1-D. High Risk Occupation and Industries in Regards to Asbestos Related Diseases

Compile information on methods to identify high risk occupations and industrial sectors in relation to asbestos related diseases (ARDs) from information sources including the database system of European Union for carcinogenic exposure in workers (CAREX), surveillance system of developed countries, and job exposure matrix for asbestos exposure of published peer reviewed articles.

Introduction

Following matters can be included in the introduction part.

High risk industry and occupation exposed to asbestos can be classified to primary and secondary asbestos production or manufacturing industry, and others. CAREX is comprehensive evaluation of asbestos industries developed by European Union, which lists 41 kinds of industries. It also estimated the magnitude and the proportion of exposed workers by industries. Industries with high exposure prevalence were mining, fishing, petroleum refineries, construction, and others (from EU CAREX report). Construction industry and the related occupation was the most common referred sector for asbestos exposure in many countries.

USA, Germany, Netherlands and Korea developed Industry/occupation with the exposure level of asbestos based on historical records from their own countries, which can be used for the basic frame of Job exposure matrix of asbestos in workplace. The highest level of asbestos exposure reported from mining industry in USA, textile industries in Germany and Korea. In Netherlands, asbestos insulation, cement and friction materials were the highest exposure level from historical review.

Surveillance system of ARDs have been operating in many developed countries (USA, UK, New Zealand, and Australia) by compulsory or voluntarily reporting system, which provides informative lists of high risk occupations.

Combined these information especially CAREX, USA and British databases, informative JEM can be accomplished.

The reviewed articles include below contents

- Job exposure matrix based on exposure assessment
  - EU CAREX (Carcinogen Exposure) database
  - USA
  - Finnish lists
- German
- Job exposure matrix of Netherlands
- Korea

- Job exposure matrix based on health outcome
  - US NCHS (National Center for Health Statistics)
  - HSE, UK
  - German registry: central registration agency for employees exposed to asbestos dust (ZAs)
  - Other countries
    - Australian registry of mesothelioma
    - China
    - South Africa
    - New Zealand
References

- **Job exposure matrix based on exposure assessment**


  - CAREX


  - Job exposure matrix of USA


  - List of asbestos industry of Finland


  - Job exposure matrix of German


  - Job exposure matrix of Netherlands


  - Job exposure matrix of Netherlands

*Asbestos Exposure level of Korea*

- **Job exposure matrix based on health outcome**


**US NCHS**


*Health and Safety Executive, United Kingdom*


*Health and Safety Executive, United Kingdom*


*Germany: Central Registration Agency for Employees Exposed to Asbestos Dust (ZAs)*


*Australian registry of mesothelioma*


*Australian registry of mesothelioma*


*China*

South Africa

Available from:

New Zealand
**Brief review of the articles**


**Background:** CAREX is an international information system on occupational exposure to known and suspected carcinogens which provides selected exposure data and documented estimates of the number of exposed workers by country, carcinogen, and industry. This project is substudy of a project on the estimation of the burden of occupational cancer in Europe.

**Objective:** This document estimates the proportion of the workers exposed to carcinogens including asbestos across industrial classes of industries in European countries.

**Asian Context:** Among 55 industries, the highest proportion of asbestos exposure was from construction industry followed by personal service, mining, and agriculture. This trend can be applied to most Asian countries.

**Critical Appraisal:** The information for asbestos exposed industries in CAREX system is comprehensive with high validity which is reviewed by experts of European countries. However, most information of exposure to carcinogen was from surveillance data of Finnish and USA. The disposal and demolition industry which was developed after ban of asbestos, might have been underestimated.

Available from:

**Background:** The relationship between asbestos exposure and disease has been well documented, although questions persist as to variation in risk by the type and length of fiber. Job exposure matrix by fiber type and length is useful in epidemiological studies where asbestos is an exposure of interest.

**Objective:** This document construct the JEM based on literature review regarding exposure level of asbestos.

**Asian Context:** By level of exposure, 4 categories were developed in JEM. Primary and secondary industries using asbestos by job and exposure level were listed in the result. The information might be useful for Asian countries.

**Critical Appraisal:** To adapt the JEM, the kinds of asbestos products should be identified. Therefore, this information might be limited to use in some countries.

Available from:

**Background:** It took 85 years before the International Labour Organisation was able to agree on the International Convention on Safety in the Use of Asbestos. At European conference of Asbestos, the author presented the trend of usage of asbestos and incidence in Finnish society.

**Objective:** This document addresses the change of the production and consumption of asbestos and the asbestos related industries and occupations in Finland.

**Asian Context:** In most industrialized counties, the heavily exposing thermal insulation, spraying of surfaces and textile production has been stopped. The uses in developing countries are primarily in asbestos cement products, pipes, sheets, and in roofing but also asbestos textile production may still occur.

**Critical Appraisal:** This paper compare the usage of asbestos in 1970s and 1990s. It also presented asbestos industry and occupations in Finnish workers in 2003 and earlier time. Asbestos related industries and occupations mixed up in the lists.

