SH@W Safety and Health at Work www.e-shaw.org

Saf Health Work 2011;2:201-9 | http://dx.doi.org/10.5491/SHAW.2011.2.3.201

pISSN : 2093-7911
eISSN : 2093-7997

Review

Preventive Measures to Eliminate Asbestos-Related Diseases in Singapore

John Wah LIM[1], David KOH[1], Judy Sng Gek KHIM[1], Giang Vinh LE[2] and Ken TAKAHASHI[2]

[1]Department of Epidemiology and Public Health, Yong Loo Lin School of Medicine, National University of Singapore, Singapore
[2]Department of Environmental Epidemiology, Institute of Industrial Ecological Sciences University of Occupational and Environmental Health, Fukuoka, Japan

The incidence of asbestos-related diseases (ARD) has increased in the last four decades. In view of the historical use of asbestos in Singapore since the country started banning it in phases in 1989 and the long latency of the disease, the incidence of ARD can be expected to increase further. As occupational exposure to asbestos still occurs, preventive measures to eliminate ARD continue to be required to protect the health of both workers and the public from asbestos exposure. The majority of occupational exposures to asbestos at present occur during the removal of old buildings. Preventive measures have been utilized by different government ministries and agencies in eliminating ARD in Singapore over the past 40 years. These measures have included the enforcement of legislation, substitution with safer materials, and engineering controls during asbestos removal as well as improvements in personal hygiene and the use of personal protective equipment. The existing Workman's Compensation System for ARD should be further refined, given that is currently stipulates that claims for asbestosis and malignant mesothelioma be made within 36 and 12 months after ceasing employment.

Key Words: Asbestos-related diseases, Prevention, Legislation, Compensation

Introduction

In the past, asbestos was commonly used in building materials, insulation, and friction materials due to its high tensile strength, and good heat and chemical resistance. However, asbestos-containing materials (ACM) can release fibers into the environment due to wear and tear or when they are disturbed.

Asbestos fibers enter the body mainly by inhalation of airborne dust; however, ingestion of fibers can occur from drinking contaminated water or after mucociliary clearance. Asbestos fibres can also deposit on the skin and cause hyperkeratosis.

Received: May 23, 2011, **Revised:** July 13, 2011
Accepted: July 29, 2011
Correspondence to: John Wah LIM
Department of Epidemiology and Public Health
Yong Loo Lin School of Medicine, National University of Singapore
16 Medical Drive, MD 3, Singapore 117597
Tel: +65-6516-6929, **Fax:** +65-6779-1489
E-mail: john_wah_lim@nuhs.edu.sg

Exposure to asbestos has been demonstrated to lead to a range of diseases such as asbestosis, malignant mesothelioma, and lung cancers. These diseases are insidious in nature and have long latent periods. To date, there are no definitive treatments for asbestos-related diseases (ARD).

This paper describes asbestos use and the ARD situation in Singapore over the past four decades. The focus will be on preventive measures used in Singapore for the elimination of ARD. Singapore has been identified as one of three countries to lead the technology in Asia and in particular, its experience in primary prevention [1]. Current gaps in existing preventive measures and future challenges also have been discussed.

Asbestos Use and the ARD Situation in Singapore

Table 1 summarizes the asbestos situation and mesothelioma mortality in Singapore: 108,545 metric tons of asbestos were

Table 1. Asbestos use and asbestos-related diseases in Singapore

	Cumulative number (tons/No. of deaths)	Rate (kg per capita per year/ age adjusted mortality rate)
Asbestos use (%)		
During 1970-1980	71,405 (65.8)	2.89
During 1981-2007	37,140 (34.2)	0.48
Total	108,545 (100.0)	1.06
Asbestos related diseases during 1990-2006		
Mesothelioma (163, ICD9)	49	0.96

No: number.

