EPIDEMIOLOGICAL STUDY ON ASBESTOS RELATED OCCUPATIONAL HEALTH PROBLEMS AMONG ASBESTOS INDUSTRY WORKERS IN SRI LANKA

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Asbestos has many applications and found commonly in domestic, commercial and industrial products. It is the generic name for fibrous materials in a family, with physical strength and resistance to heat and chemical attack.

The mineral, asbestos was identified as a toxic compound at the 20th century and until then many routine products involved this in their production line. The International Agency for Research on Cancer of the World Health Organization (WHO), confirmed that "There is sufficient evidence in humans for the carcinogenicity of all forms of asbestos". The most prominent cause of asbestos related diseases is the occupational exposure The workers involved in the industries involving asbestos constantly are exposed to this mineral thus are at a greater risk of developing health issues with time.

Since 1997, blue asbestos has been banned in Sri Lanka. But white asbestos (chrysotile asbestos) made by mixing asbestos fiber with cement, continues to be used mainly as roofing sheets. In Sri Lanka, there is no adequate studies conducted to assess the airborne Chrysotile Fiber counts and hence do not have data available on its impacts to health. At the same time, not many epidemiological studies have been conducted related to the industrial sector.

Therefore, an asbestos production company was selected as the study area for the current study with the following key objectives;

1. To analyze the incidence of occupational asbestos related diseases among industry workers
2. To assess the morphological and chemical features of the asbestos particles in the atmospheric deposition in the industrial environments
3. To evaluate the relationship between epidemiological data with the particulate features

Methodology

In this study, one production factory involved in Asbestos products will be selected and the workers and ex workers will be screened and at least 100 samples will be collected for morphological and chemical assessment.

To analyze the incidence of occupational asbestos related diseases among industry workers, a consent form will be obtained from the factory workers and a detailed questionnaire will be taken. The questionnaire is based on details on basic socio-demographic data and occupational details. The workers will be screened by the physician for symptoms of respiratory disease conditions and lung function test will be performed. The selected population will be subject to X-ray test for further assessment of the lungs.

To assess the morphological and chemical features of the asbestos particles in the atmospheric deposition in the industry premises and in surrounding environments, dust samplers will be installed to collect dry dust deposition samples at the industry premises (9). 5 samplers will be positioned at the premises and 5 in the vicinity at human breathing height of 1.5 m. Dry dust samples will be collected at 3 days interval and the samples will be analyzed for morphological and chemical properties.

A part of the samples collected will be used for morphological assessments with Scanning Electron Microscopy (SEM), Particle size analysis, Fourier Transform Infra-Red Spectroscopy (FTIR) and X-Ray Diffraction (XRD). The rest will be digested and analyzed for its chemical elements using Inductive Coupled Plasma Optical Emission Spectroscopy (ICP-OES).

Samples collected will be partly used to test the bioavailability of metals using DTPA extraction technique in order to assess the contamination towards storm water.

The results of the questionnaire will be statistically evaluated using EpiData software. To evaluate the relationship between epidemiological data with the particulate features, the results will be statistically analyzed and relationship with epidemiological data will be assessed using statistical tools. The data matrix will be analyzed for normality using the Quantile-Quantile (Q-Q) probability distribution plots and the Shapiro-Wilk test. Kruskal-Wallis one-way analysis of variance followed by Tukey's honest significance difference will be used to investigate the significance of the metal load variations and for microbial analysis. Human and ecosystem health risks will be assess using hazard quotient (HQ) and hazard index (HI), while the cancer risk will be evaluated based on life time daily cancer risk. Contamination assessment will also be calculated based on the data obtained from chemical analysis.

Progress to date

One of the four factories producing Asbestos roofing sheets in Sri Lanka

was selected and research commenced in January 2019. Workers and ex-workers (n=450) of the selected factory are to be screened and a minimum of 100 samples will be collected for morphological and chemical assessment.

Ethical Clearance for the research was granted by the Ethical Review Committee of the General (Teaching) Hospital, Kandy, Sri Lanka in the third week of February, 2019.

The factory sites have been visited, worker details obtained and sites for sample collection have been selected. Schedule for Medical investigations was prepared during the first visit

The second site visitation was carried out together with the scientist who is responsible for the chemical analysis in order to finalize the sampling sites. From this visit, seven sites were tentatively selected for deposition sample collection and five sites were tentatively selected for sample collection using the air sampler.

One of the objectives in the planed research, ie Analysis of the incidence of diseases due to environmental exposure to asbestos among inhabitants living close to the factory was removed because there are no any civil residences around the selected factory within reasonable distances.

Control Sample Collection and Analysis

Collection of control samples for setting baseline values have already been started

Epidemiological data from other studies

It has been estimated that of the 4 million workers heavily exposed to asbestos, at least 1.6 million (35-44%) are thus expected to die of asbestos-related cancers, while in the absence of asbestos exposure only about 0.35 million (8-9%) would have been expected to die of cancer. Broken down more specifically, these cancer deaths include 20-25% from lung cancer, 7- 10% of pleural or peritoneal mesothelioma, and 8-9% of gastrointestinal cancer. It is estimated that between 58,000 and 75,000 asbestos-associated deaths will occur each year, which

will account for between 13 and 18% of the total cancer deaths in the United States.

However, after reviewing nine papers Hessel et al, concluded that no epidemiological study is perfect, and the scientific question of whether or not asbestos-related lung cancer in man arises only in the presence of pulmonary fibrosis may be unanswerable epidemiologically.

Although there are many studies which have carried out regarding Epidemiology of asbestos related workers globally, there aren't any significant Epidemiological data related with the Sri Lankan scenario due to the lack of studies in Epidemiology conducted based on asbestos exposure to workers in Sri Lanka. Therefore, this will be the first study which will be conducted in this nature where an epidemiological survey will be conducted on all workers and the same time all workers will be medically screened to determine their status of health in relation to the occupational exposure to airborne particulate matter in the working premises.

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Institutions where research is carried out

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