PREVALENCE, SYMPTOMS AND MANAGEMENT OF CHILDHOOD ASTHMA: A COMPARISM OF URBAN AND RURAL AREAS IN NIGERIA.

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DECLARATION

I, ADIELE, DABERECHI KENNETH, with registration number PG/MPH/03/37495 hereby declare that the study reported herein is original and that any assistance received is acknowledged. This dissertation has not been submitted previously for a higher degree or publication either in part or full.

SIGN----------------------------------------------------------------

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ATTESTATION

I certify that the work for this dissertation: PREVALENCE, SYMPTOMS AND MANAGEMENT OF CHILDHOOD ASTHMA: A COMPARISM OF URBAN AND RURAL AREAS IN NIGERIA.

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This work is dedicated to Almighty God and all the children with respiratory problems especially those with allergies and asthma in Nigeria and all over the world.
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ABSTRACT

A community based survey was carried out in January, 2010 amongst school children aged 8 to 12 years, on the ‘Prevalence, Symptoms and Management of Childhood Asthma’ and these were compared between urban and rural subjects in Nigeria.

Two schools each were selected from both rural and urban areas of Enugu State, Nigeria by balloting the list of approved primary schools and the subjects by multistage cluster sampling method. A pretested, modified ISAAC questionnaire was used to elicit responses from caregivers (parent/guardian) of these selected pupils. The responses obtained was analysed using SPSS version 11 and statistical significance determined with Chi – square at a level of significance of 0.05.

A total of 485 (four hundred and eighty five) pupils from 4 (four) schools aged 8 to 12 years were studied; 241 (two hundred and forty one) from urban and 244 (two hundred and forty four) from rural schools.

The study revealed an atopy prevalence of 25.7% in urban and 23.4% in rural areas with no difference between the urban and rural prevalence.

Asthma was shown to have a prevalence of 12.3% in the urban area and 11.8% in the rural area, again with no difference between both geo-locations (P = 0.961).

Of all the symptoms of asthma compared, only the frequency of day time wheeze was found to be significantly higher in the urban area than in the rural area (P = 0.049).

The ability to diagnose asthma correctly was significantly low in both geo-locations with urban diagnosis level of 35.7% and rural level of 10.7%.
Standard asthma management was found to be unacceptably poor in both geo-locations, except for patients’ counseling on health situation which was quite high – 60.7% in urban area compared to 11.1% in the rural area. Markers of standard asthma management were significantly more in use in the urban area compared to the rural area, except for regular follow-up visits that was similar in both geo-locations with a P-value of 0.682.

The morbidity pattern shows significantly higher school absenteeism (P = 0.012), acute severe exacerbation of symptoms (P = 0.007) and hospital admissions in the urban area compared to the rural area.

The findings in this study showed that there is an increasing trend in the prevalence of childhood asthma in both urban and rural areas of Nigeria. The symptom severity, level of diagnosis, and use of standard asthma management protocol, even though unacceptably low in both geo-locations was significantly higher in urban area compared to rural area.

Training and re-training of health workers on early diagnosis and standard management protocol as well as commencing regular follow up clinics for childhood asthma patients were recommended.
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CHAPTER ONE
INTRODUCTION

1.1 BACKGROUND OF THE STUDY

Asthma is a very common chronic illness affecting children, and it is a major global health problem in developed countries.\(^1\) A consistent trend for higher prevalence of wheezing and asthma in more affluent westernized societies has been shown repeatedly.\(^2\) Among children, higher prevalence rates have been found in industrialized Western countries than in developing countries of Asia and Africa.\(^3\)

Despite modern treatment approaches recommending usage of potent anti-inflammatory (corticosteroid) drugs, asthma prevalence, morbidity and mortality in childhood are all increasing worldwide.\(^1\), \(^4\), \(^5\), \(^6\) Several studies from different parts of the world that used serial questionnaire surveys are reporting an increased prevalence of asthma, and also that there is wide variability in prevalence between populations.\(^7\) It appears that differences in asthma prevalence between population groups are due to differential exposure to environmental factors; genetic variation alone could not account for the rise in the prevalence of disease over a few decades.\(^5\) Allergen exposure in early life appears to correlate with sensitization and expression of asthma and atopy.\(^5\) Lifestyle factors, including diet and ambient air quality may be disease modifiers.\(^8\) These differences may be real or they may reflect study methodology.\(^9\) The etiology of these conditions remains poorly understood, despite a large volume of clinical and epidemiological research within populations that has been directed at explaining why some individuals and not others develop asthma and allergies.\(^2\) Numerous surveys have been conducted in various
countries, and there is a large body of literature on the subject. At the moment, there is considerable interest in the international comparison of asthma prevalence, stimulated by the growing evidence of an increment in the frequency. Numerous studies have assessed the epidemiology of asthma on the basis of morbidity and mortality data or from questionnaires. Among the different studies designed for this objective, the ISAAC (International Study of Asthma and Allergies in Childhood) project has had universal acceptance.

ISAAC was created in 1991 to facilitate research into asthma, allergic rhinitis and eczema by promoting a standardized methodology. ISAAC developed from a merger of two multinational collaborative projects, each of them examining variations in childhood asthma. These were an initiative from Auckland, New Zealand to conduct an international comparative study of asthma severity and an initiative from Bochum, Germany for an international study to monitor time trends and determinants of the prevalence of asthma and allergies in children. The ISAAC project is made up of three phases: Phase I, Phase II and Phase III. ISAAC was the first study carried out worldwide using standardized questionnaires in order to create a reliable global map of childhood allergy.
1.2 STATEMENT OF PROBLEM

It is now estimated that as many as 300 million people of all ages, and all ethnic backgrounds, suffer from asthma and the burden of this disease to governments, health care systems, families, and patients is increasing worldwide. In 1989, the Global Initiative for Asthma (GINA) program was initiated with the U.S. National Heart, Lung, and Blood Institute, National Institute for Health (NIH) and the World Health Organization (WHO) in an effort to raise awareness among public health and government officials, health care workers, and the general public that asthma was on the increase. The GINA program recommends a management program based on the best available scientific evidence to allow doctors to provide effective medical care for asthma tailored to local health care systems and resources. Working in continued collaboration with leaders in asthma care from many countries, and with GINA sponsors, World Asthma Day (first Tuesday in May) has been extremely successful, increasing in numbers of participants each year.\(^{11}\)

The rate of asthma increases as communities adopt western lifestyles and become urbanized. This is because most western processed food items are antigenic and with urbanization and industrialization, a lot of environmental pollutants are emitted to the atmosphere that are antigenic and irritants to the airways. With the projected increase in the proportion of the world's population that is urban from 45% to 59% in 2025, there is likely to be a marked increase in the number of asthmatics worldwide over the next two decades. It is estimated that there may be an additional 100 million persons with asthma by 2025. Asthma is estimated currently to account for about 1 in every 250 deaths worldwide. \(^{11}\) The number of disability-adjusted life years (DALYs) lost due to asthma
worldwide has been estimated to be currently about 15 million per year, and ranked 25th leading cause of DALYs lost worldwide. It also accounts for around 1% of all DALYs lost, which reflects the high prevalence and severity of asthma. The number of DALYs lost due to asthma is similar to that for diabetes, cirrhosis of the liver, or schizophrenia.\textsuperscript{11} The economic cost of asthma is considerable both in terms of direct medical costs (such as hospital admissions and cost of pharmaceuticals) and indirect medical costs (such as time lost from work and premature death).\textsuperscript{11}

New Zealand has one of the highest prevalence rates of asthma in the world, with asthma occurring in about 15\% to 20\% of children and adults and affecting at least 600,000 people.\textsuperscript{12}

Similarly, the burden of asthma in United States of America (USA) has increased in the last two decades. Trend from 2003 to 2005 clearly showed this increase. In 2005, there were three (3) different asthma prevalence estimates: Lifetime asthma diagnosis, Current asthma and Asthma attack prevalence.\textsuperscript{13} Current asthma was then estimated at 7.7\% of the population of 22.2million people. This decreased with age; 8.9\% of children (6.5million) compared to 7.2\% of adults (15.7million). Asthma attack was estimated at 4.2\% of the people (12.2million) had at least one attack in the previous year. This also decreased with age; 5.2\% of children (3.8million) compared to 3.9\% of adults (8.4million). Lifetime asthma diagnosis of 11.2\% of people (32.6million) had ever been diagnosed with asthma during their lifetime. On the contrary, this increased with age; 10.7\% of adults (23million) compared to 12.7\% of children (9million).

GINA study ranks Nigeria as number 49 in its ranking of 84 countries with prevalence of current asthma symptoms in childhood. That is, cases of self-reported wheezing in the
previous 12 months period in 13 to 14 year-old children. The study also reveals that 5.4 per cent (about 6 million) of Nigerians suffer from asthma. The study however failed to provide more information on the situation in Nigeria due to lack of standardized data.\textsuperscript{11} Oduwole noted that half of all cases of asthma develop before the age of 10 years and about 80\% of this develops before the age of 5 years. It is the third major cause of hospitalization in children younger than 5 years because their airways are very narrow and they have smaller lungs.\textsuperscript{14} A study on under 5 mortality pattern in Lagos state, Nigeria shows that acute asthma contribute 0.6\% to total death.\textsuperscript{15} This compares with the mortality rate of childhood asthma in Benin city, Nigeria of 0.83\%.\textsuperscript{16} Mortality in Nigeria generally noted to be less than 1\%. Asthma mortality was seen more in girls especially during or near puberty. In these cases, death occurs suddenly, often following extreme excitement or agitation. Many of the deaths are preventable, being due to suboptimal long-term medical care and delay in obtaining help during the fatal attack.\textsuperscript{16} Nigeria was classified by WHO as one of the countries with less than 50\% access to essential drugs, including asthma medications.\textsuperscript{11}

Some factors postulated to contribute to the rise of asthma prevalence worldwide, including Nigeria are as follows: Eating junk foods joints containing less fiber, mineral salts and other nutrients that protect against asthma; sedentary lifestyle in children especially in urban areas which include spending time watching television, video, playing computer games and thus over exposure to indoor allergens; higher survival of low birth weight infants (Premature infants), who have been proven to be more susceptible to asthma; reduced breastfeeding despite campaign for exclusive breastfeeding, as omega-fatty acids in breast milk protect against asthma.\textsuperscript{14} Although about one third of all cases
of asthma are hereditary, there is also a relationship between early childhood respiratory and intestinal infections (especially of viral origin) and development of asthma in later age.\textsuperscript{14}

1.3 RATIONALE FOR THE STUDY

Despite the large body of literature on asthma especially on clinical and epidemiological surveys within populations, the prevalence, morbidity and mortality has continued to increase worldwide. The advent of ISAAC and GINA started worldwide comparison studies with standardized instruments. These bodies have also been involved in advocacy and health education. They have brought to limelight the burden of asthma worldwide as to become of public health interest.

