



## Gujjar Lung : Adverse Effect of Indoor Air Pollution with Pinewood Smoke

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### Abstract

This is a recently introduced entity, as a chronic lung disease occurring due to prolonged exposure to indoor air pollution with pinewood smoke characterized by progressive cough and dyspnea, varied radiological picture and anthracotic nodules and fibrosis on histopathological examination.

### Key Words

Indoor air pollution, Pinewood smoke, Anthracotic nodules, Pulmonary fibrosis

### Introduction

Gujjar lung is a form of chronic lung disease as a result of indoor air pollution with pinewood smoke in Gujjar community - a social and ethnic group residing at hilly regions of the Indian sub-continent (Jammu and Kashmir, Himachal Pradesh, Rajathan, Pakistan, Pakistan occupied Kashmir and Gilgit). These people live in ill-ventilated mud hoses called "Kothas" and use pinewood for heating and cooking purposes throughout the year, with daily exposure to smoke averaging 12 to 16 hours. A high oleoresin containing part of the wood called "Lash" is used for lighting purposes adding further to the indoor air pollution (1-7).

The disease is characterized by progressive dyspnea and cough productive of blackish sputum, usually manifesting beyond fourth decade of life. Radiologically there are varying features of miliary mottling and reticulonodular shadows, usually involving the mid-and lower zones, sparing the apices. Histopathologically carbon-laden macrophages (mainly perivascular in distribution), formation of anthracotic nodules, and fibrosis are the usual findings (1-3). Although such cases are reported previously as well (1-3), we hereby report one more case and the relevant literature is reviewed.

### Case Report

A 60 - year old male got admitted with chief complaints of progressive dyspnea and cough productive of mucoid blackish sputum. There was no history suggestive of tuberculosis or any other significant disease in his past. He had history of exposure to pinewood smoke inhalation in "Kotha" since his early age. Such history was not illicited in his family members. Chest examination revealed bilateral rhonchi more prominent near the infrascapular regions. Rest of the systemic examination did not reveal any abnormality. All possible hematological, biochemical and immunological investigations were normal. Arterial blood gas analysis revealed hypoxemia with mean saturation of 81 percent. Chest radiograph revealed reticulo nodular shadows on left involving mid and lower zones. On the right sight there were more dense mass shadows, with sparing of apices (Figure 1.) Fiberoptic bronchoscopy revealed anthracotic staining of right middle and lower lobe bronchi, and bronchoalveolar lavage showed predominantly macrophages laden with carbon pigment. Pulmonary function testing by computerized equipment (Medspiror) showed obstructive pattern with FEV1 / FVC ratio of 56 percent. High

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resolution computed tomography scan (HRCT) showed bilateral reticulo nodular shadows and fibrous septa on both sides (Figure 2). Percutaneous biopsy performed under CT guidance on the right side, on histopathologic examination showed clumps of carbon laden macrophages and anthracotic nodules (Figure 3). Investigation profile for tuberculosis and fungal infections proved negative. On the basis of radiological features and histopathology the diagnosis of "Gujjar Lung" was made.

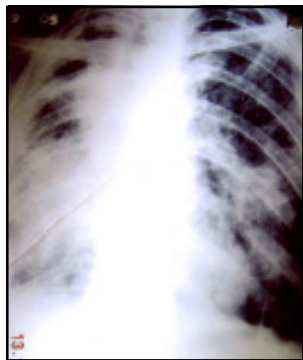


Fig. 1 : Chest radiograph (PA view) showing reticulo-nodular shadows on left and mass shadows on right, sparing apices.

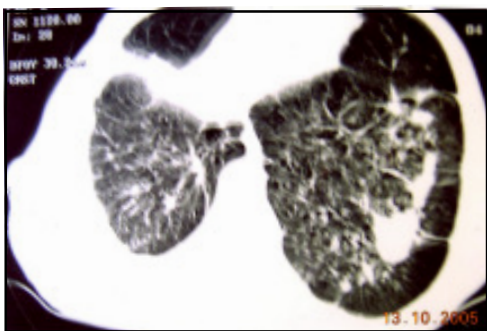


Fig. 2 : HRCT of chest showing reticulo-nodular pattern on both sides.

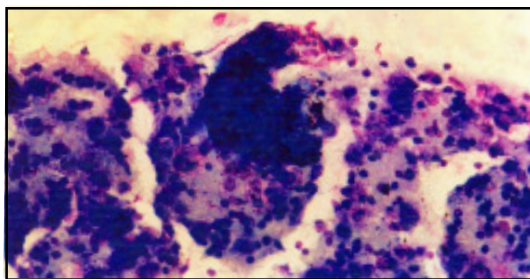


Fig. 3 : Photomicrograph of percutaneous lung biopsy showing anthracotic nodules with carbon laden macrophages. (May - Granwald - Giemsa X 40).

