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# EPIDEMIOLOGICAL STUDIES ON HEALTH STATUS OF COAL MINE WORKERS – A CASE STUDY

Environmental Science

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## ABSTRACT

**Introduction:** The expansion of industrial activity has raised people's living standards and quality of life, but it has also brought about several occupational risks. One of the oldest and most important industries in India and the rest of the globe is coal mining. The general health status of coal mine workers is currently the subject of very little literature in India. **Aim:** The current study investigated the general health condition, compare with habits like alcohol, smoking and tobacco use of the coal mine area. **Material and methods:** In accordance with the survey questions created in accordance with the prescribed proforma with norms of the National Family Health Survey, India, an epidemiological survey descriptive study was carried out among the 282 workers and non-workers of a coal mine located in the coal chemical complex areas of the Mancherial district, Telangana, India. **Results:** Personal histories were examined in relation to drinking, smoking, and other drug and tobacco use. Out of 282, 126 (45%) are alcoholics, 22 (7%), are smokers, and 14 (4.96%) are tobacco users. The medical condition shows that 173 (61.34%) people (68 non workers and 105 workers) have respiratory problem, 141 (47+94) have musculoskeletal system, along with 37 (eight non-workers and 29 workers) who have cardio-vascular problems, 65 (12 non-workers and 53 workers) who have neurological problems. There are negative health impacts of coal dust significantly with lung problems, cardio-vascular problems in coal mine workers compared to non coal mine workers; especially kidney effect in coal mine workers compared to nil effects in non coal mine workers. **Conclusion:** The data showed that high kidney, respiratory problems, cardio-vascular problems and other conditions call for rapid treatment.

## KEYWORDS

Epidemiology, Health, habits, coal mine, workers.

## INTRODUCTION:

The world's greatest known energy source, coal is increasingly used to generate electricity. Coal-fired power plants generate more than 42% of the world's electricity. (M. Nandi et al., 2022).

In addition to higher than average levels of respirable dust and quartz, underground coal mines had higher dust concentrations that frequently exceeded the PEL. The results of the survey and the results of lung histology in mining fatalities demonstrate that CWP exposures in coal mines are more frequent than previously believed (Go, L.H.T. *et., al,* 2022).

An increase in inflammation is often brought on by angular edges because of their propensity to penetrate lung tissue. The risk is caused by particles, including dangerous metals, that eventually enter the circulation (such as Fe, Cd, Hg, and Pb). Analyses of the link between particle form and toxicity have revealed that angular particles, like fibres, which have more roughness and sharp edges, are more poisonous than spherical particles (Liu, T. and Liu, S.H. 2020).

It is a universal truth that a person's genetic make-up and his exposure to the environment's environmental elements determine what kind of person he is and what diseases he may contract. Globally increased industrial activity has raised people's standards of living while also increasing their vulnerability to different occupational health risks (Subramanian, A. and Prakasam, T. 2013).

At greater levels of coal dust exposure, the risk of IHD mortality rose after controlling for age, smoking, and body mass index. The region of the coal rank was likewise linked to mortality risk. Cumulative exposure to coal dust and coal rank were both related with an increased risk of death from IHD. Different coal mine dust particle compositions could be the cause of the effect of coal rank (*Landen, D.D. et., al. 2011).*

*A considerably greater incidence of cardiovascular diseases (CVD) was identified in locations with coal mining. According to toxicants present in coal and coal processing, cardiovascular illnesses have been related to both air and water pollution. Future studies should evaluate the water and air quality in coal mining towns, and environmental programmes and regulations should be implemented as necessary (Hendryx, M. and Zullig, K.J. (2009)*

Peak PM2.5 levels above the interquartile range were linked to a 16% higher chance of gestational diabetes mellitus (95%CI 1.09, 1.22;). Contrarily, a 7% increase in the risk of gestational diabetes mellitus was linked to an interquartile range rise in average PM2.5 (Melody, S.M. 2020).

