ORIGINAL ARTICLE

FREQUENCY OF METABOLIC SYNDROME IN ASTHMATIC PATIENTS OF HAZARA DIVISION

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Background: Bronchial asthma is a common disease and most asthmatics are obese. Both asthma and obesity are showing parallel trends in their increasing prevalence. Obesity is also the main component of metabolic syndrome and several studies have shown metabolic syndrome to be associated with bronchial asthma. The present study was, therefore, designed to determine the frequency of metabolic syndrome among patients with chronic asthma in our setup. **Methods:** This cross-sectional study was conducted in Department of Medicine, Ayub Teaching Hospital, Abbottabad from May to November, 2014. One hundred and fifty-four asthmatic patients were enrolled in this study. Samples for blood glucose, triglycerides and HDL Cholesterol were taken after an overnight fast. Sitting blood pressure was measured with mercury sphygmomanometer after 10 minutes of rest. Waist circumference was measured at the level of the midpoint between the high point of the iliac crest and the last rib. **Results:** Out of 154 patients, 80 were males and 74 were females. Metabolic syndrome was diagnosed in 46 (29.87%) patients. When metabolic syndrome was stratified according to age, sex and duration of asthma, the results were found to be insignificant (*p*-0.89, 0.30 and 0.85). **Conclusion:** This study showed that metabolic syndrome was present in almost one third of study population.

Keywords: Obesity; Metabolic Syndrome; Asthma
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INTRODUCTION

Bronchial asthma is prevalent worldwide both in underdeveloped and in developed countries. It is estimated that about 300 million individuals are affected worldwide. It is a chronic inflammatory disorder with airway hyper-responsiveness and variable airflow limitation. Diagnosis is based on decreased FEV1/FVC ratio (less than 0.75 on spirometry), along with documented reversible airflow obstruction (i.e., an increase in FEV1 ≥12% either spontaneously or with medication).[1,2] According to the World Health Organization (WHO) statistics, there is annually a loss of about 15 million disability-adjusted life years because of asthma. This represents about 1% of the total disease burden around the globe. Around the world about 250,000 deaths are attributed to asthma. The same trend is seen in Pakistan with prevalence of asthma increasing day by day. An annual increase of 5% is documented in Pakistan and it is estimated that about 20 million people are suffering from asthma in Pakistan.[3]

The metabolic syndrome (MS) is basically a group of risk factors for developing cardiovascular problems. All these factors lead to disorder of energy utilization and storage. It is diagnosed by a co-occurrence of three out of five of the following:

- Abdominal (central) obesity defined by ethnicity specific values of waist circumference; man > 90cm, woman > 80cm for South Asians
- Blood pressure ≥130/85 mmHg (or on treatment of previously diagnosed hypertension
- Fasting blood glucose ≥100 mg/dl (5.6mmol/l) or on treatment of previously diagnosed type 2 diabetes mellitus
- Serum triglycerides >150mg/dl (1.7 mmol/l)
- Low high density lipoprotein cholesterol (HDL-Cholesterol), i.e., man <40 mg/dl and woman <50 mg/dl.[4]

Metabolic syndrome is estimated to be 22.9% in US adult population.[5] A recent study shows the prevalence of metabolic syndrome in South Indians to be 29.7% (26.5% men and 31.2% women).[6] Due to the increased presence of all the risk factors which are the hall mark of metabolic syndrome in Pakistan, it is reported to be present in 18–46% of population, a trend as in other South Asian countries.[7] Obesity is considered a risk factor for bronchial asthma and it can add to the severity of dyspnoea in patients with asthma.[8] On the other hand obesity is also a major component of MS.[9,10] Various mechanisms have been proposed that obesity and metabolic syndromes may be associated with asthma and its exacerbations. Physical inactivity and associated gastro-oesophageal reflux being leading culprits.[11] One longitudinal study showed that baseline lower FEV1 (also common in obese people) appears to be an independent predictor of development of MS.[12] Metabolic syndrome coexisting with chronic obstructive pulmonary disease (COPD) is also well documented and nearly half of COPD patients (important differential to be considered in chronic asthmatics) demonstrate the presence of one or more components of metabolic

syndrome.[13] The central obesity compressing the lungs may lead to impaired lung function in patients with metabolic syndrome.[14] In one of the study (prospective cohort), it was concluded that two of the components of metabolic syndrome (i.e., increased waist circumference and elevated blood glucose or diabetes) were linked with a high risk of incident asthma in adults.[15]

