Frequency of Coal Worker Pneumoconiosis in patients presented to Chest Out Patients Department

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Author Contributions

FM conceived idea, FM GN drafted the study, GM M MG collected data, M GN did statistical analysis & interpretation of data, FM GN M critical reviewed manuscript, All approved final version to be published.

Declaration of conflicting interests

The Authors declares that there is no conflict of interest.

Abstract

Background: For some time it was observed in practice that patients were coming with chest symptoms to our outpatient department having coal mine working history. So we decided to look scientifically into this problem in our area.

Objective: To find out the frequency of coal worker pneumoconiosis in patients presenting to chest OPD (Outpatient's Department).

Methodology: This was a prospective descriptive study conducted in Khalifa Gul Nawaz Teaching hospital Bannu from 1stApril 2012 to 31st December 2016. All the medical doctors were requested to send all the patients for assessment to pulmonology (chest) outpatient department (OPD) presenting with coal mine working history. After complete history, thorough examination chest x-rays, pulmonary function tests (PFTS) and High resolution computed tomography (HRCT), they were excluded or included in the study using a self-administered proforma. Actual prevalence study was not found nationally, so population sample was difficult to calculate. Analysis was done using statistical package for social sciences (SPSS) version 17.

Results: A total of 223 male patients, age range 26-67 years with 07 to 27 years coal mine working history were interviewed, examined, chest x-rays, PFTSs and HRCT were done. Out of them 142 (63.67%) were found to have coal worker pneumoconiosis and 81(36.32%) had no findings. Among these 223 patients 134(60.08%) had findings on chest x-rays and 89 (39.91s %) had normal X- rays. PFT,s were abnormal in 157 (70.40%) patients having restrictive, obstructive or mixed pattern and 66 (29.59%) had normal spirometry. HRCT findings were seen in 142 (63.67%) patients and had normal HRCT in 81(36.32%) patients.

Conclusion: Although the total magnitude of disease burden remains somewhat uncertain, what is known about the state of coal miner health in the Pakistan is troubling. Our results starkly emphasize the need for improved dust control measures and the continuing importance of active health surveillance for Pakistani coal miners. They also need compensation properly.

Key words: Coal worker Pneumoconiosis; Coal Mines; Pulmonary Functions Tests

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Introduction

Coal workers' pneumoconiosis (CWP), as part of the spectrum of coal mine dust Lung disease, is a preventable but incurable lung disease that can be complicated by respiratory failure and death. Recent increases in coal production from the financial incentive of economic growth lead to higher repairable coal dust level1. International reports of CWP suggest that there is a resurgence of Pneumoconiosis and the prevalence of CWP vary considerably among countries.

The symptoms and manifestations of CWP vary

depending on the composition of the inhaled dust, duration of exposure, stage of disease and host-related factors. CWP may develop into progressive massive fibrosis (PMF), which can be fatal.[2] Coal mining is one of the most serious occupational hazard in china and in 2014, the number of occupational disease cases in coal mining accounted for 38.02% of the total number of occupational disease burden.[3] In the same study it was shown that the most effective measure to control the disease, is decreasing dust concentration in the air of workplaces by adopting the passive preventive measures, such as wet working, timely dust cleaning, reducing wind velocity, and reducing the damage to rock and coal seams during tunneling . In addition to CWP, the dust can also cause other diseases like inflammation of the upper respiratory tract, chronic obstructive pulmonary disease (COPD), and so on.[4] The overall prevalence of coal workers' pneumoconiosis among underground coal miners in the United States was 11.2% in 1970–1974 and 3.3% in 2005–2006.[5] In Pakistan, there is no reporting system and no national data on the prevalence of CWP and also no preventive and protective measures are provided to the miners. Our study seems to be the first step to point out this important but neglected problem of poor community.

Methodology

This was a prospective descriptive study conducted in Khalifa Gul Nawaz Teaching hospital Bannu from 1st April 2012 to 31st December 2016. All the medical doctors were requested to send all the patients for assessment to pulmonology (chest) outpatient department(OPD) presenting with coal mine working history. After complete history, thorough examination, chest x-rays, pulmonary function tests (PFTS) and High resolution computed tomography (HRCT), they were excluded or included in the study using a self-administered proforma. Actual prevalence study was not found nationally, so population sample was difficult to calculate. Analysis was done using statistical package for social sciences (SPSS) version 17.

Inclusion criteria

1. All patients with coal mine working history were included
2. Patients able to undergo spirometry and HRTC were included.

Exclusion criteria

1. Patients with coal mine working history of less than one year.
2. Patients unable to perform investigations.

Operational difinitions

1. Normal chest x ray. Having no nodularity, reticulations or fibrosis
2. Abnormal chest x ray. Having any one of these findings.
3. Ab-normal CT CHEST. Having small discrete nodules or masses of more than 1cm and may be more than 4cm with necrosis.(PMF)
4. Normal CT CHEST. Having no nodules or masses
5. Ab-normal spirometry. Having obstructive, restrictive or mixed pattern.
6. Normal spirometry. Having no findings like obstruction or restriction

Results

A total of 223 male patients, age range 26-67 years with 07 to 27 years (CHART 01,02) coal mine working history were interviewed, examined, chest x-rays, PFTSs and HRCT were done. Out of them 142 (63.67%) were found to have coal worker pneumoconiosis and 81 (36.32%) had no findings. Among these 223 patients 134(60.08%) had findings on chest x-rays and 89 (39.91 %) had normal x rays(CHART03). PFT, S were abnormal in 157 (70.40%) patients having restrictive, obstructive or mixed pattern and 66 (29.59%) had normal spirometry (CHART 04). HRCT findings were seen in 142 (63.67%) patients and had normal HRCT in 81(36.32%) patients (CHART 05).

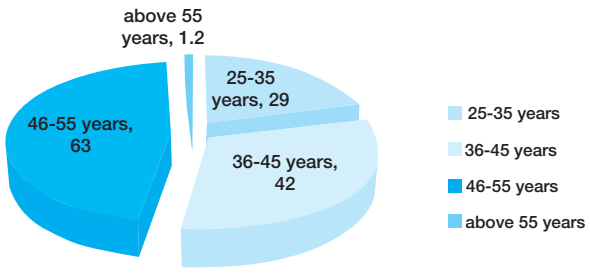


CHART 01: Age wise distribution of total no 223 patients.