Studies have shown great variability in the prevalence of asthma across regions of the same country and across countries of the world due to differential exposure to environmental factors, genetics, lifestyle and ambient air quality.\textsuperscript{10, 11} It is likely that above variations may also exist between different settlements of the same region of a country i.e. rural and urban area especially from lifestyle and environment. Studies have also shown that severity of asthma symptoms, the way it is perceived, diagnosed and managed vary from country to country.\textsuperscript{17} A lot more is known about asthma, and its management has been dynamic, undergoing constant review by GINA working group.\textsuperscript{18} How much of this new trend is known and practiced in Nigeria?

Although interest has awakened for asthma studies in Nigeria, most studies have been done in the western and northern axis of the country. Little studies have been conducted in the eastern part of the country. There are no studies in Nigeria currently to the best of
my knowledge that looked at local prevalence, demographics, symptoms, diagnosis and management of asthma in Enugu or any other eastern sub region. This study compared above mentioned parameters within the urban and rural sub-regions of the eastern part of Nigeria. The result is compared with standard practices, similar studies done elsewhere in the world and trends determined. Capacity building need areas were identified and better awareness will be created through training and retraining of health workers, mass mobilization and health education, as well as well-coordinated intervention government policies. All these will aim at helping to achieve the Millennium Development Goal (MDG) 4 of significantly reducing child mortality by 2015.
1.4 AIMS AND OBJECTIVES

1.4.1 General Objective

To compare the prevalence, symptoms and management of childhood asthma in rural and urban areas of Enugu State.

1.4.2 Specific Objectives

1. To determine the prevalence of childhood asthma in urban and rural areas of Enugu.

2. To elicit the symptoms of childhood asthma in urban and rural areas of Enugu.

3. To determine the management modalities of childhood asthma in urban and rural areas of Enugu.

4. To compare 1-3 in urban and rural areas of Enugu.
1.5 HYPOTHESES

1. \( H_0 \) – There is no significant difference in the prevalence of childhood asthma between the urban and rural areas of Enugu.

\( H_1 \) - There is a significant difference in the prevalence of childhood asthma between the urban and rural areas of Enugu.

2. \( H_0 \) – There is no significant difference in the symptoms of childhood asthma between the urban and rural areas of Enugu.

\( H_1 \) -- There is a significant difference in the symptoms of childhood asthma between the urban and rural areas of Enugu.

3. \( H_0 \) ... There is no significant difference in the management of childhood asthma between the urban and rural areas of Enugu.

\( H_1 \)---There is a significant difference in the management of childhood asthma between the urban and rural areas of Enugu.
CHAPTER TWO

LITERATURE REVIEW

2.1 EPIDEMIOLOGY

Epidemiologic surveys concerning the prevalence of asthma have documented that Asthma is on the increase and is often not recognized especially at the mild end of the asthma spectrum. This increase is more in urban compared to rural areas and also in affluent compared to developing countries of the world. For example: a study in Gambia in 1975 on over 1000 people had no case of asthma found; but a similar study in 1997 showed a prevalence of 3% in a rural Gambia population.

Global burden of Asthma Report” estimates that nearly 50million Africans currently have asthma, with the greatest prevalence of 8% of south African’s sspopulation. It also reported a burden estimate of 300million people worldwide a number that could increase by a further 100million by 2025. This increase in prevalence informed the need for a “world asthma Day”, currently held each year on the first Tuesday in May and sponsored by Global Initiative for Asthma (GINA).

Average prevalence of asthma in a given community was put at about 5 – 10% among children while a further 3 – 5% has undiagnosed asthma. Worldwide prevalence vary from one community to another; lower in rural areas. Oni and Erhabor in a cross-sectional study on 120 asthmatic patients in Bayelsa, Nigeria, noted asthma prevalence of 6.6% among respiratory unit patients; Oviawe reported 0.7% among children in the rural community in Benin. Case fatality rate is generally low, <1% worldwide, 0.83% in Benin series. Girls are more often affected and whose ages are usually at or near puberty. Local airway resistance studies have also been done in Benin-city, Ibadan,
There has been increasing numbers of studies comparing prevalence of asthma worldwide. Recent studies reported that the prevalence of asthma and atopic diseases varied widely between and within countries, with affluent English speaking countries having the highest levels.\textsuperscript{2,4} Above difference in prevalence was attributed to different allergen exposure, different environmental factors or different racial susceptibility.\textsuperscript{5}

Ethnic background, age, body mass index and residential area are significantly associated with atopic symptoms and disease as shown in a Brazilian study done on adolescents.\textsuperscript{6}

Similarly in USA, a survey for risk factors of pediatric asthma was looked at for children 0 -17yrs, looking at race and environment and hypothesized that urban residence is an independent risk factor for childhood asthma after controlling for race, poverty and other environmental and demographic variables.\textsuperscript{7,8}

### 2.2 PATHOPHYSIOLOGY

There is evidence to show allergy and immunologic basis of atopic diseases, especially asthma.

Twin studies suggest that 75\% of the variance in asthma is due to genetic factors. Atopic susceptibility genes may be involved in the regulation of specific IgE antibody production or in mediating the effector functions of IgE. Although no single "atopic gene" has been discovered, atopy has been linked to certain human leukocyte antigen (HLA) histocompatability types as well as to various chromosome loci (11q, 14, and 5q). Polymorphisms of the beta2 receptor have been associated with some types of asthma.
Furthermore, altered signal transduction secondary to an allele of the IL-4 receptor is associated with atopy. In contrast to classic mendelian recessive or dominant traits, it is possible that multiple major and minor genes involved in the inflammatory pathway (enhancers, modifiers, inhibitors) are responsible for atopy in individual families. There may be one specific gene involved in each affected family, or a combination of different genes may produce atopy.\(^9\)

The pathological findings in patients with fatal asthma have several cardinal features: occlusion of the bronchial lumen with tenacious secretions, hyperplasia of goblet cells and submucosal glands, thickening of the basement membrane, and tissue eosinophilia and, perhaps more important, infiltration by neutrophils. The recruitment of neutrophils into the bronchi probably depends on additional, as yet unexplored mechanisms that are activated in patients at risk for fatal asthma.\(^{10}\)

### 2.3 TRIGGER FACTORS

By skin prick testing, the following were found to be common allergens that trigger asthmatic attack. They include:\(^4\)

- House dust mite (*Dermatophagoides pteronyssinus* and *Dermatophagoides farinae*).
- House dust.
- Rye grass.
• Mould (Aternaria tenius and Cladosporum).
• Cat dander.
• Cockroach.

Again environmental factors that can trigger asthmatic attack not commonly sort for but significant, include the use of Aspirin (sensitivity in 1:5 asthmatics) and other Non-steriodal anti-inflammatory agents like Ibuprofen, diclofenac and Naproxen. Others include antihypertensive and strong eye drops for glaucoma.  

2.4 CLINICAL FEATURES

It is a chronic inflammatory disorder (CID) of the air ways, which is associated with airway dual component disease (Inflammation and bronchospasm) whose symptoms and signs depend on the severity of the disease. The defining symptoms are; cough, which could be nocturnal or early morning especially in young children (in about one-third of cases), wheeze, shortness of breath; chest tightness or soreness, prodromal symptoms may be apparent e.g. itching of parts of the body appearance of rash, abdominal pain, mood changes etc. Factors associated with the onset of asthma symptoms in children include:-

• Smaller airways at birth and in early life.
• Exposure to tobacco smoke.
• Male sex.
• Low birth weight.
• A parent, especially the mother, with allergies or asthma.
• Other family members with asthma and allergies.
• Viral respiratory infections.

Symptoms of asthma vary with age. For example, high prevalence of atopic conditions among children 6 – 7yrs old in Ibadan, Nigeria, with more than 60 percent (3/5th) of the children with current wheezing also showing symptoms of other atopic disease.\(^{17}\)

Similarly a Dutch study on prevalence of atopic diseases amongst early adolescents aged 12 – 14yrs showed a rising trend with a 12month prevalence of self-reported wheezing, rhinitis and itchy rash of 12.3%, 28.3% and 13.5% respectively.\(^{17}\)

Girls and adolescents with lower education levels are at higher risk of self-reported atopic symptoms. There are speculations that asthma symptoms that appear in adulthood may be a reoccurrence of asthma that had gone into remission during the early adolescent years. This supposes that the prevalence may be generally low during this early adolescent age.

The clinical features of asthma generally include respiratory distress (breathlessness); tight chest/difficult breathing (dyspnea); apprehension; cough with possible audible wheeze. Cough may be severe enough to trigger post-tussive vomiting.\(^{24}\)

The findings on examination of these children could be any of the following depending on the severity; sweating, flaring of the alar nasi, raised shoulders and leaning forward, usage of the accessory respiratory muscles(intercostal, subcostal, supra-ternal recessions) with arms to side and palms down to support. Other findings include pallor, tachycardia, tachypnea, distended chest that is congested with rhonchi on auscultation, signs of dehydration depending on the duration of attack, decreased oxygen saturation with or without cyanosis, significant drop in peak expiratory flow rate (in children over 5yrs) and good response to bronchodilator therapy.\(^{24,25}\)
The most predominant symptom of asthma noted in a Nigerian study is breathlessness during attacks. This is seen in 100% of cases in that series. Cough and wheezing were the next most common, both occurring in about 96% of cases in this series. Other common and frequent symptoms include sweating (mostly profuse on the forehead), anorexia and loss of weight. These symptoms occur while the attack lasts and abates soon after it ceases. Chest pain and headaches are usually volunteered by patients older than five (5) years. Hemoptysis (often small and infrequent) can also be seen in about 4% of bronchial asthma patients.

Remembering that in developing countries, asthma is second only to pulmonary tuberculosis as the commonest cause of chronic respiratory illness in children, care must be taken not to misdiagnose bronchial asthma for pulmonary tuberculosis (PTB). PTB presents with cardinal symptoms of cough, fever, anorexia, weight loss and night sweats, which also occurs in asthma. Even hemoptysis as been shown above, occurs in small proportion of asthmatics. To avoid this misdiagnosis, we shall later see the symptoms clinicians should lay emphasis on especially in developing countries.