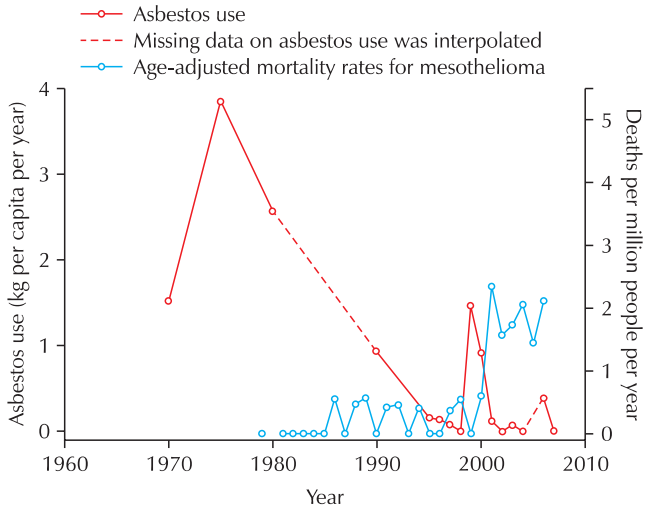

Fig. 1. Trends in asbestos use and mesothelioma (163, ICD 9) mortality in Singapore.

used in Singapore during the observed period of 1970-2007 with an annual mean consumption of 1.06 kg per capita per year. Most asbestos use occurred during the period of 1970-1980 (65.8%) with 2.89 kg per capita per year. As there were no asbestos mines in Singapore, all raw asbestos used in the past was imported [2,3].

In terms of ARD, 49 mesothelioma (ICD9, 163) deaths were recorded during 1990-2006 [4]. Asbestosis deaths were recorded as a group of diseases in ICD9, and asbestosis data could not be apportioned.

Fig. 1 shows the trends in asbestos use and age-adjusted mortality rates of mesothelioma mortality in Singapore. The increased use of asbestos from 1970-1975 resulted in an observed increase in mesothelioma deaths in the subsequent 30 years. Asbestos use was high (defined as > 1 kg per capita) [4] in the earlier period, especially from 1970-1980 reaching close to 4 kg per capita in 1975. Further, the mortality rate of mesothelioma was below the background level of 1 per million [5, 6] population until 2000; however since then, it has doubled [4].

Historically, most of the exposure in Singapore from the 1950s to the early 1980s occurred in a single large asbestos cement factory. Asbestos was also used as an insulating material in shipyard industries, buildings and power stations, as well as in friction materials for clutch plates, brake linings, and gaskets of heavy vehicles. In addition, the construction industry widely used asbestos in a variety of building materials including floor and ceiling tiles, asbestos-cement pipes or sheets, refuse chutes, and fire-resistant structures. It was also used in pipe lagging, as heat insulation materials, and in cladding or sprayed-on materials located on beams and between walls.

With the phasing out of asbestos use in different sectors since the 1980s, the number of raw asbestos users was been greatly reduced with only two known raw asbestos users registered in 1989. From 1980 to 2000, the number of brake and gasket manufacturers using raw asbestos was further reduced, and since 2001 there have been no known users of raw asbestos in Singapore.

With the ban on asbestos materials use in buildings by the Building Control Division (currently known as Building Construction Authority) and the prohibition of raw asbestos importation by the Ministry of the Environment (currently known as the Ministry of the Environment and Water Resources) in the late 1980s [7], the use of asbestos and ACM in building construction and product manufacturing effectively ceased.

Currently, occupational asbestos exposure mainly occurs during demolition or renovation of buildings constructed before 1989. Maintenance of old refinery installations and stripping of brakes are other sources of exposure. These work processes can release asbestos fibers, which may pose a health hazard to workers, building occupants, and the general public.

Preventive Measures

For primary prevention

Legislative measures

i. Factories (Asbestos) Regulations 1980

Enacted in 1980, the Factories (Asbestos) Regulations have been administered by the Ministry of Manpower (MOM) [8]. The Regulations require people who undertake work involving asbestos to notify the Commissioner for Workplace Safety and Heath at least 28 days prior to commencement of work. The Act also covers provision of exhaust ventilation in the workplace and personal protective equipment (PPE) for the workers, cleanliness of the workplace, storage, and distribution of loose asbestos in the factory. Based on the Regulations, persons younger than 18 years are prohibited from asbestos work.

