Impact of Coal Mining on Health Condition of the Local Residents: A study from Salanpur Coal belt Area of West Bengal

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Impact of Coal Mining on Health Condition of the Local Residents: A study from Salanpur Coal belt Area of West Bengal

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Abstract

In coal mining belt both formal and informal/illegal coal mining are responsible for the creating various types of health hazards for the local residents. Formal miners tries to mitigate the environmental related hazards which is in turn responsible for various health related problems among the residents who live nearby by adopting EIA (Environmental Impact Assessment) technique whereas informal/illegal miners did not adopt any such techniques. Here our study focuses on the perception of the local residents about the impact of formal as well as informal/illegal mining on health condition of the local residents. For this we took sample of 500 household members from mining village (MV) and non-mining or controlled village (CV). We specially check whether mining activities in MV has any significant impact on health condition of the residents or not. For our study we apply Mann-Whitney U test. Based on the analysis of the perception of the sample households regarding the impact of illegal coal mining on the health condition of the resident's majority of the respondent agreed that illegal coal mining has adverse impact on health condition of the local residents. The realizations of the impact of illegal coal mining on health are significantly higher in MV than that in the CV. Due to the existence of formal and illegal coal mining in the MV, ground water condition as well as air quality is deteriorated which is responsible for various types of air borne as well as water borne diseases among the local residents in comparison to the CV situated slightly away from the MV.

Keywords: Informal/Illegal Mining, Health hazards, EIA, MV, CV, Mann-Whitney U test

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Introduction

Coal is one of the main primary inputs of all core sector industries like Iron and Steel, railways, fertilizers, cement, chemicals, textiles etc. Cooking coal and non-cooking coal are the two main classification of coal. Coking coal means high coke generating coal having huge demand in the metallurgical industries like steel industries, iron industries etc. Whereas, non-coking coal is classified into seven grades starting from grade A to grade G on the basis of calories produced from them.

Coal mining in India has begun almost 250 years ago. However, Indian coal mining industry is relatively young in age compared to many European countries. It is documented that mining of coal in India had been started way back in the year 1774 with the permission to work for coal mines in the then Bengal was granted to John Summner, S.G. Heatly and Redferne. In fact, in the pre-independence period many companies came to explore coal from Indian coal mines but did not succeed much. Later on, after the independence National Coal Development Corporation (NCDC) was set up in the year 1956 for mining of coal on scientific lines as well as to promote conservation of good high-grade coals. But this undertaking could not fulfil the necessary demand as the total coal production fell far short of the target set for the year 1970. In such circumstances the government of India nationalized coal mines in two phases; in the first phase about 214 coking coal mines were nationalized in October 1971 and in second phase about 700 non-coking coal mines were also nationalized on 1st May, 1972. In September 1975, the Government of India announced the formation of a holding company for the coal industry named as 'Coal India Limited' (CIL). CIL has 8 subsidiaries in total out of which 7 are producing subsidiaries like ECL, BCCL, CCL, WCL, NCL, SECL and, MCL while one is planning subsidiary CMPDIL. Among all the subsidiaries most of the mines in West Bengal falls under Eastern Coalfields Limited (ECL). It has 14 areas in total; our study area (**Salanpur Area**) is one such area under ECL.

Now considering the impact of coal mining on health condition of the local residents we can say that both formal and informal coal mining activities are responsible for creating health related hazards in the coal mining belt. Though formal mining activities have aggravated the health-related problems for the local residents but informal/illegal coal miners have also deteriorated the health conditions of the people living in that area. So, in this study we try to focus on the impact of coal mining (both formal and informal) on the health condition of the local residents based on the perception of the people who resides very near to coal mines and persons who resides 8 to 10 Km away from coal mines.

