



A STUDY ON JHARIA COAL MINE FIRES AND HEALTH EXTERNALITIES: THE MISERABLE CONDITION OF INHABITANTS

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ABSTRACT

The present study is based on the health externalities of the people living near Jharia Coal Field (JCF) due to coal mine fire burning for centuries. The study also emphasizes on the economic valuation of the health impact of the colonials near Jharia Coal Fields. The data of a total of 60 households have been collected from four villages near coal fields and a total of 30 households have been collected from two controlled (non-mining) areas. The cost of Illness approach has been used to analyze the health impact. After field observations, discussions with the villagers, Doctor interviews, and evidence from various official reports and articles it was found that due to coal mine fire and emissions from toxic gases the atmosphere of the Jharia coal field has become highly polluted. The local people of Jharia coal fields are suffering from various air and water-borne diseases and spending a large portion of their income on the treatment of these diseases as compared to the controlled (non-mining) villages. Considering the need of urgent implementation of the sustainable pattern of development has now become crucial to act and not react to such issues because climate change is no more an illusion but a reality and the brunt of it is being witnessed throughout the globe. So, this problem is no more area specific problem but it is also a part of global stress.

KEYWORDS: Jharia Coal Fields, Cost of Illness (COI), Health Externalities, Health Expenditure

ABBREVIATIONS: JCF- Jharia coal fields, BCCL- Bharat Coking Coal Limited, COI- Cost of Illness, SPM- suspended Particulate matter, PM- Particulate matter, NAAQ- national ambient air quality index

INTRODUCTION

Coal plays an important role in today's growing industrialized economy. It supports many industries like the cement and steel Industry. Coal is an essential raw material for the production of 90% of the world's cement production and 70% of the world's steel production. 40% of the world's electricity need is fulfilled by coal. (Lium McHugh, 2017) The coal industry is the backbone of the world's economy. But its costs to the world's environment are much more than its benefits and coal fire adds to the cost. Coal mine fires are pernicious, pertinacious, and far-flung according to the occurrences of the coal. Coal mine fire in underground coal reserves is a natural phenomenon. Many of these are burning for millennia. Australia's burning mountain and USA's Powder River basin are some of them. (Heffern and Coates, 2004, Krajick, 2005, Stracher et al. 2011). Thousands of coal mines are burning all over the world, especially in India, the USA, and China (Stracher, 2007, Stracher and Taylor, 2004). Jharia coal mine fires are also one of them which is burning since 1916 (Pandey et al. 2016). These fires are burning frequently and consumed millions of tones for centuries. A report by Limited, 2020 states that in between 2018 to 2020 these fires consumed more than 2 million tons of coal (limited 2020). Another report states that these fires have consumed 37 million tons of coal and 220 billion tons of coal become inaccessible (Roy, 2017). A total of 70 underground mine fire has been reported since 1974, covering 10 sq. km of JCF area and consuming 10-12 million tons of coal per year. These coal

mine fires are emitting various toxic gases continuously and polluting the environment of Jharia. A report by Greenpeace India reports that Jharia is the most polluted town out of total surveyed 313 towns in India. Another report by Apocalypse which is released in Jan 2022 found in his research that PM 10 level in Jharia was 295 $\mu\text{g}/\text{m}^3$ (micrograms per cubic meter) in 2017, which is 3 times more than the permissible limit of 100 $\mu\text{g}/\text{m}^3$. Another study was carried out by S. Kundu & A.K. Pal (2015) on the air Quality assessment of the Rajapur Opencast Coal Mine in Jharia. In their research, they found that the average concentration of SPM, PM10, and PM2.5 ranged from 294 to 965 $\mu\text{g}/\text{m}^3$, 100 to 498 $\mu\text{g}/\text{m}^3$, and 85 to 296 $\mu\text{g}/\text{m}^3$ respectively. The concentration range of sulfur dioxide and nitrous oxide were 48.2 to 98.2 $\mu\text{g}/\text{m}^3$ and 32.8 to 149.39 $\mu\text{g}/\text{m}^3$ respectively and the concentration of trace metals e.g. nickel, arsenic, and lead in PM10 were also found to be $0.380 \pm 0.009 \mu\text{g}/\text{m}^3$, $0.06 \pm 0.02 \mu\text{g}/\text{m}^3$, and $0.00432 \pm 0.028 \mu\text{g}/\text{m}^3$ respectively when analyzed with the help of Atomic Absorption Spectroscopy Technique. They found also the values exceeded the range of statutory norms when compared with Ambient Air Quality Standard and National Ambient Air Quality Standard (NAAQS, 2009).