In 1989 the Factories (Asbestos) Regulations were amended to require factory occupiers, contractors, and employers to check for the presence of asbestos in materials used in any process. This encompassed sending samples of materials suspected to contain asbestos for analysis if necessary.

ii. Workplace Safety and Health (Risk Management) Regulations 2006

Under the Workplace Safety and Health (Risk Management) Regulations 2006 [9], employers (including contractors) have been required to conduct risk assessments before carrying out any work involving asbestos. The aim of risk assessment has been to identify all possible health and safety hazards from handling asbestos. Examples of hazards that can arise from asbestos work have included exposure to asbestos dust, machinery used, and working at heights. Employers and contractors have been required to inform all workers who are exposed to the hazards identified in the risk management and take "reasonably practicable" measures to safeguard the health and safety of workers.

iii. Guidelines for the Handling of Asbestos Materials and the Removal of Asbestos Materials in Buildings

In conjunction with the regulations discussed above, the Guidelines on the Handling of Asbestos Materials [10] were published by MOM. According to the guidelines, safer materials which do not contain asbestos have been suggested for use as a substitute whenever feasible. Special precautionary measures have been required when handling ACM to minimize the risk of inhaling asbestos fibers including engineering controls, administrative controls, and the use of PPE.

As the majority of the current exposure to asbestos fibers occurs during the removal of asbestos from old buildings, MOM has published another set of Guidelines on the Removal of Asbestos Materials in Buildings [11]. These guidelines ensure that contractors practice all safety precautions during worksite preparation, removal of ACM, and cleaning-up of the site after completion of work. Further, the rules dictate that asbestos removal work should be supervised only by competent persons who have completed the Asbestos Removal and Management Course, which has been discussed in the following section.

Asbestos Removal and Management Training Course

The Asbestos Removal and Management Training Course [12] has been jointly organized by MOM and the Singapore Environment Institute.

The aim of the course has been to equip personnel involved in asbestos removal work with the proper methods of removing ACM. As such, both theoretical as well as practical aspects are covered. These course contents include the health effects of asbestos, legislations on asbestos work, work area preparation and set-up, removal techniques, decontamination procedures, clean-up of work area, disposal of asbestos waste, use of PPE, and environmental air monitoring. Participants must pass the end-of-course test before they can be registered as competent persons for asbestos removal works. At present, no further retraining is required once an individual registers as a competent person for asbestos removal work.

Engineering controls

Engineering control measures must be in place when handling ACM in any worksite. The basic principle for work involving removal of ACM has been that it must be carried out by methods that will minimize release of asbestos fibers into the air throughout the operation.

A designated asbestos work area must be established before work begins. This area should be segregated and sealed to prevent the escape of asbestos dust to other spaces, and access allowed only to authorized workers who are directly involved in the asbestos work. Further, warning signs (part of the administrative control) should be displayed at each asbestos work area, posted at high-human traffic areas, and at the entrance to the asbestos work area. Such signs should be written in simple language to be comprehensible to all persons (Fig. 2), and they must remain posted until the work has been completed.

Within the work area, all movable furniture should be removed to avoid contamination with asbestos dust. Impervious polyethylene sheets also should be used to completely cover pieces of furniture and fittings that cannot be removed from the work area. Additionally, air conditioning systems must be shut

Fig. 2. A warning sign displayed at an asbestos work area.

Fig. 3. Isolated changing room with shower facilities for worker to remove personal protective equipment.

down as they can circulate asbestos dust to other parts of buildings. Further, all exhaust air from the asbestos work area must pass through a high efficiency particulate air (HEPA) filter before release into the environment.

For decontamination purposes, it is also important to set up proper washing and changing facilities for workers to wash themselves and to change into street clothing after the asbestos removal work (Fig. 3). Three areas including a "clean area", a "shower area" and a "dirty area" have to be established in the worksite. During the asbestos removal work, workers should only be allowed to enter and exit the worksite through the established washing and changing facilities. Also, PPE should be put on before entering the asbestos work area. In addition, efficient local exhaust systems should be installed whenever mechanical cutting, sawing or machining of soft asbestos insulating boards or hard asbestos cement building boards takes

Fig. 4. Disposal bag containing asbestos waste with the affixed warning label.

place. Alternatively, water can be used as a dust suppressant for power cutting.

