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Association of Low Serum Sodium Levels with Urinary Tract Infections: A Case Series

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Abstract

Aim: To find out the Correlation of Serum Sodium levels in prognosis of Urinary tract infection (UTI). Materials & methods: It is a case study of 6 cases of urinary tract infections. Serum Sodium and Urine Sodium levels were done once patient is diagnosed to have UTI. Patients were followed for the period of 1month after discharge and mortality rates were compared with Serum Sodium levels. Results: There is no significant association between decreased sodium and severity of UTI in advanced disease. Conclusion: Although hypernatremia does not report much significance, the choice of treatment for UTIs plays a significant role and it is influenced by whether the management alternatives are simple (i.e., easy) or complicated (i.e., difficult).

Keywords: *UTI, Urethra, Serum sodium, Urine sodium, Pyelonephritis*

1. Introduction

Urinary tract infection affects urinary tracts more in women than in males due to the differences in their systems. The infection has the potential to spread to any section of the urinary tract, putting the whole system at danger.[1] While the infection is spreading, a urinary tract infection has a substantial impact on this process and can cause a variety of symptoms in the patient. Urine generation and disposal is a well-organized procedure.[2] Invasion of pathogenic organisms into the urinary tract produces bladder infection, which can lead to renal abnormalities that impair the organs' ability to filter waste products if left untreated. The lower and upper urinary tracts play a critical role in urinary system organization due to their different regulatory activities. Through the urethra, infectious bacteria ascend upwards causing infection. Key reasons for the higher prevalence in women are their shorter urethra, which makes them more prone to the urethral infections.[3]

The choice of treatment for UTIs is influenced by whether the management alternatives are simple (i.e., easy) or complicated (i.e., difficult). Oral antibiotics are particularly effective for basic uncomplicated cystitis (a lower UTI); studies show that antibiotic-treated UTIs have better clinical outcomes than placebo-treated UTIs. Cystitis should be handled by distinguishing between acute, uncomplicated forms and severe, usually obstructive UTIs that necessitate early, appropriate imaging in pyelonephritis treatment. Urosepsis can be avoided with prompt and effective treatment.

The ability to discern between severe and minor illnesses is crucial for the appropriate management of people with UTI, according to all experts. Complicated infections, such as pyelonephritis (or prostatitis) and those involving the parenchyma, are common in association with obstructive uropathy or following instrumentation. Blockage, stones, etc. are all risk factors for kidney injury. An episode may become resistant to therapy, resulting in relapse and, in rare cases, significant complications. After bacterial colonization of the urinary and bladder mucosae, a cysto-urethritis episode occurs. Because of the rarity of sequelae and the associated morbidity in selected women with reinfection, it is considered noncomplicated. It is also found that women who are young with acute and uncomplicated pyelonephritis will have a decreased rate of further complications. [4] The aim of this cases series is to find out the correlation of Serum Sodium levels in prognosis of UTI, and to find out the association of Serum Sodium levels with outcome, severity of UTI.

2. Materials & Methods

It is a case study, conducted with 6 patients. Patients included in the study are admitted in ICU and Ward in tertiary care centre. The cases fulfilling the inclusion criteria were selected. History was taken and detailed clinical examination with vitals was performed. All the patients of hyponatremia with UTI were included in the study. All other causes of hyponatremia other than UTI e.g., Heart failure, renal failure and endocrine causes, were excluded from the study. Serum Sodium and Urine Sodium levels were investigated once patient was diagnosed to have UTI. Patients were followed during their ICU/hospital stay and hematological values were monitored. Patients were followed for the period of 1month after discharge and mortality rates were compared with Serum Sodium levels.

Case Presentation 1-

A 35 year old male reported to tertiary care centre having pelvic pain, and back pain, high fever, and chills. Laboratory investigations showed E. Coli as the causative factor. Patient was resistant to the ampicillin and CZ. Urine sample showed pale yellow colour, with clear appearance. Proteins were absent with less than 5 RBC count and ++ sugar count. Plenty of pus formation and 0-2 epithelial cells were seen. Lab investigations also revealed urea count of about 53.05, creatinine 1.07 and uric acid count to be 5.77.

Case Presentation 2-

A 42 year old female reported to tertiary care centre having foul smell in urine, frequent urination, spasms in bladder occasional blood discharge in the urine. Laboratory microbial culture revealed E. Coli to be the causative organism. Patient was reported to be sensitive to the IPM and MRP. Urine investigation revealed yellow colour with slightly turbid appearance with absence of sugar and protein. Basophils and monocytes were normal and haemoglobin was also normal.

Case presentation 3-

A 40 year old female, reported to tertiary care centre having cramps in the stomach, with burning sensation while urination. Micobial culture analysis showed K. Oxytoca as the causative microorganism. Patient was reportedly resistant to the ampicillin and CZ. Turbidity was seen in the urine. There was absence of protein and sugar in the urination. With plenty of pus formation.