OBJECTIVES:

- to evaluate the effect of coal fire on the health of people living near JCF
- to evaluate the effect of increasing health costs on their living standard

METHODOLOGY

Study area:

The present study is based on the coal mine fires of Jharia

Coalfields located in the northeastern area of Jharkhand. Jharia coal fields lie near Damodar River Valley and cover 280 square km (110 square miles). In JCM there are 23 large underground and 9 open-cast coal mines are operational under BCCL and TATA coal companies. Jharia coal fields produce India's most prime coking coal (bituminous) which is used in blast furnaces. Jharia Coal Field is also famous for its burning mines which are in fire since 1916. According to the reports of Coal India Limited, the total coal mine fire in CIL subsidiaries BCCL, CCL, WCL, and ECL were estimated at 65, 30, 61, and 12 respectively and the total affected areas by these coal fires were 17.32, 1.52, 6.6, 1.19 sq. Km in 1994 (B.B. Dhar, 1996). These fires are spreading gradually and affecting thousands of local people for centuries (S.N. Prasad et al. 1994). Subsidence due to coal fire has changed the topography of JCF, vegetation land has also turned into barren land (R. Majumdar, 2013). Toxic gas emissions in these areas are affecting the environment and human health. Local people are suffering from many chronic and serious diseases.

Sampling:

The present study mainly targets the health problems and excess health expenses of the colonials near JCF. For this four villages near JCF Phularibagh Basti, Rajpur Basti, Bokapahari and Barafkal Colony from Jharia C.D. Block have been selected. A total of 60 households have been surveyed from these areas. For comparative study, two controlled areas Amaghata and Amarapur from Govindpur Block have been selected and 15 households from each village have been surveyed. A total of 435 people have been questioned for their health status and health expenses from these 90 surveyed households.

Districts	Block	Sample Vil- lages (Near Jharia coal mine fires)	Surveyed House- hold	Total Surveyed People
Dhanbad	Jharia C.D Block	Barafkal colony	15	73
		Bokapahari	15	62
		Phulari Bagh	15	67
		Basti	15	89
		Rajpur Basti		
Controlled Villages				
Dhanbad	Gov- indpur Block	Amaghata	15	81
		Amarpur	15	63
Total			90	435

Table 1: Surveyed Sample Area

The present study is based on conducting a field survey in the villages near fired coal mines, discussions with the villagers and the doctors, visiting hospitals and private clinics, collecting the primary and secondary data. With the help of a pre-designed schedule all these households have been surveyed to collect the information about their health status and health expenses.

Study Tool:

The cost of illness technique has been used to conduct this

research. The cost of illness is also known as the burden of illness or the impact of diseases on health outcomes in a country, region, and society or even in individuals. COI can be calculated in the form of direct and indirect costs like doctors' fees, expenses on lab tests, medicines, and dietary items, hospital bedding charges, and loss of productivity, morbidity, longevity, and impact on health status and quality of life. Jefferson et al. (2000) state that, "the aim of COI studies is descriptive: to itemize, value, and sum of costs of a particular problem with the aim giving an idea of its economic burden."

RESULTS AND FINDINGS

Air pollution due to coal mine fire and their Impact on Human Health:

Central pollution control Board (CPCB), India assessed the pollution level of JCF and stated that the concentration of air pollutants in JCF is more than the National Ambient Air Quality Standards which is harmful to the local people. M.Chabra and M.D.Mukherji (2017) assessed the environmental impacts through Environmental Impact Assessment (EIA) in their article and found that these pollutants can cause several health problems like bronchitis, pneumoconiosis, black lung, etc. During coal combustion emission of carbon oxide and carbon dioxide (COx) gases mainly emits that cause harmful impact on the environment and leads to global warming. These gases mainly result in many health issues like cardiovascular disease, malaria, cerebrovascular, and asthma (Karl, 2009; Lan, Chapman, Schreinemachers, Tian, & He, 2002). Sulfur oxide inhalation leads to destabilizing heartbeats or causes heart attacks (Peters et al., 1999). People living near coal mine fires generally suffer from suffocation, coughing, wheezing, and disabilities of lung function due to high exposure to SO₂. (Health effects of outdoor air pollution. Committee of the Environmental and Occupational Health Assembly of the American Thoracic Society 1996; Pope III et al., 1995).



