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Prevalence of Pleural Calcification in Persons Exposed to Asbestos Dust, and in the General Population in the Same District

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It is of interest whether pleural calcification is primarily the result of long years of exposure to asbestos dust or whether there are factors other than exposure to dust. We have investigated persons working for a long period in a plant processing asbestos products (chrysotile), persons without occupational exposure to dust but living in the vicinity of the plant, and consanguineous relations of patients with pleural calcifications. We have also studied a large population above the age of 40, in the district in which the plant is situated. Comparison of the groups disclosed that prevalence of pleural calcifications was closely related to opportunity for exposure to asbestos dust either occupationally or by family or neighborhood contact, as contrasted with the unexposed population. The prevalence in the group with direct or indirect asbestos exposure was 5.3, 5.8, 3.5%; whereas in the unexposed population it was 0.34%. These results indicate that asbestos is primarily responsible for pleural findings, but that some pleural disease may be the result of the other factors, still not known. The identification of other causes is hampered by the long period which need elapse from the onset of the process to the radiological appearance of the pleural change.

Soon after the demonstration of the fibrogenic properties of asbestos clinical evidence appeared demonstrating pleural changes in persons with long work exposure in asbestos mines or factories. The unusual finding of pleural calcification was attributed, in the fifties, solely to the effect of asbestos [Cartier (4), Lynch and Cannon (12)]. Later, when unexplained findings of the same character were made in the populations not known to be exposed to asbestos, the etiology seemed less certain [Jacob and Bohlig (9); Anspach (1); Anspach, Roitzsch, and Clauswitzer (2); Bohlig (3)].

Epidemiological studies of populations designed to investigate possible exposures to asbestos dust led in the sixties and later to sharp differentiation of both points of view. In the first instance, are Finnish, Canadian, American and other investigators who believe that occupational or nonoccupational exposure to asbestos provide the background for pleural findings [Kiviluoto (10, 11); Raunio (16); Cartier (5); Selikoff (19); Zolov, Bourilkov, and Babaljev (21); Rubino, Concina, and Scansetti (18)]. In the second group are authors who describe regional concentrations of pleural calcification with no evident contact with asbestos and who, for this reason, reject an asbestos etiology. Prominent in this second group are Czechoslovak workers [Hromek (8); Marsová (13);

Age	No. of persons	%
31-40	190	25.2
41-50	245	32.5
51-60	182	24.0
61-70	126	16.7
71 and above	12	1.6
Total	755	100.0

In this employed group we found 42 persons with pleural calcifications (5.3%); 23 of them had simultaneous X-ray signs of asbestosis, 19 had only isolated findings of pleural calcification.

Appendix No. 2

The age distribution of persons with pleural calcifications ascertained within the entire period of studies, i.e., during 16 years, was as follows:

Age	No. of persons	%
31-40	1	2.4
41-50	4	9.6
51-60	19	45.0
61-70	16	38.1
71 and above	2	4.9
Total	42	100.0

The stated age limits relate to the time when we ascertained signs of pleural calcifications for the first time and thus these age limits do not mean the present age of the patients. Till the present day already 6 of the recorded persons have been recorded as deceased. It is important that only one of the patients in which we ascertained pleural calcification for the first time in 1959 was below the age of 40 (36 years). The absolute majority of persons with pleural findings ranges within the age groups of 51-60 years and 61-70 respectively.

The second group, with less intimate exposure, may be divided into two subgroups:

a. The population living in the neighborhood of the factory (those over the age of 20). This group includes individuals who are not and never were employed at the factory.

b. Blood relations of factory employees, older than 20 years. Asbestos air pollution in the vicinity of the factory may have been heavier 20, 30 and more years ago. At present, environmental dust concentrations and chrysotile content in the airborne dust in the vicinity of the factory, are lower because of improved industrial hygiene practice in the last 15 years (Simečewk, Internal Hygienic Report 1969).

Blood relations may be assumed to have some increased exposure by virtue of their daily contact with employees, who may have come home with contaminated work clothes.

There were 155 persons in the neighborhood group. Pleural calcifications were present in 9 (5.8%). Five were also blood relatives of employees.

It was quite difficult to investigate blood relatives of exposed factory employees. In some cases, we found it necessary to ask physicians from other

calcifications in the groups with direct or indirect exposure to asbestos dust were so numerous as to strongly affect the prevalence of pleural findings in the population as a whole. Among the factory employees, there were 42 cases of pleural calcifications against an "expected" 2.75 (based on the unexposed general population); in the neighborhood group there were 9 cases against an expected 0.53, and in the family group there were 4 instances as compared with expected 0.39.

These results lead to the conclusion that the direct and indirect exposure to asbestos dust is associated with an increased incidence of pleural calcifications. It is also of interest that the relationship of prevalence of pleural calcifications between the general population group and the other three is statistically significant at the 1% level.

DISCUSSION

This report, reviewing the experiences of several different population groups, supplements our previous observations limited to exposed persons (14). They also tend to confirm results of English, Canadian and American authors, concerning effects in occupationally exposed populations (5, 6, 19).

It should be noted that in our group of the general population, without any known asbestos exposure, 0.34% showed quite typical findings. According to Finnish and other workers (10, 11, 16, 21) one could expect even here minimal but nevertheless definite asbestos exposure in some cases, as by airborne asbestos. However, from the point of quantitative effect, such asbestos exposure probably represents a very low hazard in terms of pleural changes in the general population living and working far from possible asbestos sources. Parenthetically, serpentine and amphibole minerals are not found in the soil of the region studied, with almost only sedimentary deposits found.

Although most cases of pleural calcification in this investigation were related to direct or indirect asbestos exposure, some had no such history. The question might properly be asked whether the causes in such cases were the same as in other series in which asbestos exposure could not be identified (8, 13, 17). We are not able to give a clear answer. Comparison of the results in the several studies shows considerable variation (Table 2). It is difficult to say whether

TABLE 2
PREVALENCE OF PLEURAL CALCIFICATIONS IN GENERAL POPULATION*

Author	No. of persons examined	Pleural calcifications	%
Rous and Studený (17)	9760	644	6.50
Hromek (8)	9871	273	2.79
Marsová (13)	44549	241	0.54
This study	8133	28	0.34
Zolov, Bourilkov, and Babaljev (21) ^b	3325	155	4.66
Kiviluoto (11) ^b	35000	77	0.23

* Review of published investigations.

^b Certain environmental asbestos exposure is presumed.

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