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ORIGINAL ARTICLE

The influence of dusty environment (Makka city broken mountains) on bronchial asthma

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KEYWORDS

Dusty environment;
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Abstract *Background:* In the Kingdom of Saudi Arabia, the prevalence of asthma was 12%, with vast regional variations ranging from less than 10% in Dammam to 23% in Hail. Makka city has a lot of mountains that under the process of breaking causes dusty environment. So, the aim of this study was to evaluate the influence of broken mountain dusty environment on bronchial asthma patients in Makka city.

Subjects and methods: The study included 50 male patients of bronchial asthma in 2 groups. Group (A); 25 bronchial asthma patients were not exposed to broken mountains, and group (B) 25 bronchial asthma patients were exposed to broken mountains. All patients were matched as regards age. Pulmonary function parameters [PEFR%, FEV₁%, reversibility), skin prick test, immunoglobulin-E (IgE) and sputum levels of matrix metalloproteinase-9 and matrix metalloproteinase-9/tissue inhibitor of matrix metalloproteinase-1 (MMP-9 and MMP-9/TIMP-1) were measured. All patients received anti-asthmatic therapy (inhaled long acting B₂-against and inhaled corticosteroid and theophylline) for one month then re-assess the condition as regards, asthmatic symptoms, pulmonary function parameters, and need for reliever. The patients were categorized as controlled, partially controlled and non-controlled.

Results: Group B was more worsening as regards, duration of symptoms, limitations of activities, awakening and need for more reliever. Also, group B was more worsening as regards pulmonary function parameters (PEFR%, FEV₁%, reversibility). Group B was more atopic with higher matrix metalloproteinase-9 and ratio of matrix metalloproteinase-9/tissue inhibitor of matrix metalloproteinase-1. Lastly group B was worst than group A as regards controlling the attacks

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of bronchial asthma using anti-asthmatic therapy for 1 month.

Conclusion: Bronchial asthma patients in Makka city who were exposed to dusty environment due to broken mountains were more worsen clinically, functionally and as response to anti-asthmatic therapy than the other group who were not exposed to dusty environment.

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Introduction

Asthma is a common condition that affects 5–10% of the population worldwide [1]. In the kingdom of Saudi Arabia, the prevalence of asthma was 12%, with vast regional variations ranging from less than 10% in Dammam to 23% in Hail [2]. Makka city has a lot of mountains that under the process of breaking causes dusty environment.

It is widely accepted that there is an increase in morbidity and mortality due to bronchial asthma [3]. This may be attributed to environmental and social changes such as rapid urbanization, increased exposure to indoor allergens and occupational exposure [4].

So, the aim of this study was to evaluate the influence of broken mountain dusty environment on bronchial asthma patients in Makka city.

Materials and methods

This study included 50 bronchial asthma patients (GINA 2010 guidelines) [5]. They were selected from the allergy and immunology outpatient clinic of Makka-Hospital in Makka city-Saudi Arabia in the duration from January 2011 to February 2012.

They are divided into 2 groups (group A and group B) matched as regards age and all patients were males. Each group had 25 patients, group A was not exposed to broken mountain but, group B was working in broken mountain.

All participants were subjected to the following after written consents:

1. Full medical history and clinical examination.
2. Pulmonary function tests:
 - Peak expiratory flow rate (PEFR) using traditional peak flow meter expressed as percentage of the predicted values considering the height, age and sex.
 - Forced expiratory volume in one second (FEV₁) and the results expressed as percentage of the predicted values.
 - Reversibility test by using short acting B₂-agonist.
3. Skin prick test:
 - Using standard allergen extracts (house dust, mixed pollens, mite, mold and grass), negative control (saline) and positive control (histamine).
4. Sputum induction for:
 - Measurement of both MMP-9 and TIMP-1 (by ELISA technique from oncogene TM research products, sandwich enzyme) results was expressed in ng/ml [6].
 - Sputum induction:
 - According to Kanazawa [7] and his colleagues patients were premedicated with inhaled salbutamol, after washing their mouths, they inhale normal saline by nebulizer and encouraged to cough deeply after 5 and 10 min into polypropylene containers.

5. Serum total immunoglobulin E (IgE) in IU/L by ELISA

Quantitative measurement was performed by a commercially available ELISA kit (Med Biotech. Inc. Agenzme Company, Industrial Road, San carlos, CA, USA). Then all patients received anti-asthmatic therapy (inhaled B₂-agonist LABA, inhaled corticosteroids and theophylline) for one month, then reassess the condition as regards, symptoms, PEFR%, FEV₁%, and reversibility and need for reliever. The patients were categorized as controlled, partially controlled and non-controlled according to GINA 2010 guideline [5].

Statistical analysis

Data were checked, entered and analyzed by using SPSS version 20. Data were expressed as mean ± SD for quantitative variable, number and percentage for categorical variable. Chi-squared (X^2) or Fisher's exact test and t-test were used when appropriate. $P < 0.05$ was considered statistically significant.

Results

Table 1 shows non significant difference between group A and B as regards age of the patients (P value = 0.75) but, group B is more worse than group A as regards frequency of symptoms, limitations of activities, awakening and need for more therapy as reliever.

Table 2 shows significant difference between group A and B as regards pulmonary function tests (PEFR, %pred. and reversibility) whereas group B is more worse than group A ($P < 0.001$ and 0.05).

Table 3 shows that group B has more increase in IgE level than group A. Also, the result for the skin prike test is more atopic in group B ($P < 0.001$ for both).

Table 4 shows that MMP-9 level in sputum is more in group B and MMP-9/TIMP-1 ratio is more in group B indicating more inflammation and remodeling.

Table 5 shows that group B is worse as regards controlling the attacks of bronchial asthma using anti-asthmatic therapy for one month (controlled 9 (36%) in group B versus 16 (64%) in group A).

Discussion

Asthma is a common chronic disorder of the airways, characterized by variable reversible and recurring symptoms related to airflow obstruction, bronchial hyperresponsiveness and an underlying inflammation. It is one of the most common chronic diseases in Saudi Arabia, affecting more than 2 million Saudis (GINA, 2010) [5].

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