For the removal of ACM from buildings, wet methods should be used where feasible as this can prevent the asbestos fibers from becoming airborne. Wetting should be done before as well as continually throughout the removal work. All debris should be collected and wrapped up immediately in impermeable polyethylene sheets while still wet, and all asbestos waste must be affixed with proper warning labels before disposal (Fig. 4).

Removal of asbestos-based insulating lagging

There are three different methods that could be used for the removal of asbestos-based insulating lagging. The spray method, using a manually controlled low pressure water spray, is suitable for ACM which is not covered by other materials that require prior removal, such as paint or cladding. If the asbestos-based material is too thick whereby the dust cannot be controlled significantly by the spray method alone, a second method of soaking involving total saturation can be used as an alternative. The third, dry method should only be considered in situation where the spray or soaking method cannot be used. This method requires the insulating lagging to be isolated fully using plastic screening. The outer surface of insulation should be cleaned by vacuum cleaners fitted with HEPA filters to remove loose ACM.

Asbestos waste should not be allowed to accumulate in the work areas. Dampening of asbestos waste to reduce dustiness before disposal is highly recommended. Dry sweeping must never be used to clean asbestos dust from any surface but rather, a vacuum cleaning device with a HEPA filter should be used to minimize dust accumulation. When vacuum cleaning is impractical, the surface can be wiped clean simply by using a

wet rag and the floor can be cleaned by gently applying a water spray.

Upon completion of the asbestos removal job, all the equipment including access scaffolds and elevating platforms must be cleaned using water or a HEPA-filtered vacuum. Further, all asbestos waste and any polyethylene sheets used as barriers should be disposed of in airtight containers.

Administrative controls and PPE

Worker education is an essential part of administrative control to reduce asbestos exposure. Workers must maintain high standards of personal hygiene and meticulous housekeeping to ensure asbestos dust is not transferred from the working area to other areas. As such, eating, drinking, and smoking are strictly prohibited in the work area.

All persons engaged in asbestos work must consistently practice safe work procedures. With the exception of the removal of screws, power-operated tools should not be used to remove ACM, unless they are incorporated with dust suppression or dust extraction systems.

Regular dust monitoring is required when asbestos work is in progress. The aims of dust monitoring are to define asbestos exposure levels, identify the occupational groups at risk, improve dust control measures, and ensure compliance with hygiene standards. Asbestos dust is sampled by using the membrane filter method which include both general environment and personal breathing zone samples. The current permissible exposure limit (PEL) for all forms of asbestos dust in Singapore is less than 0.1 fibres/cc [13]. If PEL is exceeded, the contactors must take all the measures mentioned above to reduce generation of asbestos dust at the workplace.

PPE must be used even when effective asbestos dust control can be achieved by other techniques. The workers must be fully instructed in the use and maintenance of PPE.

Water-proof full body protective clothing should be worn by persons engaged in removal of asbestos-based insulation and in work areas where asbestos dust is likely to be generated. Such protective clothing should not have pockets. The clothing is best made of synthetic fiber material that does not permit the penetration of asbestos fibers. Eye irritation can be prevented by wearing goggles. In addition, respirators with a HEPA filter must be used whenever the work processes create asbestos dust during working of ACM. Workers must be taught to change the filters whenever they detect an increase in breathing resistance, and fit testing should be conducted to ensure correct size of respirators.

At the end of every work-shift, dirty coveralls and other PPE (except respirators) are to be cleaned properly before removal in the "dirty area" of the washing facilities. Respirators can only be removed in the "clean area", and workers must wash themselves thoroughly and clean the respirator inside the shower area before changing back to street clothing.

Clothing should be cleaned superficially by vacuum cleaning or hosing down with water before removal. To prevent release of the asbestos dust, contaminated clothing or belongings should not be shaken, brushed, or cleaned by air blast. Workers must not be allowed to bring their work clothing home for laundering. Clothing should be placed in airtight containers and dampened before dispatching to a laundry, and laundries engaged in the cleaning of such clothing should be informed of the precautions needed to prevent exposure to asbestos fibers. That is, they should be warned against brushing or shaking of the protective clothing before laundering. Any asbestos fibers from contaminated clothing should be treated like others asbestos waste.

