# Plasma electrolytes in patients with asthma in a tertiary hospital in Nigeria

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## Abstract

**Background:** We compared plasma electrolytes in patients with and without asthma.

**Methods:** Subjects for the study comprised of 17 male and 45 female asthmatics attending the Chest Clinic of the University of Benin Teaching Hospital (UBTH), Benin City, Nigeria. These patients had questionnaires administered and the urea and electrolyte values were determined in the standard fashion.

**Result:** Majority (80%) of the asthmatics were in the age range 48 – 57 years and with a mean age of 45±17 years. The urea and electrolyte levels for the asthmatics were in the normal range when compared to the standard used in this environment.

**Conclusion:** This study has reviewed the urea and electrolyte profile for asthmatics. The urea and electrolyte levels for the asthmatics were in the normal range when compared to the standard used in this environment.

**Key words:** Serum electrolytes, asthma

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## Introduction

Asthma is a chronic inflammatory disease of the airway which is characterised by airway hyper-responsiveness leading to airway resistance and associated with widespread but variable airflow limitations that is reversible either spontaneously or with treatment[1].

Asthma represents one of the chronic illnesses affecting all ages. There is considerable concern that the prevalence of asthma is increasing in spite of the advances in knowledge about the pathophysiology of the disease, drug and the availability of new and potent drugs. Asthma is worldwide in distribution and prevalence is between 10 and 20 percent. There is evidence that the prevalence of asthma is increasing in Africa which may be due to urbanization and adoption of western lifestyle[2-4].

Asthma symptoms include intermittent episodes of dyspnoea, wheezing, cough and chest tightness that occur more at night and/or in the early hours of the day. The clinical signs of asthma include presence of bilateral polyphonic rhonchi, though there may be no signs in between attack[5]. Acute asthma has also been defined as acute episodes of progressively worsening shortness of breath, cough, wheezing or chest tightness. Severity is defined according to the Global initiative for asthma (GINA) guidelines[6].

The pulmonary functions tests which are most helpful in diagnosing asthma are spirometry (pre and post bronchodilator), bronchoprovocation testing (usually with methacholine) and peak expiratory flow (PEF) monitoring. A reversible reduction in the forced expiratory volume in one second (FEV), a heightened sensitivity to bronchoprovocation testing, and a variability of greater than 20 percent in PEF are findings consistent with asthma. The diagnosis of asthma is based on the combination of history of symptoms consistent with asthma and the demonstration of variable expiratory airflow obstruction.

Urea and electrolyte form one of the investigations in respiratory conditions and in most chemical pathology laboratories worldwide. The significance of performing urea and electrolyte is on the increase in many developing countries including Nigeria. There is however paucity of information on urea and electrolytes level changes amongst asthmatics in Nigeria, hence this study. The status of plasma electrolytes in asthmatics was assessed in these asthmatics with the objective of elucidating the commonest type of electrolyte disorder.

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## Materials and Methods

Subjects for the study comprised of asthmatic patients (17 males and 45 females) attending the Chest Clinic of the University of Benin Teaching Hospital (UBTH), Benin City between September 1st to November 30th, 2013. Informed consent was obtained from all the

participants and controls. Approval of the hospital ethical committee was also obtained from the University of Benin Teaching Hospital Ethical Committee.

Study participants satisfied the following criteria:
a) Patient's asthma would have been confirmed by the consultant pulmonologist to be of at least 3 months duration. This was clearly stated on the patient's case note.
b) No other condition that affected the cardiorespiratory system, apart from asthma, as at the time of study.
c) The questionnaire for the study was administered by resident doctors in the department of Internal Medicine.

Those patients with asthma who were having acute attacks of asthma were excluded as the intention was to study stable asthmatics. Questionnaires were close ended and were administered to all participants. Demographic data, age, sex, occupation, clinical information were obtained. The medications used were recorded.

On completion of the questionnaire, blood samples were obtained. The blood samples were put in specimen bottles that contained lithium heparin as an anticoagulant. They were labelled appropriately and sent to the chemical pathology laboratory. In the laboratory, the specimens were centrifuged at 3000 rpm for 10 minutes and the clear plasma were harvested with clean Pasteur pipettes and put in plasma bottles and stored in deep freezer at −20C, before analysis in batches. Plasma electrolytes were analysed using a flameless photometer (ion selective electroble, ISE 4000, SFRI, France)[7].

*Data Analysis*
Data collected from this study was processed by using SPSS version 20 software. Quantitative data was displayed in simple frequencies and percentages in tables and as means with standard deviation where appropriate. Group means were compared using student t-test. All tests done were at 95% Confidence Interval (CI) and p < 0.05 was considered significant.

**Results**
A higher proportion of the patients were in the age group 18 − 27 as shown in Table 1. In all, there were more females (72.6%) than males (27.4%). The mean age of the persons with asthma in this study was 45±17 years.

Table 2 showed that most of the patients had 1 − 2 asthmatic attacks per month (35.5%). This is closely followed by patients who had 1 − 2 attacks per week (22.6%) and the least occurring was in patients who had several attacks per day (6.5%).

The combination of steroid/long acting bronchodilator agent (LABA) and -agonist agent when

necessary was the most frequently used medication among this group of patients followed by use of -agonist agent alone (12.9%) and steroid long acting bronchodilator agent (LABA) alone (4.8%).

Table 1: Age and sex distribution of asthma patients

| Age | Female,n(%) | Male,n(%) | Total,n(%) |
|---|---|---|---|
| 18 - 27 | 9 (60) | 6 (40) | 15 (100) |
| 28 - 37 | 8 (80) | 2 (20) | 10 (100) |
| 38 - 47 | 8 (88.9) | 1 (11.1) | 9 (100) |
| 48 - 57 | 8 (66.7) | 4 (33.3) | 12 (100) |
| 58 - 67 | 4 (66.7) | 2 (33.3) | 6 (100) |
| >68 | 8 (80) | 2 (20) | 10 (100) |
| Total | 45 (72.6) | 17 (27.4) | 62 (100) |

Table 2: Frequency of asthmatic attacks and medications used

| Variables | Frequency | Percent |
|---|---|---|
| Frequency of attack | | |
| Several times a day | 4 | 6.5 |
| Once a day | 9 | 14.5 |
| 1 - 2 per week | 14 | 22.6 |
| 1 - 2 per month | 22 | 35.5 |
| 1 - 2 per year | 13 | 21.0 |
| | | |
| Medications | | |
| $_2$ agonist | 8 | 12.9 |
| Long acting bronchodilator/steroid | 48 | 77.4 |
| Steroid alone | 3 | 4.8 |
| Other forms of treatment | 3 | 4.8 |

The use of other medication accounted for 4.8% (Table 3). The urea and electrolyte values for the asthmatics were in this normal ranges when compared to the controls used in this environment (Table 3).

Table 3: Urea and electrolyte profile

| Electrolyte and urea | Group Mean ± SD | | p value |
|---|---|---|---|
| | Test | Control | |
| Urea | 27.57 ± 9.61 | 25.96±9.74 | 0.6036 |
| Sodium | 141.34 ± 9.36 | 133.33±3.75 | 0.0052* |
| Potassium | 3.92 ± 0.51 | 4.14±0.62 | 0.2007 |
| Bicarbonate | 19.29 ± 4.17 | 24.25±3.63 | 0.0003* |
| Chloride | 106.60 ± 7.67 | 102.75±4.29 | 0.0994 |
| Creatinine | 0.82 ± 0.16 | 0.95±0.37 | 0.0613 |

* Statistically significant

## Discussion

Asthma was found to affect all age groups in this study. As noted here as in other studies[9,10], asthma was found to affect more males in the younger age group and more females in the older age group. There are no known reason for this difference; though as explained in an earlier study, by the third decade, the prevalence of asthma in both male and females become equal and subsequently more women than men are affected.

In the past, electrolyte disturbance in patients with asthma focused on serum potassium with the challenge of hypokalemia[11]; this was linked to treatment with -agonist and use of intravenous aminophylline[12,13]. More recently however, hypomagnesemia, hypophosphatemia and hypocalcemia were reported in asthmatic patients following administration of $_2$ agonist. In this study, we did not find any significant electrolyte disturbance. This may be explained by the fact that the majority of the studied persons were stable asthmatics. Our finding is dissimilar to that of Alamoudietal[11] who found deranged values for urea and electrolytes in asthmatics.

Some of the frequently reported complications in asthmatics include electrolyte disturbances such as hypokalemia, hypomagnesemia, hypophosphatemia and hypocalcaemia[14,15,16].

Apart from these, acid base balance can occur during acute exacerbation of asthma and include respiratory alkalosis, metabolic acidosis[16]. In the United States, respiratory alkalosis was found to be most common acid-base disturbance occurring in 48 percent of the 229 episodes of acute asthma on 170 patients[16].

This study revealed that the most frequently used medication by studied population was the combination of steroid/long acting beta$_2$ agonist and a reliever bronchodilator (short acting $_2$ agonist) when necessary. This combination was effective in the control of their asthma.

Only 25% of studied persons used reliever bronchodilator alone. Majority of the patients had only 1 – 2 episodes of acute asthma per month; this finding contradicts that of Lee et al where asthma symptoms were experienced daily in 20% of studied population.[17] The reason for the few attacks can be explained that most of these patients were drug adherent.

The limitation of this study however, was the small size of the subjects.

## Conclusion

This study has reviewed the urea and electrolyte profile for asthmatics. There was no urea and electrolyte disturbance in asthmatics that are in stable state. However, we still recommend the regular analysis of urea and electrolytes in these patients especially when they are on regular medications.

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