The present study is, therefore, conducted to determine the frequency of metabolic syndrome among patients with chronic asthma in our region. As mentioned above, this is not only obesity which threatens the incident asthma, but the other parameters of MS are also a threat to asthma because of their effect on lung functions. This study will provide local data about the magnitude of MS in asthmatic patients and based upon the results of this study, future research strategies to draw future recommendations can be suggested.

MATERIAL AND METHODS

This cross-sectional study was conducted in department of Medicine Ayub Medical College, Abbottabad from May to November 2014 after approval from the hospital ethical and research committee. Diagnosed asthmatic patients of either gender above 18 years of age were included in the study. Patients with renal failure, Cushing syndrome, Nephrotic syndrome, Hypothyroidism, Polycystic ovary syndrome or with ascites due to any reason and concurrent use of lipid lowering drugs were excluded from the study.

The purpose and benefits of the study were explained to the patients and a written informed consent was obtained. All patients were worked up with detailed history and clinical examination followed by relevant investigations. Samples for blood glucose, triglycerides and HDL-Cholesterol were taken after an overnight fast. Sitting blood pressure was measured with mercury sphygmomanometer after 10 minutes of rest. Two readings were taken and the mean recorded for data. Waist circumference was measured at the level of the midpoint between the high point of the iliac crest and the last rib.

Metabolic syndrome was diagnosed using the International Diabetes Federation (IDF) consensus worldwide definition as described above. The data was entered and analysed using SPSS version 10.0. Mean±SD was calculated for quantitative variables like age, blood pressure, blood glucose, duration of disease, PEFR, total cholesterol, HDL-C, triglycerides and waist circumference. Frequencies and percentages were calculated for categorical variables like gender. Results were presented in the form of tables and graphs. Stratified analysis was done by age, sex and duration of disease for the outcome variable, i.e., metabolic syndrome. Chi square test at 5% significance level was used to determine association of outcome variable with independent variable like age, sex and duration of disease.

RESULTS

This study was conducted in Department of Medicine, Ayub Teaching Hospital, Abbottabad. A total of 154 patients, fulfilling the inclusion criteria and giving informed consent to participate, were enrolled in the study. There were 80 (51.95%) male participants and 74 (48.05%) female participants. The mean age was 35.95±6.78 years. Youngest study participant was 26 years old and the age of the oldest study participant was 48 years. The mean duration of asthma was 11.73±3.07 years. The shortest duration of asthma was 7 years and the longest duration was 17 years.

The mean peak expiratory flow rate (PEFR) was 499.56±59.70 litre/min. The lowest PEFR was 402 litres/min and the highest was 601 litters/min in the study population. Of the 154 study participants, 46 (29.87%) were diagnosed to have metabolic syndrome.

Mean cholesterol level was 217.29±29.86 mg/dl. Likewise, the mean LDL cholesterol level was 135.35±25.01 mg/dl; for HDL-Cholesterol, the mean level was 39.79±5.05 mg/dl; mean triglyceride level was 150.92±11.61 mg/dl; mean fasting blood glucose was found to be 96.71±10.43 mg/dl. Mean waist circumference of study participants was 81.83±7.53 cm and the mean systolic and diastolic blood pressures were 133.49±8.74 and 85.07±3.30 mmHg respectively.

When metabolic syndrome was stratified according to age, sex and duration of asthma, the results were found to be insignificant. The *p*-values obtained were 0.89, 0.30 and 0.85 respectively. These values were more than the predefined value of 0.05 and, hence, rendered the results insignificant.

