

UNIVERSITI TEKNOLOGI MARA

ASSOCIATION BETWEEN EXPOSURE TO PM₁₀ AND LUNG
FUNCTION PERFORMANCE AMONG CONSTRUCTION
WORKERS.

NURULFARAHANA BTE MD NOH

Dissertation submitted in partial of fulfillment of the requirements for
the degree of Bachelor in Environmental Health and Safety

Faculty of Health Sciences

May 2010

ACKNOWLEDGEMENT

I would like to acknowledge and extend my heartfelt gratitude to the following persons who have made the completion of this final year project. My academic supervisor Madam Shantakumari Rajan for the constant reminders and much needed motivation.

Also I would like to thank Mr Jeganathan Senior Executive of the Programme Management Department and management of Sime Darby Property Berhad for his vital encouragement and support during data collection done at construction site. I wish to thank all the workers that had participate in this study.

My thanks to lecturers of the Physiotherapy Department Madam Kamaria and Mr Vikram in helping me in lung function test tutorial and interpretation . Also to the Head of Environmental Health Department , Prof Madya Rodziah Bt Ismail , my co-supervisor Mr Nazri Che Dom and Mr K. Subramaniam for the help and inspiration their extended.

All of the Environmental Health and Safety lecturers, laboratory staff ,En Shafie , En Aswat and students. Most especially to my parents, family, friends in their financial and emotional support and to Allah , Who made all things possible.

TABLE OF CONTENTS

ACKNOWLEDGEMENT	ii
LIST OF TABLE	vi
LIST OF FIGURE	vii
LIST OF ABBREVIATIONS	viii
ABSTRACT	ix
ABSTRAK	x
CHAPTER ONE : INTRODUCTION	1
1.1 Statement of problem	2
1.2 Study justification	3
1.3 Objectives	3
1.4 Hypothesis	4
CHAPTER TWO : LITERATURE REVIEW	5
2.1 Risk Assessment	7
2.2 Air Intake	10
2.3 Lung Function	11
2.4 Lung Function test	12
2.4 Air Pollution control	15
CHAPTER THREE : METHODOLOGY	
3.1 Study design	18
3.2 Study Location	18
3.3 Sample selection	18
3.4 Study instrument	19
3.4.1 Ethical	19

ABSTRACT

Association Between Exposure To PM₁₀ And Lung Function Performance Among Construction Workers

NURULFARAHANA BTE MD NOH

The cross sectional study was done to determine the association between exposure of particulate matter (PM₁₀) and lung function performance among construction workers. In addition to this, a correlation between PM₁₀ concentrations and lung function performance was quantified and identification of the duration of employment that gives effect to the lung function performance among workers was evaluated. The study was carried out among thirty construction workers and thirty office workers. The personal exposure of PM₁₀ was measured for both study groups using an personal air sampling pump. Lung function performance among the study group was measured using the vitalograph spirometer, were measurements of the FEV1%, FVC% and FEV1/FVC% were obtained. A Modified American Thoracic Society Questionnaire was used to gain the demographic data and respiratory symptoms of exposed and unexposed group Respondents comprised of three nationalities; Bangladeshi (16.7%), Indonesian (33.3%), and Malaysian (50%). Mean age, height and weight for exposed and unexposed group were 31.77±9.23, 31.87±9.33; 164.6±2.28, 167.6±2.48; and 70.2±4.48, 70.3±4.56 respectively. The study shows that there were significant differences between the concentration of PM₁₀ among workers at the construction site and office workers (p<0.05). There were significant differences of negative correlation between concentration of PM₁₀ and poor lung function performance among construction site workers (p<0.05). In addition to this, present respiratory symptoms was a significantly differences between the exposed and unexposed group (p<0.05). There were significant differences of the duration of employment of construction workers and poor lung function performance according to percentage value of FVC%,FEV1% and FEV1/FVC% among construction workers (r=-0.660,r=- 0.689,r=- 0.568 ,p<0.05). The lung function performance of the respondents were not influenced by age, gender, weight and height. The construction site workers were highly exposed to PM₁₀ due to many activities that produce high particulate matter such as excavating, grinding, reconstruction of building structure and grading of earthen materials. Moreover, the inhalation of the particulate matter during work cause deposition of small particles along the lining of alveoli that decreases the ventilation perfusion ratio and thus reduces the maximum oxygen uptake. This deposition may also be the cause of lower lung capacity. Even though the level of particulate matter was low, the study shows that there were significant association of concentration of PM₁₀ and reduction of lung function performance.

Key word: Particulate Matter 10 µm(PM₁₀), respiratory symptoms, lung function performance

CHAPTER 1

INTRODUCTION

1.0 Introduction

Over 11 million construction workers build and maintain roads, houses, workplaces and physical infrastructure. This work includes many inherently hazardous tasks and conditions such as work at height, excavations, noise, dust, power tools and equipment, confined spaces, and electricity (NIOSH, 2009).

Construction workers are exposed to hazardous dust when grinding or cutting mortar or cement from between the bricks of old buildings. The National Institute for Occupational Safety and Health (NIOSH) found that exposures could be reduced with the use of tool-mounted local exhaust ventilation and suitable work practices.

Workers who use grinders to remove deteriorated mortar between bricks such as tuck pointing may be exposed to crystalline silica at concentrations up to 100 times the NIOSH recommended exposure limit (REL) of $50 \mu\text{g}/\text{m}^3$ and are at risk of lung disease. In addition, exposure to crystalline silica has been linked to lung cancer, kidney disease, reduced lung function, and other disorders (NIOSH, 2002).

Workers in the construction industry may breathe dust that contains crystalline silica during many tasks including grinding concrete, cutting brick and block, tuck pointing masonry, or using a jackhammer to break concrete. A study to measure exposures