

DUST HAZARDS IN COAL MINES

A Brief Overview

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The global energy crisis of the last decade has provided an impetus to the development of coal resources which has, in turn, meant large scale indiscriminate mechanisation programmes. These have had disastrous consequences for the health of miners. The article highlights some of these health hazards which are being largely ignored by both the mining industry and the trade unions.

Of late the management of our nationalised coal industry has laid considerable stress on promoting the production of coal. And to achieve this end large scale mechanisation with borrowed foreign technology has been adopted. Critics from the Trade Union front have correctly identified the drawbacks of such a plan of reckless mechanisation. Lack of employment generation, high overhead cost that erodes the benefit of the economy of scale, dependence on foreign countries for spare parts of the machines are the important aspects of their criticism. But one important consequence (perhaps the most vital one) of reckless mechanisation seems to have escaped the attention of all concerned. This is the problem of health hazard which is increasing at an alarming rate.

It is unpalatably true that hazard has been synonymous with the term coal mining in India. The risk of fatal disasters to which the coal miners are exposed to is as great today as it has been during the days when coal mines were owned privately — Chasnala (1975), Jitpur (1978), Hariladih (1983) disaster. The introduction of sophisticated machines has in no way reduced the chances of such accidents. But that is a different story altogether. Here the attention is intended to be drawn towards that kind of hazards which silently, slowly and steadily shorten the life span of the miners, or make them physically disabled even when there is no massive disaster in the mines.

Coal mines are inherently unhealthy places to work. Not only in underground mines, but also in open cast quarries where giant earth movers are used, the workers inhale large amounts of dust, fumes and gases which cause many killer diseases — mainly respiratory in nature. They include influenza, asthma, emphysema, stomach and lung cancer, hypertension, Pneumoconiosis and bronchitis. The most fatal of all respiratory diseases is Pneumoconiosis commonly known as black lung disease which is incurable. (See SHR : 1 : 3, December 1984).

It is caused by the inhalation and retention of respirable coal mine dust in the lower lungs. A noticeable dose-response relationship usually appears when exposure continues for a decade or so. Coal worker's pneumoconiosis is classified into levels of ascending severity from simple to complicated by X-ray diagnosis. Continuous dust exposure can accelerate a case of simple pneumoconiosis to more advanced stages. Miners with progressive massive fibrosis are usually totally disabled. If the dust concentration is still higher, emergence of pneumoconiosis is earlier. Some miners seem to be more vulnerable than others and this vulnerability is yet to be explained. Habit of smoking appears to have no significant role in causing pneumoconiosis among the miners. It certainly contributes to lung impairment to a miner as it does to any non-miner. It has been established with a fair amount of certainty that it is dust, be it coal or otherwise, which can cause pneumoconiosis among the miners. So dust is identified as the greatest hazard.

Dust may be looked upon as suspended solid contaminant in a state of minute subdivision present in the air. It is produced during various industrial activities like blasting, grinding, drilling and crushing or whenever any material used in industry undergoes disintegration. Such operations enhancing the occurrence of dust are too common in coal mining industry. As the material undergoes progressive disintegration it acquires certain properties which has killer significance with regard to health of those exposed to its action. The very minute size (0.2-10.2 microns) itself confers it high reactivity both chemically and biologically and it becomes more toxic than its parent lump from which it has been disintegrated. These tiny particles once air borne can neither be swept off nor trapped by existing technical means. It is estimated that one cubic meter of a coal lump, after progressive disintegration may form 10^{19} particles and eventually spreads through 283 million cubic centimeter of the working environment.

Because of its small size these dust particles do not settle down and remain suspended in the air for quite long time.

It is quite natural, therefore that the various operations at the mechanised coal mines not only generate more dust but they reduce the size of the dust particles to a minimum. And these tiniest particles are more dangerous. Scientists have estimated that particles which are retained in the alveoli, the gas exchanging sacs of the lung – weigh 5 micrograms or below. These particles are termed as respirable dusts.

