The Prevalence, Management and Burden of Asthma-A Nigerian Study

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ABSTRACT

Inadequate attention given to the management of asthma and ways of improving treatment could be a significant factor for the increase morbidity and mortality from asthma despite major advances in our understanding of the pathophysiology of the disease. There seems to be paucity of data concerning the management pattern and burden of asthma in Africa. This study was undertaken to determine the prevalence, management pattern and the burden of asthma.

This study was a cross sectional design involving clinical and lung function assessment. The diagnosis of asthma was made using the clinical features of asthma and lung function parameters (Forced expiratory volume in one second, Peak expiratory flow rate, Reversibility tests). Totally, 120 asthma patients participated in this study. All subjects completed the clinical asthma control questionnaires. All items were rated with the calculation of their mean and percentages. Student t-test was used to calculate the difference between the mean of the lung function tests for subjects and control.

The prevalence of asthma among respiratory unit patients was 6.6% and higher in the first three decades of life with female preponderance (F:M=1.5-1). There is a strong family history of asthma (81.7%). Associated allergies include rhinitis (75%), pharyngitis (54%), conjunctivitis (54%) and dermatitis (30%). Percentage of asthma patients treated with bronchodilators alone (70%), combined inhaled bronchodilators and steroid (28.3%). Impaired daily activities include sports (84%), Job career (60%), Physical activity (55%), Social activity (54%), Household chores (61%), Disturbed sleep (53%), Daytime symptoms (51%), Hospitalized (50%). Subjects had significant low lung function values when compared with control (P < 0.05). The burden of asthma is very high despite the advanced knowledge of the pathophysiology and management of asthma.

Key words: Airway resistance; Burden; Chronic inflammation; Co-morbidities; Poor asthma treatment; Prevalence
INTRODUCTION

Bronchial asthma is a chronic inflammatory disease of the airway characterised by airway hyper-responsiveness leading to airway resistance which is associated with widespread but variable, airflow limitation that is reversible either spontaneously or with treatment. Asthma symptoms include intermittent attacks of wheezing, breathlessness, chest tightness and cough that occur more at night and or early in the morning. There is often bronchoconstriction without any known precipitating factor. However, some provoking agents of the airway obstruction may be specific (antigen- antibody reaction) or non-specific stimuli (exercise, emotional stress, cold air or pharmacological agents as histamine or metacholine). The clinical signs of asthma include a prolonged expiratory phase of respiration, and diffuse bilateral and a reversible wheeze (rhonchi). However, there may be no signs detectable between episodes. Asthma arises from a complex interaction of genetic and environmental factors. Airway inflammation occurs when genetically susceptible individuals are exposed to certain environmental factors. However, the exact processes underlying asthma may vary from patient to patient. Other associated allergic conditions include Rhinitis, pharyngitis, conjunctivitis and dermatitis.

The pathology is that of inflammation associated with vasodilatation, oedema, cellular infiltrates like neutrophils, eosinophils, lymphocytes and mast cells, patchy desquamation and squamous metaplasia of the mucosa cells lining the airway lumen. Substance-P within the airway nerves is increased while Vasoactive Intestinal Peptide is reduced. Airway narrowing occurs as a result of its smooth muscle contraction, vasodilatation of bronchial vessels, oedema of the sub mucosa tissues and hyper secretion of mucus into the airway lumen. Asthma affects all age groups, race and sex. For unknown reasons, boys are more affected than girls but by the third decade, the prevalence becomes equal and subsequently, more women than men are affected. It is estimated that 300 million people have asthma worldwide. The prevalence of asthma in Nigeria is 10.7% (children), 14.2% (adolescents) and 5.1 - 7.5% (adults). Objective measurement of lung function involves the use of spirometry and peak flow meter. Asthma constitutes a major functional disability on its sufferers. It affects the psychological, physical and social well being of a patient. Sleep is disturbed and patients experience day or night sleep reversals associated with poor concentration, impaired daily activities and significant co-morbidities especially depression and anxiety. Furthermore, asthma treatment has been found to equate with that of other chronic conditions such as cardiovascular diseases, especially when it becomes complicated. Some patients with severe asthma on high dose systemic steroids are prone to steroid side effects. One fifth of patients with asthma have a less restricted activity but they need to devote major time and energy to the management of their asthma.

