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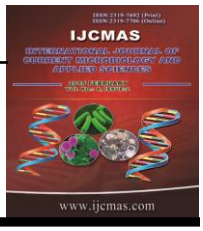


Original Research Article

Fly ash disposal and diseases in nearby villages (A Survey)

Shikha Shrivastava*, Praveen Sahu, Akanchha Singh and Lekhika Shrivastava

Government VYT PG College, Durg C.G. India

**Corresponding author*

A B S T R A C T

Chhattisgarh is a new born (2000) Tribal dominant state of India and due to rapid developmental process is soon becoming a power hub of country, producing large amount of fly ash, a major pollutant, which is being dumped in open dykes. Not much work on diseases caused by these dumpings, is done in this state, thus we have uptaken this task to get an insight for the health status of people living in and around these ash storage areas. Survey methods of hospitals were used for this study. Some Areas polluted with and without fly ash were uptaken for this study. The diseases which were found necessarily in large number in fly ash affected areas were identified. Thus fly ash is definitely the cause of these diseases and some detailed study on this topic has to be done so that remediation is possible.

Keywords

Fly Ash, Dykes, Pollutants, Hospitals, Disease

Introduction

Industrialization and urbanization are two world wide phenomena. Though they are inevitable for society, and one has to face its negative impacts. Power generation is one of the most important banes, which produces large amount of waste product-fly ash.

Fly ash is an amorphous ferroalemmo silicate, an important soil waste around thermal power plants. It creates problems leading to environmental degradation due to improper utilization or disposal. However fly ash is a useful ameliorant that may improve the physical, chemical, and biological properties of soil and is a source of readily available plant macro and micronutrients when it used with biosolids. Supply of nutrient from fly ash with biosolids may enhance their agricultural use. (Sarojini et.al. 2008).

Boiler slag&"bottom ash" is a coarser material that falls to the bottom of the furnace and forms pellets.

Fly ash is disposed loosely in ash dykes from where it becomes a source of pollution. Disposal site can increase the risk of cancer or other diseases, near an unlined wet ash pond that contains coal ash comingled with other coal wastes. People in those circumstances have as much as a 1 in 50 chance of getting cancer. (Barbara Gottlieb 2010).

Typically, coal ash contains arsenic, lead, mercury, cadmium, chromium and selenium, as wellas aluminum, antimony, barium, beryllium, boron, chlorine, cobalt, manganese, molybdenum, nickel, thallium, vanadium, and zinc(U.S. Environmental protection agency 2007).

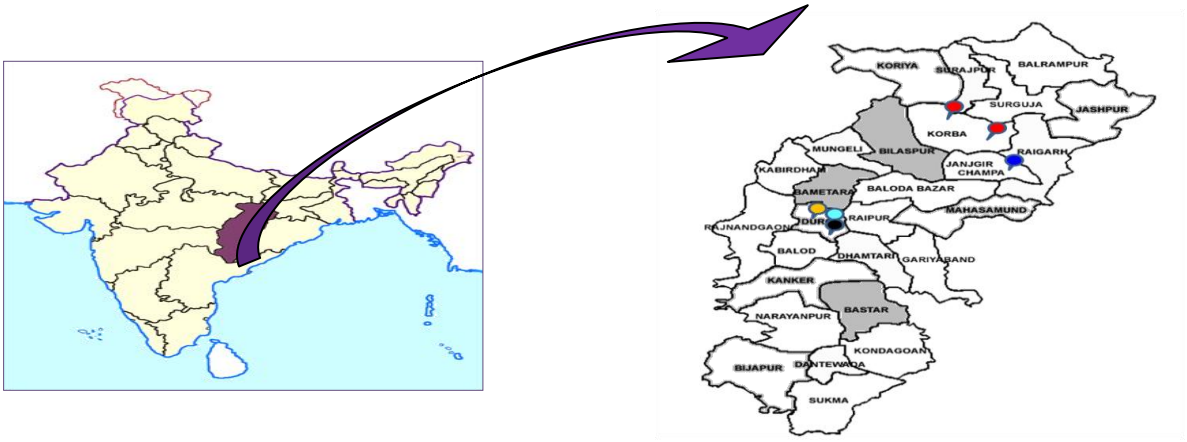
All can be toxic. Especially where there is prolonged exposure, these toxic metals can cause several types of diseases as cancer, heart damage, lung disease, respiratory distress, kidney disease, reproductive problems, gastrointestinal illness, birth defects, impaired bone growth in children, nervous system impacts, cognitive deficits, developmental delays and behavioral problems.