DISCUSSION

Bronchial asthma is characterized by chronic inflammation of the airways. There is a reversible airflow limitation and bronchial hyper-responsiveness. The airflow limitation, if untreated, leads to narrowing and ultimately obstruction of airways. A quarter of a million deaths from asthma are reported annually worldwide.[1,2]

Metabolic syndrome, on the other hand, is a disorder of energy utilization and storage. Certain criteria need to be fulfilled for its diagnosis.

Metabolic syndrome is said to be present when any three of the following are identified in a patient. Abdominal obesity, hypertension, hyperglycaemia/diabetes mellitus, low HDL cholesterol levels and high serum triglycerides.[3]

The prevalence of metabolic syndrome varies worldwide and even in Pakistan, its prevalence is not uniform. It has been reported from 18–46% in different local studies.[6] One of the major component of metabolic syndrome is obesity and it has also been documented to lead to asthma.[7,8] Obesity may also be associated with increased asthma severity.[16,17] Similarly, many interactions between metabolic syndrome and chronic obstructive pulmonary disease (COPD) have been reported that point towards the increased cardiovascular mortality in patients suffering from COPD (one of the main differentials to be considered in chronic asthmatics).[18]

The present study was conducted to determine the frequency of metabolic syndrome in patients with chronic asthma in the light of other mentioned studies and determine its prevalence in our population. Patients who had been diagnosed for asthma for at least three years were included in the study. Of 154 study participants, 46 (29.87%) patients with chronic asthma fulfilled the criteria required for diagnosis of metabolic syndrome. Although metabolic syndrome was found in almost one third of study participants, when it was stratified according to age, sex and duration of asthma in study population, the results were rendered insignificant.

Lee *et al* reported that MS was associated with symptoms that resemble to the ones like asthma. Central obesity and hypertension are the main risk factors for developing asthma like symptoms.[19] They conducted the study to obtain the prevalence of asthma like symptoms using a questionnaire and also conducted spirometry in a population-based study comprising of 10,038 participants. They concluded that the group of the study population with MS were found to have more symptoms like asthma.

More recently, Uzunlulu *et al* reported that they did not find any evidence that metabolic syndrome was found significantly more in asthmatic population.[20] They conducted a study which included a total of 188 non-diabetic patients. The study participants were divided into two groups. The asthma group, diagnosed by a pulmonologist (90 patients, mean age = 43.83±10.98), while the control group (98 non-asthmatic patients, mean age = 42.01±9.21) consisted of patients coming to hospital for routine health matters. In this study the primary endpoint was to compare the prevalence of metabolic syndrome between the groups. This study concluded that the prevalence of MS was slightly higher in the asthma group than in the control group (36.7% vs 33.7%), but this difference was statistically insignificant. The results are somewhat similar to this study in which 29.87% asthmatic patients were found to have metabolic syndrome, yet the association was not found to be significant.

A study by Del-Rio-Navarro et al reported that adolescent obese males with asthma had a significantly higher prevalence of MS than obese males who were not having asthma.[8] Another study by Adeyeye *et al* also found that metabolic syndrome prevalence was high in asthmatic patients.[21] They carried out a cross-sectional study at asthma clinics. One hundred and fifty-eight (158) asthmatics participated in the study comprising of 63 (39.9%) males and 95 (60.1%) females. The prevalence of metabolic syndrome was 17.7%, affecting 28 patients, who were also having poor control of asthma ($p<0.05$).

Forte *et al* reported a high prevalence of obesity among asthmatic patients.[22] In this study gender was found to have significant association with the MS, contrary to the findings of our study.

This was a small hospital based descriptive study and the results could not be generalized to whole population because not every asthmatic in the local population presented to this hospital for management. In order to correctly determine the prevalence and impact of metabolic syndrome in local asthmatic population, large scale study is required.

CONCLUSION

One third of study participants in this study were found to have metabolic syndrome which is quite significant. Whether metabolic syndrome has any causal or bad prognostic relation with asthma needs to be confirmed by large scale double-blind studies.

AUTHORS' CONTRIBUTION

NA designed, supervised and wrote the study. SMK and SYG collected/verified the data according to set protocol.

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