Prevalence of Hyponatremia in an Elderly Population: A Case Study

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ABSTRACT

Hyponatremia is the most frequent electrolyte disorder both in hospitalized and outdoor patients. Elderly patients represent a high-risk group for the occurrence of hyponatremia because age is a strong independent risk factor for hyponatremia. Decreased serum sodium concentration is a rather frequent electrolyte disorder in the elderly population because of the presence of factors contributing to increased antidiuretic hormone, the frequent prescription of drugs associated with hyponatremia and also because of other mechanisms such as the “tea and toast” syndrome[1]. Hyponatremia in elderly subjects is mainly caused by drugs (more frequently thiazides and antidepressants), the syndrome of inappropriate antidiuretic hormone secretion (SIAD) or endocrinopathies; however, hyponatremia is multi-factorial in a significant proportion of patients. Special attention is needed in the elderly population to exclude endocrinopathies as a cause of hyponatremia before establishing the diagnosis of SIAD, which then requires a stepped diagnostic approach to reveal its underlying cause. Hyponatremia is an important and common electrolyte abnormality that can be seen in isolation or, as most often is the case, as a complication of other medical illnesses (eg, heart failure, liver failure, renal failure, pneumonia). The normal serum sodium level in the body is 135-145 mEq/L. Therefore, hyponatremia is defined as a serum sodium level of less than 135 mEq/L. This research is based on the prevalence of hyponatremia in an elderly population. This study indicates an increase in patients of hyponatremia above 60 years of age. This study also tells the increase in number of patients having hyponatremia as well as abnormal creatinine levels.

Keywords: Creatinine, Hyponatremia, Patients, Sodium.

I. INTRODUCTION

Hyponatremia occurs when the concentration of sodium in body falls below 135 mEq/L. Sodium is an electrolyte that helps to regulate the amount of water that’s in and around cells. In hyponatremia, one or more factors-ranging from an underlying medical condition to drinking too much water-cause the sodium in body to become diluted[1]. When this happens, water level in body rises and cells begins to swell. Sodium helps in maintaining normal blood pressure, supports the work of the nerves and muscles, and regulates the body’s fluid balance. Sodium is the most important electrolyte involved in the maintenance of blood volume; therefore, adequate levels of sodium in the blood are needed to maintain the supply of oxygen to the kidneys.

Causes of Hyponatremia

Many possible conditions and lifestyle factors can lead to hyponatremia, which includes some medications, like water pills, antidepressants and pain medication. These medications can interfere with the normal hormonal and kidney processes that keeps sodium concentration within the healthy normal range. Congestive heart failure and certain diseases affect the kidneys or liver and can cause fluids to accumulate in body, which dilutes the sodium in body, lowering its overall level. Kidney failure is one of the major reasons for Hyponatremia. Creatinine is a waste product produced by muscles from the breakdown of a compound which abnormally goes high during Hyponatremia[1]. Syndrome of inappropriate anti-diuretic hormone (SIADH) causes retention of water instead of excreting it. Chronic to severe vomiting or diarrhea and dehydration also cause the body to lose electrolytes, like sodium. Hormonal changes like, adrenal gland insufficiency (Addison’s disease) affects adrenal glands ability to produce hormones that help maintain balance of sodium, potassium and water.

Risk Factors

Factors which can increase the risk of Hyponatremia are age-related changes, taking certain medications and greater likelihood of developing chronic diseases like congestive heart failure and cirrhosis of liver, nephrotic syndrome and chronic kidney disease that alters the body’s sodium balance[2]. Certain drugs like thiazide, diuretics as well as some antidepressants increase the risk of hyponatremia. In addition, the recreational drug ecstasy has been linked to fatal cases of hyponatremia[3].

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Types of Hyponatremia

Water and sodium imbalance can occur in three ways which are Hypervolemic Hyponatremia, Hypovolemic Hyponatremia and Euvolemic Hyponatremia[4]. Hypervolemic Hyponatremia is increase in water and sodium content, and can be caused by kidney failure, heart failure or liver failure. Hypovolemic Hyponatremia is decrease in total body water with greater decrease in total body sodium[5]. Euvolemic Hyponatremia can be caused by excessive sweating or diarrhea without replenishing loss of fluid electrolytes the increase in total body water level but no change in sodium content. It can be caused by chronic health conditions or certain medications[6]. In this study, we are focusing on Hypovolemic Hyponatremia since it is the most prevalent type among elderly population. Among hospitalized patients, 15-20% is reported to have a serum sodium level of < 135 mEq/L.

II. MATERIALS AND METHODS

The blood samples of 138 patients of the age > 60 years were collected in the tubes and were send for testing. The results of the samples were evaluated on the basis of creatinine concentration, sodium levels, age and sex.