2.5 DIAGNOSIS

Studies have shown that diagnosis and treatment patterns differ between racial groups for comparable severity of the disease. In non-affluent countries cough is more likely to be diagnosed as an infection such as pneumonia or tuberculosis than as asthma because these infections are common. However, in affluent countries cough is likely to be diagnosed as asthma.
There is reported high prevalence of rhino-conjunctivitis and eczema in some non-affluent countries like Nigeria where prevalence of the symptoms of asthma was low.\textsuperscript{14}

For above reasons, including lack of respiratory specialists and diagnostic tools in Nigeria, making diagnosis is often delayed or misdiagnosed. A study at Ibadan looked at the prevalence of asthma symptoms among University Students 15 – 35 years of age in Obafemi Awolowo University, Ile-Ife, Osun State and conclusion indicate a relatively high prevalence of asthma among the students with greater proportion of them not being diagnosed and were not receiving proper treatment.\textsuperscript{15}

This is compounded by the fact that lots of other causes of chronic respiratory disease abound in developing countries especially in childhood.

These other causes constitute the differential diagnosis of childhood asthma and include the following: \textsuperscript{25}

**Wheeze present from birth:**

- Presents immediately, constant wheeze without variation - structural abnormality e.g. bronchogenic cyst, vascular ring
- Weak cry, stridor - laryngeal abnormality
- Signs of heart failure - congenital heart disease

**Wheeze present shortly after birth:**

- History of prematurity or ventilation - bronchopulmonary dysplasia
- Recurrent bacterial infections and failure to thrive (FTT) - immunodeficiency
- Persistent cough and FTT, family history of chest disease - cystic fibrosis
- Persistent nasal discharge and otitis media - ciliary dyskinesia
- Vomiting and aspiration - gastro-oesophageal reflux (GORD)

  Sudden onset in a previously well child:

- History of choking, unilateral reduced breath sounds - foreign body
- Persistent wet cough - cystic fibrosis, bronchiectasis, recurrent aspiration, immunodeficiency, ciliary dyskinesia
- Failure to thrive - cystic fibrosis, immunodeficiency, GORD
- Finger clubbing, purulent sputum - cystic fibrosis, bronchiectasis
- Focal signs in the chest - developmental anomaly, post-infection, bronchiectasis, tuberculosis, foreign body
- Others include – bronchiolytis, chronic bronchitis, parasitic lung infestation.

Diagnosis could be made for epidemiological purposes by using the International Study on Asthma and Allergies in Childhood (ISAAC) questionnaire.² This questionnaire has eight (8) core questions which has been validated and a global diagnostic sensitivity of 64.7% which is low, but a high specificity of 91.6% and satisfactory positive and negative predictive value.²⁶ It has been applied in epidemiological studies done in various countries of the world.

1) Diagnosis of asthma in acute situation is basically from history of at least three attacks(recurrent) breathlessness and wheezing²⁷, often associated with cough with or without auscultatory finding of widespread respiratory rhonchi (mainly expiratory).

To avoid misdiagnosis, great emphasis should be placed on the history of recurrent attacks of breathlessness as on wheezing, for it is much easier to obtain a history of breathlessness than of wheezing in Africa where there is often no vernacular equivalents of the word and where to elicit such symptoms the examiner must be able to mimic the wheezing sound.
2) Diagnosis in acute situation is further supported by the use of Wright’s peak expiratory flow meter or a spirometer. These instruments measure airway resistance.

During acute attacks and with administration of $\beta$-agonists like Salbutamol, a significant improvement in peak expiratory flow rate in one second (PEFR$_1$) by 20% is diagnostic of asthma.$^{17}$

Exercise induced asthma can also be diagnosed with this Wright’s Peak Flow meter by demonstrating a reduction in PEFR$_1$ of 12% following a 6 minute free range (running) exercise obtained 3 minutes later.$^{28}$

Other types of bronchial hyper responsive tests can be done with metacholine or mannitol, where their administration precipitates an acute attack with a drop in baseline PEFR$_1$ of 15%. This is dangerous and often discouraged as a way of making diagnosis in clinical setting and a $\beta$- agonist (e.g. Salbutamol) must be handy for use as soon as possible, if this test must be performed.$^{28}$

Having made the diagnosis of asthma, the patients can be categorized based on severity of their asthma symptoms under the following sub-headings according to the GINA recent guildline,$^{11,18}$ under Intermittent; mild persistent; moderate persistent; severe persistent and life threatening asthma.
There are 5 levels of severity:

<table>
<thead>
<tr>
<th></th>
<th>Symptoms/Day</th>
<th>Symptoms/Night</th>
<th>PEF %</th>
</tr>
</thead>
<tbody>
<tr>
<td>Intermittent</td>
<td>Less than 1/week</td>
<td>Less than 2/month</td>
<td>80% or more*</td>
</tr>
<tr>
<td>Mild Persistent</td>
<td>More than 1/week, but not daily</td>
<td>More than 2/month</td>
<td>80% or more</td>
</tr>
<tr>
<td>Moderately Persistent</td>
<td>Daily</td>
<td>More than 1/week</td>
<td>60% - 80%</td>
</tr>
<tr>
<td></td>
<td>Interferes with activity</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Severe Persistent</td>
<td>Continuously</td>
<td>Frequent</td>
<td>below 60%</td>
</tr>
<tr>
<td></td>
<td>Limits activity</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Life threatening</td>
<td>Continuously</td>
<td>Daily(very frequent)</td>
<td>below 33%</td>
</tr>
<tr>
<td></td>
<td>Limits activity</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*Percentage of predicted PEF

Patients at any level of severity - even intermittent asthma, can have severe attacks at times.

2.6 MANAGEMENT/TREATMENT

The severity of asthma determines the type of treatment needed.

There are six steps in the successful management of this condition: 29 education, monitoring severity, avoiding risk factors, a long-term medication plan, a plan for treating attacks, and good follow-up care.
2.6.1 Education

This implies getting the patient actively involved in managing their asthma, based on the following:

- Knowledge of their own risk factors,
- How to take their medications correctly,
- Knowing which medications are used for long-term control ('preventers' or 'controllers') and which are for relieving an attack ('relievers'),
- How to monitor their severity using symptoms and a PEF meter, and
- How to take action when asthma is worsening, seeking medical help if necessary.

A written plan is highly desirable. It should be completed by the doctor and the patient, working together. This include parent and self administered questionnaire known as asthma control test (ACT) and asthma calendar all for monitoring therapy.

2.6.2 Monitoring Severity

Long-term PEF monitoring at home is the best way to recognize early signs of worsening of asthma - a reading less than 80% of one's personal best is an alert. Regular doctor's visits are necessary, when the following check-list can be discussed:

- Are you meeting your asthma plan management goals?
- Are you using your inhaler, spacer, and peak flow meter correctly?
- Are you taking your medications, and avoiding your risk factors, according to plan?
- Do you have any concerns?
If necessary, medications can be adjusted, and the management plan modified to suit new circumstances.

### 2.6.3 Avoiding Risk Factors

Common risk factors and ways to evade them are given below:

<table>
<thead>
<tr>
<th>Risk Factor</th>
<th>Avoiding Action</th>
</tr>
</thead>
<tbody>
<tr>
<td>Domestic dust mite allergens</td>
<td>Wash bed linen weekly, keep pillows and mattress in air-tight covers, and replace carpets with linoleum etc, use vinyl, leather or wood furniture. Vacuum with a filter.</td>
</tr>
<tr>
<td>Tobacco smoke</td>
<td>Avoid all tobacco smoke</td>
</tr>
<tr>
<td>Allergens from furry animals</td>
<td>Ban animals from home, or at least bedroom.</td>
</tr>
<tr>
<td>Cockroach allergen</td>
<td>Clean suspect areas regularly, and spray.</td>
</tr>
<tr>
<td>Outdoor pollens and molds</td>
<td>Windows and doors shut when counts are high</td>
</tr>
<tr>
<td>Indoor molds</td>
<td>Reduce dampness in the home.</td>
</tr>
<tr>
<td>Physical activity</td>
<td>Don't avoid exercise - use an inhaler first!</td>
</tr>
<tr>
<td>Drugs</td>
<td>No beta-blockers, aspirin, or NSAIDs if these cause symptoms.</td>
</tr>
</tbody>
</table>
One can consider allergy injections to attempt desensitization to grass, other pollens, dust mites, animal dander, etc. if avoiding the allergen is not possible, or medications fail to control the symptoms of exposure.

2.6.4 Long-Term Medication (Preventers/Controllers)

The number of medications used is increased (stepped up) as greater control is needed, and decreased (stepped down) when the condition is under control. This is the stepwise approach in management.

Anti-inflammatory drugs, in particular inhaled steroids, are at present the most effective preventers. It is best to obtain control promptly with a high level of treatment (e.g. addition of an extra drug to the regular therapy the patient is taking), and then step down.

Stepping up is necessary if control is not achieved and sustained within a month. Stepping down can be done if control is sustained for at least 3 months. And once the asthma is under control, treatment should be reviewed every 3-6 months.

Preventer medications include:

- Glucocorticosteroids - inhaled, tablets, or syrup
- Sodium cromoglycate - inhaled
- Long-acting beta-2 agonists (LABA) - inhaled, tablets
- Sustained release theophylline - oral
- Antileukotrienes - e.g. montelukast, pranlukast
A common example of this in our environment now is Seretide (by GlaxoSmithKline), which is a combination of inhalational salmeterol (LABA) and fluticazone (inhaled steroid).

2.6.5 Treating Asthma Attacks (Relievers)

Never underestimate the severity of an attack; a severe attack may be life-threatening.

Seek medical care if the patient is:

- breathlessness at rest
- hunched forward position
- talking in words rather than sentences
- agitated, drowsy, or confused
- respirations over 30/minute, or pulse over 120/minute
- PEF less than 60% of personal best even after initial treatment
- no improvement within 2 hours after oral glucocorticosteroid
- response to bronchodilator treatment is not sustained for 3 hours

Prompt treatment with reliever medications is needed, starting with an inhaled short-acting beta-2 agonist (SABA) in adequate doses e.g. Albuterol, Feneterol, and Salbutamol. Oral steroid therapy is begun early. Other reliever drugs may be used as required.

Reliever medications include:

- Short-acting beta-2 agonists (SABA) - usually inhaled; also tablets, syrup
• Anticholinergics - inhaled: e.g. ipratropium, oxitropium
• Short-acting theophylline - intravenous infusion
• Epinephrine/adrenaline - by injection

The following are not recommended for acute asthma attacks:

• Sedatives
• Mucolytic agents - they may worsen cough
• Physical therapy to the chest
• Hydration with large volumes of fluid
• Antibiotics - unless there is a bacterial infection

2.6.6 Regular Follow-Up Care

Once asthma is controlled, the patient should make regular follow-up visits to his physician, or the clinic that is helping to manage his/her asthma. The interval - between 1 and 6 months - varies with the individual and the ease with which the condition is controlled.
There are four difficult forms of asthma: acute severe asthma with recurrent attacks, chronic difficult asthma, brittle asthma, and fatal asthma.