Study Area

Salanpur Coalbelt Area lies on the north-western part of Raniganj Coalfields. This Area is located around 23.7768^0N and 86.8832^0E. Salanpur Coalfield area of West Bengal falls under the Jurisdiction of Asansol Sub-division in the newly formed district Paschim Bardhaman. Our study area covers only two community development blocks, Barabani and Salanpur block. The Area office is about 10 Km from Asansol city. The Ajoy River flows along the northern boundary of this area. The area has two geological formations namely, Barakar and Raniganj Measures. The northern portion consists of Barakar Measures formations hence, have seams

regionally named as B-I, B-II, B-III, B-IV, B-V, B-VI, B-VII and B-VIII. The southern part lies in Raniganj Measures formations and hence the seams are regionally named as R-I, R-II, R-III, R-IV, R-V, R-VI, R-VII, R-VIII and R-IX. All these seams are present in the Lease-hold area of ECL. The NH-2 (bye-pass GT Road) is passing through the southern part of this area. Important Railway lines like Asansol to Jamtara and Jasidih to Patna route, Eastern Railway main lines pass through both northern and southern part of the lease. The Indian Oil Corporation (IOC) pipe line is also passing through the lease area and almost parallel to the Eastern Railway main line. The Area is populated near the important roads, railway stations lying over the surface. The Chittaranjan Locomotive Works- both Colony and Factory, Hindustan Cable Township at Rupnarayanpur lies on the north-west side of the Area. The total area of mining plan of this Area is 107.81 Square Km. At present only 6 operating formal mines, 7 closed mines and 2 proposed mines are there in our study area. Apart from that about 25 active illegal coal mining pits and several abandoned illegal coal mining pits are also found in this area.

Literature review

Resosudarmo, et al. (2009) have highlighted the illegal mining activities in Indonesia. According to them illegal mining in Indonesia means mining activities carried out by a person or a group of persons known as company foundation having legal entity, but does not have any authorized government permit for its operation. This type of mining is called *PenambangTanpaIzin* (PETI) in Indonesian term, which means mining without permission. In Indonesia, illegal mining activities have increased considerably after the economic crisis of 1998 which creates huge amount of unemployment in the country and it gets bigger as a result of decentralization policy of the government.

According to them illegal mining in Indonesia generates massive environmental hazards. They have pointed out that in south Kalimantan region, illegal coal mining activities are responsible for troubling hillsides or hilltops situated there, and accordingly the area affected by huge amount of soil erosion, sedimentation in steams and acid rock drainage. The tunnels or holes formed by illegal miners are the major cause of landslide as well as soil erosion in the adjoining areas. Apart from that illegal coal mining and its related activities deteriorates health condition of the local residents. Most of the times these illegal coal miners operate in poor environmental conditions, they sometimes breach the safety standards of mine work. As per the author, the workers involved in illegal coal mining activities are unwilling to wear gloves, thereby allowing their skin to come in direct contact with harmful mercury which causes serious skin diseases. Due to the typical working conditions, these miners often inhale coal dust which creates lung related problems and regardless of 6 to 8 hours of nonstop exposure to noisily motorized sound, they are reluctant to put ear caps, they sometimes drink mercury infected river water, they still have a preference to seek advice from a conventional healer than a doctor for their treatment. They have also highlighted the fact that a lot of accidents at illegal mining spots remain uninformed and even most of the wounded miners do not get proper medical treatment. In this literature the authors did not mention the nature of occupation of the poor local people before starting mining activity and how it has been changed with the advent of illegal mining.