Generally the larger particles (nonrespirable dust) do not penetrate the alveoli and are not thought to cause pneumoconiosis. While the distinction between respirable and non-respirable dust is scientifically valid, it is clear that both sizes can impair lung functions when inhaled in quantity over time. The larger particles are probably linked to bronchitis among the miners. Although these particles are generally not retained in the lung, continuous exposure to them during normal work year produce more or less constant irritation of the upper respiratory tract. Breathlessness has also been found to be significant among miners who do not show X-ray evidence of pneumoconiosis. Researchers believe the breathlessness is related to chronic non specific obstructive pulmonary disease. Some investigators have found, in addition to pneumoconiosis and broncho-pulmonary disease, a third as yet unidentified disease process that reduces the ability of the lungs to exchange gases.

Black lung disease has come to represent a broad definition of occupational respiratory disabilities in miners of which coal miners' pneumoconiosis (henceforth referred as CWP) is one major component. Respirable dust which is invisible to the unaided eye accounts for less than one percent of the dust in a mine. It is not clear how much non-respirable dust is retained in the lungs when the standards for respirable dust (if they exist at all) are being met.

Along with CWP, coal miners will continue to experience other lung diseases—bronchitis, severe dyspnoea (shortnesses of breath) and airways obstruction. Many of these illnesses are work-related. Coal mine dusts contain a wide range of non-coal constituents including silica and naphthalenes. Researchers have found as many as 13 Polynuclear Aromatic Hydrocarbons (PAH) in the respirable mine dusts they had studied. (Shultz, Fridel and Sharkey, 1972). PAHs are tested carcinogens. Besides trace elements that are mentioned above there are a host of other elements listed as 'hazardous elements' which are liberated as dust or gas

in the place where coal is cut from the working face. These hazardous elements are identified as Arsenic, Beryllium, Cadmium, Fluorine, Lead and Mercury. It is worthwhile to mention here that a mine producing one million tons of coal generates one ton of each element annually. These elements may have a role in producing black lung disability either alone or synergistically. They may also play a role in the excess lung and stomach cancer found among the coal miners.

Diesel powered equipments are commonly found in all the mechanised coal mines throughout this country. Diesel engines produce emissions that are known to be hazardous, unburnt hydrocarbons, oxides of nitrogen, particulates, PAH, phenols, aldehydes, oxides of sulphur, trace metals, Nitrogen compounds, smoke and light hydrocarbons many of which cause adverse respiratory effects.

Noise is a proven hazard to the miners working in a mechanised mine. Noise may cause temporary or permanent loss of hearing sensibility, physical and psychological disorder, interference with speech communication or the reception of other wanted sounds and disruption of job performance. Excessive noise may also cause changes in cardiovascular, endocrine, neurologic and other psychological functions. Studies on the subject indicate that coal miners have miserably worse hearing than the average.

CWP and other work related disease in coal mines have been recognised as the subjects of large-scale investigations in countries like USA and UK and this recognition came through relentless struggle of the workers themselves. A physician Dr. Lorin Kerr who is also the representative of the coal miners of America voiced his alarm against CWP "At work, you (coal miners) are covered with dust. It is in your hair, your clothes and your skin. The rims of your eyes are coated with it. It gets between your teeth and you swallow it. You suck so much of it in your lungs that until you die you never stop spitting up coal dust. Some of you cough so hard that you wonder if you have a lung left. Slowly you notice you are getting short of breath, when you walk up a hill. On the job you stop more often to catch your breath. Finally just walking across the room at home is an effort because it makes you so short of breath. (Kess, 1968.)

We do not have any Dr Kerr to lament for our miners. Our miners are not even aware of such a fatal disease. As the detection of CWP is difficult in the initial stage without powerful X-ray examination (the facilities for which is non-existent in our colliery hospitals) the miners who suffer from shortness of breath or exhaustion are often wrongly treated.

