An epidemiological study in an Anatolian village environmentally exposed to tremolite asbestos

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Tremolite is the most commonly occurring of the amphibole asbestos minerals and is found in a wide range of geological environments. It is an early product of thermal metamorphism of dolomites with silica impurities and is a common contaminant of industrial talc and chrysotile asbestos.

Tremolite is found in some countries in sufficient quantities for commercial exploitation including Italy, Turkey, Pakistan, and South Korea. It can occur in a variety of forms ranging from a fine fibre to a coarse flake like fibre. Although there is some experimental and clinicopathological evidence that fine tremolite is carcinogenic,¹⁻⁴ since it is not used commercially it is given virtually no consideration when the epidemiology and aetiology of asbestos related diseases are considered.

After the detection of four cases of malignant pleural mesothelioma in the small village of Çaparkayı an epidemiological study was performed there.

Materials and methods

Çaparkayı is in the Sabanözü area of the Çankiri district in Turkey, about 90 km from Ankara (fig 1). The main economic activity is farming and livestock breeding. The houses are made of mudbrick and rocks and there is no asbestos mine nearby.

As the result of migration to the cities to seek employment, the population and the proportion of young people has decreased and the present population is 425 of whom 215 (51%) are aged 20 or over.

A questionnaire was completed for all those over 20 and a physical examination was performed by four physicians. From the questionnaire, information on medical history, smoking habit, occupational exposure to asbestos, and symptoms related to the respiratory system were obtained.

Using a portable Picker model x ray apparatus, standard posteroanterior chest x ray films were taken and the films were evaluated by three chest specialists.

Samples of white stucco which had been used for

Radiological abnormalities in 63 chest x ray films*

Abnormalities	No of patients		Prevalence (%)	Mean age
	Male	Female		
Interlobar fissure thickening	17	11	16.8	52.6 ± 14.5
Diffuse interstitial fibrosis	15	11	15.6	55.2 ± 20.7
Calcified pleural plaque*	16	8	14.4	58.2 ± 13.6
Pleural thickening	8	5	7.8	61.2 ± 10.6
Compatible with tuberculosis	2	5	4.2	62.5 ± 8.2

*Some have more than one abnormality.

†Typical calcification with asbestos exposure.

many years by all villagers for indoor and outdoor painting were taken and examined at the Dust Disease Research Unit of McGill University, School of Occupational Health, Canada.

The information about the population and its mortality was obtained from the records of the health centre from 1980 to 1987.

Results

Everyone aged over 20 lived in houses that were painted with a white stucco obtained from a nearby source.

Chest x ray films were taken from 167 of those aged 20 and over and 63 (37.7%) were found to have radiological abnormalities (table).

The analysis of the white stucco sample showed that it was rich in tremolite asbestos including some very fine fibres (fig 2).

Some of the adult deaths between 1980 and 1987 were from malignant disease; two from mesothelioma and one each from gastric carcinoma and lymphoma.

Discussion

Mesothelioma is rare and the annual incidence in populations with no exposure to asbestos is about one per million; the risk may be increased by a factor of a

Fig 1 Map of Sabanözü area showing location of Çaparkayı.

thousand or more among those heavily exposed to asbestos.⁵ In a small village with a population of 425, four cases of mesothelioma occurring in four years is unusual. In the same village there were also patients with pleural asbestosis and diffuse pulmonary fibrosis.

The villagers of Çaparkayı are not occupationally exposed to asbestos but fine and coarse tremolite fibres were found in the bulk sample of white stucco. Thus the villagers may *inhale* these fibres from the walls of houses painted with the stucco. The natural erosion of asbestos containing soil and the formation of dust from this soil, however, may also produce air pollution.

It is well known that the amphibole form of asbestos is the most important in the aetiology of mesothelioma, in particular crocidolite and amosite. Recent reports, however, have suggested that the serpentine forms may also be implicated in the causation of this disease. This evidence comes from reports of increased rates of mesothelioma in chrysotile miners in Canada³ and in workers from a talc mine in New York State.⁶ Both these mines, however, are known to be contaminated with tremolite asbestos, which would appear to be a better candidate as the cause of these mesotheliomas because of its physical structure. Another study by McConnochie *et al* in Cyprus found that

Fig 2 Electron micrograph of Çaparkayi white stucco showing fine and coarse tremolite fibres.

cases of mesothelioma occurred near a pure chrysotile mine.⁴ Once again, environmental studies indicated tremolite contamination of the roof tops of certain houses. Tremolite was also found in patients' lung samples and in sheep lungs and the mines were not considered to be the cause of the mesothelioma.

In the present study the prevalence of parietal and visceral pleural thickening and calcification, pulmonary fibrosis, and pulmonary tuberculosis is high. There is no doubt that calcified pleural plaques are related to exposure to asbestos. Solomon *et al* suggest that thickening of the interlobar fissure is the best radiological sign of exposure to asbestos.^{7,8} A prevalence of 16.8% interlobar fissure thickening points to long and heavy exposure to asbestos.

Two patients died from pulmonary tuberculosis and seven more cases were detected by radiological screening. Some of the pleural and parenchymal changes noted may also have been related of tuberculosis. Roviario *et al* reported three cases of pulmonary tuberculosis associated with mesothelioma.⁸ There are other reports that the incidence of tuberculosis is higher in asbestos workers than in the normal population which may be related to the depression of the immune system reported in those exposed to asbestos. There are also reports that chronic pleuropulmonary tuberculosis may cause mesothelioma in the absence of a history of exposure to asbestos.^{9,10} We believe, however, that tremolite fibres are the real cause of the

high incidence of mesothelioma and of some of the pleural and parenchymal changes in the village. The high incidence of tuberculosis may be primarily due to asbestos related immune depression or simply to a tuberculous endemic.

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