Available from:

**Background:** Asbestos is a leading cause of occupational diseases, especially malignant diseases, in Germany. Following the increased consumption of asbestos after World War I, the recognition of asbestos related diseases developed.

**Objective:** This document reviewed the historical consumption of asbestos and the trend of related disease in Germany.

**Asian Context:** It listed the high exposure industry and the exposure level in earlier industrial era. The exposure level of asbestos in Germany during 1950s to 1990s could be informative for Asian countries.

**Critical Appraisal:** The exposure level of German industries came from high risk industries for asbestos exposure. The industries limited to only 5 kinds of asbestos sector.


**Background:** Netherlands is a country with late start of asbestos legislation, with high incidence rate of mesothelioma. Because paucity of information on asbestos exposure before 1970, a job-exposure matrix (JEM) on historical asbestos exposure must rely heavily on qualitative descriptions of working conditions and subsequent translation into expected exposure levels by experts in Netherlands.

**Objective:** This article describes the structure and content of a JEM for historical asbestos exposure in the Netherlands during 1945-1994, using databases from three British sources and one Netherlands source.

**Asian Context:** JEM resulted in seven categories of exposure levels to asbestos by 4 categories of period (70~74, 75~79, 80~84, and 85-89). The exposure level of seven categories (handling raw asbestos > manufacturing> handling products, waste management> transportation > supervision and inspection) will be useful for estimation of exposure level of asbestos in Asian countries.

**Critical Appraisal:** This article provides some information for exposure level by occupation, especially the information for supervision and inspection or waste management is valuable. Because it does not list the industries, the information will be limited to evaluation the asbestos risk in occupation, not industries.


**Background**: In the absence of quantitative exposure information that allows a valid estimate of an individual's historical exposure, general guidelines are required to retrospectively evaluate asbestos exposure.

**Objective**: A risk matrix has been developed that contains qualitative information on the proportion of workers exposed and the level of exposure in particular industries over time.

**Asian Context**: Asbestos related industries in compensation system in Netherlands JEM listed three categories of industries such as primary industries (manufacturing of insulation, textile, cements, friction materials, interior, and floors), secondary industries (construction, ship building, installation of insulation, car maintenance), and others (loader/sacker, engineer, furnace, foundry, demolition of ship building, etc). These lists have quite informative for Asian countries.

**Critical Appraisal**: Because the compensation scheme always requests confirmative causal relationship, the list might be limited to high level of exposure. The list of industries is too simple and short to make JEM for asbestos.

Available from:  

**Background:** In Korea, asbestos was first recorded as having been mined in the mid-1930s and in the mid-1980s, asbestos mining again ceased. The trend of asbestos exposure is related with industrial structure and social policy.

**Objective:** This article analyzed a total of 2,089 asbestos exposure data sets compiled from 1995 through 2006 as well as all occupational asbestos exposure levels reported in occupational health related journals in Korea.

**Asian Context:** Asbestos exposure level of Korea was categorized according to the time period and the industries such as primary and secondary industries. This information will be helpful for Asian countries, especially late-developed or developing countries where the asbestos usage started late 1980s.

**Critical Appraisal:** Because the peak of asbestos using was 1980s in Korea, and the lack of information earlier than 1980s, the expected high exposure level of asbestos mining in Korea in 1940s is ignored in this article.


**Background**: Work-Related Lung Disease (WoRLD) Surveillance Report presents national and state summary statistics such as counts, crude and age-adjusted mortality rates by industry and occupation.

**Objective**: This report includes national rates of asbestos related disease (ARD) such as asbestosis and mesothelioma. It represents the high risk industries and occupation for ARD.

**Asian Context**: The construction industry accounted for nearly one-fourth of decedents with asbestosis and mesothelioma in USA, Insulation workers or boilermakers had proportionate asbestosis mortality 20 times higher than that in all occupations combined. The lists of industries and occupation of this report can be used for Asian countries’ high risk lists.

**Critical Appraisal**: The risk rate and ratio was based on US population, which might not appropriate for other countries.

Available from:
http://www.cdc.gov/niosh/docs/2008-143/.

**Background:** The British mesothelioma register contains all deaths from 1968 to 2001 where mesothelioma was mentioned on the death certificate. The information analyzed to assess the proportional mortality ratio (PMR) of mesothelioma by occupations.

**Objective:** This report estimates summary statistics of the British mesothelioma epidemic including summaries by occupation and geographical area.

**Asian Context:** The highest SMRs over the period 1981-2000. The occupations with the highest PMRs are metal plate workers, vehicle body builders, plumbers and gas fitters and carpenters. The trends over time suggest a change in the balance of risk away from traditional asbestos exposure industries to industries where one could describe the exposure as secondary, such as plumbers and gas fitters, carpenters, and electricians.

**Critical Appraisal:** The risk rate and ratio was based on UK population, which might not appropriate for other developing countries.

Available from:
11. HSE, UK. Occupational, domestic and environmental mesothelioma risks in Britain; A case-control study. HSE; 2009 [cited 2011 May].

**Background:** UK mesothelioma mortality is the highest worldwide, but no large case-control study with personal interviews has been conducted. This article obtained lifetime occupational and residential histories from 622 mesothelioma patients.