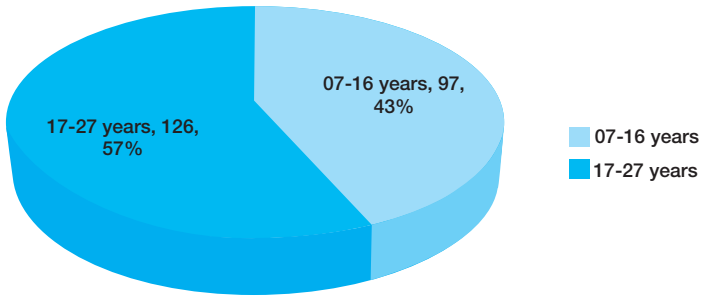


Chart 02: Working history in years of total number of 223 patients

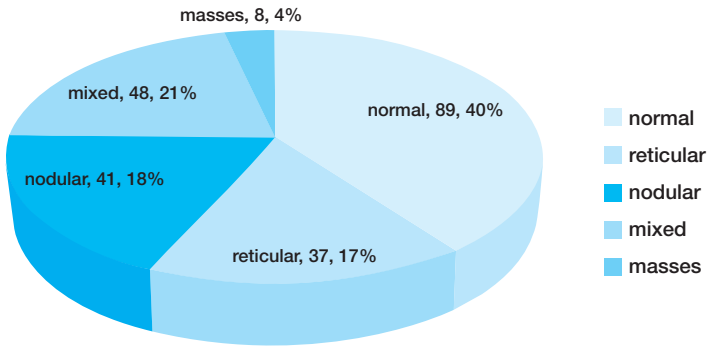


Chart 03: X-ray findings of total 223 patients

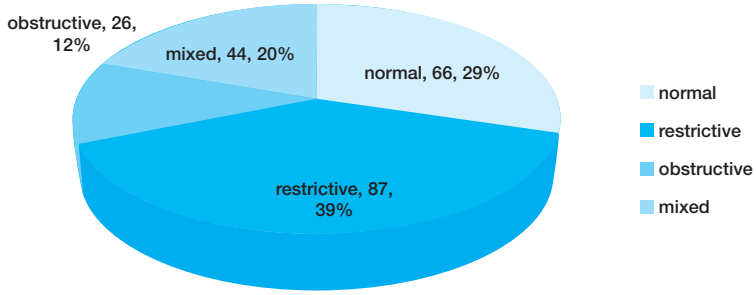


Chart 04: Spirometry pattern of total 223 patients

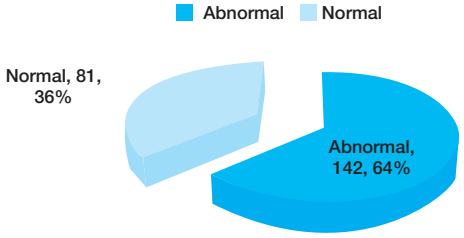
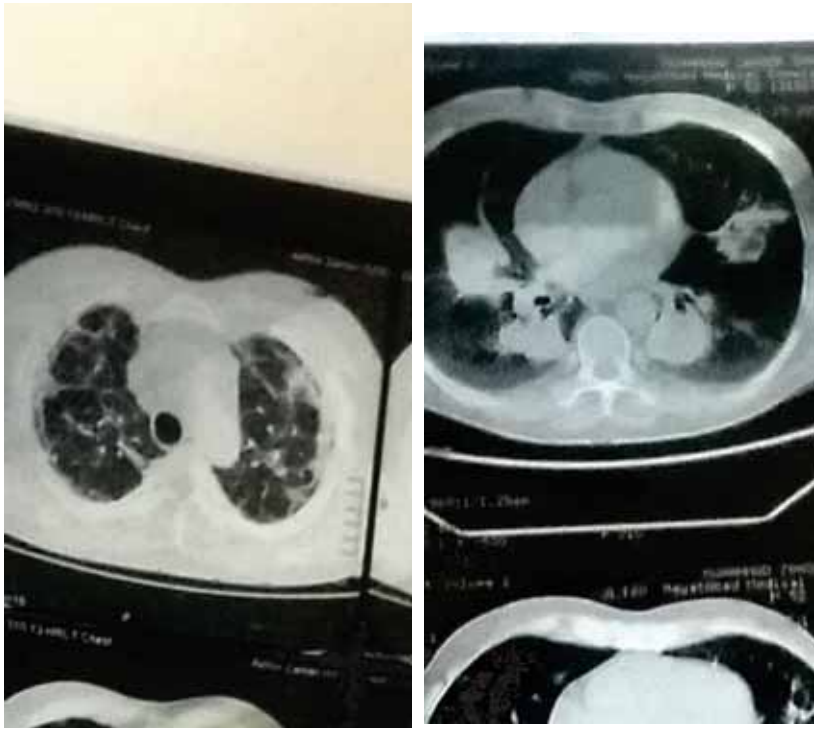


Chart 05: TOTAL 223----------HRCT- FINDINGS

X RAY WITH CWP------11 YEAR WORKING HISTORY



TWO CT THORAX ---ONE WITH FIBROSIS ONLY AND THE OTHER WITH PROGRESSIVE MASSIVE FIBROSIS—MASSES FORMATION

Discussion

In Pakistan usually females don't work in mines and we also had no female in our study population.

In our study more than 39% of workers were above 55 years of age, which shows that our community is economically poor, working at this age even with the diseased lungs, as compared to the US study where maximum age was 48 years.[6]

The duration of daily work was more in our country but total years of work were comparable to international studies especially in the above American study they had median 24 years and we had maximum 27 years working history.

The chest x rays were abnormal in 60% of workers mostly ,mixed pattern 48% followed by nodular 41% , reticular 37% and 8% had masses indicating progressive massive fibrosis(angel wing appearance). In an old international study, they had found 37% nodular shadows and only 0.7% masses on chest x rays, which shows that due to regular examinations they don't reach to the stage of masses formation on x rays.[7] According to international labour organization (ILO), nodules smaller than 7 mm are micro nodules, those 7-20 mm are macro nodules, and those larger than 20 mm are PMF. According to this criteria, round nodules smaller than 1.5 mm are p, those 1.3-3 mm are q, and those 3-10 mm are r, Lesions of CWP also become cavitated and calcified8. Unluckily in our remote district we don't have expert radiologist to report according to the international classifications (ILO), to measure the sizes of all nodules.

we found that spirometry is very good investigation to look for the functions of lungs in these workers, because it was found abnormal in more than 70% of coal workers. In 55% of workers it showed restriction and 44% had mixed restriction and obstruction, which means that the interstitium had already diseased at the time of presentation. In a multi-center study, lung functions (spirometry, diffusing capacity) and x ray chest findings were recorded and the spirometry findings were comparable with our study.[9] In our center facility of diffusing capacity is not available. In one recent study by David et al ,he found that pulmonary functions are more disturbed in diffuse profound nodularity as compared to less sparse nodules on chest radiographs.[10]

In our series 26% workers had obtrusive pattern only, in spirometry, and interestingly most of these workers come repeatedly to OPD with typical asthma like symptoms and had post-bronchodilator reversibility, which were rarely seen in international research. In

other articles like article number 9 above emphysema (COPD) like pattern was mostly found.