Sarkar, et al. (2003) in their article, have attempted to study the nature and magnitude of diseases arising from coal related occupation in three coal mines in West Bengal. The main hypothesis was that the health conditions of the workers who work in mines have poor quality of health compared to the health condition of the workers who work in other sector apart from mines i.e the incidence of diseases is higher in mineworkers. For their analysis they choose three formal coal mines in Raniganj Coal belt Area such as one UG coal mine at Pandaveswar, another UG coal mine at Khottadih and also one OC coal mine at Khottadih. All three selected mines fall under Pandaveswar Area of ECL. Since each of these mines employs a different technology which will enable them to learn variation in health-related problems associated with the use of these different technologies. They have collected data by adopting face to face interviews using a house-hold based questionnaire. They have divided the whole mine workers under study into three main groups such as monthly rate, time rate and piece rate workers. They have taken only 15% of total working force from each category for their study. When they compare the obtained survey data with all India and West Bengal Level, the proportion of ill health workers from total working population is considerably higher in case mine workers as per their survey data. Not only that, when they compare the non-mineworkers of their surveyed group, they have found that the percentage of ill persons is slightly higher compared to the state and national figures which indicate that a negative externality is operating on the residents of the mining areas. Moreover, their survey study reports that the mine workers share the major burden in each disease group and the incidence of disease is significantly lower for the workers as well as for the family members in the non-mining sectors. It replicates the fact that mining activity has adversely affected the health conditions of the mine workers. While describing the causes behind this, they stated that lower level of education and lack of awareness amongst workers are the main cause of this problem. They have pointed out the fact that, most of the workers working in mining sector, having health related problems, were even unable to identify actual disease they are suffering from. They have identified that the vital cause behind such diseases is the nature of the duties of the mine workers which have to perform with strenuous manual nature resulting common disease like body pain and backache in the lumber region. In addition to this, influenza, gastritis, breathing problems, chest pain, common cold and intestinal infections are also common diseases of those mine workers.

First of all, the authors have tried to establish the fact that mining activities has some negative impact on the health condition of the mine workers. Then they recognize the factors which can influence the health condition of the mine workers. In this study seven factors, namely education level of the mine workers, size of the family of the mine workers, income of the mine workers, salary group to which they belong, place of work of the mine workers, period of exposure to mining environment and technological impact of mining on the mine workers have been identified as responsible for continuous deteriorating health condition of the mine workers.

Goswami (2013) has stressed that though coal mining activities contributed vastly in the direction of economic development of any country, this activity creates serious threat to the health condition of residents living nearby mining areas. He has felt that mining activities should be adopted in such environmentally friendly manner that can minimize the impact of mining on adjoining habitats and ecosystem. He has argued that waste dump of coal mines contaminates the air by emitting smoke and polluted gas due to spontaneous combustion. Blasting and diesel equipment is the source generating harmful gases like CO_2, NOX, CO, CH_4, H_2O, SO_2etc which

are severe for "greenhouse effect". He has suggested some measures to protect environment from pollution and hence from the evil effects of greenhouse gases. However, the author did not consider the effect of coal mining on human health in the coal mining region.

Katoria, et al. (2013) have pointed out that the most unlawful activities presently running in the country is the coal mining activity because it completely disregarded the function of EIA in its pre-operational periods, operational periods as well as post-operational periods. They have documented how coal mining and its related activities have degraded land, air, water, health condition of the workers in the mining areas, and also the societal impact of coal mining in the adjacent villages and towns. Therefore, their suggestion is to utilize coal resources in such environmentally sustainable manners so that the rapid depletion of coal reserves can be arrested. According to their estimate, the surface mining method has the capacity to destroy four hectares of land for mining of one million tonne of coal. Therefore, for mining of 10 million tonnes of coal through opencast method in 20 years about 800 hectares of land can be destroyed. While addressing about the impact of mining on air they observed that most mining operation generate fugitive dust which are originated from the activities like drilling, blasting, movement of vehicles on haul roads, screening, sizing and segregation, storage, transportation etc types of mining operation and causing huge amount of air pollution in the surrounding areas of mining. According to them presence of sulphide mineral in coal is the main cause of acid mine drainage in coal mining areas. Presence of such types of acidic mineral has a negative impact on the quality of drinking water and it also degrades the life of water animals in that region.