For Secondary Prevention: Factories (Medical Examinations) Regulations 1985

Under the Factories (Medical Examinations) Regulations enacted in 1985 [14], all workers handling asbestos or who are likely to be exposed to airborne asbestos fibers must undergo pre-employment and annual medical examinations by a Designated Factory Doctor (DFD) [15]. A DFD is a doctor who is trained in occupational medicine and registered with the MOM to carry out the statutory medical examinations [16]. From 1997 onwards, the frequency of periodic medical examination was reduced to every 3 years which was due to the long latency of ARD after initial exposure. The interval between periodic medical examinations can be shortened if clinically indicated. The statutory medical examination has included screening for ARD-related symptoms such as exertional dyspnoea and clinical examination focusing particularly on the lungs and abdomen. Workers who smoke have been advised to quit, as cigarette smoking and exposure to asbestos dust have been shown to interact in a multiplicative fashion in the causation of lung cancer [17].

A full-size chest x-ray is taken and compared with the standard set by International Labour Organization (Classification of Radiographic appearances of Pneumoconioses) [18]. Further investigations, such as lung function tests and sputum examination to look for asbestos bodies and abnormal cells should be done if clinically indicated. However, if the chest x-ray shows suspected asbestosis (category 1/0), a repeat full size chest x-ray and clinical examination should be conducted after one year, rather than waiting until three years. If the chest

x-ray confirms definite asbestosis (category 1/1 or above in two consecutive films), the worker should be followed up annually or more frequently.

Complete suspension from work to prevent further asbestos exposure is indicated if the worker becomes symptomatic, or if there is progressive deterioration in the clinical or radiological findings in a worker younger than 35 years old. They should be followed up more frequently to exclude other complications of asbestos exposure.

Employers are required to send summary reports of chest x-rays and a list of asbestos-exposed workers to the Occupational Safety and Health Division (OSHD) of MOM. In addition, chest-x-ray films and original reports should be kept for at least five years by the employer and be produced for inspection at any time. Previously exposed workers (from year 1980 to 2000) registered by OSHD, are offered 5-yearly chest x-rays on a voluntary long-term follow up basis.

For tertiary prevention: workmen's compensation

The Work Injury Compensation Act (WICA) [19] came into force on 1 April 2008, replacing the 1975 Workmen's Compensation Act. According to Section 4 of the WICA (Compensation for Occupational Diseases), "if an employee contracts malignant mesothelioma within 12 months of, or asbestosis within 36 months after ceasing to be employed, and if incapacity or the death of the workman results from that disease, compensation shall be payable as if the disease were a personal injury by accident arising out of and in the course of the employment".

Based on the timeline stated in the WICA, many cases of workers who develop ARD would have left the workplace where the exposure occurred. Compensation quantum is based on criteria in the workmen's compensation guidelines and determined by the degree of severity, as assessed by the lung function test [20].

Workers who do not fulfill the criteria under the WICA can apply to the Worker's Fund. This fund has been set up from other unclaimed compensation where a deceased employee had no dependents. However, as this Fund is limited, compensation amounts are based on "means testing" (Singapore Ministry of Health) [21] and thus, there may be many affected workers who would not qualify for compensation.

For general environment

Environmental protection and management act, 2002

Since 1999, the Environmental Pollution Control Act has prohibited the importation of all products containing crocidolite, amosite, other amphiboles, and building materials containing chrysotile. Chrysotile for manufacturing gaskets and seals, however, can still be imported with a license.

This act was amended and renamed the Environmental Protection and Management Act in 2002 [22]. Asbestos in the form of actinolite, anthophyllite, and tremolite and products containing these forms of asbestos were added to the prohibited list. Certain chrysotile-containing products are still allowed to be imported with a license.

Disposal of asbestos waste

Asbestos is one of the toxic industrial wastes controlled under the Environmental Public Health (Toxic Industrial Waste) Regulations 1987 [23]. As Singapore is a small country, the land is intensely used for housing, industries, water catchment and recreation and therefore, it is imperative that hazardous wastes are safely managed at all times to protect the population and the environment as well as to conserve limited resources.