Materials and Methods

Study Area

Fly ash particles are generally spherical in shape and range in size from 0.5 to 300 µm& these minute particles easily penetrate to the respiratory system through dust and drinking water which causes health risks etc. In short, coal ash toxins have the potential to injure all of the major organ systems, damage physical health and development, and even contribute to mortality.

Adding to the toxicity of coal ash is that some power plants mix coal with other fuels and wastes, such as used tires and even hazardous wastes.(U.S. environmental protection agency 2009).



Grouping of study area

Area under study was divided into two groups

Non- Fly Ash Contaminated Area	Fly ash contaminated area
Durg City	Chhuri
Palari	Korba City
Armarikala	
Champa	

- **Survey method was adapted for present study.**
- **Data was collected from-**

1) Government District Hospitals

2) Primary Health Centre's (PHC)

Private clinics and private hospitals were not included for the study

Result and Discussion

Considering Table: 01 and Graph: 01, Korba district was observed with the maximum incidence of four selected diseases viz. chronic cough, pneumonia, fever, diarrhea and sepsis. Highest number of patients was recorded for diarrhea (8900) followed by fever (7632), however chronic cough (6298) followed by sepsis (531) and 356 cases of pneumonia. District Janjgir –champa patients suffering from fever (1584) were more followed by chronic cough (834) and diarrhea (351). Here no patients of pneumonia and sepsis were recorded. According to available data Durg district has no patients of chronic cough, pneumonia and sepsis, and 1495 patients of diarrhea. Considering graph:02 Korba, which is fly ash contaminated district shows respiratory diseases such as chronic cough and pneumonia are more prominent than other which could be assumed due effect of air contamination by Fly ash.

Present study was done to check out the effect of fly ash on local residency, the fly ash contaminated area. Fly ash is a dangerous waste left after coal combustion as it contains heavy metals (Vimal Kumar 2005) and according to report by PSR (Physicians For Social Responsibility 2010) and EPA (Environmental Protection Agency, 2010) that people living next to a fly ash deposal site have increased risk of cancer and other diseases. Thus our study area was related concerning presence and absence of fly ash disposals site. Our study area includes fly ash contaminate zones such as Chhuri and Korba and non-fly ash contaminated zone such as Durg, Palari and armarikala, Champa. Korba is a fly ash contaminated zone and it is called power hub of Chhattisgarh because of the presence of the many power plants and Chhuri is a village which is surrounded by ash dumping sites.

Thus in our study from the survey we found –

- ✓ Chronic cough – It is an air borne disease. In our survey 834 patients of chronic cough present in Champa, 815 patient of chronic cough present in Chhuri and 1034 patient of chronic cough present in Korba.
- ✓ Asthma – It is also air borne disease. In our survey 150 patients of asthma found in Durg and this is because high rate of population, pollutions and industries and in Palari, Armarikala and Korba, the number of asthma patients are 37, 13, and 25 respectively.
- ✓ Pneumonia – 356 patients found in Korba.
- ✓ Tuberculosis –It is an air communicable disease. In Durg, Palari, Champa, Armarikala and Korba, the number of tuberculosis patient are 149, 03, 14, 02, and 556 respectively.

- ✓ Skin diseases-We found skin disease patient only in Chhuri (Total patient no-343).
- ✓ Diarrhea- It is water borne disease. In Durg, Palari, Armarikala, Chhuri and Korba, the number of diarrhea patient are 108, 82, 21, 56 and 02 respectively.
- ✓ Jaundice- It is water borne disease. In Durg, Palari, Champa, Armarikala, and Korba, the number of jaundice patient are 306, 56, 04, 16, and 209 respectively.
- ✓ Malaria – This disease cause by mosquito female anopheles. In Durg, Palari, Champa, Armarikala, and Korba, the number of malaria patient are 208, 50, 02, 27, and 708 respectively.
- ✓ AIDS- It is a sexual transmitted disease. In Durg, Champa and Korba, the number of patients are 464, 15, and 29 found respectively.
- ✓ Leprosy- It is a chronic infection disease cause by Mycobacterium. In Durg, Palari and Champa, the number of leprosy patient are 62, 07, and 01 respectively.
- ✓ Sickle cell anemia-It is a condition in which the blood is deficient in red blood cells, in hemoglobin, or in total volume. In Durg and Champa, the number of sickle cell anemia 130 and 06 respectively.
- ✓ Other disease- which are fever and body pain which are found only in Chhuri in No. of 888 and 346 respectively.