In some patients, asthma is not a problem on most days, but it occasionally causes sudden, severe attacks that necessitate unscheduled hospital visits and repeated courses of systemic corticosteroids. This unstable condition is called brittle asthma. The attacks often occur without an obvious trigger and may be life-threatening.\(^\text{10}\)

The risk factors for death from asthma include previous attacks requiring intubation, respiratory acidosis, hypercapnia, severe attacks despite long-term use of oral corticosteroids, and attacks complicated by pneumothorax. Depression, other psychiatric disorders, or the excessive use of inhaled ß-agonists increases the risk of death.\(^\text{10}\) In Nigeria, acute severe asthma was shown to contribute 0.6% of all under 5 mortalities; with the highest contributors being bronchopneumonia(13.5%), sepsis(12.4%), anaemia(8.1%) and malaria(7.9%) in that order.\(^\text{15}\)

List of possible outcomes of asthma include: School absenteeism; Home confinement; Hospitalization; Status asthmaticus; Asphyxia and Death. Others include: Cardiac arrest, pneumothorax, pectus carinatum, short stature, eosinophilia, respiratory failure, pulsus paradoxus, chest hyperinflation, chest hypo expansion and bronchospasm.\(^\text{30}\)
CHAPTER THREE
MATERIALS AND METHOD

3.1 STUDY AREA

This study was done in Enugu state.

Enugu State is an inland state in southeastern Nigeria. Its capital is Enugu. The principal cities in the state are Enugu and Nsukka. It is one of the states in the south eastern part of Nigeria. The state shares borders with Abia and Imo States to the South, Ebonyi State to the East, Benue State to the Northeast, Kogi State to the northwest and Anambra State to the West.

Lying partly within the semi-tropical rain forest belt of the south, the state spreads towards the north through a land area of approximately 8727.1 km². Its physical features change gradually from tropical rain forest to open wood-land and then to Savannah. Apart from a chain of low hills, running through Abakaliki, Ebonyi state in the east to Nsukka in the north-west and southwards through Enugu and Awgu, the rest of the state is made up of low land separated by numerous streams and rivulets, the major ones of which are the Adada River and the Oji River.

Enugu has good soil and climate, sitting at about 223 meters above sea level, and the soil is well drained. The mean temperature in Enugu state in the hottest month of February is about 36.2 °C (97.16F), while the lowest temperatures occur in the month of November, reaching 20.3 °C (68.54F). The amount of rainfall measured in this state varies between 0.16cm³ in February and about 35.7cm³ in July. Economically, the state is predominantly rural and agrarian, with a substantial proportion of its working population engaged in farming, although trading (18.8%) and civil services (12.9%) are also important. In the
urban areas trading is the dominant occupation, followed by civil services. A small proportion of the population is also engaged in manufacturing activities, with the most pronounced among them located in Enugu, Oji, Ohebedim and Nsukka.

There are 17 Local Government Areas in Enugu State:

<table>
<thead>
<tr>
<th>RURAL</th>
<th>URBAN</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Aninri</td>
<td>1. Enugu-North</td>
</tr>
<tr>
<td>2. Awgu</td>
<td>2. Enugu-South</td>
</tr>
<tr>
<td>3. Ezeagu</td>
<td>3. Enugu-East</td>
</tr>
<tr>
<td>5. Igbo-Eze-North</td>
<td></td>
</tr>
<tr>
<td>6. Igbo-Eze-South</td>
<td></td>
</tr>
<tr>
<td>7. Isi-Uzo</td>
<td></td>
</tr>
<tr>
<td>8. Nkanu-East</td>
<td></td>
</tr>
<tr>
<td>9. Nkanu-West</td>
<td></td>
</tr>
<tr>
<td>10. Oji-River</td>
<td></td>
</tr>
<tr>
<td>11. Udenu</td>
<td></td>
</tr>
<tr>
<td>12. Udi</td>
<td></td>
</tr>
<tr>
<td>13. Uzo-Uwani</td>
<td></td>
</tr>
</tbody>
</table>
3.2 INCLUSION CRITERIA:

Pupils 8 years to 12 years in the schools chosen for study whom the parents or guardian gave an informed consent.

The age 8-12 years was chosen because below this age group childhood asthma would have other confounders like the transient early wheeze due to small lung capacity and narrow airways and persistent early onset wheeze associated with acute viral respiratory infections, often no evidence of atopy and no positive family history. On the other hand, above this age range, adolescence is fully established during which most asthma symptoms become quiescent due to effect of puberty hormones.

3.3 EXCLUSION CRITERIA:

1. Pupils of study age group that are not registered members of the chosen primary schools.

2. Pupils less than age 8 years of age.

3. Pupils more than 12 years of age.

4. Pupils that were chosen but the parents or guardian failed to give informed consent.
3.4  STUDY DESIGN
This is a cross-sectional study design, in which a parent/caregiver’s administered modified ISAAC questionnaire is applied to a sample of primary school pupils aged 8 to 12 years in both urban and rural areas, to compare the prevalence, symptoms, diagnosis and management of childhood asthma in these two geo-locations in Nigeria.

3.5  STUDY POPULATION
Enugu State has an estimated population of 3,140,471 people from the 2006 National Census. This population is a mix from different works of life in terms of occupation, religion and educational attainment. Majority of the residents are Igbo speaking (95% of the population), the Igala and other ethnic groups also live within the metropolis.

3.6  SAMPLE SIZE AND SAMPLING METHOD
The minimum sample size is determined using the formula;  

\[ n = \frac{2Z^2p(1-p)}{d^2} \]

where:

\( Z \) = A constant for the two groups.

\( n \) = Minimum sample size required

\( p\% \) = Proportion belonging to the specified category

\( (1-p)\% \) = Proportion not belonging to the specified category

\( Z \) = Value corresponding to the level of confidence
d% = Margin of error required(4%)

The sample size was determined using the above formulae, and the prevalence of 10.2% of a study done on Nigerian children.\textsuperscript{17}

Level of significance, $Z_{0.05} = 1.96$

Desired precision (allowable error) $d% = 0.04$

\[ p = 0.102 \]

\[ 1-p = 0.898 \]

\[ n = 2 \times (1.96)^2 (0.102) (0.898) / (0.04)^2 \]

\[ = 432 \]

The minimum sample size is approximately 480 given an anticipated 10% non – response rate.

\[ 480 / 2 = 240 \text{ for rural area.} \]

\[ \text{Same number } = 240 \text{ for urban area. Thus, total sample size is 480 subjects.} \]

3.7 SAMPLING

Multi - stage cluster sampling technique was used for this study.

The target population in this study was primary school pupil aged 8 to 12 years old from both urban and rural communities of Enugu state. A sample of 480 pupils was selected using above sampling technique.
First, the seventeen (17) local government areas (LGAs) were stratified into two groups—urban and rural as earlier grouped. Then one urban (Enugu-North) and one rural (Agwu) LGAs were randomly selected by balloting.

In the second stage, one urban school after another (Spring of life and Bright Eyes primary schools) and two rural schools as above (Obodoakpu and Obute memorial primary schools) were selected from the list of approved government and private primary schools.

In the third stage, the pupils aged 8-12yrs were drawn from classes 3-6, using the cluster sampling method. First simple balloting was used to choose one class of 3A, 3B, 3C, 3D….etc, and then the whole class was sampled until the required number of 60 pupils was obtained. If one class is not up to 60 pupils, another class from the remaining is obtained by repeat balloting and everyone in the class had equal chance of being chosen until the required number (60) was obtained. The same procedure was repeated for classes 4, 5 and 6; giving a total of 240 pupils for each of the selected LGAs.

3.8 ETHICAL CONSIDERATIONS

Ethical approval for the study was obtained from the research ethics committee of the University of Nigeria Teaching Hospital Enugu. Permission to carry out the study was obtained from the head of the schools and private primary schools in each of the LGAs chosen randomly again by balloting.
3.9 CONSENT

A written consent was obtained from the parents or care-givers of the subjects after
detailed explanations were given to them on the objectives of the study.

3.10 SURVEY INSTRUMENT AND DATA COLLECTION

The survey instruments were the parent/guardian administered modified International
Study of Asthma and Allergies in Childhood (ISAAC) questionnaire, Meter rule and
weight measuring scale.

ISAAC questionnaire is a standardized tool designed in 1991 to promote standardized
methodology and facilitate research into asthma, allergic rhinitis and eczema in childhood
for worldwide uniformity and comparison.\textsuperscript{11}

The questionnaire was distributed among the selected respondents. They took it home
along with the consent forms, were filled by the parents or care-givers and then returned
back the next day. The questionnaire was made as simple as possible for clarity and to
avoid misinterpretation. For illiterate parents/ care-givers, they were asked to come to the
school where the child’s school teacher and my team assisted them to fill it. A copy of the
questionnaire is attached as appendix.

The next day, for those that gave consent and filled their questionnaire, height and weight
was measured, and body mass index (BMI) calculated. Those who did not return their
questionnaire or had some sections incorrectly filled, were traced or contacted by
telephone for clarifications.
3.11 DATA ANALYSIS

The data obtained were analyzed with the computerized statistical package for social science (SPSS) version 11.0.

Chi-square $X^2$ – test (level of significance of 0.05) was used to determine the statistical significance of observations.
CHAPTER FOUR

4.0 RESULTS

There were four hundred and eighty five children enrolled during the study period from January 2010 to February 2010, during the dry season when the symptoms of asthma was expected to be high. The participants were drawn from schools in Enugu North Local Government Area (Urban) and Agbogugu in Awgu Local Government Area (Rural). The results of this study are based on two hundred and forty one (241) respondents drawn from urban schools in Enugu North LGA and two hundred and forty-four (244) respondents drawn from rural schools in Agbogugu, Awgu LGA, both of Enugu state, Nigeria.

In the urban area, of the three hundred and seventy (370) questionnaires distributed, only two hundred and forty-one (241) gave informed consent and completed, giving a participation rate of 65.1%, while in the rural area of the two hundred and sixty (260) questionnaires distributed, two hundred and forty-four (244) gave informed consent and completed, giving a participation rate of 93.9%.
4.1 DEMOGRAPHIC AND OTHER CHARACTERISTICS OF THE STUDY POPULATION

Table I: Demographic Characteristics Distribution of Respondents.