The author has encountered several such cases in the Jharia coalfield. Kripal Chamar of Damoda Colliery has been treated as a TB patient because he has been suffering from shortness of breath. Kripal was told that TB is a curable disease but he wonders why in his case the medicine does not work. Another miner Chanari Beldar of Kenduadih Colliery died of TB(?) two years ago. When this trouble of breathlessness began Chanari used to abstain from his work once or twice a week. He received charge sheets and warning letters for negligence of duty. No one bothered to enquire about the real causes of his illness and consequent abstenteeism. We do not know the exact number of miners who suffer from breathlessness or other similar symptoms of CWP among Indian coalminers. But certainly the number is not small. Even in technologically advanced countries where more effective dust control methods are used and where people are more aware of such diseases, the number of miners affected by CWP is quite large. It was estimated that in USA between January 1970 and December 1977, 4,20,000 coal workers were awarded Federal Black Lung compensation because of total disablement due to CWP. In UK, National Coal Board had conducted a survey during 1974-77 and found that seven percent of the British coal miners were suffering from CWP. In India a small scale study conducted in 1960-66 by the Chief Advisor of factories revealed that 178 (18 percent) of 2754 coal miners who were radiologically examined were suffering from CWP. Another random representative survey

done by Dr Viswanathan in 1964 showed the incidence of CWP varied between 6.0 to 16.8 percent. The situation here in India is certainly alarming.

Last decade witnessed a global energy crisis caused by price-hike of petroleum resources coupled with impending depletion of the same and this resulted in reemergence of coal as vital alternative. Eventually its scale of production was raised, mines were mechanised with borrowed technology associated with heavy over-head cost in terms of foreign exchange but a thing which was conveniently forgotten is the probable environmental impact.

Legislations, covering mines safety fail to address the problem related to miners' health and welfare. It appears that miners' health and welfare as an entity distinct from mines safety is yet to be recognised. It is equally distressing to note that established trade unions with commendable fighting spirit while realising economic demand are yet to recognise this invisible monster—the fugitive dust which slowly but steadily, surreptitiously advances forward to collect its toll among the miners. Now the question is who will cry a halt?

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References

- Kerr, Lorin Speech to United Mine Workers of America, UMWA Convention *Congressional Record*, September 25, 1968 p. 1446.
MSHA Mines Safety and Health Administration USA. The public law 91-173 83 Sec (202) Act is basically a compensation legislation was passed in February after a month-long wild cat strike that idled 42,000 miners in West Virginia, USA.
Shultz, J.L., Fridel, R.A and Sharkey, A.G. *Detection of organic compounds in respiratory coal dust by high resolution mass spectroscopy* Bureau of Mines, Technical Progress Report 61, Pittsburg, p. 14,1972

From Pg. 83 Table - 3: People's knowledge of agencies for CHW selection and supervision

| | Category I | | | Category II | | | Category III | | |
|--------------------|------------|------|-----|-------------|------|------|--------------|------|------|
| | 1 | 2 | 3 | 1 | 2 | 3 | 1 | 2 | 3 |
| * SELECTION | | | | | | | | | |
| No. of house-holds | 5 | 90 | 7 | 13 | 23 | 6 | 13 | 26 | 12 |
| % | 4.9 | 88.2 | 6.8 | 30.9 | 54.7 | 14.2 | 25.4 | 50.9 | 23.5 |
| ** SUPERVISION | | | | | | | | | |
| No. of house-holds | 18 | 84 | | 9 | 33 | | 25 | 26 | |
| % | 17.6 | 82.3 | | 21.4 | 78.5 | | 49.0 | 50.0 | |

*Code for Selection

1. By Sarpanch with or without other members.
2. Don't know
3. By hospital with or without Sarpanches.

**Code for Supervision

1. Supervised by Hosp/PHC
2. Don't know

Table - 4: Social Background of CHWs

| Tribe caste | No of HWCs | % of Total CHWs |
|-----------------|------------|-----------------|
| Gonds | 15 | 40.0 |
| Baiga | 4 | 10.8 |
| Kol | 1 | 2.7 |
| Panika/Kangikar | 2 | 5.4 |
| Brahmin/Thakur | 11 | 29.7 |
| Gupta/Srivastav | 2 | 5.4 |
| Muslim | 2 | 5.4 |

