

COAL WORKER PNEUMOCONIOSIS: AN EXPERIENCE WITH 58 CASES OF COALMINE WORKERS IN THE SOUTHERN DISTRICTS OF NWFP

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ABSTRACT

Objective: Clinical and radiological evaluation of coal worker pneumoconiosis (CWP).

Material and Methods: A retrospective study was conducted in District Headquarter Hospital Karak from February 2002 to October 2002. Fifty Eight cases of coalmine workers who showed evidence of pneumoconiosis, were collected from the hospital OPD. Some individuals presented as patients while some were their attendants who showed radiological changes of coal worker pneumoconiosis (CWP). History, clinical examination and past investigations were collected. They were also investigated in the hospital with X-ray chest, sputum examination and blood cytology with ESR.

Results: Seven (12%) workers were found to be asymptomatic with X-ray chest findings of simple coal worker pneumoconiosis (CWP). Their average duration of work was 10.5 years ranging from 2 to 20 years. Forty (69%) workers were symptomatic of cough and breathlessness with X-ray chest findings of simple CWP. Eleven(19%) workers were having complicated coal worker pneumoconiosis or progressive massive fibrosis (PMF). All were symptomatic of productive cough, black sputum and breathlessness. All were past workers with their average duration of work of 25 years ranging from 18 to 35 years. Their average time to leave the work was 10 years. Smokers showed 40% prevalence of progressive massive fibrosis (PMF) versus 14.5% in nonsmokers. Seven(12%) patients used antituberculous drugs without clinical and radiological improvement. Out of 33 past workers 8(13.7%) left the work because of CWP.

Conclusions: Patients with simple CWP may remain asymptomatic for long time and so remain able to perform mine work while the patients with PMF are mostly symptomatic and are not able for work in the mine. CWP may closely resemble tuberculosis so occupational history is important in suspected cases. This study found no signs of reversibility in CWP after leaving the work, rather showed progression in the cases of PMF.

Key Words: Coal Workers Pneumoconiosis, Progressive Massive Fibrosis, Smoking.

INTRODUCTION

Coal worker's pneumoconiosis is a common condition in the coal miners¹. It is caused by inhaling coalmine dust and is irreversible respiratory disease with progressive nature². Regional differences in the prevalence of CWP are present in different mine regions in USA despite comparable coal dust exposure. These are considered to be due to differences in the iron free radical (Fe+) content released by the coal particle in different mine regions^{3,4}. In the early stages of CWP the disease is not severe, the so called simple CWP in which the workers can carry on the mine work. In this stage the

workers may be asymptomatic and only radiological abnormalities may be present. Radiological abnormalities of simple CWP are bilateral diffuse rounded small nodules with linear shadows and honeycombing⁵. Differential diagnosis of CWP includes silicosis, sarcoidosis, berylliosis and granulomatous infections like tuberculosis and fungal infections⁶.

Progressive massive fibrosis (PMF) is the complicated form of CWP, which is characterized by an X-ray opacity/opacities of one or more than one cm in the largest diameter with predominantly oval shape⁶. PMF may be unilateral or bilateral and may occur

even after the worker's exposure to the coal dust is ceased⁷. PMF has the predilection to upper posterior and peripheral zones of the lung.

But may be present in the other zones of the lung as well. The lesion of PMF has the tendency to contract and changes its position by migrating towards the hilum⁶. Patchy calcifications may be seen in them later on. Other conditions, which resemble PMF, are malignant neoplasms, infectious granulomas like tuberculosis fungal infections, nontuberculous mycobacterial infections and hamartomas⁸. The lesions of PMF may cavitate and be infected with aspergillus causing chronic necrotizing pulmonary aspergilosis⁹.

CWP may present with symptoms many years after the developments of radiological features. In simple form of CWP, the patients may remain asymptomatic or having dry or productive cough with black sputum and occasionally breathlessness. Patients with PMF are almost always symptomatic with jet-black sputum (melanoptysis) caused by ischemic rupture of the PMF lesion⁶. Systemic symptoms like fever, night sweats, weight loss, fatigue and anorexia, as opposed to tuberculosis, are not present⁶.

CWP may be associated with complications like chronic obstructive pulmonary disease^{10,11}. Concomitant cigarette smoking adds to this risk¹¹. Lung cancer and pulmonary hypertension were also associated with CWP but the potential of misdiagnosis was suggested regarding the association of CWP with lung cancer¹⁰.

The diagnosis of CWP is mostly made on the chest X-ray but high resolution C.T scan of the chest may reveal the finding earlier than the chest X-ray^{12,13}.

There is no specific treatment of CWP. Whole lung lavage may reduce the dust burden of lungs². This study was carried out to do clinical and radiological evaluation of coal workers pneumoconiosis in symptomatic and asymptomatic coal workers.

MATERIAL AND METHODS

This retrospective study was performed in the DHQ Hospital Karak from February 2002 to October 2002.

Workers who worked in the coalmines for 6 months or more, who were having radiological finding of CWP were included in this study. While those workers who were having no signs of CWP were excluded from the study. Workers were collected from the OPD who presented as patients or their attendant coalminers. The following data were collected from every worker, personal bio data, history regarding the duration of work, the time passed after leaving the work (in a case of past worker), the reason for leaving the job; social or job related disease and the working environment; using kerosene lamp or electricity for light source in the mine.

Patients were also inquired about their awareness regarding the harms of coal dust and use of any personal protective device to reduce the inhalation of dust. History of the time the worker first visited the doctor for respiratory problems. Systemic symptoms like fever, night sweats, weight loss, and anorexia were asked. Signs like blackish tinge in the appearance and signs on auscultation were included. Past investigations like X-rays, sputum examinations and some specialized investigations like bronchoscopy reports were also collected. Investigations performed at the time of examination were X-ray chest, sputum examination for AFB, blood cytology and ESR.