<table>
<thead>
<tr>
<th>SERIAL NO.</th>
<th>Demo-character</th>
<th>URBAN</th>
<th>RURAL</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Sex</td>
<td>Male N (%) 118 (49.0)</td>
<td>172 (70.5)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Female N (%) 123 (51.0)</td>
<td>72 (29.5)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Male: Female ratio 1 : 1</td>
<td>2.4 : 1</td>
<td></td>
</tr>
<tr>
<td>2. Mean Age (years ± S.D)</td>
<td>8.53 ± 1.5</td>
<td>10.04 ± 2.0</td>
<td></td>
</tr>
<tr>
<td>Total no of respondents. N (%)</td>
<td>241 (100)</td>
<td>244(100)</td>
<td></td>
</tr>
</tbody>
</table>

Table I shows the demographic characteristics distribution of the respondents. This data shows almost equal males (49.0%) and females (51.0%) in the urban respondents giving a male: female ratio of 1:1, while there were more males (70.5%) compared to females (29.5%) in the rural subjects, giving a male: female ratio of 2.4: 1.

The mean age of the subjects for urban was 8.53 years ± 1.5 S.D, while it was 10.04 years ± 2 S.D. for rural subjects.

Table II: Distribution of Anthropometric Parameter Respondents.
<table>
<thead>
<tr>
<th>Serial No.</th>
<th>Anthropometric Parameter</th>
<th>URBAN</th>
<th>RURAL</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Mean Height (cm)</td>
<td>138.47</td>
<td>92.23</td>
</tr>
<tr>
<td>2.</td>
<td>Mean Weight (Kg)</td>
<td>33.96</td>
<td>30.98</td>
</tr>
<tr>
<td>3.</td>
<td>Mean Body Mass Index (BMI) in (Kg/m$^2$)</td>
<td>17.38</td>
<td>15.98</td>
</tr>
<tr>
<td><strong>Total No of Respondents, N (%)</strong></td>
<td><strong>241 (100)</strong></td>
<td><strong>244 (100)</strong></td>
<td></td>
</tr>
</tbody>
</table>

P-value = 0.000 for mean height, weight and body mass index.

Table II, shows that the mean height, weight and body mass index (BMI) of 137.45cm, 33.96kg and 17.38 respectively for urban subjects, as against 92.23cm, 30.98kg and 15.98 respectively for rural subjects, showed a significant difference between geo-locations with a p-value of 0.000.
The distribution of the educational level of the caregivers as shown in figure 1, highlights marked higher level of educational attainment amongst urban primary care givers with 90.1% of them having tertiary (post-secondary) education, 6% secondary, 3.4% primary and only 0.4% had no formal education while for the rural primary care givers, 11.1% of them had post-secondary education, 25% secondary, 46.3% primary and 17.6% had no formal education. This difference was significant with a p-value of 0.00.
Figure 2, shows the socio-economic class distribution of the respondent determined with the aid of Oyedeji’s 33 social classification criteria (Appendix C), utilizing the educational level and occupation of care givers to classes 1 to 5. The classes 1 and 2 make up the upper social class, 3 represents middle class, while classes 4 and 5 stands for the lower socio-economic class.
For the urban subjects, 57.6% belong to the upper social class, 41.5% the middle social class and 0.9% the lower social class while for the rural subjects, none (0%) belong to the upper social class, 10.2% to the middle and 89.8% the lower social class.

### 4.2 ATOPIC PREVALENCE

Figure 3: Distribution of Atopic Symptoms on respondents.

![Bar chart showing distribution of atopic symptoms among urban and rural respondents.](image)

- Current respiratory symptoms: Urban = 60, Rural = 64, p = 0.445
- Ever had wheeze (but not in the last 12 months): Urban = 21, Rural = 21, p = 0.856
- Dry cough at night without respiratory problem: Urban = 20, Rural = 21, p = 0.783

Figure 3, shows individual distribution of some symptoms attributable to just allergy (atopy). As shown, 56 (23.3%) of the total urban respondents and 64 (26.3%) of the rural had current respiratory problems like cough, catarrh, sneezing, blocked nose et cetera with no statistical difference between them, p-value = 0.445.

The number of respondents that had ever wheezed (but not in the last 12 months), was 21 (8.7%) in the urban and 21 (8.6%) in the rural with no difference p = 0.856, while number with dry cough at night without respiratory (breathing) problem like wheeze was
seen in 39 (16.2%) of urban and 35 (14.3%) of rural, again with no statistical difference, p-value 0.783.

Generally however, the number that had at least one of the above atopic symptoms was 62 in urban and 57 in rural respondents, which based on the total number of respondents for each geo-location, gave an atopic prevalence of 25.7% and 23.4% for urban and rural geo-locations respectively.

4.3 ASTHMA PREVALENCE:

Table III: Distribution of Current Asthma Among Different Ages Studied.

<table>
<thead>
<tr>
<th>GEO LOCATION</th>
<th>wheeze last 12mths</th>
<th>Age range</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>NO</td>
<td>Age range</td>
<td></td>
</tr>
<tr>
<td>URBAN</td>
<td>wheeze last 12mths</td>
<td>8 years</td>
<td>9 years</td>
</tr>
<tr>
<td></td>
<td>NO</td>
<td>47</td>
<td>50</td>
</tr>
<tr>
<td></td>
<td>YES (%)</td>
<td>7(13.0)</td>
<td>5(9.1)</td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td>54</td>
<td>55</td>
</tr>
<tr>
<td>RURAL</td>
<td>wheeze last 12mths</td>
<td>26</td>
<td>31</td>
</tr>
<tr>
<td></td>
<td>NO</td>
<td>5(16.1)</td>
<td>4(11.4)</td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td>31</td>
<td>35</td>
</tr>
</tbody>
</table>

P-value = 0.961

Table III shows a cross-tabulation of the frequency(and prevalence) of subjects of different ages that answered ‘yes’ to question “presence of wheeze in the last 12 months” (which connotes current asthma symptoms) against the total number of subjects of same
age that answered the question, for the two geo-locations. It shows that the urban prevalence of asthma is **12.3%** while the rural prevalence is **11.8%** for the age group studied.

**Table IV: Distribution of Current Asthma Prevalence for Sex and Geo-Location.**

<table>
<thead>
<tr>
<th>Serial No.</th>
<th>Characteristics of subjects.</th>
<th>Male</th>
<th>Female</th>
<th>Male</th>
<th>Female</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Total number of respondents to question (N)</td>
<td>97</td>
<td>102</td>
<td>169</td>
<td>69</td>
</tr>
<tr>
<td>2.</td>
<td>Number of respondents with current asthma (N)</td>
<td>13</td>
<td>13</td>
<td>19</td>
<td>7</td>
</tr>
<tr>
<td>3.</td>
<td>Prevalence of current asthma for sex (%)</td>
<td><strong>13.4%</strong></td>
<td><strong>12.8%</strong></td>
<td><strong>11.2%</strong></td>
<td><strong>10.2%</strong></td>
</tr>
</tbody>
</table>

**P-values:**

- Male/Female (Urban) = 0.891
- Male/Female (Rural) = 0.805
- Male (urban/rural) = 0.602
- Female (urban/rural) = 0.604

Table IV shows the distribution of prevalence for sex and geo-location (sex-specific prevalence) of current asthma, found to be: for males 13.4% in the urban and 11.2% in the rural while for females 12.8% in the urban and 10.2% in the rural geo-locations.
NB: A few outliers were discovered during the analysis which gave the total number of current asthma (wheeze in the last 12 months) as twenty-eight (28) for urban and twenty-seven (27) for rural geo-locations. Based on this total number of asthma subjects, the subsequent tables were constructed.

4.4 ASTHMA SYMPTOMS AND DIAGNOSIS

Table V: Distribution of the Severity of Current Asthma Symptoms.

<table>
<thead>
<tr>
<th>Serial no</th>
<th>Markers of asthma severity</th>
<th>Urban N (%)</th>
<th>Rural N (%)</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>No of wheeze episodes in the last 12 months (Day time)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>1-3 wheeze episodes</td>
<td>16 (57.1)</td>
<td>17 (63.0)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>4-12 wheeze episodes</td>
<td>3 (10.4)</td>
<td>6 (22.2)</td>
<td>0.049</td>
</tr>
<tr>
<td></td>
<td>&gt;12 wheeze episodes</td>
<td>5 (17.9)</td>
<td>0 (0.0)</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>No of night symptoms</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Less than 1 night/week</td>
<td>9 (32.1)</td>
<td>9 (33.3)</td>
<td>0.335</td>
</tr>
<tr>
<td></td>
<td>1 or more nights/week</td>
<td>10 (35.7)</td>
<td>5 (18.5)</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Symptoms (wheezes) causing speech difficulties in the last 12 months.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>11 (39.3)</td>
<td>8 (29.6)</td>
<td>0.491</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>Symptoms (wheezes) after physical exercise in the last 12 months</td>
<td>14 (50.0)</td>
<td>12 (44.4)</td>
<td>1.000</td>
</tr>
</tbody>
</table>

Table V shows the distribution of severity of current asthma symptoms by geo-locations. It shows that 1-3 episodes of daytime wheeze in the last 12 months were seen in 57.1% of urban and 63.0% of rural subjects.

Daytime frequency of 4-12 episodes were seen in 10.7% urban and 22.2% of rural, while frequency >12 episodes in the last 12 months were found in 17.9% of urban and 0.0% of rural.
rural subjects. On comparing the different frequencies of wheeze episodes for geo-
locations, a significant difference was found with a p-value of 0.049.

Night symptoms that occur less than one night per week was seen in 32.1% urban and
33.3% of rural subjects, while symptoms occurring in one or more nights per week was
seen in 35.7% of urban and 18.5% of rural subjects, showing no significant difference
between geo-locations with a p-value of 0.335.

Symptoms severe enough to cause speech difficulties were found in 39.3% of urban
29.6% of rural subjects, showing no significant difference with a p-value of 0.491.