Table - 5

Relationship of CHWs with Sarpanch and other Elite in Pali Villages

(a) Relations with present Panchayat :

| Himself a Sarpanch or Upsarpanch | Sarpanch or Upsarpanch a cousin/uncle/inlaw/father | Panchayat members/ Mukhias as uncle/aunt/cousin | Not related to Panchayat Members |
|----------------------------------|--|---|----------------------------------|
| 1. Kannavahra | 1. Jamrhi | 1. Badwahi | 1. Kanchodar |
| 2. Paharia | 2. Bhautra | 2. Odri | 2. Jamuhai |
| 3. Dhawrai (J) | 3. Vardhar | 3. Sans | 3. Amilaha |
| 4. Medhi | 4. Makra | 4. Maliagoda | 4. Khalaund |
| 5. Kathai | 5. Khichkiri | 5. Barhai | 5. Dhawrai (P) |
| 6. Vermathola | 6. Sarwahi | | 6. Malaudu |
| | 7. Bannoda | | 7. Madaria |
| | 8. Karkati | | 8. Manthar |
| | 9. Audhera | | 9. Sunder Dadar |
| | 10. Malchua | | 10. Sundri |
| | 11. Chaka | | 11. Ghunghuti |
| | 12. Gijri | | 12. Vadhvachhot |
| | 13. Shahpur | | |

(b) Relations of above with previous Panchayat :

| | | | |
|------|--|--------------------------------|-------------------------|
| None | 4. Uncle was Sarpanch | 4. Father was panchayat member | 2. Brother was Sarpanch |
| | 5. Father was Sarpanch | | 3. Uncle was Sarpanch |
| | 8. Uncle was Mukhia | | 7. Father was Sarpanch |
| | 9. Aunt was member of Pali Zila Parishad | | 9. Father was Sarpanch |
| | 12. Uncle was Sarpanch | | 12. Father was Sarpanch |
| | 13. Father was Sarpanch | | |

(c) CHWs who had relatives in other influential positions:

| | | |
|--|---------------------------|--|
| 1. Father was a well-off Thekedar of the area, Brothers Revenue Inspector and Gram Sahayak | 6. Brother school teacher | 4. Brothers as school teachers, railway clerks, railway khalasi father-railway gangman |
| 6. Father Patwari | 13. Father Thekedar | 5. Brothers Patwari and rationshop owner Father Ranger; brothers in army. |

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Table - 6 : Land Holdings of the CHW's family and occupation of male members (fathers & brothers)

| Relatives Occupation | 2-5 acres | | 5-15 acres | | over 15 acres | |
|-------------------------|-----------|-----|------------|------|---------------|-----|
| | (1) | (2) | (1) | (2) | (1) | (2) |
| Farming | 2 | 0 | 7 | 4 | 5 | 3 |
| Farming with employment | 0 | 0 | 0 | 3 | 3 | 6 |
| Wage labour | 1 | 0 | 2 | 0 | 0 | 0 |
| Total households | 3 | 0 | 9 | 7 | 8 | 9 |
| % | 15.0 | — | 45 | 43.7 | 40 | 56 |
| No. of CHWs | 3 (8.3) | | 16 (44.4) | | 17* (47.1) | |

(1) Adivasi (2) Non-Adivasi

*Out of 17 CHWs, 11 (30.5)% owned more than 20 acres of land

Table - 7 : Preferred action in Minor Illnesses in the intensive study villages

| Category | CHW alone | CHW with traditional medicine | CHW with hospital | CHW with private practitioner | Hospital only | Hospital with traditional medicine | Private practitioner alone | Gunia | Home treatment | TOTALS |
|-----------|-----------|-------------------------------|-------------------|-------------------------------|---------------|------------------------------------|----------------------------|-------|----------------|--------|
| I Total | 0 | 29 | 9 | 2 | 2 | 8 | 6 | 10 | 36 | 102 |
| % | - | 28.4 | 8.8 | 1.9 | 1.9 | 7.8 | 5.8 | 9.8 | 35.2 | — |
| II Total | 0 | 2 | 9 | 0 | 0 | 11 | 6 | 2 | 12 | 42 |
| % | - | 4.7 | 21.4 | - | - | 26.1 | 14.2 | 4.7 | 28.5 | — |
| III Total | 1 | 3 | 8 | 1 | 10 | 14 | 6 | 2 | 2 | 51 |
| % | 1.9 | 5.8 | 15.6 | 1.9 | 19.6 | 27.4 | 11.7 | 3.9 | 3.9 | — |

Table - 8 : Peoples awarness of Preventive activities of CHWs in intensive study villages and his Private Practice

| Activity house holds | | Category I | | | | Category II | | | | Category III | | | |
|--|-------|------------|------|------|------|-------------|------|------|------|--------------|------|------|------|
| | | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 |
| I Chlorination | Total | 72 | 1 | 5 | 24 | 21 | 1 | 2 | 18 | 27 | 7 | 6 | 9 |
| | % | 70.5 | 0.9 | 4.9 | 23.5 | 49.9 | 2.3 | 4.6 | 42.8 | 56.8 | 13.7 | 11.7 | 17.6 |
| II MCH Services | Total | 97 | 0 | 5 | — | 42 | 0 | 0 | — | 49 | 1 | 1 | — |
| | % | 95.0 | — | 4.9 | — | 100 | — | — | — | 100 | — | — | — |
| III Source of information regarding prevention | Total | 67 | 5 | 30 | — | 32 | 0 | 10 | — | 22 | 2 | 27 | — |
| | % | 65.5 | 4.9 | 29.4 | — | 76.1 | — | 23.8 | — | 43.1 | 3.9 | 52.9 | — |
| IV Private practice | Total | 43 | 29 | 30 | — | 30 | 7 | 16 | — | 37 | 2 | — | 12 |
| | % | 42.2 | 28.4 | 29.4 | — | 47.6 | 16.7 | 35.7 | — | 72.5 | 3.9 | — | 23.5 |

Codes :

- | | | | |
|---|---------------|---|----------------------------|
| I | II | III | IV |
| 1. Don't know/He does not chlorinate wells. | 1. No | (1) Neighbours, friends and their own observation | (1) Give free medicine |
| 2. He chlorinates wells. | 2. Yes | (2) = CHW | (2) Charges for injections |
| 3. Ws use Jhiria/river | 3. Don't know | (3) = Paramedical worker with or without others. | (3) Don't know. |
| 4. Chlorinates occasionally | | | |

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The People

(Excerpts)

Pablo Neruda

That man I remember well, and at least two
centuries have passed since I saw him :
he travelled neither on horseback nor in a
carriage — purely on foot
he undid,
the distances,
carrying neither sword nor weapon
but nets on his shoulder,
axe or hammer or spade;
he never fought with another of his kind —
his struggle was with water or with earth,
with the wheat, for it to become bread,
with the towering tree, for it to yield wood,
with the walls, to open doors in them,
with the sand, constructing walls
and with the sea, to make it bear fruit.

I knew him and still he is there in me
.....
.....

Where he lived everything
a man touched would grow :
the hostile stones,
hewn
by his hands,
took shape and form
and one by one took on
the sharp clarity of buildings
he made bread with his hands
set the trains running,
.....
.....

I think that those who made so many things
ought to be masters of everything.
And those who make bread ought to eat !

And those in the mine should have light !
Enough by now of grey man in chains !
Enough by now of the pale lost ones !
Not another man will go past except as a ruler
Not a single woman without her diadem
.....
.....

Someone is listening to me and although they
do not know it,
those I sing of, those who know
go on being born and will fill up the world.
