Original Article

The PMF (Pulmonary massive Fibrosis) and the Exposure period to the Respirable Coal Dust

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ABSTRACT

Objective: To determine the association between pulmonary massive fibrosis and duration of dust exposure in patients with coal worker pneumoconiosis.

Study Design: A cross sectional descriptive study.

Place and Duration of Study: This study was carried out in the Medicine department of Saidu Teaching Hospital Saidu Sharif swat from Jan 2007 to Dec 2011.

Materials and Methods: One hundred and twenty (120) patients suffering from coal worker pneumoconiosis were included**.** They were either already diagnosed patients of coal worker pneumoconiosis or newly diagnosed symptomatic patients.

Results: Forty four(36.6%) had simple coal worker pneumoconiosis, Forty six (38.3%) had complicated coal worker pneumoconiosis and thirty (25%) had PMF, in which twenty patients(66.6%) had exposure of more than twenty years. The results were analysed using the chisquaretest with a p value of 0.00000472.There is clear association between PMF and exposure period to the respirable coal dust.

Conclusion: We conclude that prolonged period of exposure has association with the development of PMF.

Key Words: Coal dust, pneumoconiosis, PMF (pulmonary massive fibrosis).

INTRODUCTION

Coal worker's pneumoconiosis is a progressive parenchymal lung disease [1]. It is caused by the inhalation of respirable coal dust [2]. This dust contains fibrogenic material like Iron and Pyrite [3]which initiates an inflammatory response by the release of different cytokines[4,5]. The fibroblast growth factor and transforming growth factor are considered the main cytokines for causing fibrosis [6]. Based on the radiological features coal worker's pneumoconiosis is divided in threeCategories (I) Simple coal worker pneumoconiosis,(II) complicated coal worker pneumoconiosis(III) Pulmonary massive fibrosis abbreviated as PMF.[7]

In simple coal worker pneumoconiosis pulmonary nodules are less than 1cm in size and dominating the upper lobes.In complicated coal worker pneumoconiosis there are multiple nodules and the size of each nodule is more than 1cm.In PMF the nodules are more than 1cm in size and they fuse together. The period of exposure as well as the concentration of respirablecoal dust is important in the working environment[8] .Lack of preventive measures and prolonged exposure has an impact on the final outcome [9].However all those who are exposed don't develop coal worker pneumoconiosis and PMF, So other factors may be interplaying like smoking, working in small mines (employing less than 50 people),[10, 11] and genetic factors [12, 13].

In developed world the condition is detected earlier through Coal worker X-ray surveillance programme(CWXSP), and every coal worker has to undergo X-Ray examination every five years [14] .PMF is a major health problem in our country because effective legislation and preventive measures are lacking. This study was done to establish the association between PMF and duration of exposure to the respirable coal dust.

MATERIALS AND METHODS

This study was done from Jan 2007 to Dec 2011. A total of 120 patients were included in the study. They were either already diagnosed patients of coal worker pneumoconiosis or newly diagnosed symptomatic patients.The history, age at which exposure started and stopped, duration of exposure, smoking status, the use of face mask during mining, the old x-ray finding, and new x-ray findings were recorded.

At the end of study period X-Ray findings were classified as (I) simple coal worker pneumoconiosis, (II) complicatedcoal worker pneumoconiosis (III) PMF. As the exposure period was variable we operationalized this variable by dividing it in to three groups:

(I)Exposure less than 10years at work place (II) Exposure between 10-20 years at work place

(III)Exposure more than 20 years at work place .The results and association between exposure and PMF were statistically analysed using the chi square test of independence.

RESULTS

All patients (120) were males. The age was ranging from 25 years to 60 years.80% patients belonged to Shangla district while 20% belonged to different parts of malakand division. All patients had active exposure

at work place mainly at underground levels. Minimum age of exposure was 15 years and maximum at which exposure started was 40years.Minimum age at which exposure stopped was 25 years and maximum age at which exposure stopped was 60 years. Minimum period of exposure was 5 years and maximum period of exposure was 25years.

80% patients developed symptoms while still at work while 20% developed symptoms after leaving the work place.85% patients were not using any face mask. Main symptoms were chest tightness and shortness of breath. Forty fourpatients (36.6%) had simple coal workerpneumoconiosis, Forty six patients (38.3%) had complicated coal workerpneumoconiosis and thirtypatients (25%) had PMF (pulmonary massive fibrosis).

When the category of patients with PMF (N=30) was further analysed it was found that 20(66.6%) had exposure of more than 20years, 6(20%) had exposure of 10-20 years and only 4(13.3%) had exposure of less than 10years.

Table 1 shows that prolonging the period of exposure increases the chances of PMF. Although 13.33% patients with PMF had exposure of less than 10 years. When the results were statistically analysed using the chi square test (χ^2 =30.77 ,df=4) the observed and expected values are given in the table 2. The p value was calculated to be 0.00000472 suggesting statistically significant association between PMF and exposure period to the respirable coal dust.

The results in the parenthesis are expected values which are close to the observed values.

Table No.1: Categories of coal worker pneumoconiosis and association with the exposure period in years.

Groups	No	Exposure in years	Simple coal worker pneumoconiosis No (%)	Complicated coal worker pneumoconiosis No (%)	PMF No (%)
I	59	<10	29(65.9%)	26(56.52%)	4(13.33%)
II	25	10-20	10(22.72%)	9(19.56%)	6(20%)
III	36	>20	5(11.36%)	11(23.9%)	20(66.66%)
Total	120		44(36.6%)	46(38.3%)	30(25%)

Table No.2: Period of exposure and development of PMF

Groups	No	Exposure in years	Simple CWP	Complicated CWP	PMF
			Observed (Expected)	Observed (Expected)	Observed (expected)
I	59	<10	29(21.6)	26(22.6)	4(14.8)
II	25	10-20	10(9.17)	9(9.58)	6(6.25)
III	36	>20	5(13.2)	11(13.8)	20(9.00)
Total	120		44	46	30

cwp=coal worker pneumoconiosis, PMF= Pulmonary massive fibrosis

DISCUSSION

Coal worker pneumoconiosis and PMF are serious health problems. All our patients were males because females are not involved in mining industry at present. However many other studies have shown that males are dominating this profession[15]. All our patients were symptomatic because they seek medical advice late and we are lacking in enforced X-rays surveillance program .Majority of our patients belonged to Shangla district. The reason is that majority of the labour go to Baluchistan and other parts of the country for coal mining. Majority of these patients were not using any face mask and were working under unprotected conditions which increased the chances of development of PMF [15, 16].In this study 25% had PMF and out of this 66.6% had exposure period of more than 20 years. This percentage is higher than some other studies carried out in USA [15, 16].This may point to the poor working conditions and high concentration of the dust and failure to detect cases earlier[16].Moreover there is lack of education and lack of awareness about the hazards of coal dust.This has also been shown by the study of Sadia Ashraf[17].Awareness on the part of family physicians and GP is also important, as majority of coal worker pneumoconiosis patients may be minimally symptomatic[18].However progression may occur after stopping working at coal mines [19].So regular follow up is necessary.There are limitations to this study. This is not a multicentre study and was carried out in one of the tertiary care hospital of malakand division and not necessarily represents the whole of the country. Moreover it is not possible to directly inspect the working conditions as most of the coal mines are in Baluchistan and tribal areas.

CONCLUSION

We conclude that PMF has close association with the duration of exposure to the coal dust.

Recommendation:

Effective X-Ray surveillance programme to detect the cases earlier, laws to enforce the use of face mask at

work place and to build residential colonies away from the mines.

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