Symptoms occurring after physical exercise were almost equal with 50.0% found in
urban and 44.4% in rural subjects, with a p-value of 1.000.
Figure 4 highlights the proportion of those with current symptoms of asthma that was diagnosed correctly by a doctor or a nurse. This was the case in only 35.7% of urban and 10.7% of rural asthma subjects.
### 4.5 ASTHMA MORBIDITY

**Table VI: Distribution of Asthma Morbidity Pattern.**

<table>
<thead>
<tr>
<th>Serial No.</th>
<th>Marker of asthma morbidity (frequency in days)</th>
<th>Urban N (%)</th>
<th>Rural N (%)</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Limitation of physical activity like play in the last 12 months.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>1-3</td>
<td>6 (21.4)</td>
<td>2 (7.4)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>4-12</td>
<td>4 (14.3)</td>
<td>1 (3.7)</td>
<td>0.711</td>
</tr>
<tr>
<td></td>
<td>&gt;12</td>
<td>1 (3.6)</td>
<td>1 (3.7)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Everyday</td>
<td>0 (0.0)</td>
<td>0 (0.0)</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>School absenteeism (missed school days) in the last 12 months.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>1-3</td>
<td>10 (35.7)</td>
<td>1 (3.7)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>4-12</td>
<td>1 (3.6)</td>
<td>4 (14.8)</td>
<td><strong>0.012</strong></td>
</tr>
<tr>
<td></td>
<td>More than 12 days</td>
<td>1 (3.6)</td>
<td>0 (0.0)</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Sudden exacerbation of symptoms requiring urgent medical attention in the last 12 months (acute severe asthma)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>1-2</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>3-4</td>
<td>8 (28.6)</td>
<td>0 (0.0)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>5-10</td>
<td>2 (7.1)</td>
<td>0 (0.0)</td>
<td><strong>0.007</strong></td>
</tr>
<tr>
<td></td>
<td>&gt; 10</td>
<td>0 (0.0)</td>
<td>1 (3.7)</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>1 (3.6)</td>
<td>0 (0.0)</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>Hospital admission in the last 12 months (No of times)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>1-2</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>3-5</td>
<td>5 (17.9)</td>
<td>0 (0.0)</td>
<td>applicable</td>
</tr>
<tr>
<td></td>
<td>Others (&gt;5)</td>
<td>1 (3.6)</td>
<td>0 (0.0)</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>0 (0.0)</td>
<td>0 (0.0)</td>
<td></td>
</tr>
<tr>
<td></td>
<td><strong>Total based</strong></td>
<td><strong>28 (100)</strong></td>
<td><strong>27(100)</strong></td>
<td></td>
</tr>
</tbody>
</table>
Table VI shows the asthma morbidity pattern for both geo-locations. It reflects that limitation of physical activity due to respiratory symptoms in the last 12 months occurred in 1-3 days in 21.4% of urban asthma subjects and 7.4% of rural counterparts; in 4-12 days in 14.3% of urban and 3.7% of rural; greater than 12 days (>12 days) in 3.6% of urban and 3.7% of rural categories, and no everyday limitation of physical activity found in either of the categories, showing no significant difference with a p-value of 0.711.

School absenteeism in the last 12 months occurred in 1-3 days for 35.7% of urban and 3.7% of rural asthma subjects; in 4-12 days for 3.6% of urban and 14.8% of rural counterparts and in >12 days for 3.6% of urban and none (0.0%) of the rural asthma subjects, showing a significant difference with a p-value of 0.012.

Sudden worsening of asthma symptoms, requiring urgent medical attention (acute severe asthma) in the last 12 months, occurred for 1-2 days in 28.6% of urban and none (0.0%) of the rural asthma subjects; for 3-5 days in 7.1% of urban and none (0.0%) of rural; for 5-10 days in none(0.0%) of urban and 3.7% of rural while for >10 days occurred in 3.6% of urban and none(0.0%) of rural asthma subjects, showing a significant difference between geo-locations with a p-value of 0.007.

Hospital admissions in the last 12 months were noted for 1-2 occasions in 17.9% of urban and none (0.0%) of rural asthma subjects; for 3-5 occasions in 3.6% of urban and none (0.0%) of rural, while none (0.0%) of both categories was admitted for greater than five (5) occasions within this period, showing significant difference between both geo-locations, though p-value figure was not applicable.
4.6  ASTHMA MANAGEMENT

Table VII: Distribution of the Use of Standard Asthma Management.

<table>
<thead>
<tr>
<th>Serial no.</th>
<th>Markers of standard asthma management.</th>
<th>Urban N (%)</th>
<th>Rural N (%)</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Patient counseling on health situation.</td>
<td>17 (60.7)</td>
<td>3 (11.1)</td>
<td>0.002</td>
</tr>
<tr>
<td>2</td>
<td>Written asthma plan for the family (on action steps/situation)</td>
<td>5 (17.9)</td>
<td>0 (0.0)</td>
<td>-</td>
</tr>
<tr>
<td>3</td>
<td>Use of inhaled bronchodilators (SABA) Ventolin inhaler</td>
<td>6 (21.4)</td>
<td>1 (3.7)</td>
<td>0.49</td>
</tr>
<tr>
<td>4</td>
<td>Use of inhaled steroids (e.g. Becotide)</td>
<td>0 (0.0)</td>
<td>0 (0.0)</td>
<td>-</td>
</tr>
<tr>
<td>5</td>
<td>Use of oral steroids (Prednisolone)</td>
<td>6 (21.4)</td>
<td>0 (0.0)</td>
<td>-</td>
</tr>
<tr>
<td>6</td>
<td>Use of spacer device</td>
<td>5 (17.9)</td>
<td>0 (0.0)</td>
<td>-</td>
</tr>
<tr>
<td>7</td>
<td>Use of nebulising machine</td>
<td>8 (28.6)</td>
<td>0 (0.0)</td>
<td>-</td>
</tr>
<tr>
<td>8</td>
<td>Use of controller medication (LABA (e.g. Seretide))</td>
<td>4 (14.3)</td>
<td>0 (0.0)</td>
<td>-</td>
</tr>
<tr>
<td>9</td>
<td>Regular (scheduled) follow-up visits</td>
<td>4 (14.3)</td>
<td>2 (7.4)</td>
<td>0.682</td>
</tr>
</tbody>
</table>

  - Monthly 1 (3.6) 0 (0.0)
  - 3 monthly 1 (3.6) 1 (3.7)
  - 6 monthly 1 (3.6) 1 (3.7)
  - 1 yearly 1 (3.6) 0 (0.0)

  **TOTAL based** 28 (100) 27 (100)

**NB:** Some p-values could not be calculated because of zero (0) frequencies found. For the purpose of this study however, when these zero frequencies are compared with frequencies of three (3) and above, it was regarded as significant.
Table VII shows the proportion of subject with current asthma that received standard asthma management for both geo-locations.

The health conditions of the subjects were discussed with them by a doctor or a nurse, giving them positive health tips in 60.7% of urban subjects and 11.1% of rural asthma subjects, which shows a significant difference with a p-value of 0.002.

A written asthma plan on what action to be taken (including drugs) at various conditions that may present, as well as when to seek immediate medical assistance which is to be pasted for the whole family were provided to 17.9% of urban asthma subjects and none (0%) of the rural counterpart, showing a significant difference between the two groups.

Inhaled short acting bronchodilator (ventolin inhaler) was used by 21.4% of urban asthma subjects as compared to 3.7% of the rural counterpart showing no difference with a p-value of 0.49.

None of the asthma subjects in both categories studied use inhaled corticosteroid during acute exacerbation of symptoms.

Oral corticosteroid (prednisolone) was used by 21.4% of urban asthma subjects and none (0.0%) of the rural counterparts, giving a significant difference.

Spacer device had been used by 17.9% of urban asthma subjects and none (0.0%) of rural asthma subjects, showing a significant difference.

Same observation was the case with the use of nebulizing machine and controller medication like seretide which were seen in 28.6% and 14.3% respectively of the urban asthma subjects but not observed (0.0%) in any of the rural asthma subjects, giving significant differences.
A regular (scheduled) follow-up visit was the practice generally in 14.3% of urban asthma subjects and 7.4% of the rural counterparts; with 3.6% each being monthly, three (3) monthly, six (6) monthly and yearly visits respectively for the urban asthma subjects while only three (3) monthly and six (6) monthly visits was observed in 3.7% respectively of rural asthma subject, showing no significant difference with a p-value of 0.682.
5.1 DISCUSSION

This study reveals that participation rate was 65.1% in the urban area, which compares favourably with a Nigerian participation rate of 60.8% in a similar study conducted in an urban town of Lagos state,\textsuperscript{17} and compared with an Australian participation rate of 70.3%.\textsuperscript{17} In that study, lower participation rate for Nigerians was attributed to poor awareness and education on asthma, as well as some level of stigma associated with asthma.\textsuperscript{17} A very high participation rate of 93.9% observed in the rural subjects could be attributed to ignorance, high level of illiteracy as well as excitement to participate in such an exercise occurring in their locality.

The mean age of 8.53 years ± 1.5 S.D for urban and 10.04 years ± 2 S.D for rural subjects found in this study, compares with a similar finding of a mean age of 10.2 ± 0.20 years reported by Uyan et al in Turkey.\textsuperscript{2}

Mean height, weight and body mass index (BMI) of 137.45 cm, 33.96 kg and 17.38 respectively for urban and 92.23 cm, 30.98 kg and 15.98 respectively for rural with a p-value of 0.000, highlights significant poorer nutritional status in the rural subjects compared to the urban counterparts. This finding is not surprising as most rural children tend to be stunted in growth usually from chronic malnutrition.

This study also shows predominance of the upper social class (57.6%) in the urban subjects and predominance of lower socio-economic class (89.8%) amongst the rural subjects. This socio-economic class determines to some extent the type of environmental factors these subjects could be exposed to. Examples in the lower social class include the
use of firewood for cooking, exposure to pollen as majority are farmers, poor housing with poor ventilation et cetera. On the other hand, the upper social class could be exposed to cold environment from use of air conditioners, fungus aspergillus spp., house dust mite in rug carpets and exposure to chemical irritants like automobile fumes, generator fumes et cetera. Factors similar to these outlined for upper social class was also identified in Australian subjects, an affluent country that was compared with Nigeria.\textsuperscript{17}

5.1.1 Prevalence

Atopic prevalence in this study was determined by those with current and recurrent respiratory symptoms like catarrh, blocked nose, runny nostrils et cetera, those that have ever wheezed (but not in the last 12 months) and those with dry cough at night without prior respiratory problem. This study showed no significant difference in atopic symptoms between both geo-locations. Further analysis to see if any relationship exists between these atopic symptoms and the development of childhood asthma suggested no such relationship. For current respiratory symptoms/current asthma (p-value=0.602); ever wheezed (but not in the last 12 months) /current asthma (p-value=0.929) while dry cough at night without prior respiratory problem/current asthma (p-value=0.840). This dissociation between atopy and asthma is corroborated by Roel et al,\textsuperscript{34} Rona et al,\textsuperscript{35} Yemanekerhan et al\textsuperscript{36} and von Mutius et al.\textsuperscript{37}

The general prevalence of atopic symptoms in this study of 25.7\% in urban and 23.4\% in the rural subjects compares favourably with the prevalence of atopy in Nigeria of 28.2\% reported by Faniran et al,\textsuperscript{17} but at variance with a lower prevalence of atopic symptoms of allergic rhinitis and eczema of 3.35\% and 2.8\% respectively in Turkey.\textsuperscript{2}
The distribution of asthma (as defined by those that has wheezes in the last 12 months) for the age group 8-12 years, shows that the highest age-specific prevalence is seen in children aged 10 years (18.9%) in the urban, and aged 12 years (17.0%) in the rural subjects. However, there is no significant difference in the prevalence between these ages (p-value=0.830). The overall prevalence of asthma in this age group is 12.3% for the urban and 11.8% for the rural geo-locations, with no statistical difference between the two geo-locations (p-value=0.961). The finding in the urban area compares favourably with highest age-specific prevalence of 15.1% for age 10 years noted in Sweden \(^{34}\) and nine (9) years in Turkey.\(^2\) The overall prevalence of asthma for urban area in this study (12.3%) again compares favourably with Nigerian prevalence got from an urban setting in Lagos state of 10.2% in 1999 and 10.7% from an Ibadan study.\(^{38}\) This is further supported by Burney et al study in England which showed a rising prevalence of asthma in a locality over time.\(^{39}\) Similar figures is also seen in Gishu, Kenya (13.8%), Ramallah, Palestine (10.2%), Ankara, Turkey (11.9%) and Afyon, Turkey (12.2%).\(^{38}\)