According to the Guidelines on the Disposal of Asbestos Waste [24] issued by National Environment Agency (NEA), a designated asbestos waste area should be established within the work site to consolidate and store all containers of ACM. All asbestos waste and other disposable materials used in the work area must be collected into impermeable containers prior to removal, and care should be taken to avoid damage to the containers or spillage of asbestos waste before disposal. Further, workers must wear suitable respirators when collecting or replacing these filter bags.

Under the same guideline [24], those transporting asbestos waste must ensure it is kept properly inside the air-tight containers, and that external surfaces are free of asbestos debris. Compactors are not allowed as they may rupture the asbestos waste container. Transport vehicles must have an enclosed

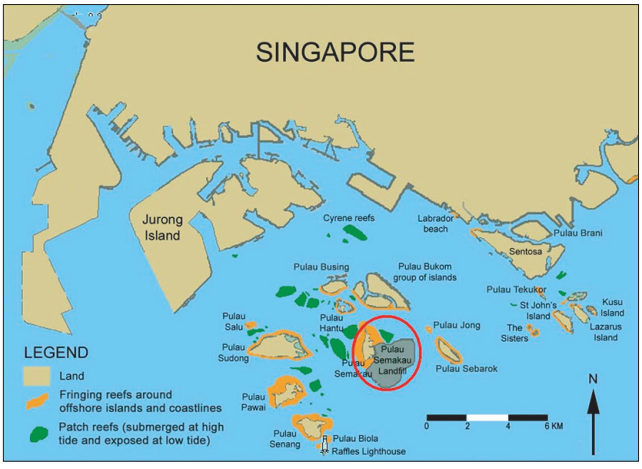

Fig. 5. Location of Semakau Landfill, 8 km from the main Singapore Island.

compartment to contain the waste and at the same time to prevent the release of asbestos fibers en route to the disposal site.

Disposal of asbestos waste can only be handled by licensed disposal contractors approved by NEA, with written permission from the Pollution Control Department. Asbestos waste can only be disposed in the designated man-made landfill located offshore at Semakau Island (Fig. 5).

Gaps and Challenges

Despite the current comprehensive legislation and guidelines used to reduce asbestos exposure in the work place and eliminate ARD, there are still several gaps and challenges in current preventive measures.

For primary preventive measures, there is a need to ensure all contractors comply with the legislation and guidelines. This is one of the challenges faced by the Workplace Safety and Health Council which aims to have 95% of workplaces inspected in compliance with asbestos work-related legislative requirements by the year 2018 [25]. In addition, the registration of competent person for asbestos removal work is only done once without the need for further re-training. The authorities may want to conduct the refresher training for these individuals so that they can keep up with their competency on the knowledge and skills for asbestos removal work.

Criterion for suspension of workers from further asbestos exposure under the current guidelines may need further revision, as it may be too late to suspend a worker who has become symptomatic during periodic medical examination. In addition, the requirement for employers to keep the chest x-rays and the original reports for at least five years is not adequate. For the medico-legal reasons, they should be kept for the duration of the latent period of ARD, or the regulators should set up a central depot to keep all these records, should any dispute arise in the future.

Malignant mesothelioma and asbestosis are the only two ARD notifiable to the MOM. As with any other occupational diseases, these two ARD have been underreported by doctors. In addition, occupational lung cancers due to asbestos have not been reflected in the MOM database. Additionally, the confirmation of lung cancer due to asbestos exposure has often been complicated by smoking history.

The compensation system for ARDs also needs to be reviewed because it only compensates workers who contract malignant mesothelioma within 12 months or asbestosis within 36 months after ceasing to be employed. This is not in keeping with the natural history of the diseases with their long latency period. The worker's fund can assist some victims to a certain degree, but as explained earlier this fund has its limitations. One of the challenges faced in compensation is that all of the workplaces handling raw asbestos have shut down since the use of raw asbestos was banned in Singapore. Also, most of the workers had already ceased employment before developing ARDs. One possible solution that Singapore could possibly adopt is the Industrial Accident Compensation Insurance Fund system [26] used in South Korea. This is a social insurance system in South Korea under which the government, on behalf of employers, assumes responsibility for compensating workers for occupational injuries and diseases.