Noise and vibration which are also the result of mining activities can affect health conditions of the residents living near the mines and even property and houses of the nearby residents can also be demolished due to mining. While considering the impact of mining in occupational health they observed that the workers engaged in mining activities are more prone to job-related diseases like Pneumoconiosis which occurs due to breathing in the atmosphere filled with coal dust. Such unhealthy atmosphere can cause severe lung related problems and even can generate lung cancer. It can also create diseases like dust allergy and asthma, influence noise hazards such as temporary or permanent hearing loss, headache and even high blood pressure. They also observed that coal mining activities have the effect on the local neighbourhoods at various stages such as at the beginning of the mining process local communities are displaced from their own land and thereby losing their livelihood; during mine's operation there exists huge amount of pollution like air, water, noise, vibration etc which causes health hazards to the local people; and during mine's closure there exists sudden economic halt in that region. To mitigate this type of environmental problem, Environmental Management Plan (EMP) framework is implemented. According to them EMP is a well-documented plan where elaborated environmental impact details are enclosed; environmental monitoring and mitigation plans are suggested and above all it is a legal document based on which environmental performance is scrutinized. However, the authors here did not consider the effect of land subsidence and connected to that the effect on water absorption capacity of land which is associated with the agricultural productivity in that region.

Sampling Design and Survey Methodology

In order to estimate the impact of coal mining (both formal and informal/illegal) on local livelihood we have conducted a household survey in Salanpur coal belt. Salanpur coal belt scatters into two community development blocks namely Barabani block and Salanpur block in Paschim Bardhaman district, West Bengal. In Salanpur block there exists 69 villages and 11 Gram Panchyats whereas in Barabani block the number villages are 46 and the number Gram Panchyats are 8. So, our study area covers 115 villages and 19 Gram Panchyats. Out of these 115 villages we have purposively chosen 10 villages- 6 mining affected villages and 4 control villages, for our study purpose.

In order to conduct this empirical study, we have purposively selected five villages from each block. Among five villages in each block three are mining villages and others are non-mining or controlled villages. Mining villages refers to the villages where formal or/and illegal coal mining are situated within 2 km from the selected villages and non-mining villages are 8 to 10 km away from the formal or informal coal mines. The sample includes 500 household data taking 50 households from each village. Households from each village have been selected using random number table to make the sample probabilistic sample. Before going to door-to-door collection of data we have conducted a pilot survey to each selected village. In the course of pilot survey, we have collected the data of the villages regarding the infrastructure, location, demographic composition and occupational composition of the households residing at the villages. The data has been collected from personal interview with the active earning member of the household formulating a structured questionnaire from each selected household. In view of the above sampling design the field survey in Salanpur Coal belt Area has been conducted by the author.

Location of the Sample Village

The present study was undertaken by taking the samples from six mining affected villages (three from each block) and four controlled villages (two from each block). All the mining affected villages are within the vicinity of 2 Km from the nearby mines. Whereas, the controlled villages are chosen further away from their nearby mines.

Table 1: Distance of Sample Villages from Mining Pits

Sl No	Name of the Village	Distance from the mines	Affected By
Mining Affected Villages			
1.	Rasunpur	Within 2 Km	Gourangdi-BeguniaColliery
2.	Kantapahari	Within 1 Km	Gourangdi (A) Colliery
3.	Jamgram	Within 1 Km	Gourangdi (A) Colliery
4.	Pratappur	Within 2 Km	Banjemhari Colliery
5.	Harishadi	Within 2 Km	Dabour Colliery
6.	Achhra	Within 2 Km	Dabour Colliery
Controlled Villages			
7.	Putulia	Within 8 Km	Gourangdi (A) Colliery
8.	Parulberia	Within 8 Km	Gourangdi (A) Colliery
9.	Damdaha	Within 11 Km	Bonjemhari Colliery
10.	Dhanguri	Within 10 Km	Bonjemhari Colliery

Source: Field work by the author

From the table 1 it is very much clear that all the above mentioned six mining affected villages are within the closure proximity of coal mines. As per our observation we can rank the mining affected villages in respect of their extent of illegal coal mining activities. Our observation confirms that among the mining affected villages Jamgram gets the first rank for illegal coal mining activity, second rank goes to Rasunpur village, followed by Harishadi, Kantapahari, Achhra and Pratappur village. But the control villages though situated in the same district with two different blocks are nearly 8-10 Km away from the mining set-up. Therefore, there is a clear physical distance between the mining and non-mining villages in our sample. This distinction helps us to compare the perceptions of the households regarding the impact of illegal coal mining activity on the livelihood of the locality.

