OCCUPATIONAL HAZARDS: DETECTION AND MANAGEMENT OF RESPIRATORY PROBLEMS RELATED TO INDUSTRIAL POLLUTION

Hamdan Noor, Zolkepli Othman and Faridah Mohamad

Faculty of Science and Environmental Studies
Universiti Putra Malaysia, 43400 UPM, Serdang, Selangor, Malaysia

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Introduction

The safety of working in highly dusty and polluted environment is of serious concern. Dust and other inhalable pollutants have been demonstrated to have adverse effects on human health, particularly chronic obstructive lung disease, COLD. Other problems associated with exposure to occupational air pollutants include reduction in spirometric values, increased incidence of chest tightness and wheezing. We have carried out studies to measure dust concentrations in occupational settings such as cement factories, wood based factories, tea processing factories, flour and spice processing factories, printing houses as well as in specific locations such as schools and busy streets, which may pose pollution problems to the school children, traffic policemen and postmen. We have also carried out spirometric studies to correlate the lung function of the people exposed to the pollution with the environmental data.

Materials and Methods

Air quality data were collected using two-stage high volume cascade impactor (130, Shimadzu) which fractionates dust into fine (<10um, PM10) and course (>10um) dust. The measurements were run continuously for two hours at 400L/min initial flow rate. Lung function tests were conducted using spirometer (Vitalograph Ltd.) with the subject in standing position. Each subject performed at least three attempts of vital capacity (VC) and forced vital capacity (FVC) with a gap of at least one minute between attempts. The highest readings plotted on the vitologram were selected to obtain FEV1 (forced expiratory volume in 1 second), FEV1% (percentage of FEV1 over FVC or VC, whichever is higher), FEF25-75% (mid-expiatory flow volume) and FMFT (forced mid-expiratory flow time). The measurements were standardised to BTPS unit. In addition, all subjects were required to answer questionnaires based on the American Lung Association, (1978) concerning their personal and medical history, respiratory symptoms and occupational history. Air quality data and respiratory parameters were then statistically analysed for possible correlation.

Results and Discussion

Air pollution levels (PM10) in all of the occupational settings studied highly significantly exceeded the Recommended Malaysian Guideline of 150μg/m^3. The PM10 in the cement factory was 2 000-8 000μg/m^3, wood factories 390-22 000 μg/m^3, tea factory 2 000-21 000μg/m^3, spice factories 1 000-4 000μg/m^3, flour factories 2 000-5 000μg/m^3 and in the busy streets of Kuala Lumpur >200μg/m^3. The very high levels of dust in the work place could cause serious respiratory problems to the subjects. Invariably, spirometric values obtained from the subjects exposed to the occupational pollution showed significant reduction, implying disturbance in pulmonary function. In addition, results from the questionnaires revealed that the subjects experienced higher prevalence of respiratory symptoms compared to the controls.

Conclusions

The significant correlation between the air quality data in the work place and the spirometry and personal health data from the workers revealed a strong warning that dusty environment in the occupational settings could cause detrimental effect on the health of the workers. Therefore, drastic measures must be taken to ensure that the pollution is brought down to tolerable levels for the benefit of the workers.

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