III. RESULTS

25 out of 46 male patients were found to be suffering from Hyponatremia. These patients had normal creatinine but low sodium levels (Table 1). Their creatinine ranged from 0.70-1.30 which is a normal range but their sodium content was found to be low and ranged from 125-135.
Table 1: Male patients having normal creatinine levels and low sodium levels

| SL. NO | Age | Gender | CREATININE:MALE-(0.70-1.30) | SODIUM(136-145) |
|--------|-----|--------|-----------------------------|-----------------|
| 1      | 61  | MALE   | 0.72                        | 135             |
| 2      | 62  | MALE   | 0.89                        | 134             |
| 3      | 72  | MALE   | 1.04                        | 132             |
| 4      | 67  | MALE   | 0.75                        | 133             |
| 5      | 62  | MALE   | 1                           | 125             |
| 6      | 70  | MALE   | 0.88                        | 134             |
| 7      | 75  | MALE   | 1.27                        | 131             |
| 8      | 68  | MALE   | 1.06                        | 125             |
| 9      | 73  | MALE   | 0.93                        | 133             |
| 10     | 81  | MALE   | 0.79                        | 112             |
| 11     | 67  | MALE   | 1                           | 133             |
| 12     | 77  | MALE   | 1.28                        | 134             |
| 13     | 70  | MALE   | 0.89                        | 134             |
| 14     | 61  | MALE   | 0.72                        | 135             |
| 15     | 75  | MALE   | 0.81                        | 130             |
| 16     | 62  | MALE   | 0.57                        | 126             |
| 17     | 65  | MALE   | 1                           | 135             |
| 18     | 80  | MALE   | 1.14                        | 132             |
| 19     | 61  | MALE   | 0.82                        | 128             |
| 20     | 74  | MALE   | 0.74                        | 118             |
| 21     | 66  | MALE   | 1                           | 133             |
| 22     | 72  | MALE   | 1.07                        | 135             |
| 23     | 80  | MALE   | 1.14                        | 135             |
| 24     | 62  | MALE   | 0.74                        | 135             |
| 25     | 66  | MALE   | 0.78                        | 131             |

14 out of 22 females were found to be suffering from hyponatremia. These female patients had normal creatinine but low sodium levels (Table 2). Their creatinine ranged from 0.40-1.20 which is a normal range for females but their sodium content was found to be low and it ranged from 124-134.

Table 2: Female patients having normal creatinine levels and low sodium levels

| SL. NO | AGE | GENDER | CREATININE: FEMALE(0.40-1.20) | SODIUM(136-145) |
|--------|-----|--------|------------------------------|-----------------|
| 1      | 85  | FEMALE | 0.88                         | 134             |
| 2      | 62  | FEMALE | 0.5                          | 133             |
| 3      | 88  | FEMALE | 0.88                         | 131             |
| 4      | 69  | FEMALE | 0.86                         | 134             |
| 5      | 84  | FEMALE | 0.69                         | 126             |
| 6      | 82  | FEMALE | 0.99                         | 129             |
| 7      | 61  | FEMALE | 0.35                         | 134             |
| 8      | 68  | FEMALE | 0.55                         | 131             |
| 9      | 75  | FEMALE | 0.93                         | 124             |
| 10     | 67  | FEMALE | 1.02                         | 131             |
| 11     | 65  | FEMALE | 0.72                         | 133             |
| 12     | 67  | FEMALE | 0.78                         | 131             |
| 13     | 62  | FEMALE | 0.96                         | 131             |
| 14     | 71  | FEMALE | 0.61                         | 132             |
15 out of 46 males were found to be suffering from Hyponatremia. These male patients had high creatinine and low sodium levels (Table 3). Their creatinine ranged from 1.31-5.56 which is higher than the normal levels of creatinine. Whereas, their sodium ranged from 114-135, that is lower than the normal levels.

Table 3: Male patients having high creatinine levels and low sodium levels

| SL. NO | AGE(YRS) | GENDER | CREATININE:MALE-(0.70-1.30) | SODIUM(136-145) |
|--------|----------|--------|-----------------------------|-----------------|
| 1      | 75       | MALE   | 2.39                        | 114             |
| 2      | 93       | MALE   | 1.77                        | 135             |
| 4      | 69       | MALE   | 5.56                        | 135             |
| 5      | 71       | MALE   | 2.82                        | 133             |
| 6      | 66       | MALE   | 2.44                        | 134             |
| 7      | 67       | MALE   | 1.73                        | 124             |
| 8      | 75       | MALE   | 1.36                        | 132             |
| 9      | 80       | MALE   | 1.74                        | 130             |
| 10     | 63       | MALE   | 1.63                        | 135             |
| 11     | 71       | MALE   | 5.02                        | 131             |
| 12     | 74       | MALE   | 3.3                         | 133             |
| 13     | 70       | MALE   | 1.31                        | 135             |
| 14     | 75       | MALE   | 1.72                        | 130             |
| 15     | 74       | MALE   | 1.35                        | 127             |

8 out of 22 females were found to be suffering from Hyponatremia. These female patients had high creatinine and low sodium levels (Table 4). Their creatinine ranged from 1.28-10.18 which is higher than the normal levels of creatinine. Whereas, their sodium ranged from 129-134, that is lower than the normal levels of sodium.