Table 2 Demographic Profile of the Study Zone

Name of Villages	No. of Residing Households	SC population (%)	ST population (%)	Work force participation rate among total population (%)	Literacy rate among total population (%)	Number of Sample Household	No. of Sample Households	
							SC	ST
Mining Villages								
Rashunpur	326	20.05	7.84	36.05	74.94	50	8	13
Kantapahari	397	26.77	21.62	42.38	61.37	50	24	6
Jamgram	1523	23.89	31.82	35.15	51.24	50	20	1
Pratappur	147	1.004	49.64	29.27	62.70	50	16	19
Harishadi	507	10.40	0.48	32.95	79.04	50	16	0
Achhra	546	46.07	3.83	30.16	61.67	50	18	6
Total	3190	-	-	-	-	300	102	45
Controlled Villages								
Putulia	123	29.11	0.00	28.21	81.69	50	26	0
Parulberia	407	21.67	13.70	34.37	55.93	50	17	1
Damdaha	191	22.06	25.52	34.87	58.09	50	32	1
Dhanguri	274	87.70	6.22	32.85	70.26	50	47	0
Total	995	-	-	-	-	200	122	02

Source: Population Census in India, 2011&Household Survey by the author

From the table 2 we can observe that out of the above six mining affected villages Jamgram village has the highest (1523) number of residing households and Pratappur village has the lowest number of families (147). Now considering the SC population percentage in those villages we can visualize that more than 46 percent of the population of Achhra village belong to SC category, whereas in Pratappur village this percentage is only 1 percent. In our sample data out of the 300 households from mining affected villages, 102 belongs to SC population that means 34 percent of sample households are SC category. It is also seen that in Pratappur village almost 50 percent of the people belong to ST category, while in case of Harishadi village this percentage is only 0.48 percent. Our sample data suggests that in case of those six mining affected villages ST population percentage is 15.

Work force participation rate is more than 42 percent in Kantapahari village while it is only 29 percent in Pratappur village. Literacy rate is higher in case of Harishadi village and Rasunpur village while it is very much lower (51.24%) in case of Jamgram village. In Putulia village more than 29 percent of the population belongs to SC category while in Dhanguri village this percentage is 87 percent. In Damdaha village percentage of ST population and work force participation rate is highest among those four controlled villages. In terms of literacy rate Putulia village and Dhanguri village have the larger percentage compared to other two villages in this category.

Methodology

To study the opinion of the local public regarding the impact of illegal coal mining on the health condition of the local people, we have formulated one question for seeking the opinion. The question that is asked is

- Whether the continuation illegal coal mining activity in Salanpur coalbelt area has deteriorated the health condition of the local people.

To understand the perception of the people of the mining and non-mining village regarding the above statement we first ask them whether the statement is true or false. If it is true we ask them regarding the extent of the problem. Actually, we have Likert scale to understand the perception of the local people regarding each indicator. Here respondents are asked to state their level of agreement with our given statement for each criterion. For each statement we have formulate the scale in such a way that the extreme problem indicating value 5. If the respondent agreed with the heavy level of the particular problem, we attach value 4, we attach value 3 if the level of problem to the respondent is moderate. We attach value 2 if the level of problem is slight from the respondent's point of view and finally, we attach value 1 if the respondent agreed that the level of problem has not at all any impact.

