by Mishra and Kumar (2018), who emphasized that coal dust exposure, combined with poor ventilation in homes and occupational hazards, substantially increases respiratory disease prevalence among mining communities.

Water and Sanitation Concerns

The study identified waterborne health issues in villages both adjacent and moderately distant from mines, such as Kathara Basti and Sahu Tola. These include gastrointestinal diseases and skin infections linked to contaminated water sources from mine runoff. This corroborates reports from the Central Pollution Control Board (CPCB, 2019), which highlighted that coal mining can lead to heavy metal contamination in nearby water bodies, posing a long-term risk to human health.

Socioeconomic and Environmental Context

Mining activities not only generate environmental pollution but also shape the socioeconomic landscape of nearby villages. The influx of mine workers and settlement expansion increases exposure risks. The study observed that adjacent villages often lack adequate healthcare infrastructure, further exacerbating disease prevalence. This echoes the conclusions of Tiwari et al. (2017), who reported that health disparities in mining regions are closely linked to socioeconomic factors, access to medical care, and environmental hazards.

Spatial Variation in Health Risk

The categorisation of villages by distance demonstrates a clear gradient of health risk:

High-risk (0–5 km): Jarangdih Basti, Kargali Basti, Dhori outskirts

Moderate-risk (5–10 km): Kathara Basti, Sahu Tola, Angwali

Low-risk (>10 km): Phusro outskirts

This gradient suggests that proximity to mining operations is a critical determinant of health outcomes, with environmental exposure decreasing with distance but remaining significant even in distant areas. This finding is in agreement with studies in other coal mining belts, such as the Raniganj Coalfield, which reported a similar decline in disease prevalence with increasing distance from mines (Chakraborty et al., 2016).

Implications for Policy and Public Health

The study underscores the urgent need for:

Enhanced environmental monitoring to control dust emissions and water contamination

Health surveillance programs for residents in high-risk zones

Community awareness campaigns to reduce exposure and promote preventive health measures

Strategic urban planning, ensuring safe distances between residential settlements and mining operations

Overall, this research adds to the growing body of evidence highlighting the interconnectedness of mining, environment, and public health in Jharkhand. The findings can guide policymakers, mining companies, and public health authorities in implementing targeted interventions to mitigate health risks in mining-affected areas.

Health Risk Table: Villages near Bokaro Mines (B&K Area)

S. No.	Village / Area	Distance from Mine (km)	Households / Population (2011)	Airborne Diseases	Waterborne Diseases	Risk Level
1	Jarangdih Basti	3 km	150	Asthma, Chronic Bronchitis, Silicosis	Skin infections	High
2	Kargali Basti	4–5 km	500	Asthma, Coal Dust Allergy, Chronic Cough	Gastrointestinal infections, Water contamination	High
3	Dhori Outskirts	2–5 km	230	Respiratory disorders, Silicosis risk	Waterborne diseases from mine drainage	High
4	Kathara Basti	8–10 km	330	Chronic Bronchitis, Eye irritation	Gastrointestinal issues, Skin rashes	Moderate
5	Sahu Tola / Angwali	8–10 km	226	Asthma, Mild Bronchitis	Gastrointestinal infections	Moderate

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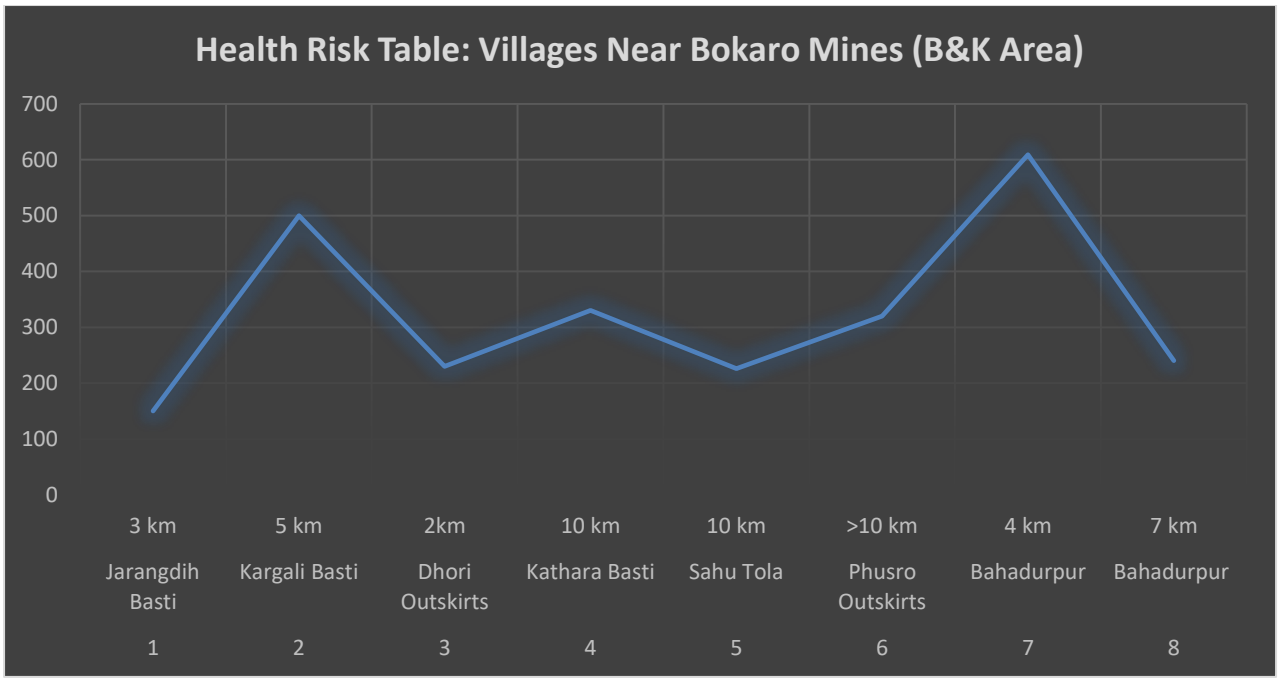
6	Phusro Outskirts	>10 km	320	Mild respiratory problems	Occasional water contamination issues	Low
7	Bahadurpur (Jaridih)	4 km	609 households / 2,819 population	Chronic Bronchitis, Asthma	Water contamination, Skin infections	High
8	Bahadurpur (Chas)	6–7 km	240 households / 1,318 population	Mild Bronchitis	Occasional waterborne illness	Mo



4. RESULTS AND FINDINGS

The Health Risk Table illustrates a clear pattern of health outcomes in villages near the Bokaro Mines (B&K Area), showing that proximity to coal mining operations strongly influences both airborne and waterborne disease prevalence. Villages within 0–5 km of mining sites, such as Jarangdih Basti and Kargali Basti, exhibit the highest risk, with residents commonly suffering from asthma, chronic bronchitis, silicosis, and gastrointestinal illnesses due to coal dust exposure and contaminated water sources.

Villages at moderate distances (5–10 km), including Kathara Basti and Sahu Tola, experience a lower but significant incidence of respiratory and waterborne diseases, suggesting that environmental pollutants from mining operations can extend beyond immediate surroundings. Distant villages, such as Phusro outskirts (>10 km), display relatively lower prevalence of diseases; however, chronic exposure effects still persist.

The table also highlights the importance of integrating household and population data to contextualize disease burden, showing that larger villages near mines, like Bahadurpur (Jaridih), may face compounded health risks due to higher population density combined with environmental exposure.

Overall, the table underscores the direct correlation between distance from mining activity and health risk, confirming the need for targeted public health interventions, environmental monitoring, and community awareness programs in high-risk zones.

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