Association of Indoor Air Borne Particulate Matter 2.5 as a Passive Smoking Indicator with Bronchial Asthma and Other Allergic Conditions Among Children in Zawiet Razeen Village

Thesis

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List of Abbreviations

AKC ····· Atopic keratoconjunctivitis

BHR ····· Bronchial hyper-responsiveness

EPA ····· Environmental Protection Agency

ETS ····· Environmental tobacco smoke

IgE ····· Immunoglobulin E

P.M. ····· Particulate Matter

$P.M._{2.5}$ ····· Particulate Matter less than 2.5 Micron

SHS ····· Secondhand smoke

TSP ····· Tobacco smoke pollution

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Introduction

Secondhand smoke (SHS), also known as environmental tobacco smoke, is a complex mixture of gases and particles that include smoke from the burning cigarette, cigar, or pipe tip (side stream smoke) and exhaled mainstream smoke. Secondhand smoke contains at least 250 chemicals known to be toxic, including more than 50 that can cause cancer, cardiovascular, chest and other diseases ***(National Toxicology Program, 2000).***

Most exposure to tobacco smoke occurs in homes and workplaces. Secondhand smoke exposure causes respiratory symptoms in children and slows their lung growth. About 25% of children aged 3–11 years live with at least one smoker, compared to only about 7% of nonsmoking adults. There is no risk-free level of secondhand smoke exposure. Even brief exposure can be dangerous ***(U.S. Department of Health and Human Services, 2006).***

Asthma is defined as reversible obstruction of airways, characterized by hyper-responsiveness to a variety of stimuli, these produce recurrent episodes of wheezing, cough and shortness of breath ***(Kercsmar, 2003).***

Indoor factors related to incident asthma include passive exposure to Environmental tobacco smoke (ETS) ***(King et al.,2004).***

Airborne Particulate Matter P.M., which is a major component of air pollution, is a mixture of solid and liquid particles of different size, origin and composition, among which pollen grains and other vegetable particles carrying allergens and mould spores are included. Proximal airways filter P.M. larger than 2.5 Microns, human lung parenchyma retains P.M. sized 2.5 microns ($P.M._{2.5}$), which is a significant component of Tobacco smoke ***(Hopkins et al.,2001).***

Particulate air pollution is significantly associated with respiratory and cardiovascular diseases, exacerbation of allergies, asthma and chronic bronchitis, respiratory tract infection and hospital admissions ***(U.S. Department of Health and Human Services, 2006).***

Aim of the Work

1) Assess indoor P.M.$_{2.5}$ air level as an indicator of extent of environmental tobacco smoke exposure to children in households.

2) Examine the relationship between passive smoking (from cigarettes and shisha) to bronchial asthma and other allergic conditions among children resident at home.

Pediatric Bronchial Asthma

Definition of Asthma:

Asthma is a disorder defined by its clinical, physiological, and pathological characteristics. The predominant feature of the clinical history is episodic shortness of breath, particularly at night, often accompanied by cough. ***(GINA, 2008).***

Asthma may be regarded as a diffuse obstructive lung disease with hyper-reactivity of airways to a variety of stimuli and a high degree of reversibility of the obstructive process, which may occur either spontaneous or as a result of treatment ***(Bachmer et al.,1992)***.

Pathophysiology of Asthma:

Asthma is an inflammatory disorder of the airways, which involves several inflammatory cells and multiple mediators that result in characteristic pathophysiological changes ***(Tattersfield et al.,2002).***

This pattern of inflammation is strongly associated with airway hyper-responsiveness and asthma symptoms. The airway inflammation in asthma is persistent even though symptoms are episodic. The inflammation affects all airways including in most patients the upper respiratory tract and nose but its physiological effects are most pronounced in medium-sized bronchi. ***(Cohn et al., 2004).***

Mechanisms of airway narrowing in asthma:

1. 1-Airway smooth muscle contraction in response to multiple bronchoconstrictor mediators and neurotransmitters is the predominant mechanism of airway narrowing and is largely reversed by bronchodilators ***(Hirst et al.,2004)***.

2. 2-Airway edema is due to increased microvascular leakage in response to inflammatory mediators. This may be particularly important during acute exacerbations ***(Hirst et al.,2004)***.

3. 3-Airway thickening due to structural changes, often termed "Remodeling" may be important in more severe disease and is not fully reversible by current therapy ***(Hirst et al.,2004)***.

4. 4-Mucus hypersecretion may lead to luminal occlusion ("mucus plugging") and is a product of increased mucus secretion and inflammatory exudates ***(Hirst et al.,2004)***.

Epidemiology of Asthma:

Asthma may have its onset at any age, 30% of patients are symptomatic by age of one year, whereas 80-90% of asthmatic children have their first symptoms before 4-5 years of age ***(El-Sayed et al.,2007).***

Asthma is a worldwide problem that has been considered to be more common in the more affluent and the developed countries, and is higher in urbanized areas than rural areas and air pollution might be one of important factors affecting this problem ***(Yu et al.,2002)***.