

**ND OCCUPATIONAL PATHOLOGY
E ANTERIOR SEGMENT OF THE
EYE IN GLASS INDUSTRY**

THESIS
Submitted for fulfilment
of PH. D.

**In Environmental Sciences
Medical Science**

By
Inas Awadallah Salama
Msc in Ophthalmology

Supervisors

Professor Dr.
Aly Abdel Hady Massoud
Prof. of Community Environmental
and Occupational Medicine
Faculty of Medicine
Ain Shams University

Professor Dr.
Rifky Faris Hannallah
Prof. of Community Environmental
and Occupational Medicine
Faculty of Medicine
Ain Shams University

Professor Dr.
Ahmed Hussein Abdel Karim
Prof. of Environmental and
Occupational Health
National Research Center

Doctor
Mostafa Hassan Ragab
Lecturer in Environmental
and Medical Studies
Institute of Environmental studies
and Research
Ain Shams University

**Institute of Environmental Studies and Research
Ain Shams University
1994**

ACKNOWLEDGEMENT

Thanks to God the most merciful, the most compassionate, who guided my steps during this work, and always.

I would like to express my deep gratitude to Professor Dr. Aly Massoud, Prof. of Community Environmental, and Occupational Medicine, Faculty of Medicine, Ain Shams University for his constructive guidance, persistent follow up, and valuable supervision.

I feel much honoured to express many indebtedness to Professor Dr. Rifky Paris Hannallah, Prof. of Community Environmental, and Occupational Medicine, Faculty of Medicine, Ain Shams University, for his sincere initiating drive, stimulating suggestions, solid encouragement, and effective scientific contributions particularly in the area of data analysis.

I also wish to express my profound gratitude and sincere appreciation to Professor Dr. Ahmed Abdel Karim, Prof. of Community Environmental, and Occupational Health, National Research Center, for his valuable scientific contributions to this work particularly in the environmental monitoring of the studied factories in addition to his continuous moral support.

In fact, I would like to thank the staff of the Medical Department of the Institute of Environmental Studies and Research, especially Dr. Mostafa Hassan Ragab, for their help and support.

I feel very grateful to the Head of the Board of El-Naser Glass Company "Yassin Factories", the General Director of the factories, and all members of the board and especially the workers and the technical staff who offered me generously their time and their cooperation during the preparation of this work.

Moreover, I would like to express my special gratitude to Miss Vicky Naguib - Who typed this thesis - for the special quality of her work.

At a personal level, I would like to express my deep appreciation to my husband and my mother, for the great support they offered me during performing this work.



CONTENTS

INTRODUCTION.....	1
AIM OF THE WORK.....	3
REVIEW OF LITERATURE.....	4
- Glass Industry.....	4
- Health Hazards associated with glass industry...	7
- Anatomy of the anterior segment of the eye.....	13
- Occupational eye diseases.....	17
- Occupational pathology of the anterior segment of the eye in glass industry.....	21
- Eye protection.....	39
MATERIAL AND METHODS.....	44
- Glass manufacture on El Nasr Company.....	44
-Subjects.....	54
-Methods.....	56
* Eye examination.....	57
* Environmental assessment.....	62
* Statistical analysis.....	66
RESULTS.....	67
- Characteristics of the study sample.....	67
- Environmental measurements.....	85
- Eye diseases detected among the sample.....	87
- Relation between the environmental exposure and the anterior segment eye diseases.....	91
DISCUSSION.....	111
RECOMMENDATIONS.....	134
SUMMARY AND CONCLUSION.....	136
REFERENCES.....	141
APPENDIX	
- Questionnaire "in Arabic"	
- Psychometric chart	
ARABIC SUMMARY	

INTRODUCTION

INTRODUCTION

In modern industry, every day brings out new products and materials. These substances have become widely circulated in the environment, causing many forms of health hazards. The eye is a common target in occupational diseases. Traumatic, chemical, physical and radiational injuries may occur.

Glass manufacturing is one of the first industries known to man. Egyptians were producing glass many thousands years ago. (El Sadik, 1964).

In 1932, Mohamed Sayed Yassin started to build a large plant for manual glass manufacturing in Shoubra El-Kheima area. New factories, the automatic and the sheet-glass factories, were set up in addition to the original plant. Now, these factories are employing thousands of workers who are exposed to dusts, chemical substances, hot environment, and high intensities of infrared radiations. This occupational exposure may result in conjunctival hyperemia, blepharo-conjunctivitis, pterygium, and cataract (Cameron, 1983).