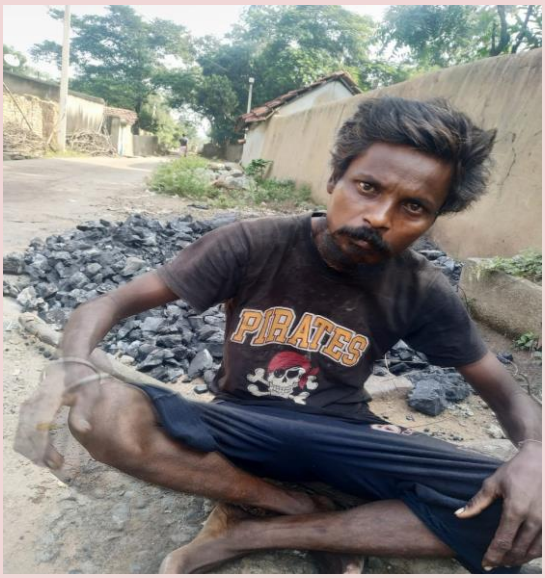
Initially we explore the percentile distribution of the perception of the local people regarding the livelihood impact of illegal coal mining. Next, we compare the perception of the households residing in the mining village with that of the households residing in the non-mining villages. To measure the perception, we have defined the variable for each statement measured in Likert scale. Basically, it is a constructed order variable taking values 1 to 5. Therefore, we cannot assume that the variable follows the normal distribution and equal variance for different samples. It implies that in order to compare the perception of the households residing in mining village and non-mining villages we cannot apply a parametric test like independent sample t test. Therefore, we follow a non-parametric test selected as the alternative to the independent sample t test. In our study, we have planned to apply Mann-Whitney U test for comparing the perceptions of mining village and non-mining village households.

Impact of Illegal Coal Mining on Human Health

Influenza, gastritis, breathing problems, chest pain, common cold and intestinal infections are common diseases of mine workers (Sarkar et.al 2003). Mine workers used to suffer some common health related problems, whether it is formal mine workers or it is informal mine workers. To measure the impact of illegal coal mining on the health condition of the local residents we have planned to ask the household members through the structured questionnaire about their most common diseases which they have to suffer such as lung related diseases, Pain related, Intestinal infection, Tension related, Influenza, Chest pain, Dermatological problems etc. Due to the presence of huge number of formal and informal mines in our study area, the presence of coal dust in the air causes lung related problems for the coal miners and also for the local residents. As a result of the presence of various hazardous metals in the soil, the water in this area becomes highly polluted and this contaminated water cause intestinal diseases for the local

residents. In spite of that due the carrying of over loaded coal with cycle and pushing these cycles at a distance of more than 8 to 10 km per day causes severe chest pain for the poor coal-cycle pullers in the locality. Coal dust, polluted environment and intestinal diseases together can cause dermatological problems for the local residents.

Picture 5.6.1 Document of Deterioration of Health Condition due to Illegal Coal Mining



Name- SupinderTudu, Age- 45 Yrs, Vill- Shibdhawra,Work as rope puller for more than 12 years, suffering from chest pain for more than 6 years.

Table 5.6.1 Percentage Distribution of Responses regarding the Disease of the Local Resident due to Illegal Mining (n=500)