RESULTS

This was a retrospective study in which 58 coalmine workers were included. All were male with their age range of 18-70 years. Out of 58 workers 25(43%) were present while 33(57%) were past workers. Ten(17%) were smokers (chillum or cigarette) either presently or in the past, smoking an average number of 6 cigarettes per day and the average duration of smoking was 7.5 years (2-11years). All the patients were using kerosene lamps as source of light and they worked without any personal protective device.

Clinical and radiological outcomes: The duration required to develop symptoms and radiological signs of CWP was found to be very variable. The minimum time to develop simple CWP was 2 years ranging from 2-5 years while the minimum time to consult a doctor for related symptoms (cough and breathlessness) was 3.5 years ranging from

3.5 to 20 years. Thirty(43%) workers were aware of the hazards of coal dust.

The workers were divided in the following clinical groups.

1. **Asymptomatic with simple CWP:** Seven (12%) workers were in this group. One of them was past worker. Their average duration of work was 10.5 years ranging from 2 to 22 years. One of them was a smoker. Only two of these workers were having scattered crepitations on auscultation of the chest.
2. **Symptomatic with simple CWP:** Forty(69%) workers were in this group. Average duration of work was 20 years ranging from 3.5 to 40 years. 21 were past workers. Four were smokers. Four workers had used antituberculous therapy without improvement.
3. **Complicated CWP or PMF:** Eleven(19%) workers were in this group. All were past workers and symptomatic. Average duration of work was 25 years ranging from 18 to 39 years. The average time to leave work was 10 years. Four workers were smokers while 3 had used antituberculous therapy without improvement. Two out of these were

investigated for malignancy with sputum cytology and bronchoscopy with negative results.

Out of 51(88%) symptomatic workers 35(68%) were having the clinical features of COPD (productive cough, breathlessness and wheezes) in the chest. They were having simple CWP. They make 60% of the total patients. The rest of the other patients were either with PMF not included in COPD patients or with dry cough and central chest pain having no airway limitation. Out 33 past workers only 8(24%) left the work because of occupation related chest disease, the rest left because of social reasons.

Effects of smoking: The table given below compares the effects of coal dust exposure in the smokers with the nonsmokers. The prevalence of complicated CWP (PMF) was 40% in the smokers versus 14.5% in the nonsmokers. However the time to develop complicated CWP (PMF) was not much different in the smokers from the nonsmokers.

DISCUSSION

Coal worker pneumoconiosis a common condition in coal miners, may be more common in our country because of the poor working environment. In this study all the

The comparison of smokers and nonsmokers regarding the effect of coal dust exposure

Group of patients	Smokers		Nonsmokers	
	No. Of patients	Average duration of work	No. Of patients	Average duration of work
Total patients	10	21 years	48	19.5 years
Asymptomatic simple CWP	1(10%)	4 years	6(12.5%)	10.5 years
Simple CWP without features of COPD	-----	-----	5 (10.4%)	13years
Simple CWP with features of COPD	5(50%)	20 years	30(62%)	20 years
Complicated CWP (PMF)	4(40%)	25 years	7(14.5%)	27 years

Table -1

CWP; coal worker pneumoconiosis.
 COPD; chronic obstructive pulmonary disease
 PMF; progressive massive fibrosis

workers worked in the light of kerosene lamps, no one used any personal protective device and more than half were not aware of the hazards of coal dust. In some countries the incidence and prevalence of CWP is decreased because of good working conditions⁵. Since the patients may remain asymptomatic for long time after the development of radiological findings, they should be monitored regularly with X-ray chest. This will help in reducing the incidence and prevalence of CWP.

CWP may closely resemble pulmonary tuberculosis⁶. As far as the resemblance of CWP with pulmonary tuberculosis is concerned, this study is in accordance with the other literature⁶. In this study 7 patients used antituberculous drugs, some of them, for more than one time without clinical improvement.

This study showed the association of COPD with coal dust exposure. This is also mentioned in the other literature^{10,11}. 60% workers in this study showed the features of COPD (productive cough, breathlessness and wheezes in the chest). Cigarette smoking in the coalminers adds to the risk of COPD due to coal dust¹¹. The table given above shows the comparison of smokers with the nonsmokers in the patients of CWP. Though the prevalence of COPD in the smokers was comparable to that in the nonsmokers, its severity was more in the smokers. This was evident by the fact that 2 smokers needed admission versus none in the nonsmokers group. This shows that cigarette smoking increases the prevalence of PMF, while it adds to the severity of COPD.

As mentioned in the other literature², CWP is not reversible rather may be progressive in nature. This was evident from this study by comparing the new and old radiographs of the past workers who remained symptomatic after an average of 9 years of leaving the work. This study revealed the progressive nature of complicated CWP (PMF).

CONCLUSION

1. Coal workers may remain asymptomatic for long time after developing X-ray chest changes, raising the importance of regular monitoring the workers with X-ray chest within maximum 2 years of the work.

2. Since the patients with CWP may present to the hospital with other clinical conditions like fever, the chance of misdiagnosis like miliary tuberculosis or apical tuberculosis are there. Therefore occupational history in suspected cases is important.
3. Most of the workers with severe symptoms and PMF were past workers with their average time to leave was 9 years. This shows that PMF is a progressive disease even after ceasing the exposure to coal dust.
4. Smoking increased the severity of airway limitations without affecting its prevalence, while it increased the prevalence of PMF without much affecting its time to develop.

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