The asthma prevalence obtained in this study for the rural subjects (11.8%) was surprisingly higher than that seen in most studies. Similar studies showed prevalence of as low as 0.7% in a rural community of Edo state by Oviawe et al,\(^{16}\) 1.4% in rural Ghana of exercise induced bronchospasm (EIB) using peak expiratory flow rate (PEFR),\(^{40}\) 0.14% in a similar EIB study in rural Xhosa South-Africa,\(^{41}\) 1.9% in rural Turkey (Sanliurfa)\(^{42,43}\) and 2.0% in rural (Jimme) Ethiopia.\(^{44}\)

The reason for the high prevalence of childhood asthma in this rural community of Agbogugu in Awgu L.G.A of Enugu State could be attributed to:
a) The fact that the present state government is embarking on massive rural development involving this community with ongoing several uncompleted and un-tarred dusty roads especially as the study was conducted in January/February, the peak of dry season.

b) The people of this community are mainly farmers with most involved in poultry and piggery farming right within their homes. Bush burning is also rampant in the community.

c) The proximity of this community to a teaching hospital in a neighbouring village, Ituku-ozalla is springing out some development in these villages. The status of this studied community is almost a semi urbanized one. A similar trend is seen in Palestine where, though with a generally lower prevalence, but relatively higher in the villages (8.2%) and semi urbanized villages (6.3%), cities of 7.2% and refugee camps located in cities of 12.6%. A recent Kenyan study noted a high asthma prevalence in rural area of 13.2% (with an urban counterpart of 22.7%). Studies from U.K and Australia show same prevalence rates for both urban and rural areas with a reversal of trend seen in the United States of America, rural of 27% and urban of 22.7%.

In this study, significantly more males than females were noted to have asthma in the rural subjects (p-value=0.019) as against equal male: female distribution in the urban subjects (p-value=1.000). This is seen as a fall out of the proportion of males and females seen and recruited in schools for the study alb-initio. When a sex-specific prevalence of asthma was calculated for better comparison, it shows slightly higher prevalence in males as against females for both urban (13.4% as against 12.8%) and rural (11.2% as against 10.2%) geo-locations with no significant difference between both sexes for both geo-locations, nor between geo-locations for each of the sexes (p-values as shown in results.
on table III). This finding is corroborated by many other studies like Okoromah & Oviawe that noted in a cohort of asthma patients, 66.7% male and 33.3% female, a male: female ratio of 2:1,47 Britto et al in Brazil that noted prevalence 7.3% male and 4.9% female for age 6-7 years but more females in age group 13-14 years, 10.2% as against 9.8% in males,48 Uyan et al that reported 58.4% males, 41.6% females giving a male: female ratio of 1.4:1,2 and El-sharif et al who again noted a male asthma preponderance in his Palestinian study.9

5.1.2 Asthma Symptoms and Diagnosis

Looking at the distribution of the severity of current asthma symptoms in both urban & rural subjects, intermittent asthmatics with 1-3 daytime symptom(s) in the last 12 months and <1 night symptom/week were almost equal in both geo-locations. Higher prevalence in the rural area is seen for daytime symptoms, 4-12 times in the last 12 months. On the other hand, severe forms of asthma with greater than twelve (12) daytime symptoms in the last 12 months and 1 or more night symptoms occur more in the urban subjects with 17.9% against 0.0% and 35.7% against 18.5% respectively. For each of the markers of asthma severity, only daytime symptoms, especially severe forms was noted to show significant difference between the geo-locations in favour of the urban area, with a p-value of 0.049. The others, night symptoms, symptoms causing speaking difficulties and exercise induced symptoms did not differ significantly across the two geo-locations [p-values= 0.335, 0.491 & 1.000 respectively]. A general look at the asthma severity markers reveals low percentages less than 50% but severe enough to be of public health concern. This finding is collaborated by El-sharif et al that noted more severe asthma symptoms in urban Palestine compared to the rural areas9 and by Faniran et al that noted
generally less severe asthma symptoms in Nigerian children compared to children of affluent Australia. Furthermore, Dagoye et al in Ethiopia noted high parasite (ascariasis) load on the rural asthma subjects as being protective both on the prevalence and manifestation of severe symptoms in asthma cases. Could this be the case in this series?

Despite the comparative high prevalence of childhood asthma in these two geo-locations, the ability of doctors and nurses to recognize it as asthma and clearly diagnose it as such is still very low. This is clearly shown in figure 4 which highlights the proportion of those with current asthma symptoms that were actually diagnosed either by a doctor or a nurse of having asthma. This correct diagnosis is shown to be made in only 35.7% of the urban and 10.7% of the rural asthma subjects. The difference in asthma diagnosis between these two groups of subjects is statistically significant when compared within the same geo-location and across geo-locations [p-value =0.000 & 0.039 respectively]. The urban figure in this study compares favourably with the figure of 43% obtained for Nigeria in the Faniran et al study. This again is similar to the figure of 24.4% of asthma cases diagnosed as such in Nigeria by Okoromah et al. Even lower figures for level of diagnosis is reported by Uyan et al in Turkey (6.4%) and El-sharif in Palestine of 7.3% in cities, 8.1% in villages and 15.6% in refugee camps.

The general low level of diagnosis could be attributed to the level of awareness of the current criteria for making clinical diagnosis of asthma, with the aid of which diagnosis could be made at any age even in infancy. Again, could be as a result of the stigma attached to this illness and the “It’s not my portion” syndrome among patients which makes our health personnel hide under some terminologies like wheezy bronchitis,
allergy, childhood wheeze, pneumonia and even tuberculosis. These alternative diagnoses was noted to be as high as 64.4% among asthma subjects in Okoromah and Oviawe’s study. This practice negates the use of appropriate medication, counseling and other standard management modalities that will control, halt or even reverse the progress of this illness and its attendant complications.

5.1.3 Asthma Morbidity

Asthma morbidity markers as shown on table vi are essentially more pronounced in the urban asthma subjects as compared to the rural counterparts. Statistical difference between geo-locations in favour of urban area is noted with school absenteeism (p-value=0.012), sudden exacerbation of asthma symptoms requiring urgent medical attention (p-value=0.007) and hospital admissions in the last 12 months (p-value not applicable). It is most likely that the only patient with sudden exacerbation of symptom noted in the rural asthma subjects may have sort for medical aid in a patent medicine store or herbalist considering the zero figure for hospital admission noted in the rural asthma subjects. No difference exists between geo-locations for limitation of physical activity in the last 12 months (p-value=0.711). This finding in our urban asthma subjects is again collaborated by Faniran et al who noted that Nigerian asthma patients (in an urban setting) are more likely to be managed in the acute form with more visits to hospital casualty and more hospital admissions as compared to Australian asthma patients.
5.1.4 Asthma Management

From above, little wonder why this study reveals an unacceptably high level of inadequacy in the application of standard worldwide asthma management modalities recommended by Global Initiative on Asthma (GINA) in both the urban and rural subjects with childhood asthma. The only heartwarming aspect is the significant high level of patient counseling on his/her respiratory health status shown in 60.7% of the urban subjects compared to 10.7% in the rural subjects, with a p-value of 0.002.

Other markers of standard asthma management as shown in table v depicts gross inadequacy in both geo-locations, but significantly better in the urban area, though the p-value of some markers could not be calculated due to zero figure in the rural subjects. There was no significant difference in the use of short acting inhaled bronchodilators (SABA like Ventolin) with a p-value of 0.49 and the practice of follow-up visits for both geo-locations (p-value=0.682). This finding is collaborated by the following authors: Faniran et al who noted low proportion of Nigerian asthmatic children taking controller (preventive) medication or visited a doctor routinely compared with Australian asthmatics. Erhabor et al noted poor adherence to asthma treatment guideline with no doctor in his series using PEF-meter. A review article by Fawibe A.E. noted lack of proper diagnosis and monitoring technique like use of PEF-meter; injudicious use of asthma medication; poor compliance in medication due to high cost, fear of side-effects, incorrect use of inhaler and stigma associated with use of inhalers; use of traditional treatment methods like Egyptian plant “ammivisnega” which contains sodium cromoglycate; lack of proper education as well as presence of fake and substandard drugs as the state of asthma management in sub-saharan Africa.
CHAPTER SIX

CONCLUSION, RECOMMENDATION AND LIMITATION.

6.1 CONCLUSION

Based on the findings of this study, the following conclusions were drawn:

1. There is slightly higher prevalence of asthma and atopy in the urban compared to the rural area studied. However, there is no significant difference between these prevalence in the two geo-locations (p-value = 0.961 for asthma).

2. This study further noted that there is no relationship between atopic symptoms and the development of childhood asthma (p-values >0.05).

3. This study shows a higher prevalence of childhood asthma than that of earlier Nigerian studies showing an appreciable increase over the years. This could be attributed to continued climatic and other man-made changes affecting our environment.

4. The symptoms of childhood asthma were found to be generally more severe in the urban compared to the rural area. However, the only marker of asthma severity that showed statistical difference is the number of daytime wheeze episodes with a p-value of 0.049 in favour of the urban area.

5. There is an unacceptably high level of under-diagnosis of childhood asthma in both urban and rural areas. This under-diagnosis level is more marked in the rural area with a significant difference between both geo-locations (p = 0.027).

6. This study again reveals an unacceptably high level of inadequacy in the application of standard worldwide asthma management modalities recommended by Global Initiative on Asthma (GINA) in both urban and rural areas. The only aspect of standard
management protocol that is practiced fairly well in the urban area is patient counseling on his or her respiratory health status, showing a significant difference (p = 0.002). Every other marker of standard asthma management was found to be grossly inadequate with no difference between geo-locations.

7. Finally, this study shows clearly that childhood asthma morbidity is more in the urban area as compared to the rural area, with significant high levels of school absenteeism (p=0.012), acute severe asthma (p=0.007) and hospital admissions for asthma (p < 0.05) being noted in the urban asthma subjects.
6.2 RECOMMENDATIONS

Based on the findings and conclusions drawn from this study, the following are recommended:

1. Government, donor agencies, non-governmental organizations (NGOs) and organized private sectors should be encouraged to channel more funds to asthma research. Prevalence studies like this should be funded to take place at various seasons, involving much larger sample size, using more objective methodology like household survey and indebt interview by trained research assistants and taking place in many localities at the same time including very interior often invisible and excluded villages, to give a clearer representation of the true picture of Nigeria’s childhood asthma prevalence.