The Global Initiative for Asthma (GINA) management goals have not been achieved as demonstrated in the report of the various surveys around the world that investigated the levels of asthma control. Inadequate attention given to the management of asthma and ways of improving the treatment could be a significant factor for the increased asthma burden despite improved knowledge of the pathophysiology and treatment. The current study revealed the prevalence of asthma and described the management pattern of asthma and its consequent burden on patients in Benin City, Nigeria. The study also recommends ways of improving the overall management of asthma and consequently, reducing asthma burden.

MATERIALS AND METHODS

The clinical setting was the respiratory unit of the department of Medicine, University of Benin Teaching Hospital (UBTH), Benin City, Nigeria. The respiratory unit treats most patients with respiratory conditions presenting to the hospital. The patients recruited cut across the various professions in the society and were 18 years old and above. A total of 3000 patients were seen in the respiratory clinic during the study period of eighteen (18) months (2004-2005), out of which two hundred (200) were confirmed asthma patients. However, only 120 relatively stable asthma patients finally participated in the study. Patients who had severe asthma attacks and co-morbid conditions like cardiac failure were excluded from the study. Asthma patients that had busy work or home schedules and fear of stigmatization especially the undergraduates were excluded. It was against the religious belief of some patients while some felt they were being used for
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experiment like animals. A control group of 120 healthy Nigerians with a similar socio-demographic background were also studied. The study was analytic Cross-sectional design involving clinical and lung function assessment. The diagnosis of asthma was made using the following criteria:

- History of recurrent cough, breathlessness, chest tightness, and wheezing.
- Physical examination indicating asthma and or expiratory wheeze with evidence of hyper inflated lungs.
- Lung Function tests. This includes a low Peak Expiratory Flow Rate (PEFR), Forced Expiratory Volume in one second (FEV₁) and FEV₁/FVC.
- Reversibility test with bronchodilator shown by improvement of at least 12% and above within 10 - 20 minutes of β₂ agonist aerosol inhalation in FEV₁.

All subjects completed the clinical asthma control questionnaire that was designed and validated by Juniper et al. This questionnaire is a composite of asthma symptoms and the effects on the daily lives of patients, spriometric values and bronchodilators used. The validated asthma control questionnaire was used to evaluate the total burden of asthma in this study. All items were rated with the calculation of their mean and percentages. The student t-test was used to calculate the difference between the lung function tests mean of subjects and the control. The prevalence of asthma was calculated using the following formula:

\[
\text{Prevalence rate (Pr)} = \frac{\text{Total no. of cases of a disease at a specified time (T)}}{\text{Population at risk at the specified time (P)}} \times 100
\]

\[
T = 200 \\
P = 3000 \\
Pr = 200/3000 \times 100 \\
Pr = 6.6\%
\]

Table 1. Gender prevalence of asthma in the various age groups

<table>
<thead>
<tr>
<th>Age group</th>
<th>Subjects M (n= 49)</th>
<th>F (n= 71)</th>
<th>controls M (n= 49)</th>
<th>F (n= 71)</th>
</tr>
</thead>
<tbody>
<tr>
<td>18-27</td>
<td>26(53.1%)</td>
<td>42(59.2%)</td>
<td>26(53.1%)</td>
<td>40(56.3%)</td>
</tr>
<tr>
<td>28-37</td>
<td>8(16.3%)</td>
<td>9(12.7%)</td>
<td>10(20.4%)</td>
<td>10(14.1%)</td>
</tr>
<tr>
<td>38-47</td>
<td>9(18.4%)</td>
<td>7(9.8%)</td>
<td>9(18.4%)</td>
<td>7(9.9%)</td>
</tr>
<tr>
<td>&gt; 48</td>
<td>6(12.2%)</td>
<td>13(18.3%)</td>
<td>4(8.1%)</td>
<td>14(19.7%)</td>
</tr>
<tr>
<td>Total</td>
<td>49(100%)</td>
<td>71(100%)</td>
<td>49(100%)</td>
<td>71(100%)</td>
</tr>
</tbody>
</table>

M=Male  F=Female

Table 2. General characteristic features, co-morbidities and management of asthma