The High Resolution Computed Tomography (HRCT) had findings in 63% of patients and the remaining were normal. These findings were comparable with a large Japanese study in which HRCT findings were compared with histological findings. In both the main shadows were different sizes of nodules with some cavitation, calcifications, emphysematous and cicatreseal changes.[11]

Computed tomography is considered to be one of the best investigations in occupational lung diseases and this was thoroughly studied in an international article and most of the findings were matching with our study.[12]

The overall prevalence of CWP in our series was 63% as compared to the one of the above mentioned study by Attfield et al where he found 38% in an American population. we found only two workers having tuberculosis concomitantly.

27 workers were smokers but in these people only 03 were behaving like asthma not COPD.

Regarding the preventive measures, our population had nothing for prevention supplied by the owners or officials of the mines. They use their own turban, handkerchief or any sheet to cover the nose and heads, and eyes are usually not protected. In one study by Lany AS et al found that the basic protective measures were not sufficient to protect the workers from the effect of the coal dust even internationally13.

Conclusions

Although the total magnitude of disease burden remains somewhat uncertain, what is known about the state of coal miner health in the Pakistan is troubling. Our results starkly emphasize the need for improved dust control measures and the continuing importance of active health surveillance for Pakistani coal miners. They also need compensation properly.

Authors participation

01. Fazli maula, associate professor data collection, writing article,
02. Ghazala naz, Medical student patients history, keeping records
03. Maria, Psychologist, statistical analysis
04. Muhammad Ghassan typing, charts making

References

1. Walter C, Clarke P, et al. Coal mine dust lung disease in the modern era. Respirology. 2017 May;22(4):662-670.
2. Lane E, Anderson WH.Coal workers' pneumoconiosis.South Med J. 1977 Jan; 70(1):53.
3. Zosky GR, Hoy RF, Silverstone EJ, Brims FJ, Miles S,Johnson AR et al. Coal workers' pneumoconiosis: an Australian perspective. CMAJ. 2012 Nov 6; 184(16)
4. Justin Cheng-Ta Yang,Kao-Lang Liu.Survival Analysis of Coal Workers' Pneumoconiosis (CWP) Patients in a State-Owned Mine in the East of China from 1963 to 2014. Int J Environ Res Public Health. 2017 May; 14(5): 489.
5. Attfield MD, Morring K. An investigation into the relationship between coal workers' pneumoconiosis and dust exposure in US coal miners. Am Ind Hyg Assoc J 1992;53:486–92.
6. Scott Laney A, Edward L. Petsonk, MD, Janet M. Hale, BS, Anita Let al.Potential Determinants of Coal Workers' Pneumoconiosis, Advanced Pneumoconiosis, and Progressive Massive Fibrosis Among Underground Coal Miners in the United States, 2005–2009.Am J Public Health. 2012 May; 102(2):279–28.
7. Young RC Jr1, Rachal RE, Carr PG, Press HC. Patterns of coal workers' pneumoconiosis in Appalachian former coal miners.J Natl Med Assoc. 1992 Jan;84(1):41-8.
8. Wang X1, Yu IT, Wong TW, Yano E.Respiratory symptoms and pulmonary function in coal miners: looking into the effects of simple pneumoconiosis.Am J Ind Med. 1999 Feb;35(2):124-31.
9. Scott Laney A, Edward L. Petsonk MD, Janet M, Hale BS, Anita L et al. Potential Determinants of Coal Workers' Pneumoconiosis, Advanced Pneumoconiosis, and Progressive Massive Fibrosis Among Underground Coal Miners in the United States, 2005–2009.Am J Public Health. 2012 May; 102(2):279–28.
10. David J. Blackley,A. Scott L, Cara N. Halldin, Robert A et al.Profusion of Opacities in Simple Coal Worker's Pneumoconiosis Is Associated With Reduced Lung Function. Chest. 2015 Nov; 148(5): 1293–1299.
11. Wang X1, Yu IT, Wong TW, Yano E.Computed tomography of pneumoconiosis.SSangyo Eiseigaku Zasshi. 1995 Sep;37.
12. Remy-Jardin M1,Remy J,Farre I, Marquette CH.Computed tomographic evaluation of silicosis and coal workers' pneumoconiosis. JapanRadiol Clin North Am. 1992 Nov;30 (6):1155-76.

13. Laney AS1, Attfield MD. Coal workers' pneumoconiosis in small underground coal mines in the United States. Basic protections are still lacking. Environ Med. 2010 Jun;67(6):428-31.