

Malignant mesothelioma in Singapore

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Malignant mesothelioma is a rare tumour strongly associated with asbestos exposure.¹ It is a notifiable disease in Singapore—voluntarily to the Cancer Registry since 1968 and statutorily under the Factories Act, 1973. Singapore's industrial exposure to asbestos started in the late 1940s with the establishment of a factory engaged in manufacturing asbestos cement products. Asbestos is now being used in about 60 establishments. This report presents an epidemiological and occupational profile of the few cases of malignant mesothelioma confirmed in Singapore.

Case selection

A total of 16 cases were notified between 1968 and 1984. Three foreigners who had left the country and four subjects who were not confirmed to have malignant mesothelioma on a review of the histology were rejected from this report which is thus confined to nine Singapore residents. A chronological occupational history of these subjects, their parents, spouses, and children was obtained through interviews with their nearest living relatives except for two who were personally interviewed.

Epidemiology

Of the nine cases of malignant mesothelioma reported in the 17 year period, five occurred in the five years 1980-4. This gives a crude average annual incidence rate of about 0.43 per million population; there were five peritoneal and four pleural cases. Eight were men, of whom six had had their diagnosis made before they were 50 with the youngest at 34. The only woman was diagnosed at 62.

Occupational profile (table 1)

Two of the subjects who were personally interviewed before death had definite exposure while working in the same factory manufacturing asbestos cement products. This factory started operations more than

30 years ago using all forms of raw asbestos fibres (white, brown, and blue asbestos). Various grades of asbestos fibres were mixed and milled to the desired degree of fiberisation before being repacked to be used in the manufacture of asbestos cement pipes and sheets. Both subjects started work in this factory in the 1950s and had worked for 15 and 17 years respectively. One was a mixing machine operator who had to tip bags of cement and asbestos fibres into the mixing tank at least 40 times a day. The other was a fitter who repaired and serviced all machines and cut asbestos cement sheets and pipes to the required sizes.

The fitter's wife, who also worked in this factory as an odd job labourer for about a year, is well. They claimed that the environment was dusty and no respirators were provided or used. The earliest record of environmental assessments in this factory in 1981 showed air concentrations of asbestos ranging from 0.1 to 3.9 fibres per ml, with the higher concentrations at areas where these two subjects worked. The asbestos dust concentrations exceeded the current safe exposure levels of 2f/ml.² Bearing in mind that the relevant exposures took place before the days of effective dust counting and dust control measures, exposure to asbestos in the earlier years could have been much higher. This factory subsequently ceased operation and was dismantled in 1984.

Two subjects were subcontractors engaged in building renovation work. One lived within a kilometre of the above mentioned factory and had been in his job for 40 years since the 1940s. The other started work in the 1950s as a fitter cum subcontractor and had worked for about 15 years. Both could have probable asbestos exposure as asbestos cement products, such as roofing sheets, wall boards, pipes, floor tiles, and paints, were then used in the construction industry.³

A further two subjects who worked at the same sea port had equivocal asbestos exposure as they did not handle any cargo although asbestos cargoes were occasionally handled by other workers. One serviced and maintained forklifts. The other, a draftsman, occasionally carried out site inspections.

Occupational histories were not available for the three remaining cases.

Table 1 Summary of main occupational histories of cases with malignant mesothelioma, 1968-84

Occupation	Place of work	Asbestos exposure	No of cases
Mixing machine operator Fitter	Asbestos product manufacturing factory Same factory as above	Definite Definite	1 peritoneum 1 peritoneum
Subcontractors	Renovation sites	Probable	1 pleural 1 peritoneum
Mechanical technician Draftsman	Sea port Same sea port as above	Equivocal Equivocal	1 pleural 1 pleural
No history available			1 pleural 2 peritoneum
Total			9

Table 2 Duration of exposure and the likely latent period according to the probability of asbestos exposure

Occupational exposure to asbestos	No of cases	Mean age at first exposure (years)	Mean duration of exposure (years)	Mean latent period (years)
Definite exposure in factory manufacturing asbestos products	2	18.5	16.0	33.0
Probable exposure at renovation sites	2	22.5	27.5	36.0
Equivocal exposure	2	29.0	9.0	10.5

Latent period (table 2)

The duration of exposure for the six cases varied widely, from five to over 40 years. In the "definite exposure" group mean age at first exposure was low (18.5 years) and the mean latent period was 33 years. For the two subcontractors, the mean latent period was 36 years. The findings for the "equivocal exposure" group would have to be viewed with reservation.

Comment

In Singapore the estimated incidence rate of 0.43 per million population for the period 1980-4 is low when compared with incidence rates of the order of one to 12 cases per million in industrialised countries.¹⁻⁵ Only four cases are recorded for 1968-79. The main reason for this could be the misdiagnosis of cases, especially as the condition is rare.

The association of malignant mesothelioma with asbestos exposure is well recognised¹⁻⁶ (20-70% of the cases would have had occupational or domestic exposure). Owing to the long latent period of 20 to 40 years and in cases where the exposure period is short, this association may be difficult to obtain. This is further aggravated when interviews are conducted by proxy after the patient's death.

In Singapore six of the nine subjects had occupational histories, of which only the two who were personally interviewed gave a history of definite exposure to asbestos. This indicates a need for medical practitioners, especially chest physicians, radiolo-

gists, and pathologists, to be more aware of the occurrence of mesothelioma. A complete occupational history should be obtained, preferably while the subjects are still living to establish the relation with exposure to asbestos. As Singapore's industrialisation started only about 20 years ago, we would expect more cases of mesothelioma in view of the long latent period and our past exposure to high concentrations of asbestos.

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References

- 1 Becklake MR. Asbestos-related diseases of the lungs and other organs. Their epidemiology and implications for clinical practice. *Am Rev Respir Dis* 1976;114:187-227.
- 2 American Conference of Governmental Industrial Hygienists. *Threshold limit values and biological exposure indices for 1986-87*. Cincinnati: ACGIH, 1986.
- 3 International Labour Office. *Encyclopaedia of occupational health and safety*. 3rd ed. Geneva: ILO, 1983.
- 4 McDonald AD, Harper A, El Attar OA, McDonald JC. Epidemiology of primary malignant mesothelial tumors in Canada. *Cancer* 1970;26:914-9.
- 5 Hinds MW. Mesothelioma in the United States. Incidence in the 1970s. *J Occup Med* 1978;20:469-71.
- 6 Hasan FM, Nash G, Kazemi H. The significance of asbestos exposure in the diagnosis of mesothelioma: a 28-year experience from a major urban hospital. *Am Rev Respir Dis* 1977;115:761-7.



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