2. Continued Medical Education (CME) involving training and retraining should be organized regularly for all health professionals on childhood asthma symptoms, diagnosis and management, especially for those manning our primary health care centres.

3. This health education should be extended to the patients and the general public on the symptoms, immediate and long term treatment as well as complication. The need for a strong patient (or caregiver)/doctor’s relationship in its management should be stressed. During this education, the public should be discouraged from the use of traditional medications and from stigmatization of asthmatics. This should be done at every level of contact as well as via mass media like radio, newspapers and television.
4. Early diagnosis of childhood asthma even in infancy and institution of standard preventive and treatment modalities should be encouraged to prevent its attendant morbidity and mortality.

5. Instruments and medications required to offer standard asthma management like peak expiratory flow meters (PEF-meters), reliever and controller inhaled medications, nebulizing machines and nebulizers, oxygen cylinders, pulse-oxymeters and an uninterrupted power (electricity) supply should be made available in all health institutions especially our primary healthcare centres. In addition, effective pharmaco vigilance against fake and substandard drugs should be enforced.

6. There is need for an effective childhood asthma management plan (protocol) for Africa. This will be adopted based on local healthcare resources and cultural preferences, rather than depending solely on that developed by developed countries. Interestingly, South Africa has taken the lead in this initiative.50

7. Finally, International bodies like World Health Organization (WHO), Global Alliance against Chronic Respiratory Diseases (GARD) et cetera, should come together to make the right to breathe freely a reality for all.
6.3 LIMITATIONS OF THE STUDY

1. The limitation of this study include the non-inclusion of the use of peak flow meter for monitoring peak expiratory flow rate (PEFR) as a marker of standard asthma management.

2. Sampling school children may not give a true representation of the total population, thus household survey and indebt interview method, even with the use of tape recorder, may be a better methodology.
REFERENCES


   


APPENDIX A

ETHICAL CLEARANCE CERTIFICATE
APPENDIX B

TOPIC: PREVALENCE, SYMPTOMS AND MANAGEMENT OF CHILDHOOD ASTHMA: A COMPARISM OF URBAN AND RURAL AREA IN NIGERIA.

CONSENT FORM (For child’s Caregiver)

INTRODUCTION/BENEFIT OF PARTICIPATION:

• Your child/ward has been selected for a study to find out how common the cough of asthma is among our children, the common ways it presents and if our healthcare providers are able to recognize and treat it the way it should.

Voluntary Nature of Participation:

• Taking part or not in this study is completely your choice (Voluntary). If you choose not to be part of the study, you are free to withdraw your child or ward from it at any time you deem fit.

Study Procedure:

• Attached is a simplified questionnaire that seeks your response to questions on breathing conditions you have noticed on your child/ward and what is being done for him/her. You are requested to answer the questions honestly and to the best of your knowledge.

• The child’s weight, height and body mass index (BMI) will be taken after completing and returning the questionnaire.
**Risks:**

- Participation in this study is completely free of risk or harm to your child/ward. No part of the study will cause pain.

**CONFIDENTIALITY:**

- All information that you give to us or that we get by taking measurement of your child will not be made known to anyone else whatsoever without your permission if necessary. You are not required to indicate your name on the questionnaire.

**FEEDBACK:**

I, the researcher will always be available 24 hours, to answer all your questions on the study or clarify any unclear question on the questionnaire throughout the period of the study and beyond. I can be reached through the number 08036672838 or through the Department of Community Medicine, UNTH old site, Enugu.

Thank you.
RESPONSE:

I, the undersigned hereby permit my child/ward to participate in the above stated study (details of which have been fully explained to me). I am aware that I am free to withdraw my child/ward at any stage during this study.

I give this consent out of my own free will.

---------------------------------------------  -----------------------------
Name of Caregiver.                                Name of Researcher.

-------------------------------  -------------------------------
Signature/Thumb print with date.                Signature/date.
## APPENDIX C

**SOCIO-ECONOMIC INDEX SCORES**

<table>
<thead>
<tr>
<th>Parental Occupation</th>
<th>Father</th>
<th>Mother</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Class</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>I. Senior public servants, Professionals, Managers, Large scale traders, Businessmen and Contractors.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>II. Intermediate grade public servants, Senior School Teachers, Nurses and Technicians.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>III. Junior School Teachers, Clerks, Auxiliary Nurses, Drivers and Mechanics.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>IV. Petty traders, Laborers, Messengers and Similar Grades.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>V. Unemployed, Full-time housewives, Students and Subsistence farmers.</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Parental Educational Attainment</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>I. University graduates or equivalents.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>II. School certificate holders (GCE or SSSC) who also had teaching or other professional training i.e. NCE.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>III. School certificate or Grade II teachers’ certificate holders or equivalents.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>IV. Junior secondary school certificate, Modern three and primary six.</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
V. Those who could not just read or write or are illiterates.

Total Score \[ \square + \square \sqrt{2} \]

Therefore, Socio-economic Class = ……………..
APPENDIX D

Questionnaire of Asthma Prevalence for Schoolchildren Aged 8-12 years

Serial no:-----------------------------

SECTION A

School:--------------------------------------------- Date: ----------

LGA (where school is located)…………………………………………………

Caregiver’s Phone number:------------------------- Child’s Sex: ( ) Male ( ) Female

Home address:--------------------------------------------------------------------------------

-----------------------------------------------------------------------------------------------

Child’s Age:----- Child’s Height------ Child’s Weight------ Child’s BMI------

Caregiver's Relationship with child:- Father ( ) ;Mother ( ); Grandparent ( );

Aunty/Uncle ( ); Elder Brother/ Sister ( ); Guardian ( ).

Caregiver’s Sex : - Male ( ); Female ( ).
Caregiver’s Occupation (Specify)-----------------------------------------------

Caregiver’s Wife/Husband’s Occupation (Specify)----------------------------------

Caregiver’s highest educational level attained?

( ) None

( ) Primary school

( ) Secondary

( ) Higher Institution.

Caregiver’s spouse (wife/husband) highest educational level attained?

( ) None

( ) Primary school

( ) Secondary

( ) Higher Institution

Does this child currently have any breathing symptom (cough, catarrh, blocked nose etc)?

( ) Yes    ( ) No
SECTION B

1) Has this child ever had wheezes/wheezing (fatigue, noises like whistling, crackling, pussy cat noise) in the chest while breathing since he/she was born?

(  ) Yes           (  ) No

If your answer is “NO”, go to question No. 6

2) Has this child had these wheezes/wheezing (fatigue, whistling, crackling, pussy cat noise) in the chest, within the last 12 months?

(  ) Yes                  (  ) No

3) How many episodes of this wheezing (fatigue, whistling, crackling, pussy cat noise) has the child had in the last 12 months?

(  ) None ( ) 1 to 3 crises ( ) 4 to 12 crises ( ) More than 12 crises

4) How many times have the wheezing (fatigue, whistling, crackling, pussy cat noise) disturbed the child’s sleep in the last 12 months?

(  ) The wheezing crises never disturbed child’s sleep (  ) Less than 1 night a week

(  ) 1 or more nights a week

5) Were the episodes of wheezing (fatigue, whistling, crackling, pussy cat noise) severe enough to cause this child to have speaking difficulties in the last 12 months?

(  ) Yes       (  ) No.

6) Has this child ever suffered from asthma? (Confirmed by a doctor/Nurse?)
( ) Yes  ( ) No.

SECTION C

7) Have you noticed this child wheeze (fatigue, whistling, crackling, pussy cat noise) after taking part in physical exercises in the last 12 months?
   ( ) Yes  ( ) No

8) Have you noticed this child have dry cough at night, without having a cold or a breathing illness in the last 12 months?
   ( ) Yes  ( ) No

SECTION D

9) Has your child’s doctor/nurse discussed the child’s breathing problem with you (caregiver) or any other family member?
   ( ) Yes  ( ) No

10) Did your child’s doctor/nurse provide you (family) with a written plan concerning your child’s breathing problem, instructing you on what drug to give in different situations and when to seek immediate medical help at the hospital?
    ( ) Yes  ( ) No

11) Has this child ever used any asthma medicine due to his/her breathing problems?
    ( ) Yes  ( ) No

12) If YES, tick the name(s) of medicines the child has used in the last 12 months.
[Can tick more than one]

( ) Ventolin tablet  ( ) Ventolin inhaler  ( ) Intal inhaler  ( ) Becotide inhaler

( ) Prednisolone tablet  ( ) Aminophylline tablet  ( ) Seretide inhaler

( ) Others (specify) -----------------------------

13) Has this child ever used inhaler medication applied through a plastic tube from one end while he/she inhales the medicine from the other end (Spacer device), especially when he/she was younger?

( ) Yes  ( ) No

14) Has this child ever been put in a machine powered by electric or oxygen cylinder that delivers asthma medicine as fumes and inhaled through a face mask (Nebulizing machine)?

( ) Yes  ( ) No

15) Has your child’s doctor/nurse ever told you of the need to put the child on a controller medicine which the child has to inhale two times a day for initial three (3) months whether he/she is having breathing problem or not?

( ) Yes  ( ) No
16) Does this child go for regular checkups to see a doctor/nurse for his/her breathing symptoms?
   ( ) None ( ) monthly ( ) 3monthly ( ) 6monthly ( ) Yearly Others specify -----

SECTION E

17) Does this child stop playing (limited activity) because of breathing problems?
   ( ) Yes ( ) No

18) How many days has he/she had to stop playing (limited activity) due to breathing problems in the last 12 months?
   ( ) None ( ) 1 to 3 days ( ) 4 to 12 days ( ) More than 12 days ( ) Everyday

19) Does this child miss school because of breathing problems?
   ( ) Yes ( ) No

20) How many days have he/she missed school due to breathing problems in the last 12 months?
   ( ) None ( ) 1 to 3 days ( ) 4 to 12 days ( ) More than 12 days ( ) Everyday

21) How many times in the last 12 months has this child had sudden worsening of his/her breathing problems requiring urgent doctor/nurse’s attention?
   ( ) None ( ) 1-2times ( ) 3-5times ( ) 5-10times ( ) > 10times
22) How many times in the last 12 months has this child been admitted in hospital due to his/her breathing problems?

( ) None ( ) 1-2 times ( ) 3-5 times ( ) 5-10 times ( ) > 10 times

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UNTH,

Enugu.

Phone:- 08036672838.