Depending on their toxicity, chemical properties and concentration in the air, fly ash particles may pose an inhalation hazard to exposed workers. When fly ash particles are inhaled and deposited in the lung they can impose health risks by leaching genotoxic compounds, and through the alteration of immunological mechanisms. More specifically, as the lung burden of particles increases, alveolar macrophages and epithelial cells become activated leading to the release of inflammatory mediators, reactive oxygen species (ROS), enzymes (elastase, proteases, collagenase), cytokines (TNFa, MIP-1) and growth factors (TGF/?) that control and stimulate fibrosis (Heppleston *et al.*, 1984; Borm, 1994; Vanhee *et al.*, 1995) and genotoxic events (Borm and Driscoll, 1996; Driscoll *et al.*, 1996, 1997).

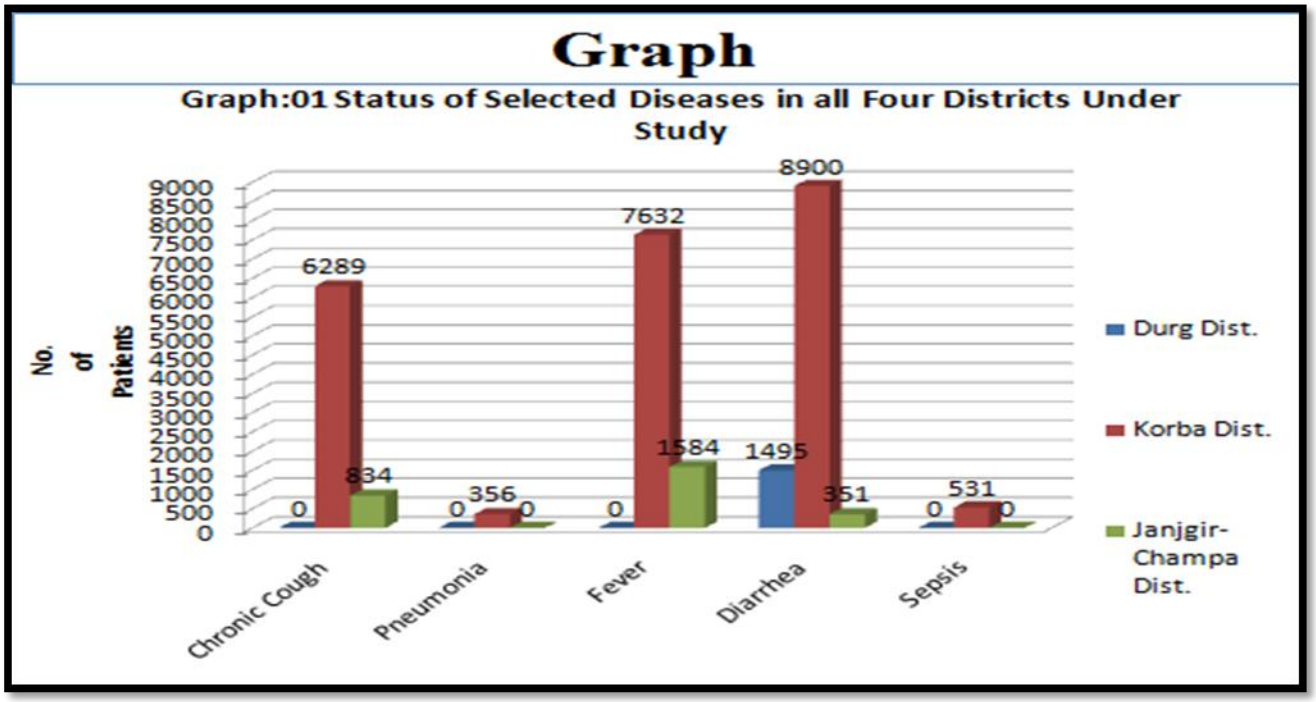
Effects on immune system and inflammatory cells: Studies aimed at the mechanism of action of coal dust and quartz have focused on inflammatory cells or precursors from bronchoalveolar lavage (BAL) and spleen after *in vivo* exposure of animals to coal dust and/or silica. Many studies done using coal dust show an increase in the number of alveolar macrophages and neutrophils.

Diseases caused by coal (mine) dust exposure have been reviewed previously (Heppleston, 1992; Wouters *et al.*, 1994). Apart from simple coal workers' pneumoconiosis (CWP), characterized by the presence of small opacities (< 10 mm) on the chest X-ray (ILO, 1980), complicated CWP (PMF, progressive massive fibrosis), pleural abnormalities, emphysema, chronic bronchitis, accelerated lung function loss, lung and stomach cancer have also been reported in (ex) coal miners and some occupations other than mining. CWP and PMF are highly correlated with estimates of cumulative dust exposure or dust components remaining in the lung (Hurley *et al.*, 1982, 1987; Attfield and Seixas, 1995).