*According to a study, abnormal BP was most common in coal miners, followed by abnormal ECG, PF, and radiographs. Coal miners' abnormal blood pressure, heart rate, pulse, and radiograph readings varied significantly depending on their age, years of exposure to the mine's dust, smoking and alcohol use, type of job, and mine size. To ensure coal miners' health, practical health promotion and safety measures should be taken (Wu, Q. et., al. 2019).*

*Particularly elevated risks were seen for asthma hospitalisations. A 5-year increase in the risk of respiratory hospitalisations was linked to a 6-week exposure to coal mine fire-related particulate matters (Xu, R. et., al. 2022).*

## MATERIALS AND METHODS:

The goal of the study was to learn more about the general health-related behaviors, drinking, smoking, and tobacco use of the population in the coal chemical complex region of Mancherial district, Telangana's mine workers and non-miners.

To determine the sample size and study's viability, a trial was conducted. The preliminary study's findings were used to determine the sample size, which came at 282. The following formula was used to complete the epidemiological survey.

Tabel 1

| | CASE (NUMBER) | NON CASE (NUMBER) | TOTAL EXPOSURE (NUMBER) |
|---|---|---|---|
| EXPOSED | A | B | TOTAL EXPOSED |
| NON EXPOSED | C | D | TOTAL NON EXPOSED |
| | TOTAL CASES | | TOTAL |

Disease Frequency Measures
Prevalence of Disease, By Exposure Status
For Exposed: A/(A+B)

For Not Exposed: C/(C+D)
Exposure Prevalence, by Disease Status
For Cases: A/(A+C)
Non-cases for Fon: B/(B+D)
Cases: Odds of Exposure, by Disease Status
For cases: A/C
For non-casesB/D

**Table 2**

| Measures of Association | |
|---|---|
| [A/(A+C)] / [B/(B+D)] | Ratio of Exposure Prevalences |
| [A/(A+B)] / [C/(C+D)] | Ratio of Disease Prevalence |
| [A/(A+C)] - [B/(B+D)] | Difference in Exposure Prevalence |
| [A/(A+B)] - [C/(C+D)] | Difference of Disease Prevalence |
| [A/C] / [B/D] = [A*D] / [B*C] | Exposure Odds Ratio |

Logistic regression would be an appropriate statistical method given that the result is binary (case, non-case). The major problem is that this table only provides a "picture" of the current situation because it displays poll data.

A standardised questionnaire was used to gather thorough data on demographics, job history, smoking history, respiratory symptoms, blood pressure and diabatics, based on the standards spelled forth in the World Health Organization (WHO) Oral Health Assessment form (2013). Participants who met the International Labour Organization's criteria for necessity received full-format posterior-anterior chest radiograps.

## RESULTS AND DISCUSSION

The following material comprises important epidemiological data that relate to coal mine dust-effected workers and non-workers, according to the results of the epidemiological investigation.

### Demographic Characteristics Of The Worker

**Table 1**

| S.No | Range | Control | Coal Workers |
|---|---|---|---|
| 1 | Age (Yrs) | 43.28±11.21 | 44.16±8.27 |
| 2 | SEX | 141±0.02 | 141±0.02 |
| 3 | B M I (kg) | 27.82±2.34 | 28.46±1.82 |
| 4 | Duration of Exposure | - | 8 |

The data of non-workers' and coal mine workers' ages (43.28 and 44.16), sex (141 and 141), BMI (kg) (27.82 and 28.46), and duration of exposure are shown in Table 1. (nil in control and 8 in workers).

**Table:2 Habit And Habitation Of The Study Group**

| S.No. | PARTICULARS | CONTROL | EXPOSED |
|---|---|---|---|
| 1 | VEGETARIAN | 2 | 1 |
| 2 | NON VEGETARIAN | 140 | 141 |
| 3 | ALCOHOLICS | 54 | 72 |
| 4 | SMOKERS | 13 | 9 |
| 5 | TEETOTALER | 87 | 69 |
| 6 | TOBACCO CONSUMER | 2 | 12 |

The Habit and Habitat of the Workers are explained in Table 2 and Figure 1 as vegetarians and non-vegetarians parameters are equal between workers and non-workers. However, in the category of alcoholics, workers (72) outnumber non-workers (54), while the categories for smokers (13 controls and 9 workers) and abstainers (87 non-workers and 69 workers) are the opposite. There are similarities between tobacco consumer and alcoholics (2 non workers and 12 workers).