Table 4: Female patients having high creatinine levels and low sodium levels

| SL. NO | AGE(YRS) | GENDER | CREATININE: FEMALE(0.40-1.20) | SODIUM(136-145) |
|--------|----------|--------|-------------------------------|-----------------|
| 1      | 65       | FEMALE | 1.48                          | 129             |
| 2      | 65       | FEMALE | 1.28                          | 131             |
| 3      | 74       | FEMALE | 2.82                          | 133             |
| 4      | 62       | FEMALE | 10.18                         | 133             |
| 5      | 78       | FEMALE | 1.81                          | 134             |
| 6      | 91       | FEMALE | 1.22                          | 131             |
| 7      | 81       | FEMALE | 1.35                          | 134             |
| 8      | 67       | FEMALE | 6.81                          | 129             |

6 out of 46 males were found to be suffering from Hyponatremia. These male patients had low creatinine and low sodium levels (Table 5). Their creatinine ranged from 0.22-0.68 which is lower than the normal levels of creatinine. Whereas, their sodium ranged from 130-135, that is lower than the normal levels of sodium.

Table 5: Male patients having low creatinine levels and low sodium levels

| SL.NO | AGE(YRS) | GENDER | CREATININE:MALE-(0.70-1.30) | SODIUM(136-145) |
|-------|----------|--------|-----------------------------|-----------------|
| 1     | 70       | MALE   | 0.22                        | 132             |
| 2     | 64       | MALE   | 0.58                        | 135             |
| 3     | 80       | MALE   | 0.62                        | 130             |
| 4     | 64       | MALE   | 0.35                        | 132             |
| 5     | 61       | MALE   | 0.61                        | 133             |
| 6     | 70       | MALE   | 0.68                        | 132             |
In all, out of 138 patients analyzed, 68 patients were found to be suffering from hyponatremia. Therefore, from the data analyzed, it can be seen that around 50% of the population that are above 60 years of age suffers from hyponatremia. Also from the data, it can be seen that out of 138 patients, there are around 30 patients who had abnormal creatinine as well as sodium levels which shows that kidney disease can one of the major reasons for Hyponatremia. Further, from the data, it was seen that there were 46 male and 22 female patients that suffer from hyponatremia and hence we can say that, male patients are more prone to hyponatremia than female.

IV. CONCLUSION AND DISCUSSION

Based on the results, we can say that hyponatremia is the most common electrolyte imbalance encountered in clinical practice[7]. As we can see from the results, prevalence of hyponatremia is known to increase in elderly patients where it is observed in almost half of acute geriatric admissions. The study indicated that there were 34% male and 16% females of total population who suffered from Hyponatremia. Therefore, it can be seen that there were almost 50% of the total population who suffered from Hyponatremia. Older people have an increased predisposition to hyponatremia due to degenerate physiology, multiple co-morbidities and poly-pharmacy[8]. It is also observed that due to abnormal levels of creatinine in kidney, the condition of hyponatremia in elderly population has become more prevalent. This may be because of one of the most important factor that is frequent prescription of drugs such as thiazides or antidepressants which can be associated with hyponatremia[9]. Thus, changes associated with aging and lack of mobility may facilitate the development of hyponatremia in elderly patients[10]. These patients are also at a higher risk of the complications of hyponatremia such as brain injury, associated with significant morbidity and mortality. Severe hyponatremia, if unrecognized in its first stages and left untreated, has a high rate of mortality; for this reason, an accurate clinical assessment must be made[11]. It can also lead to osteoporosis, abnormal gait patterns, cognitive impairment, bone demineralization, respiratory failure, non-cardiogenic pulmonary edema, falls, and fractures[12]. Even mild hyponatremia is considered a risk factor for falls in elderly people. Mortality has ranged from 6.7 to 51% among hospitalized patients who are suffering from Hyponatremia. In a study of patients with a mean age of 72 years, 22.5% had repeated serum sodium determinations of less than 135 mEq/L[13].

V. FUTURE WORK

The early diagnostic is necessary to reduce fatality. This should include a history and physical examination with specific attention to cardiac, cancer, pulmonary, surgical, endocrine, gastrointestinal, neurologic, and renal histories[14]. Diuretics, carbamazepine, and selective serotonin reuptake inhibitors can cause Hyponatremia; therefore, medications should be reviewed. Symptoms of hyponatremia depend on its severity and on the rate of sodium decline. Gradual decreases in sodium usually result in minimal symptoms, whereas rapid decreases can result in severe symptoms[15]. Polydipsia, muscle cramps, headaches, falls, confusion, altered mental status, obtundation and coma may indicate the need for acute intervention[16].

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