Name of the Diseases		Nature of Village		Total
		Non-mining Village	Mining Village	
Lung Related	Count	4	18	22
	% within Disease	18.2%	81.8%	100.0%
	% within Mining/non mining Village	2.0%	6.0%	4.4%
Pain	Count	51	30	81
	% within Disease	63.0%	37.0%	100.0%
	% within Mining/non mining Village	25.5%	10.0%	16.2%
Intestinal Infection	Count	53	84	137
	% within Disease	38.7%	61.3%	100.0%
	% within Mining/non mining Village	26.5%	28.0%	27.4%
Tension Related	Count	18	20	38
	% within Disease	47.4%	52.6%	100.0%
	% within Mining/non mining Village	9.0%	6.7%	7.6%
Influenza	Count	14	22	36
	% within Disease	38.9%	61.1%	100.0%
	% within Mining/non mining Village	7.0%	7.3%	7.2%
Chest Pain	Count	0	31	31
	% within Disease	0.0%	100.0%	100.0%
	% within Mining/non mining Village	0.0%	10.3%	6.2%
Dermatological	Count	5	26	31
	% within Disease	16.1%	83.9%	100.0%
	% within Mining/non mining Village	2.5%	8.7%	6.2%
Miscellaneous	Count	55	69	124
	% within Disease	44.4%	55.6%	100.0%
	% within Mining/non mining Village	27.5%	23.0%	24.8%
Total	Count	200	300	500
	% within Disease	40.0%	60.0%	100.0%
	% within Mining/non mining Village	100.0%	100.0%	100.0%

Source: Computed by the author using the household survey data, 2017-18

We have considered all the above-mentioned diseases into our structured questionnaire and make some quarries about their diseases from the household members residing in our study area. Common perception suggests that mining villages have greater harmful impact on environment than the non-mining villages in our study area. For the purpose of measuring the impact of illegal coal mining on health condition of the local people we have planned to divide entire 500 surveyed household members into two groups, mining village (MV) household members, those who are from mining affected villages in our survey area taken from two blocks; Barabani block and Salanpur block, each block having three villages each with 50 household members and thus comprises 300 households. The other group is called the non-mining villages or control villages (CV) taken from same two blocks in our survey zone, each block having two villages each with 50 household members and thus consists of 200 households. We have collected information about major health problem of the respondents and against each respondent only one response (major disease) has been sorted out. All the responses are recorded and presented in a tabular form as presented in table 5.6.1 and 5.6.2.

Table 5.6.2 Village Wise Percentage Distribution of Responses about the Different Diseases

Name of the Village		Name of the Diseases Villagers suffering from								Total
		Lung Related	Pain	Intestinal Infection	Tension Related	Influenza	Chest Pain	Dermatological	Miscellaneous	
Rasunpur (MV)	Count	0	3	17	11	13	3	2	1	50
	% within Village	0.0%	6.0%	34.0%	22.0%	26.0%	6.0%	4.0%	2.0%	100.0 %
Putulia (CV)	Count	2	19	12	3	2	0	2	10	50
	% within Village	4.0%	38.0 %	24.0%	6.0%	4.0%	0.0%	4.0%	20.0%	100.0 %
Parulberia(CV)	Count	0	3	13	14	12	0	1	7	50
	% within Village	0.0%	6.0%	26.0%	28.0%	24.0%	0.0%	2.0%	14.0%	100.0 %
Kantapahari(MV)	Count	0	5	20	3	4	7	1	10	50
	% within Village	0.0%	10.0 %	40.0%	6.0%	8.0%	14.0 %	2.0%	20.0%	100.0 %
Jamgram (MV)	Count	4	11	10	0	0	4	6	15	50
	% within Village	8.0%	22.0 %	20.0%	0.0%	0.0%	8.0%	12.0%	30.0%	100.0 %
Pratappur (MV)	Count	7	0	14	1	0	5	9	14	50
	% within Village	14.0%	0.0%	28.0%	2.0%	0.0%	10.0 %	18.0%	28.0%	100.0 %
Harishadi (MV)	Count	4	5	8	1	0	9	4	19	50
	% within Village	8.0%	10.0 %	16.0%	2.0%	0.0%	18.0 %	8.0%	38.0%	100.0 %
Dhanguri	Count	1	19	20	1	0	0	0	9	50