<table>
<thead>
<tr>
<th>Item</th>
<th>Values</th>
</tr>
</thead>
<tbody>
<tr>
<td>S/C (n)</td>
<td>120/120</td>
</tr>
<tr>
<td>Age in yrs(S/C)</td>
<td>31.7±12.6/32.4±13.9</td>
</tr>
<tr>
<td>Sex: M:F (S/C)</td>
<td>49:71/49:71</td>
</tr>
<tr>
<td>Age of onset M:F(S)</td>
<td>17.04±12.13/18.04±14.83</td>
</tr>
<tr>
<td>Duration of asthma M:F</td>
<td>14±9.31/12.89±9.29</td>
</tr>
<tr>
<td>Body Mass Index M:F(S/C)</td>
<td>24± 4.5:24.8±5.2 / 24.2±5.2:24.6±4.8</td>
</tr>
<tr>
<td>Prevalence of asthma(S)</td>
<td>6.6%</td>
</tr>
<tr>
<td>Associated allergies(S/C)</td>
<td></td>
</tr>
<tr>
<td>Rhinitis</td>
<td>75% / 16.6%</td>
</tr>
<tr>
<td>Pharyngitis</td>
<td>54% / 13.3%</td>
</tr>
<tr>
<td>Conjunctivitis</td>
<td>54% / 5%</td>
</tr>
<tr>
<td>Eczema</td>
<td>30% / 2.5%</td>
</tr>
<tr>
<td>Family history: yes: no (S/C)</td>
<td>81.67%:18.33%/38.2%/61.8%</td>
</tr>
<tr>
<td>Medication (S)</td>
<td></td>
</tr>
<tr>
<td>No medication</td>
<td>2(1.7%)</td>
</tr>
<tr>
<td>Bronchodilators only</td>
<td>84(70%)</td>
</tr>
<tr>
<td>Bronchodilator/steroid</td>
<td>34(28.3%)*</td>
</tr>
</tbody>
</table>

M: male, F: female, S:subjects, C:controls
### RESULTS

There were 49 male and 71 female asthma patients in this study. This gives a male to female ratio of 1:1.5. The prevalence of asthma was highest in the age group of 18 to 27 years and the mean age of asthma was 31.7 years. Asthma peaks in the third decade of life. The body mass index were 24 and 24.8 for both male and female patients respectively table 2. The mean age of onset of asthma was 17.04 years ± 12.13 for male and 18.04 years ± 14.83 for female while the mean duration of asthma were 14 years ± 9.31 and 12.89 years ± 9.29 for male and female patients respectively.

Majority (70%) of the patients preferred aerosol bronchodilator use for the treatment of asthma while 28.3% of the patients used a combination of bronchodilators and steroid aerosol. The difference was statistically significant at a P-value of 0.05. Family history of asthma was noted in 81.67% of the subjects. Associated co-morbid allergic conditions included rhinitis (75%), pharyngitis (54%), conjunctivitis (54%), dermatitis (30%).

| Table 3. Lung function assessment of asthma patients and control group |
|-----------------------------|-----------------------------|
| **LFP** | **Subject** | **Control p< 0.05** |
| PEFR (L/M) | 321 (68%) | 433 (101.2%) |
| FEV₁ (L) | 2.21 (70.5%) | 2.66 (95%) |
| FVC (L) | 2.64 (77.8%) | 3.0 (98.4%)* |

LFP = lung function parameter  
PEFR = Peak Expiratory Flow Rate  
FEV₁ = Forced Expiratory Volume in one second  
FVC = Forced Vital Capacity

| Table 4. The burden of asthma presented as percentages |
|-----------------------------|-----------------------------|
| **Asthma restrictions** | **%** |
| Sports | 84% |
| Job or Career choice | 60% |
| Physical activity | 55% |
| Social activity | 54% |
| Household chores | 61% |
| Disturbed sleep | 53% |
| Daytime symptoms | 51% |
| Asthma patients hospitalised | 50%* |

The absolute and percentage predicted values of lung function parameters were low. Table 4 revealed the burden of asthma on the affected patients with respect to their job/career choice (60%), sports (84%), social activities (54%), household chores (61%), physical activity (55%). Asthma was a major cause of disturbed sleep (53%) and caused daytime symptoms in about 53% of patients. Recurrent acute attacks of asthma were a cause of emergency room treatment and hospital admission in about 50% of patients.

### DISCUSSION

Asthma is a global disease which affects all ages, race and sex. The demographic features, treatment pattern and the subsequent burden of asthma on its sufferers have been subjects of many researches but with little emphasis in Africa.