## Discussion

The entity "Gujjar Lung" came into existence in medical literature in 1991 when Dhar & Pathania (2) from Government Medical College associated Chest Diseases Hospital Srinagar studied 46 Gujjar patients who had history of exposure to pinewood smoke inhalation since early age in the dwellings, with radiological evidence of miliary mottling and reticulo nodular shadows, who were empirically put on therapeutic trials of antituberculosis treatment, but the shadows remained same or increased in density. Finally lung biopsy revealed features of anthracotic nodules, carbon-laden macrophages and fibrosis to Gujjar community. By 2000, Raison and co-workers (3) from the George Washington University Medical Center, USA observed similar histopathological findings in a Kashmiri baker working in Saudi Arabia whose chest radiograph taken for immigration purposes revealed diffuse nodular lesions measuring 5mm and HRCT showed well defined nodules on both sides. After going retrospectively in the literature, the diagnosis of Gujjar Lung was made when findings were similar to that of Dhar and Pathania (2). Saiyed HN and co-workers (8) in Ladakh region of Jammu and Kashmir observed miliary mottling in chest radiographs in residents of this region. The disorder was designated as "non-occupational pneumoconiosis" due to either exposure to free silica dust or inhalation of domestic wood smoke, however, lung biopsy was not performed in any case. Prior to this, Sandoval and co-workers (9) studied clinical, radiological, functional and pulmonary hemodynamic characteristics in 30 non-smoking individuals in Maxico where mostly women were involved with dyspnea and cough as presenting features. The chest radiographs revealed diffuse reticulonodular shadows with normal sized or hyperinflated lungs and features of pulmonary arterial hypertension. Pulmonary function testing (PFT) showed mixed restrictive - obstructive pattern with severe hypoxemia and variable hypercapnea. Histopathology of lungs revealed fibrosis and inflammatory thickening of alveolar septa and diffuse parenchymal anthracotic deposits. They concluded that intense and prolonged smoke inhalation may produce chornic lung disease similar



in appearance to other forms of inorganic dust exposure related interstitial lung disease, and described it as wood-smoke inhalation - associated lung disease.

More recently Saini and co-workers (10) in 2003 from the Postgraduate Institute and Government Medical College Chandigarh observed miliary mottling in a 26-year-old woman of Himachal Pradesh residing at high altitude (8000 feet) who was a non-smoker but had significant history of exposure to wood smoke. PFT demonstrated mild obstructive airway disease. Tuberculosis and other possible causes of miliary mottling were ruled out. Transbronchial lung biopsy showed thickening of alveolar septa, carbon-laden macrophages and fibrosis. It was suggested that carbonaceous particles produced by wood burning have fibre-like character which incite chronic inflammatory reaction, and coal macules formed in the lungs following prolonged exposure to carbonaceous dusts are seen as fine opacities radiologically. They again designated the disease as wood smoke inhalation associated lung disease, as a poorly understood entity and without proper nomenclature. We are studying such cases for last 8 years now with varying radiological pattern of miliary mottling, reticulo-nodular shadows usually sparing the apices. Histopathologically anthracotic nodules with carbon-laden macrophages usually perivascular in distribution, thickened alveolar septa and fibrosis are seen. We attribute the occurrence of this disease to inhalation of pinewood smoke over prolonged periods and the disease manifests usually beyond the fourth decade with progressive dyspnea and non-productive cough. Fiberoptic bronchoscopy usually reveals anthracotic staining of the lobar bronchi. Broncho-alveolar lavage shows predominance of carbon-laden macrophages. We did not encounter any case having history of prolonged exposure to smoke of biomass fuels other than pine wood smoke. Pine wood is rich in oleoresins which on burning give rise to sulfur dioxide, benzopyrene, carbon monoxide, nitrogen oxides, polycyclic hydrocarbons and acetic acid. These gases alone or along-with carbon could be the

responsible factors for lung injury with fibrosis (2-3,8-10). The entity "Gujjar Lung" needs to be differentiated from coal workers pneumoconiosis which has similar histopathological appearance but the patient's ethnic origin, history and occupation help to differentiate it from the later. Cryptogenic organizing pneumonia is differentiated by absence of polypoid granulation with the human of bronchioles and alveolar ducts (2,3).

Further studies with large samples are needed to study the injury pattern and genetic predisposition. Prevention of the disorder may need to change the living standard to prevent exposure to pinewood smoke.

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