

**Epidemiological and Environmental Study
of Malignant Pleural Mesothelioma Cases
in Shubra El-Kheima Region**

By

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MBBCH, Ain Shams Univeristy , ١٩٨٢.

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*A thesis Submitted in Partial Fulfillment
Of
The Requirement for the Doctor of Philosophy
In
Environmental Sciences*

**Department of Medical Sciences
Institute of Environmental Studies and Research
Ain Shams University**

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Abstract

The present study aimed to evaluate the prevalence of malignant pleural mesothelioma (MPM) in Shubra El-Kheima city due to occupational and environmental “non-occupational” exposure to asbestos and to estimate the exposure-response relationship between environmental exposure to asbestos and MPM.

The study included ٢٩١٣ environmentally exposed subjects to asbestos living in the neighbourhood areas of the asbestos plant in Shubra El-Kheima city, ٤٨٧ occupationally exposed subjects working inside the asbestos plant and ٩٧٩ non-exposed subjects living at Banha city as a control group.

All subjects were interviewed. Mass miniature radiographic (MMR) findings for all studied groups were reviewed. Standard chest radiographs and high resolution computerized tomography (HRCT) for persons with abnormal MMR were done.

Details of age, sex, duration of residence in Shubra El-Kheima city and hospital records for all patients including pathologic diagnosis were recorded.

The airborne asbestos fiber concentrations were determined in the industrial, residential and control areas. Pleuropulmonary disorders including mesothelioma were more prevalent among exposed groups than control group.

Eighty-eight cases of MPM were diagnosed, ๐๔ cases (๖๑.๔%) were females and ๓๔ cases (๓๘.๖%) were males. The risk of mesothelioma was ๓๖ times among exposed groups compared to control group.

The mean concentration of airborne asbestos fiber was ๐.๐๑ ($\pm$ ๐.๓๖) inside the asbestos plant, ๐.๓๘ ($\pm$ ๐.๘๓) in the neighbourhood areas surrounding the plant and ๐.๐๐๓ ($\pm$ ๐.๐๑๓) in the control area.

This study revealed the extent of pleuropulmonary disorders including MPM in Shubra El-Kheima city and showed that the risk of these disorders increased significantly with duration and intensity of exposure to asbestos.

At these levels of asbestos exposure, there was a significantly increased risk of these disorders which was dose dependent. The study recommended the adoption of periodic medical check ups for population at risk living in Shubra El-Kheima city and increasing awareness of the public regarding the risk of asbestos exposure. Moreover, continuous monitoring of airborne asbestos fibers in Shubra El-Kheima city should be a routine procedure.

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LIST OF ABBREVIATIONS

ACGIH	American Conference of Governmental Industrial Health
BAPE	Benign asbestos pleural effusion
CAPMAS	CENTRAL AGENCY FOR PUBLIC MOBILIZATION AND STATISTICS
CC16	Clara-Cell Protein
CT	Computed tomography
EGF	Epidermal growth factor
EPA	Environmental protection agency
GOFI	GENERAL ORGANIZATION FOR INDUSTRIALIZATION
HRCT	High resolution computerized scan
IPF	Interstitial pulmonary fibrosis
Km	Kilometer
m	Meter
MM	Malignant mesothelioma
MMR	Mass miniature radiographs
MPM	Malignant pleural mesothelioma
MRI	Magnetic resonance imaging
NIOSH	NATIONAL INSTITUTE OF OCCUPATIONAL SAFETY AND HEALTH
OSHA	OCCUPATIONAL SAFETY AND HEALTH AGENCY
PCM	Phase contrast microscopy
PEL	Permissible exposure limit
ROS	Reactive oxygen species
SPA	Surfactant associated protein
STEL	Short term exposure limit
SVC	Superior vena cava
t.p	Thermal precipitator
TSGs	Tumour suppressor genes
TWA	Time weighed average
UK	United Kngdom
US	United States
USA	United States of America

INTRODUCTION

Malignant pleural mesothelioma (MPM) is caused by environmental and occupational exposure to asbestos (*Selcuk et al., 1997*). During the last four decades, numerous studies on malignant mesothelioma have been conducted (*Hillerdal, 1999 and Giarelli and Bianchi, 2000*).

However, the natural history of this tumour remains for various aspects ill defined or scarcely known. In particular, topics that deserve further investigation include the proportion of cases attributable to asbestos, the spectrum of the population at risk, the length of the latency periods, the impact of mild exposure to asbestos, and the role of co-factors in the development of the tumour (*Bianchi et al., 2001*).

Cohort studies found increased incidence and mortality from mesothelioma among asbestos workers employed in insulation (*Selikoff et al., 1979*), mining (*McDonald et al., 1997*), textile manufacture (*Yano et al., 2001*) and asbestos cement factories (*Ulvestad et al., 2007*). Epidemiological studies have shown that occupational exposure to asbestos causes mesothelioma (*Dement et al., 1994*).

Exposure has been assessed by a variety of methods, but all these studies reached the conclusion that the rate of

mesothelioma increases as the level of exposure increases (**Hansen et al., 1991**).

Nonoccupational or environmental exposure to asbestos is associated with an increased risk of mesothelioma (**Joubert et al., 1991**). Exposure is experienced by individuals living near factories manufacturing asbestos products (**Hammond et al., 1999**), asbestos mines and mills (**Reid et al., 1990**), or living with asbestos workers (**Dodoli et al., 1997**).

The development of this disease has a long latency, with cases arising more than 10 years after first exposure, and continues to rise exponentially with time since first exposure (**Deklerk et al., 1989**).

Since other factors such as levels of exposure (**Hauptmann et al., 2007**) also determine mesothelioma risk, it is important to analyze all these factors to disentangle their separate effects. The prevalence of mesothelioma has been increasing throughout the industrialized world (**Britton, 2007**). The incidence is predicted to peak around 2020 (**White, 2007**).

This reflects industrial exposure to asbestos, which was common up to the 1980s combined with a latent period between exposure to asbestos and development of mesothelioma averaging 30–40 year (**Britton, 2007**).