Asthma affects more boys than girls for unknown reasons, but by the third decade, the prevalence becomes equal and subsequently, more women than men are affected. But, Apter et al and Schmier et al demonstrated a higher prevalence of asthma in female patients irrespective of age. However, the report of this present study revealed a higher concentration of asthma patients up to the third decade of life with female preponderance (F:M = 1.5:1). There is a global increase in the prevalence of asthma. The global prevalence of asthma in children and adults ranges from 1% to 18% of the population in different countries. The prevalence rate of asthma in this study, among respiratory unit patients was 6.6%. However, this is low, compared with the prevalence of asthma in Sweden (9%), Australia (10.7%) and Norway (9.3%) which were done in the hospital environment as well.

The global increase in the prevalence of asthma is associated with a rise in the global burden of asthma. The result of this study shows that asthma restricted patients from engaging in sports, deciding career choice, physical activity and household chores. It was also found to disturb sleep and was responsible for recurrent hospitalisation in 50% of the patients. This findings corresponded with the reports of Rabe et al, Adams et al and Lai et al in Europe (AIRE), America and Asia respectively. Undiagnosed and undertreated asthma cases were responsible for the increased burden of asthma in these continents despite an improved knowledge into the pathophysiology and management.
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The reason for this high asthma burden in our environment is a subject for future studies. Associated co-morbid allergic conditions in this study included rhinitis (75%), pharyngitis (54%), conjunctivitis (54%) and eczema (30%). The impression that allergic rhinitis is a continuation of asthma and vice versa is not controversial considering, the frequency of occurrence of both diseases and a common respiratory tract. Associated allergic conditions especially allergic rhinitis is a provoking factor of asthma which is normally undermined in the management of asthma and may cause recurrent asthma attacks and subsequent frequent hospital visits.26,27,28

The fact that asthma is a chronic inflammatory disease associated with airway resistance, necessitates the use of combined inhaler anti-inflammatory drug (prevent further inflammation) and bronchodilator for immediate relief.32 This correlated with the result of this study that reported 28.3% of relatively stable patients who were on regular dose of combined inhaled glucocorticoid and β2-agonists. The addition of long acting inhaled β2-agonists to a daily regimen of inhaled glucocorticoids has been confirmed to improve lung function, decreases the use of rapid – acting inhaled β2-agonists, reduces the number of exacerbations,33-35 and achieves clinical control of asthma in more patients, more rapidly, and at a lower dose of inhaled glucocorticosteroids.36 However, Global Initiative for Asthma (GINA) defined the control of asthma with respect to short acting β2-agonists as ≤ 2 times use of reliever bronchodilator per week.3 This collaborated the result of this study that revealed majority (70%) of these patients used short acting β2-agonists and 1.7% who were not on any therapy. Nevertheless, the regular use of rapid acting β2-agonists as monotherapy in both short and long acting forms may lead to relative refractoriness to β2-agonists and associated increased risk of asthma related death which is not documented with the use of the combined therapy.37,38 This is an issue for future studies to compare the quality of life of relatively stable asthma patients in our environment who are on combined therapy of inhaled steroids/ β2-agonists and those taking inhaled β2-agonists alone.

However, the results of the Gaining Optimal Asthma Control (GOAL) study revealed that total control of asthma is achievable with associated increase in the quality of life scores of asthmatics after treatment with combined therapy.36,39 In addition, a 10-year program launched in Finland, 1994 revealed a 75% increase in the use of inhaled corticosteroid and 35% reduction in the number of days spent on hospital admissions.40 This was associated with 10-20 % drop in the total cost per patient to treat asthma.40

CONCLUSION

The prevalence of asthma in this study, among respiratory unit patients was 6.6% and associated with a female preponderance of (F: M) 1.5:1. The majority (70%) of these patients used short acting β2-agonists and 38.2% were using combined inhaled long acting β2-agonists/steroid for the relief and control of asthma. There was an associated high asthma burden that could not be explained despite improved knowledge of the pathophysiology and management of asthma.

Recommendation

There are urgent needs for effective patient management systems, especially at the primary care level, prompt and better diagnosis, implementations of guidelines and a more appropriate referral and treatment involving the use of controller medications.

Moreover, associated co-morbid conditions like rhinitis, pharyngitis, conjunctivitis and dermatitis should be considered in the overall management of asthma.

The government should make asthma a health care priority if total control of asthma should be achieved. Government and health care providers should renew emphasis on lifestyle changes and provision of adequate education, access to safe and effective medications and primary health care.

We advocate future studies of this type that will emphasize the treatment pattern, burden and quality of life of asthma patients in order to adequately assess the progress of asthma treatment.

AKNOWLEDGEMENTS

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