The objectives of this study is to determine the prevalence of anterior segment eye diseases among workers

in Yassin Factories, in relation to different stages of manufacturing. In view of these forthcoming results, we might be able to suggest some preventive measures against ocular affections.

AIM OF THE WORK

AIM OF THE WORK

1. To determine the prevalence of anterior segment pathology among workers in glass industry, and to find out the environmental factors associated with the occurrence of this pathology.

2. To recommend a future strategy aiming to reduce workers exposure to noxious substances.

REVIEW OF LITERATURE

REVIEW OF LITERATURE

GLASS INDUSTRY

All industries in some way or another, present some conditions which may affect the health of the workers. In certain industries, the diseases produced may be very dramatic. In other industries, immediate effect may be less noticeable, but prolonged exposure can incapacitate man.

Glass manufacturing is one of the first industries known to man. It has been claimed that many thousand years ago, the Egyptians were producing glass which they used to glaze or coat small stones to make beads. It was never been determined however, when and where the first "man made" glass was produced. An ancient Glenshow glass company credits a group of Phoenician sailors with making the world first glass item.

The story which was told, stated that the Phoenicians beached their boat on sandy shores of a tidal river. Finding no rocks on which to rest their cooking pots, they used lumps of natron (a crude soda ash) from the ship's cargo. Fanned by sea breezes, their camp fire blazed hot. The sailors found in the ashes a shiny

substance which became hard when it cooled. (El Sadik, 1964).

Glass manufacture in Egypt :

At present, in Egypt many factories were established for glass industry. One of the first factories to be built in Cairo, was the "Yassin" factory in 1932. Glass workers are exposed to many health hazards due to environmental exposure to dusts, heat, and injuries.

Glass has physical properties intermediate between liquid and solid; when cooled from the hot molten state it gradually increases in viscosity without crystallization over a wide temperature range until it assumes its characteristic hard form.

Chemical composition of the glasses :

1. Soda-lime-silica glasses :

These are the most important glasses including flat glass, containers, and electric light bulbs.

2. Lead-potash-silica glasses :

These types contain oftenly high proportions of lead oxide such as : Optical glass manufacture (makes use of the high refractive index), hard blown domestic and decorative glassware.

3. Barosilicate glasses :

Barosilicate glasses having a low thermal expansion are resistant to thermal shock so it is ideal for domestic oven and laboratory glassware.

HEALTH HAZARDS ASSOCIATED WITH GLASS INDUSTRY

1. Exposure to silica :

Hunter, (1973) defined silicosis as a pathological condition of the lungs due to inhalation of free silica particles (silicon dioxide).

Clayton, (1977) stated that in glass industry since the major component of each batch of glass is sand, this material would seem to present a potentially serious silicosis hazard. However, it was found that when washed sand is used, fine particles are removed, and the airborne dust from the mixed batch contains only from 1-5% free silica.

Kilburn, (1980) and Cameron, (1983) added that the fine sand particles with sizes in range of $0.1-2\mu$ can penetrate to respiratory bronchioles and alveoli, producing a hazardous airborne silicosis. They stated that fine sand which has been well agitated in sand dryers can produce silicosis in glass industrial workers, especially those grinding and polishing with fine quartz. At higher temperatures ($1100^{\circ}\text{C}-1500^{\circ}\text{C}$), it is transformed into cristobalite, which is more potent than quartz in producing pulmonary fibrosis. The concentration, particle size, and the duration of exposure are the main

determinants of the incidence, rate of progression, and the prognosis of the disease. The first symptom of silicosis is dyspnea on exertion. In more advanced cases, the dyspnea occurs even on very slight exertion or at rest. The most frequent causes of death are pulmonary tuberculosis, respiratory insufficiency, and acute pulmonary infections. Periodic radiological examination, and measures of pulmonary functions i.e. vital capacity, residual volume, forced expiratory volume, and functional residual capacity, are all useful criteria in the diagnosis of the disease (WHO, 1975 and Vigliani, 1983).

Prevention is very important in case of silicosis. Early diagnosis (using chest X-ray) to reveal the initial micronodular stages of the disease, which is asymptomatic, should be done. Moreover, removing workers with pulmonary disorders from exposure areas is very important in prevention of complicated silicosis.

2. Exposure to other raw materials :

Exposure to alkaline dusts as soda ash and potash, may cause serious injuries to the cornea and conjunctiva, because alkalis penetrate more easily than acids (Smith, 1983). It may also cause nasal ulceration and perforation of the nasal septum. Lead poisoning may occur when it is used (in the form of lead oxide), in manufacture of