(CV)	% within Village	2.0%	38.0 %	40.0%	2.0%	0.0%	0.0%	0.0%	18.0%	100.0 %
Achhra (MV)	Count	3	6	15	4	5	3	4	10	50
	% within Village	6.0%	12.0 %	30.0%	8.0%	10.0%	6.0%	8.0%	20.0%	100.0 %
Damdaha (CV)	Count	1	10	8	0	0	0	2	29	50
	% within Village	2.0%	20.0 %	16.0%	0.0%	0.0%	0.0%	4.0%	58.0%	100.0 %
Total	Count	22	81	137	38	36	31	31	124	500
	% within Village	4.4%	16.2 %	27.4%	7.6%	7.2%	6.2%	6.2%	24.8%	100.0 %

Source: Computed by the author using the household survey data, 2017-18

Table 5.6.1 and table 5.6.2 illustrates that out of the 22 household members who have reported that they are suffering from lung related disease, 18 household members (81.8%) are from mining affected village and only 4 household members (18.2%) are from non-mining village. It indicates that mining affected villages has higher percentage of lung related problems than the non-mining villages in our study area. In another way we can say that among all the diseases, 2 percent respondents from non-mining villages and 6 percent respondent from mining affected villages suffer from lung related problem in our survey area. Out of the 137 household members having problem related to Intestinal infection, 84 (61.3%) are from mining affected villages and 53 (38.7%) are from non-mining villages. This clearly indicates that mining affected villagers have greater intestinal problem than the non-mining villagers. As intestinal problem is related to water, so we can say that mining village has the problem of water quality and coal mining activity is responsible for such water related problem. However, data reveals that impact of tension related disease in both the group of villages are more or less same. But in case of Chest pain, we can see that all 31 household members are from mining affected villages, no one from the control villages. Village wise we can see those 3 household members from Rasunpur village, 7 members from Kantapahari village, 4 members from Jamgram village, 5 members from Pratappur village, 9 members from Harishadi village and 3 members from Achhra village, all have informed that they had chest pain for a long. All the above mentioned six villages are mining affected villages and the household members from those villages have to carry coal loaded cycles for maintaining their livelihood and that is why they have experienced chest pain like problems. However, no household members from the remaining four control villages have experienced chest pain like problems. This clearly indicates that Chest pain like problem only arises because of the continuation of illegal coal mining in those mining affected villages. This is a serious issue and we have to think deeply about this matter. In spite of that in our survey area 83.9% of dermatological problems comes from the mining affected villages and only 16.1% from non-mining villages. That means dermatological problem may arise because of the continuation of mining activities in those mining affected villages for a long period of time.

Table 5.6.3 Inference Analysis of Impact of Illegal Coal Mining on Health

Null Hypothesis	Test	Significance*	Decision**
The distribution of disease is the same across the mining and non-mining villages.	Independent Sample Mann-whitney U Test	0.064	Retain the null hypothesis

*Asymptotic significances are displayed, **the significance level is 0.05
Source: Computed by the author using the household survey data, 2017-18

Keeping the hypothesis on impact of illegal coal mining on the health condition of the local people, the test result (Mann-Whitney U test) as presented in the table 5.6.3 shows that there is no significant difference in the disease in the mining affected villages and non-mining villages. That means illegal coal mining activity in the adjacent mining villages has significant impact on the health condition of the local people residing in mining or non-mining villages in Salanpur coal belt area. In other words, health impact of illegal coal mining is not confined within the mining villages. The logic behind this finding is that illegal mining adversely affects the environment of the mining villages and non-mining villages, although there is significant difference. The environmental degradation of the villages causes several diseases of the people across the villages in our study area.

Conclusion

Based on the analysis of the perception of the sample households regarding the impact of illegal coal mining on health condition of the local residents we draw the following conclusion. Majority of the respondent agree that illegal coal mining has adverse impact on human health. Our non-parametric analysis infer that mining and non-mining villages are significantly different in respect of the realization of the impact of illegal coal mining on air quality, on water quality and on agricultural productivity. However, mining and non-mining villages are indiscriminate with respect to the realization of the impact of illegal coal mining on human health.

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