

Duarte Nuno Vieira • Anthony Busuttil
Denis Cusack • Philip Beth
Editors



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H. Kinoshita¹, K. Matsui², M. Takahashi², M. Nishiguchi², H. Ouchi²,
T. Minami², N. Ohtsu², S. Yoshida², N. Adachi², S. Hishida², M. Jamal¹,
N. Tamaka, E. Ghkubo, K. Ameno¹

¹ *Department of Forensic Medicine, Kagawa University, Japan*

² *Department of Legal Medicine, Hyogo College of Medicine, Japan*

STUDIES FOR THE ASBESTOS EXPOSURE IN JAPANESE URBAN POPULATION

Abstract: It has been well known that exposure of asbestos results in pulmonary diseases. Pulmonary concentration of asbestos bodies (Ab) is a good indicator of asbestos exposure. The aim of the present study is to determine the pulmonary concentration of Ab in the Japanese urban population. We observed age dependent increase of incidence of Ab. This may indicate that the very low level exposure of asbestos would be continued in a daily life.

Introduction

Asbestos had been widely used as an industrial material, because of its physical properties such as heat-resistant, high tensile strength and flexibility (1). It has been well known that exposure of asbestos results in pulmonary diseases such as asbestosis, lung cancer and mesothelioma (1). Pulmonary concentration of asbestos bodies (Ab) is a good indicator of its exposure, and used for the assessment of the occupational exposure. It is widely recommended to identify persons with a high probability of exposure to asbestos dust at work over 1000 Ab/g of dry lung tissue (Helsinki criteria) (2). Only a few study have been reported Ab concentration in Japanese general population (3-7). The aim of the present study is to determine the pulmonary concentration of Ab in the Japanese urban population.

Materials and Methods

The lung tissue samples (n=530) were collected from the autopsy cases (above 10 years old) between 1974 and 1987 at the Department of Legal Medicine, Hyogo College of Medicine, Japan. The pulmonary concentration of Ab is determined by light microscopy, according to the method of Kohyama (8). In brief procedures are as follows; after small pieces of lung tissue (approximately 1g of wet weights) was dried in air bath and weighted exactly, the samples were digested with laboratory brech (Clean99 K-200®, Clean chemical, Osaka, Japan) for few hours. The digested

solutions were washed with distilled water, and adjusted the volume. A part of solution were filtrated through a membrane filter (pore size; 0.45 μ m). The filter was fixed on a glass slide with acetone vapor and observed by light microscope. In the present study, we classified the pulmonary Ab concentrations, slightly modified the category of previous reports (4,7).

This study was approved by ethical committee of Hyogo College of Medicine.

Results and Discussion

Ab are asbestos fibers that have been coated with ferroprotein by macrophages in the lung tissue (9), which is a good indicator of asbestos exposure. In the present study, we have investigated 530 autopsy cases. The 530 subjects are composed of 376 males (range: 10-85 year-old, mean: 44.9 year-old) and 154 females (range: 10-86 year-old, mean: 47.8 year-old).

Table 1 shows the incidence and distribution of the Ab concentration in lung samples. In 108 cases (20.4%), we observed more than 100Ab/g (male: 87cases (23.1%), female: 21cases (13.6%)). According to the Helsinki criteria, some of the investigated cases would be speculated as the occupational exposure, but not confirmed because of no detailed information of past occupational history. Figure 1 shows the incidence and distribution of the Ab concentration in each range of ages. We observed relatively high incidence of more than 100Ab/g at the age of forties or above (forties; 26.8%, fifties; 31.4%, sixties; 32.4%, seventies; 64.2%) in males, and at the age of sixties or above (forties; 10.0%, fifties; 9.1%, sixties; 23.5%, seventies; 33.3%) in female. This data indicates that age dependent increase of incidence of the observation of more than 100 Ab/g lung tissue. This may also indicate that the very low level exposure of asbestos would be continued in a daily life. The observation of high incidence in the male is earlier and higher than that of female. This may be owing to the difference of the life style between male and female. In general, the work of the male in the open air is longer than that of female.

Figure 2 shows the distribution of the number of Ab in each year. The increase tendency of the exposure to asbestos may be observed year after year since late 1970. In Japan, asbestos had been widely used until the prohibition of its use in October, 2004. The vast majority of asbestos used in Japan was imported, and it was peaked at the middle of 1970's (10). As the asbestos-related diseases have a long latent period, these diseases will continue to increase next 10-20 years. Further investigation would be required to clarify its relationship.

Conclusion

Our data indicate an age dependent increase of incidence of the Ab concentration (more than 100 Ab/g lung tissue). This may suggest that the very low level exposure to asbestos would be continued in a daily life. The increase tendency of the exposure to asbestos may be observed year after year. Further investigation would be required to clarify its relationship.

Aknowledgement

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	Concentration of Ab (per g dry lung weight)				
	<100	101-350	351-500	501-1000	1000
Male (n=376)	288	54	12	17	4
Female (n=154)	136	10	6	4	1

Table 1 – The incidence and the concentration of Ab in this study.

Figure 1(a)

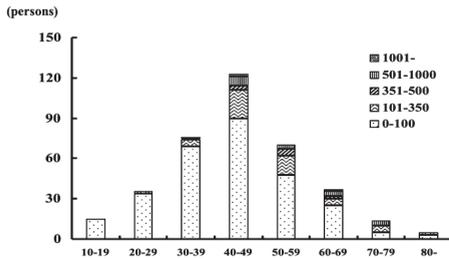


Figure 1(b)

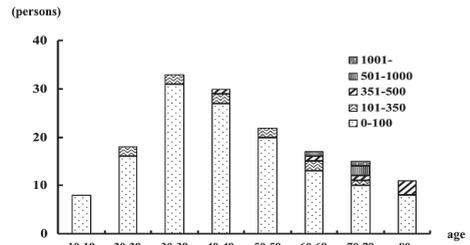


Figure 1 – The incidence and distribution of the Ab concentration (Ab/g lung tissue) in each range of ages of male (a) and female (b).

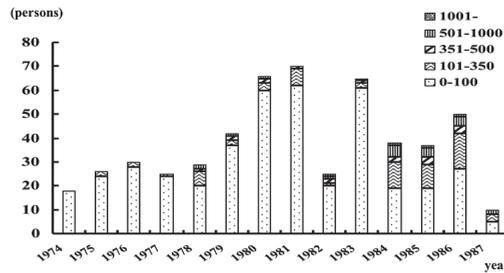


Figure 2 – The distribution of the number of Ab in each year.