Conclusions

Similar to other developed countries, there is a rising trend of ARD in Singapore, in particular malignant mesothelioma. Singapore has taken a major step to eliminate the asbestos hazard by banning the import of most of the products containing asbestos since 1989. However, workers and the public are still at risk of exposure to asbestos, especially during demolition and renovation of old buildings constructed before 1989.

Different legislations have been enforced by the authorities to reduce the risk of exposure to asbestos. Guidelines were also prepared by MOM and NEA to guide the contractors and workers on the handling of asbestos material, removal of ACM in buildings, and disposal of asbestos waste.

There are still gaps in the current preventive measures that need to be overcome in order to eliminate the ARD in the long term. Such gaps include the underreporting of ARD by doctors, criterion for suspension of workers, and timelines for compensation of occupational ARD. Therefore, there is a need to educate physicians regarding the importance of reporting these occupational diseases. Criterion for suspension of workers from further asbestos exposure under the current guidelines may also need further revision. The government could consider adopting compensation systems from other countries to better help ARD victims.

Conflict of Interest

No potential conflict of interest relevant to this article was reported.

Acknowledgements

The authors would like to thank the OSHD, Singapore Ministry of Manpower for providing the photos for this paper.

References

1. Takahashi K; Asian Asbestos Initiative. Asbestos-related diseases: time for technology sharing. Occup Med (Lond) 2008;58:384-5.
2. Virta RL. World asbestos supply and consumption trends from 1900 to 2003 [Internet]. Reston (VI): US Geological Survey. 2006 [cited 2010 Dec 6]. Available from: http://pubs.usgs.gov/circ/2006/1298/.
3. Asbestos Statistics and Information [Internet]. Reston (VI): US Geological Survey. 2010 [cited 2010 Sep 22]. Available from: http://minerals.usgs.gov/minerals/pubs/commodity/asbestos/.
4. LE GV, Takahashi K, Park EK, Delgermaa V, Oak C, Qureshi AM, Aljunid SM. Asbestos use and asbestos-related diseases in Asia: Past, present and future. Respirology 2011;16:767-75.
5. Robinson BW, Musk AW, Lake RA. Malignant mesothelioma. Lancet 2005;366:397-408.
6. Hillerdal G. Mesothelioma: cases associated with non-occupational and low dose exposures. Occup Environ Med 1999;56:505-13.
7. Lee HS, Phoon WH, Wang SY, Tan KP. Occupational respiratory diseases in Singapore. Singapore Med J 1996;37:160-4.
8. Factories (Asbestos) Regulations 1980 [Internet]. Singapore: Ministry of Manpower. 2009 [cited 2010 Sep 22]. Available from: http://www.mom.gov.sg/Documents/safety-health/FACTORIES%20(ASBESTOS)%20REGULATIONS.pdf.
9. Workplace Safety and Health (Risk Management) Regulations. [Internet]. Singapore: Ministry of Manpower. 2006 [cited 2010 Sep 22]. Available from: http://www.mom.gov.sg/Documents/safety-health/WORKPLACE%20SAFETY%20AND%20HEALTH%20_RISK%20MANAGEMENT_%20REGULATIONS%202006.pdf.
10. Guidelines on the Handling of Asbestos Materials [Internet]. Singapore: Ministry of Manpower. 2000 [cited 2010 Sep 22]. Available from: http://www.mom.gov.sg/Documents/safety-health/factsheets-circulars/Handling%20Asbestos%20Materials.pdf.
11. Guidelines on the Removal of Asbestos Materials in Buildings [Internet]. Singapore: Ministry of Manpower. 2005 [cited 2011 Feb 07]. Available from: http://www.mom.gov.sg/Documents/safety-health/factsheets-circulars/Removal%20of%20Asbestos%20Materials%20in%20Buildings.pdf.