Source: - Field Survey

Figure 1: coal fire smoke from burning mines

Figure 2: excavation of burning coal from a fire-affected area

Source: Field Survey

During fieldwork, it was also found that the local people near the Jharia coal mine fire are suffering from various chronic and acute diseases. Suffocation, coughing, and eye and nose irritation can be felt very easily in the atmosphere. Various toxic gases with coal smoke are emitted from the coal mines continuously. Their houses also fill with coal smoke. Process of coal mining, blasting, combustion, and transportation adds-on the emission of toxic gases. Various reports and research done in these areas also reports that the air and water are highly polluted and exceeded the water and air quality index. During field survey discussions with villagers and doctors also have been done. They have also stated that due to coal mine fires and mining processes, the air and water quality have degraded. People are suffering from various air and water-borne diseases. They also stated that coal fly ash and particulate dust and mine stock water mix with the water which is supplied for their drinking and domestic use. The coal company purifies the water before supply but still, the supplied water is often found yellowish and dirty. Doctors also stated that eye and skin allergies, asthma, pneumoconiosis, black lung, Tuberculosis, liver and kidney abnormalities, and gastrointestinal are found common diseases in the patients from these areas.

In this research paper, a total of 60 households have been surveyed near the coal mine fire area of JCF with the help of a pre-designed schedule to know about their health status and living standard. These households were from Phularibagh Basti, Barafkal Colony, Bokapahari and Rajpur Basti. For a comparative study, 30 households were surveyed from Amaghata and Amarpur from Govindpur Block. After surveying these households a table can be made according to their ages and diseases they are suffering from.

Sample Area near JCF

Diseases	Age-wise distribution of patients				
	(0-20)	(20-30)	(40-60)	(60+)	Total
Malaria	2	11	6	5	24
ENT allergy	9	15	6	8	38
Lung & Skin Cancer	0	0	1	2	2
Asthma	2	3	4	6	15
Tuberculosis	2	4	6	7	19

Cardiovascular Diseases	0	1	3	7	11
Abdominal Diseases	3	5	9	10	27
Skin Allergies	2	3	7	8	20
Headache	3	15	8	11	37
Miscarriages or pre-mature delivery	0	13	3	0	16
Neurological Diseases	1	1	1	3	6
Cough & Cold	12	16	15	8	51
Eye Diseases	3	6	11	15	35
Total	39	93	80	89	301

Source: field survey

Table 3: Age-wise distribution of patients in the surveyed area

The above tables' shows that in surveyed area of JCF like Barafkal colony near Rajapur Opencast Mines, Bokapahari, Rajpur Basti, and Phularibagh Basti near Indira Chowk, Jharia people are battling with various acute and chronic diseases due to the toxic smoke of Jharia coal mine fire. Old age people are in a more vulnerable state. Some of them are suffering from many health problems at a time. Case of asthma, Tuberculosis, cardiovascular diseases, and abdominal diseases are found common in the old age group. Whereas in young age groups malaria, colds and coughs, and ENT infections are found common in young age groups (0-20) and (20-40) age groups. ENT allergy, Headache, weak eyesight, or eye allergy was found to have the highest numbers of 38, 37 & 35 cases. Cold & cough is the most common problem among all age groups of them. 16 Cases of miscarriages of pre-mature delivery were also found in (20- 40+) age groups. 2 cases of cancer and 6 cases of neurological problems were also found in between them. A total of 301 cases of diseases were found in these areas with which they are suffering for the last 6 months. Which is a huge number among 60 surveyed households.

Controlled Area

Diseases	Age-wise distribution of patients				
	(0-20)	(20-30)	(40-60)	(60 & above)	Total
Malaria	2	3	1	1	7
ENT allergy	5	3	2	1	11
Lung & Skin Cancer	0	0	0	0	0
Asthma	0	1	2	3	6
Tuberculosis	1	0	0	1	2
Cardiovascular Diseases	0	0	3	2	5
Abdominal Diseases	2	3	7	4	16
Skin Allergies	1	4	5	7	17

Headache	2	5	2	0	9
Miscarriages or pre-mature delivery	0	4	1	0	5
Neurological Diseases	0	0	0	1	1
Cough & Cold	10	6	2	1	19
Eye Diseases	3	2	1	1	7
Total	26	31	28	22	107

Table 4: Age-wise distribution of patients in the surveyed area

On the other hand, in the controlled area the total number of cases is only 107 among 30 surveyed households which they are suffering for the last 6 months. Cases of ENT allergy, asthma, headache, and abdominal diseases were found very less in comparison to uncontrolled areas. The mainly old age group was found vulnerable to these diseases. Cancer of neurological problem type acute found negligible. Cold and cough, malaria, and ENT are found common in young age groups which are seasonal problems. The air quality index of Amaghata and Amarpur is under the range of NAAQ standards. People also stated that the air in their area feels fresh and they never feel suffocation. Most of the households use underground water which is also under the water quality index.