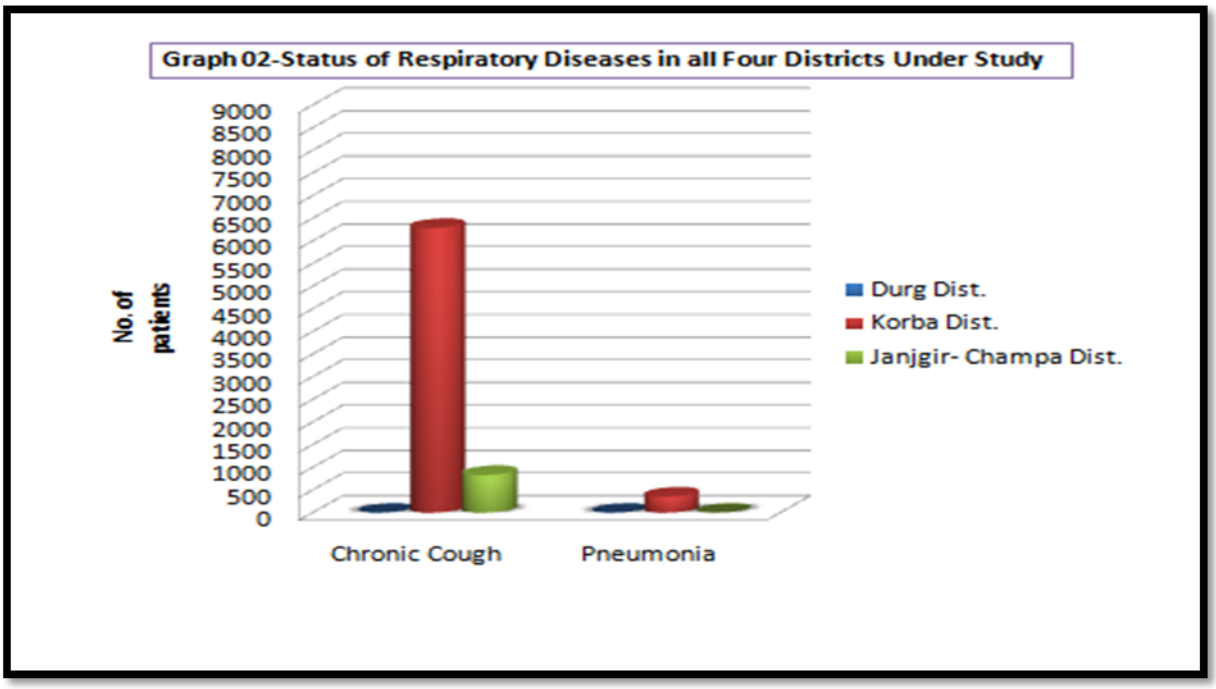
Table.1 No. of patients in Study Area

S. No.	Diseases	Non- Fly ash Polluted Area				Fly Ash Polluted Area	
		Durg City	Palari	Champa	Armarikala	Chhuri	Korba City
1	Chronic Cough	0	0	834	0	815	1034
2	Asthma	150	37	-	13	-	25
3	Tuberculosis	149	3	14	2	-	556
4	Skin diseases	-	-	-	-	343	-
5	Diarrhea	108	82	-	21	56	2
6	Jaundice	306	56	4	16	-	209
7	P- Typhoid	-	-	-	-	-	-
8	Body pain	-	-	-	-	346	
9	Fever	-	-	-	-	888	-
10	Malaria	208	50	2	27	-	708
11	AIDS	464	-	15	-	-	29
12	Leprosy	62	7	1	-	-	-
13	Sickle Cell	130	-	6	-	-	--
14	Pneumonia	0	0	0	0	0	356

Graph.1 Status of selected diseases in study area



Graph.2 Status of Respiratory diseases in study area



The amount remaining is the net result of deposited dose minus long-term clearance. Several post-mortem studies have been done in which the whole lung is digested or ashed and the total or specific dust in the lung measured (Nagelschmidt *et al.*, 1963; Rossiter, 1972; Douglas *et al*, 1986). These studies show that in coal workers, 40- 60 g of total dust may be found in the lungs, and suggest that the lung dust burden is not simply a reflection of cumulative exposure, but that deposition and/or clearance might be fine-tuning factors.

Fly ash particles are generally spherical in shape and range in size from 0.5 to 300 micro meter & these minute particles are easily penetrate to the respiratory system through dust and drinking water which causes health risks.

Thus in this study, we conclude that fly ash is necessarily promoting some of the diseases in the affected population, of which respiratory diseases are among the foremost. In Our study we found patients of chronic cough and pneumonia to be in the largest number.

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