According to the findings, coal dust has a negative impact on coal mine workers. The findings are confirmed by earlier research because cumulative coal dust exposure was linked to an increased risk of death from heart disease (*Landen, D.D. et., al. 2011; Wu, Q. et., al.2019; Hendryx, M. and Zullig, K.J. (2009)*

**Table 3** Health Status Of The Study Group (epidemiology)

| S.No | HEALTH STATUS INDICES | CONTROL (n=141) | EXPOSED (n= 141) |
|---|---|---|---|
| 1 | MUSCULOSKELETAL SYSTEM | 47 | 94 |
| 2 | CARDIO VASCULAR | 8 | 29 |
| 3 | NEUROLOGICAL | 12 | 53 |
| 4 | RESPIRATORY | 68 | 105 |
| 5 | KIDNEY | 0 | 7 |

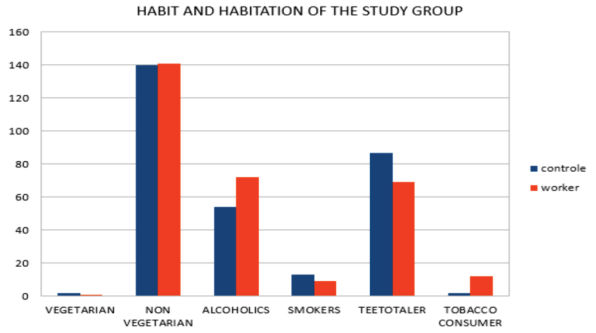


**Figure 1**

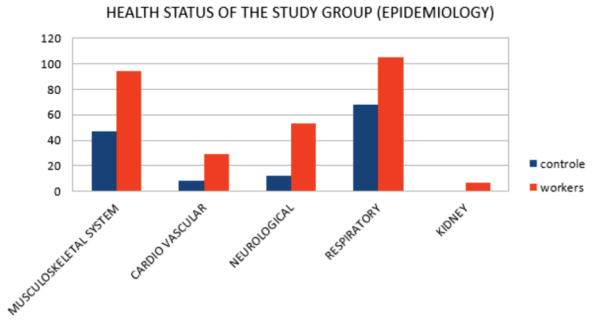


**Figure 2**

According to the health status indices shown in Table 3 and Figure 3, 141 people (47 non-workers and 94 workers) in the study area have respiratory irregularities caused by CMD, along with 37 (eight non-workers and 29 workers) who have cardio-vascular problems, 65 (12 non-workers and 53 workers) who have neurological problems, and 173 (68 non-workers and 105 workers) who have neurological problems. The difference in renal condition severity between worker (7) and non-workers (both zero). The Human health has been negatively impacted by coal mines containing arsenic, fluorine, selenium, and possibly mercury on a local and regional level. The results are same as the presence of nearby Pliocene lignite deposits has been linked to Balkan endemic nephropathy (BEN), an incurable kidney disease of unknown origin. The prevailing theory is that as groundwater runs through lignites, harmful organic chemicals are leached out and consumed by the local populace, causing this health issue (Finkelman, R. B. et. al., 2002). The kidney problem is significant in coal mine workers (7) as compared to nil in non coal mine workers (0).

## CONCLUSION

The poor general health status of coal mine workers has been made clear by this study. The research showed that high rates of CMD, alcohol consumption, smoking, and cigarette use cause greater rates of blood pressure disease and lung injury in the community, necessitating rapid care. This study has paved the way for additional investigation and intervention in a population where more than 83 mining regions in 9 Indian states (the ministry of coal) are actively using labour to produce coal.

The normal general health examinations that are performed on a regular basis at the mines must be included. On mine premises, general health education materials, alcohol- and smoking-related posters, as well as information about the benefits of quitting smoking, must be posted. To give employees individualised care and support, CMD cessation counselling facilities must be built.

To prevent those who do not already have the habit from being persuaded to adopt it, strict restrictions must be implemented prohibiting the consumption of alcohol and smoking in mines. The current general healthcare services offered by my government, which focus mostly on treatment, should be more proactive in their approach. To improve these particular occupational subjects' health state, ongoing study and treatments are required.

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