**Objective:** This report estimates the high risk industry and occupation for mesothelioma due to the asbestos exposure in UK.

**Asian Context:** The risk ration was estimated according to three categories of occupations, such as high, medium and low risk group. This study developed construction and non-construction lists of risk group for risk of mesothelioma. Asian countries will adapt this list.

**Critical Appraisal:** The risk rate and ratio was based on UK population, which might not appropriate for other developing countries.

Available from:  
12. Neumann V, Gunthe S, Mulle KM, Fischer M. Malignant mesothelioma-German mesothelio-

**Background:** The study group comprised a collective of 1,605 patients with malignant mesotheli-
omas from German central registries. This registry have been collection the useful information from
asbestos exposed patients

**Objective:** This report evaluates the asbestos bodies of lung tissue from mesothelioma patients due
to explore high risk occupation.

**Asian Context:** The high risk occupations were asbestos using manufacturers, insulation sectors,
car manufacturing, ship building, and etc. This information can be adapted Asian countries.

**Critical Appraisal:** The risk rate and ratio was based on German population, which might not ap-
propriate for other developing countries. Among 1,605 patients, 364 cases did not have record of
occupation, which means that reliability of this data could be questionable.

Available from:
ids=11563601

**Background:** Australia has one of the highest national incidences of mesothelioma in the world and the rate is still rising. Australia has been operating Mesothelioma Surveillance Program and registration system, which could provide reliable information for JEM.

**Objective:** An industry-occupation matrix analysis was conducted for the 858 mesothelioma cases that were reported to the Australian Mesothelioma Surveillance Program between 1980 and 1985.

**Asian Context:** Definite, probable, or possible occupational exposure had occurred in 57 percent of the subjects. The primary asbestos production or manufacturing industry constituted the largest number of cases, followed by shipbuilding, repair and demolition, the building industry, and the railway locomotive construction and maintenance industry. The information seems to be comparable with many Asian countries.

**Critical Appraisal:** In case of the Laborers of which 14% of them had a history of exposure to asbestos, the classification of the occupation was too broad to understand the working situation.

Background: Occupational histories of a total of 3758 mesothelioma cases collected by two sequential national schemes--the Australian Mesothelioma Surveillance Program (1979-1985) and Australian Mesothelioma Register (1986-1995)--were reviewed and coded by the authors.

Objective: Review of the occupational and industrial distribution of mesothelioma cases.

Asian Context: The high risk occupations were categorized to primary, secondary and other industries. More than 40% of asbestos related mesothelioma came from other industries. Therefore, not only primary and secondary asbestos industries, but also other industries are important regarding asbestos exposure.

Critical Appraisal: The insufficient information for industries were 16-28% in the data, which means the possibility of misclassification of the occupation in this surveillance data.

Available from:

**Background**: Various industries were produce or using asbestos, mainly chrysotile in China. Therefore systematic review of the asbestos related disease in China is necessary to summarize the asbestos and the health effects in China.

**Objective**: Review of epidemiological studies on asbestosis, lung cancer, malignant mesothelioma, and pleural plaques in China.

**Asian Context**: In 1950s and 60s, asbestosis had been a major health hazard for asbestos exposed workers. In the late 1970s, lung cancers with or without asbestosis were found among asbestos workers. There have been not so many cases of malignant mesothelioma reported. Experience of China is relevant to most of Asian counties especially where the mining and textile is prevalent.

**Critical Appraisal**: More specific industrial profile is not presented in this article. The usage for JEM is very limited.

Background: Asbestos was commonly found in most sectors of South African industry. Consequently there is a large but indeterminate pool of formerly exposed workers, will present possible asbestosis, the pneumoconiosis.

Objective: Review the specific situation of asbestos exposure in 141 cases of asbestosis identified for the years 1980-2000 in South Africa. Patients were included in if they had no asbestos exposure in mining, and had been certified with asbestosis by a compensation panel.

Asian Context: Majority (54%) of the cases arose from exposure in primary asbestos industries, i.e. companies selling, distributing, refining, milling or using raw asbestos to manufacture products. This information will be practical for the Asian countries where the major portion of asbestos related industry is non-mining sector.

Critical Appraisal: The cases were collected from compensation system; therefore the information from exposure might be limited to high exposure industries.

Available from:
Background: The Department of Labour’s two Asbestos Registers - the Disease Register and the Exposure Register - have been in existence since 1992.

Objective: This report reviews 1198 cases that were notified to the National Asbestos Medical Panel between March 1992 and July 2010. They include: 224 cases of mesothelioma, 116 cases of lung cancer, 269 cases of asbestosis, and 589 cases of pleural abnormalities.

Asian Context: Carpenters, plumbers and electricians are together responsible for 67 percent of all cases. Department of Labor listed the high risk occupation related to asbestos and their level of the exposure. The information is identical from Australian system, might be helpful for Asian workers.

Critical Appraisal: Surveillance of New Zealand present only percentage of the cases, not estimate the risk rate or ratio. The cases were collected from compensation system; therefore the information from exposure might be limited to high exposure industries.

Available from: