RELATIONSHIP BETWEEN AIR POLLUTION AND RESPIRATORY AFFECTION IN GLASS INDUSTRY

BY

MOHAMED ABDEL RAHMAN AHMED

THESIS

SUBMITTED IN FULFILMENT FOR THE (PhD.) DEGREE IN ENVIRONMENTAL MEDICAL SCIENCE

SUPERVISED BY

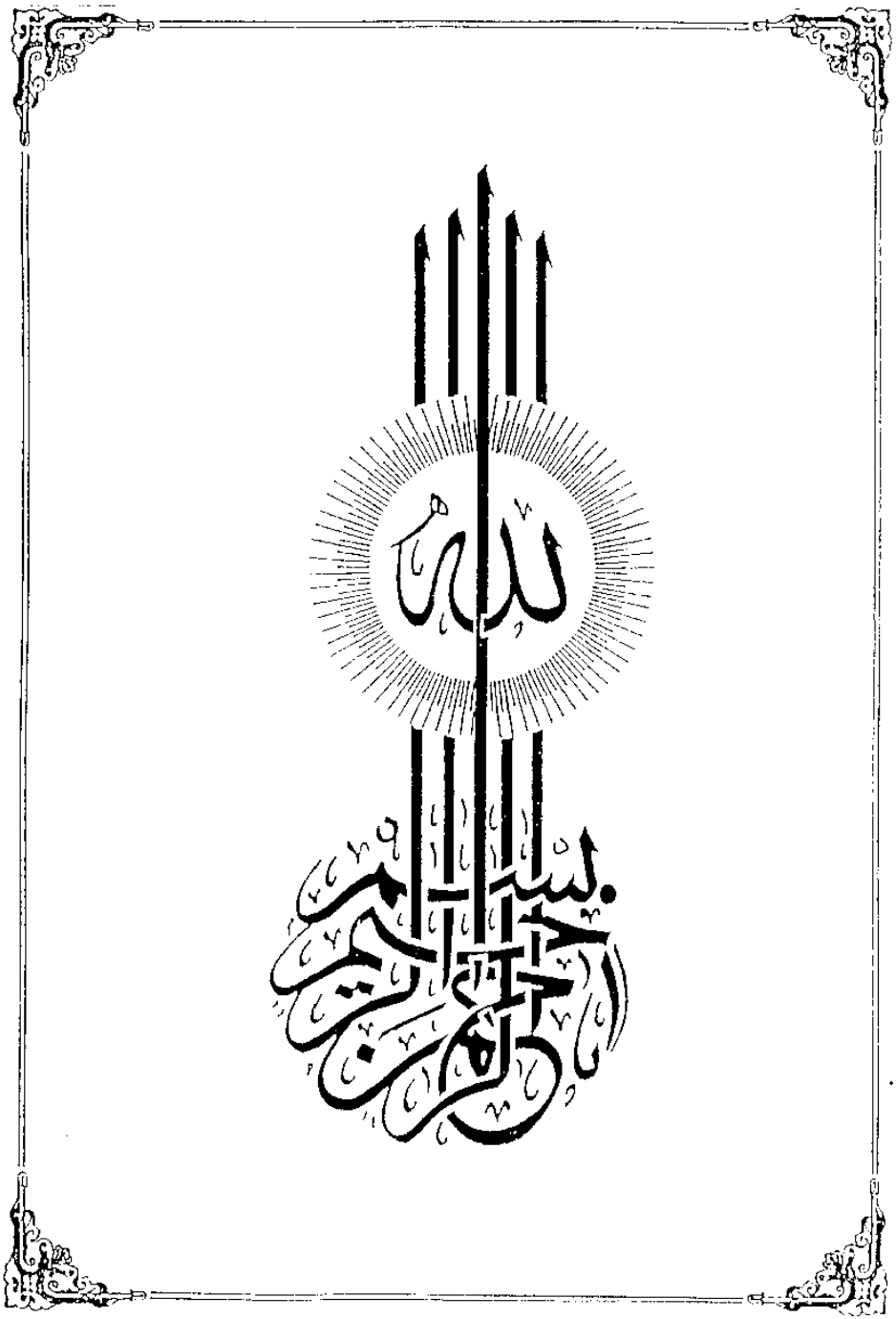
PROF. DR. ALY A. MASSOUD
PROFESSOR OF COMMUNITY, ENVIRONMENTAL AND OCCUPATIONAL MEDICINE
AIN SHAMS UNIVERSITY

PROF. DR. AHMED A. AHMED
PROFESSOR OF GLASS CHEMISTRY
NATIONAL RESEARCH CENTER

PROF. DR. MOHSEN A. GADALLA
PROFESSOR OF COMMUNITY, ENVIRONMENTAL AND OCCUPATIONAL MEDICINE
AIN SHAMS UNIVERSITY

INSTITUTE OF ENVIRONMENTAL STUDIES AND RESEARCH
AIN SHAMS UNIVERSITY

1993



ACKNOWLEDGEMENTS

This study was supported and completed with the sincere help of many persons to whom no words of thanks and feelings of gratitude are sufficient.

I would like to express my gratitude and deep appreciation to PROFESSOR DR. ALY A.E. MASSOUD, Professor of Community, Environmental and Occupational Medicine. Ain Shams University for his kind moral support, guidance advice, and constant encouragement and supervision which made this study possible.

I wish to express my thanks and respect to PROFESSOR DR. AHMED A. AHMED Professor of glass chemistry. National Research center who offered me a lot of his time and experience.

I gratefully acknowledge the truthful help and fatherhood support of PROFESSOR DR. MOHSEN A. GADALLA. Professor of Community, Environmental and Occupational Medicine Ain Shams University for his keen interest and honest guidance, suggestions, planning and motivation of this research work.

I would liked to thank PROF. DR. MAMDOUH AHMED GHONAIM Professor of Radiology. Ain Shams University. for his kind help and encouragement.

I wish to express my thanks and respect to PROF. DR. SAYED AHMED GHONAIM Professor of Radiology. El-Azhar University. for his kindness and efforts in accomplishing this work.

Thanks are due to DR. MOHAMMED EL AWADY Lecturer of Community, Environmental and Occupational Medicine. Ain Shams University, for his step-by-step supervision and guidance. I feel much honoured to express my indebtedness to him for his encouragement during the preparation of this work.

CONTENTS

LIST OF ABBREVIATION

ACGIH: American conference governmental industrial hygienists.

BMRC : British Medical Research council.

Al_2O_3 : Aluminium oxide

$CaCo_3$ $MgCo_3$: Calcium carbonate, magnesium carbonate (Dolomite)

CaO : Calcium oxide.

$FEF_{25-75\%}$: Forced expiratory flow at middle half of the FVC.

$FEV_1\%$: Forced expiratory volume in one second.

FVC: Forced vital capacity.

I.D: Identification.

M.A.C. : Maximum allowable concentration.

Mg/m^3: Milligram per cubic meter.

$Mg\ Co_3$: Magnesium carbonate

MgO : Magnesium oxide.

$Na_2\ co_3$: Sodium carbonate (Soda ash).

$Na_2\ So_4$: Sodium sulfate

PEFR: Peak expiratory flow rate.

TLV : Threshold limit value.

TWA: Time weighed average.

INTRODUCTION

INTRODUCTION

Until the second world war, silicosis was the most important and widespread form of pneumoconiosis. But since then, due mainly to substitution by other materials and hygienic measures, the incidence of new cases appears to have declined in the majority of industrial countries. But accurate statistics are rarely available as they are often based on compensation figures. (Morgan WKC, et al., 1984).

In the U.S.A., it is believed that the prevalence of silicosis is not decreasing. (Ayer, 1969). Some increase has been reported in Bulgaria, Spain (WHO, 1968), Sweden (Ahlmark and Bruce, 1967) and Singapore (Khoo and Toh, 1968). Nigeria has resulted in a 39 percent prevalence rate of silicosis (Warrell et al., 1975).

Environmental and health issues are of a very real concern today for most industries and particularly for glass industry. Because tightening environmental regulations, glass manufacturers are developing and/or implementing control technologies to satisfy these regulations. Of particular concern to glass companies

are: 1- The daily operation with raw materials and glass batching systems. 2- Release of volatile substances from the molten glass. 3- Particles generated during glass furnace demolition and rebuilds.
4- The emission of exhaust gases from the chinney stack.
5- exposures to hot environment. 6- Noise generated by machinery used. (Greg Geiger, 1992).

The principal cause of atmospheric pollution in glass companies is the emission of exhaust gases from the chinney stack.The principal source of these gases is the fuel which has burned. (Moilanan G.L. et al., 1991). Most operating glass furnaces have volatile substances which have been evolved from the molten glass. A wide range from coating operations also occur, (Macdowell, J.F., 1990). Another source of atmospheric pollution is the raw materials used. Fine batch dust particles are evolved in the exhaust gases. The nature of these substances depends on the glass composition and the raw materials used.

In soda-lime-silica glass melting, the principal volatiles (sodium, boron, fluorine and lead compounds) are often found in glass batches and because of their

volatile nature usually decompose and contaminate the exhaust gases, (Kinsman B.Q, 1990). Particulates are produced in the air by mechanical means during unloading, weighing, mixing, transporting and charging of the raw materials into the furnace. They can also be produced by physical/ chemical reactions such as volatilization, calcination, and condensation, (Radenback D,. et al., 1990). Most industrial dusts consist of particles that vary widely in size, the small particles greatly out numbering the larger ones. Consequently, when dust is noticeable in the air around an operation there are probably more invisible than visible dust particles present. It is not the dust seen with the naked eye that does damage in the lungs and it is therefore important that, in addition to using engineering controls and work practices to minimize the generation of dust, the worker must be fully protected from the very small respirable dust particles which may not be seen in the work area. (ACGIH, 1984).

This study was carried out in Yassin glass factories at shoubra el Kheima district, kaliubia governorate to provide-on field study basis-an idea about the impact of selective occupational hazard on the pulmonary system.

Occupational hazards to which the workers in a glass producing factory are exposed, include hazards to the eye, ear, skin, bone, muscles, teeth and the lungs, as a result of exposure to various factors at the work field, such as exposure to excessive heat, radiations, noise, chemicals, free silica and fuel and combustion exhausts, as well as the processing stages itself (Cameron et al., 1983).

It was decided to study in detail the pulmonary affection of glass industrial workers because this industry employed a big proportion of working population and those workers are exposed to many forms of pulmonary hazards.

Community health can be monitored by surveying different sectors of the population (Sartwell 1973 and Davis, 1978).

Occupational groups have important practical advantages in term of accessibility, cheapness and often stability for long term follow up (WHO, 1968).

This study is a trial to create a preliminary realistic up to date information of health survey about the pulmonary hazards, to which glass industrial workers are exposed and its effect on their lungs, in order to be able to satisfy some of the needs of health planner and to help in guiding community health actions in the way of understanding the hazardous raw materials through which the workers are affected and the ways of protection of the workers aiming at keeping them in a good health to satisfy the needs of their work.

AIM OF THE STUDY

AIM OF THE STUDY

The objectives of this study are:

1- To asses the respiratory system affections of exposed workers at the raw material preparation department in Yassin glass factories.

2- To clarify the relationship between size and/or profusion of radiological opacities, and changes in pulmonary functions.

3- To explore the relation between some environmental measurements in glass industry and ventilatory functions together with some risk factors e.g. smoking habits and duration of exposure.