Expenses on Health or Cost of Illness:

BCCL and TATA Coal Company operate their health center and hospital near their mining areas free for their employees and with minimum charges for others. For casual diseases like cold & cough, Malaria, Headache, and ENT allergy people prefer to go to local hospitals or private doctors and nursing homes. Normally Private Doctors charge 200-500Rs. for each visit. And BCCL and TATA hospital charges 150Rs. for private patients. In case of hospital admission private hospital charges 500-1000rs. Per day charges to their patients. But for severe and chronic diseases like lung and Kidney problems, Asthma, Tuberculosis, and abdominal problems most people prefer to go to BCCL central hospital or Private Hospitals like JALAN and ASARFI private hospital in Dhanbad. These hospitals are well facilitated and preferred for better treatment but the charges of these hospitals are very high. People spend thousands in these hospitals. On the basis of questions asked about their expenses on health treatment the below table expresses the average expenses on health in JCF Area and controlled area.

Parameters (average expenses in last 6 months)	Average expenses in JCF	Average expenses in Controlled Area
Frequency of doctor visits	10 times	3 times
Doctor's fees	5,560rs.	1,250rs.
Medicine and Dietary items	18,320rs.	4,270rs.
Lab tests	7,240rs.	15,60rs.

Hospital Bedding charges	4,580rs.	2,050rs.
Travel expenses	6,430rs.	1,140rs.
Average days taken leave	15 days	5 days
Loss of wage	12,090rs.	5,450rs.

Source: field survey

Table 5: Average Expenses on Health in JCF and Controlled Area

[Note- doctor's fees include frequency of doctor's visit multiplied by visit charges, and loss of wage= days taken leave multiplied with daily wages]

The above table shows that there is a huge difference in health expenses of residential near JCF and controlled areas. The household heads of JCF told that they need to visit doctor 2 or 3 times a month for themselves or their family. For this, they need to spend approx. 1500rs. Per month. Whereas in JCF the average expense for a doctor's visit is 5,560rs. In a controlled area, it is only 12,50rs. There is also a huge difference in medicine and dietary items between these two controlled and uncontrolled areas. Where in JCF expenses on medicine during the last 6 months is approx. 18,000 while it is less than 5,000rs. in Govindpur areas. Same as all expenses in uncontrolled areas were found much more than in controlled areas due to the high frequency of diseases and severity of the diseases.

DISCUSSION AND CONCLUSION

The household heads also stated that due to high expenses on health treatments they are unable to live a standard life. A large amount of their income expands on their health. They are living in a very miserable state in which they are suffering and battling various casual and chronic diseases continuously and spending their large amount of income on their health, losing their wages by taking leaves. They are unable to live a healthy and wealthy life even if they are unable to breathe freely. Measures to cope up with these problems by the govt. or by the coal companies is not enough. BCCL started a rehabilitation program in 2008 through Jharia Rehabilitation and Development Authority, to rehabilitate the people living near fire-affected areas in 2008. According to their master plan, 79,159 families would need to be reallocated by 2021, the JRDA said. But implementation of the program was not done properly. Only 4,049 families were being relocated to Belgaria till 2016 which is approximately 5% of the total rehabilitation needed families, the former coal minister Piyush Goyal admitted in Lok Sabha. (Tom Maguire, march 2019). A Das (13 Jan, 2022) in his reports to news click also stated that the rehabilitation program by JRDA expired with very little success. More than 10,000 families are still bound to live at the top of fire affected mine area. More than 100 families live in Rajput Basti under the Kenduadih area and 47 cases of subsidence happened in this area. Many people lost their lives in these accidents. Researchers say that the only way to save the life of the people is to relocate them from fire-affected areas. Govt. and BCCL should take some effective initiative towards that and implement JRDA again in an effective way.

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