12. Asbestos Removal Management Course [Internet]. Singapore: Singapore Environment Institute. 2010 [cited 2010 Sep 23]. Available from: http://www.nea.gov.sg/cms/sei/Courses_asbestos.html.
13. The Factories (Permissible Exposure Level of Toxic Substances) Notification 2004. OSHD Annual report 2004 [Internet]. Singapore: Ministry of Manpower. 2005 [cited 2010 Sep 22]. Available from: http://www.mom.gov.sg/workplace-safety-health/resources/Pages/reports-statistics.aspx.
14. Factories (Medical Examinations) Regulations 1985 [Internet]. Singapore: Ministry of Manpower. 2009 [cited 2010 Sep 22]. Available from: http://www.mom.gov.sg/Documents/safety-health/FACTORIES_MEDICAL_EXAMINATIONS_REGULATIONS.pdf.
15. Phoon WH, Chan OY. Statutory medical examinations and designated factory doctors in Singapore. J Soc Occup Med. 1990;40:55-8.
16. Phoon WH, Magdalene Chan, Ho SF. Department of Industrial Health Guidelines For Designated Factory Doctors - The Factories (Medical Examinations) Regulations. Singapore: Department of Community, Occupational and Family Medicine, National University of Singapore; 1997. p.1-4.
17. Lee PN. Relation between exposure to asbestos and smoking jointly and the risk of lung cancer. Occup Environ Med 2001;58:145-53.
18. International Labour Office. International Classification of Radiographs of Pneumoconiosis. 2nd ed. Geneva (Switzerland): International Labour Organization; 2002.
19. Work Injury Compensation Act [Internet]. Singapore: the Attorney-General's Chambers and the Managing for Excellence Office, MOF. 2008 [cited 2010 Sep 22]. Available from: http://statutes.agc.gov.sg/non_version/html/homepage.html.
20. A guide to the assessment of traumatic injuries and occupational diseases for workmen's compensation. 5th ed. [Internet]. Singapore: Workmen's Compensation Medical Board. 2007 [cited 2010 Sep 22]. Available from: http://www.mom.gov.sg/Documents/safety-health/GATIOD-Fifth-Edition.pdf.
21. Subsidy (Means-Testing at Restructured Hospitals) Singapore Ministry of Health FAQ [Internet]. Singapore: Ministry of Health. 2007 [cited 2010 Dec 7]. Available from: http://www.pqms.moh.gov.sg/apps/fcd_faqmain.aspx?qst=2fN7e274RAp%2bbUzLdEL%2fmJu3ZDKARR3p5Nl92FNtJifw8iBZoOww9Gf8%2fdLi7cbTadpIw2tF7Fdn5I9r5Y9UM9XPY37bcAtM7ZvDLVsTJgDSks74Ew7gnY0O7OPO5%2fzDG7VL1ugrF%2fa3wpwYm%2fLw8EgQTEN2HpITreQmMf2L2f0BUIH5nRwNLV5fvxTy5jHxoEd75Hgf8LI%3d.
22. Environmental Protection and Management Act (CHAPTER 94A) [Internet]. Singapore: the Attorney-General's Chambers and the Managing for Excellence Office, MOF. 2008 [cited 2010 Sep 23]. Available from: http://statutes.agc.gov.sg/non_version/html/homepage.html.
23. Environmental Public Health Act (Chapter 95, Section 113) Environmental Public Health (Toxic Industrial Waste) Regulations [Internet]. Singapore: National Environmental Agency. 2010 [cited 2010 Sep 22]. Available from: http://app2.nea.gov.sg/data/cmsresource/20090316310637867307.pdf.
24. Guidelines on the Disposal of Asbestos Waste [Internet]. Singapore: National Environmental Agency. 2008 [cited 2010 Sep 23]. Available from: http://app2.nea.gov.sg/onlinesvcs_guidelines_disposal.aspx.
25. Workplace Safety and Health Council. Improving workplace

health management in Singapore, WSH 2018 [Internet]. Singapore. 2010 [cited 2010 Dec 07]. Available from: https://www.wshc.sg/wps/themes/html/upload/cms/file/Improving_WSH_Management_Singapore.pdf.
26. Kang SK, Kim EA. Occupational diseases in Korea. J Korean Med Sci 2010;25(Suppl):S4-12.