Case presentation 4-

A 30 year old male reported to the tertiary care centre having pelvic pain, and high fever, and chills. Laboratory investigations confirmed E. Coli infection. Patient was resistant to the ampicillin. Urine sample showing pale yellow colour, with clear appearance. Proteins were absent with less than 5 RBC count and ++ sugar count.

Case Presentation 5-

A 27 year old female, reported to tertiary care centre having cramps in the stomach, with burning sensation while urination. Laboratory investigations showed positive culture of K.Pneumonia and were the suspected causative microorganisms. Patient was resistant to the ampicillin and CZ. Turbidity was seen in the urine. There was absence of protein and sugar in the urination, with plenty of pus cells.

Case Presentation 6-

A 50 year old male, reported to tertiary care centre having foul smell in urine, frequent urination, spasms in bladder and blood discharge seen in the urine. Laboratory investigations showed Pseudomonas as the causative organism. Patient was reported to be sensitive to the IPM and MRP. Urine analysis revealed yellow colored fluid with slightly turbid appearance with absence of sugar and protein. Basophils and monocytes were normal and haemoglobin was also normal.

3. Discussion

Hyponatremia is the most common electrolytei disordersi in clinical practice, mainly in hospitalized patients. Reportedly, 15% to 40% of hospitalized cases have hyponatremia, based on the definition as a sodium level in the blood below 135 mEq/L [1,2] In our case study, in addition to the above findings the patients were also seen resistant to ampicillin and CZ and sensitive to IPM and MRP. All the cases after receiving a thorough antibiotic regimen were discharged in a healthy state. Thereby, the study reports no significant association between decreased sodium and severity of UTI in advanced disease.

Hyponatremia can result from a lack of sodium, although it is most commonly caused by excessive water consumption, which dilutes the body's solutes. Acute hyponatremia has the potential to be damaging to one's health. When someone already has a febrile UTI, this could exacerbate their condition and lead to more disease-related morbidity. These "blueprints" showed reduced aldosterone activity. Delforge and colleagues investigated secondary pseudohypoaldosteronism and CAKUT in 116 infants. Only ten percent of those who did not have a UTI had these metabolic abnormalities.[5-17]

There are a number of bacterial adhesins that detect and colonise bladder epithelium (also known as uroepithelium) receptors, as described by Ana L. Flores-Mireles el al. The survival of uropathogens like UPEC depends on their ability to invade the bladder epithelium, produce toxins and proteases, and synthesise siderophores to extract iron from the host cells. The uropathogens can then ascend to the kidneys, where they connect via adhesins or pili to colonise the renal epithelium and produce tissue-damaging toxins after proliferating and overcoming host immune surveillance. In high-risk groups, treatment guidelines for urinary tract infections (UTIs) have changed over time to emphasise optimal antibiotic therapy, urinary tract imaging, and recurrence prevention. Electrolyte abnormalities in UTI are poorly understood, which might increase patient morbidity and make diagnosis more difficult.

The ability to discern between severe and minor illnesses is crucial for the proper treatment of people with urinary tract infections, according to all experts. Complicated infections, such as pyelonephritis (or prostatitis) and those involving the parenchyma, are common in association with obstructive uropathy or following instrumentation. Blockage, stones, high-pressure vesico-ureteric reflux, perinephric infection, and potentially life-threatening septicemia are all risk factors for kidney injury.
An episode may become resistant to therapy, resulting in relapse and, in rare cases, significant complications such as sepsis, a metastatic abscess, or acute renal failure. After bacterial colonisation of the urinary and bladder mucosae, a cysto-urethritis episode occurs. Because of the rarity of sequelae and the associated morbidity in selected women with reinfection, this type of infection is considered uncomplicated. It is also found that women who are young with acute and uncomplicated pyelonephritis and who respond well to therapy will have a low rate of sequelae. [18]

Abbreviations:

CO3 - Carbonate
D.M - Diabetes mellitus
DCLD - Decompensated liver disease
ECF - Extracellular fluid level.
G - Gram
GFR - Glomerular Filtration Rate
H+ - Hydrogen ion
H2O - Water
HCo3 - Bicarbonate.
HE - Hepatic Encephalopathy
HF - Heart failure
HIV - Human Immunodeficiency virus
Hrs - Hours
IHD - Ischemic Heart Disease
ISE - Ion Selective Electrodes
K+ - Potassium
Kg - Kilogram
L - Litre
MDMA -3,4 Methylenedioxymethamphetamine
ME - Metabolic encephalopathy
mEq - Milliequivalents

4. Conclusion

In a nut shell, the case emphasizes no significant correlation between low sodium levels and severity of UTI. However, the case series also elaborates upon the meticulous choice of treatment for UTIs which is influenced by whether the management alternatives are simple (i.e. easy) or complicated (i.e. difficult). Oral antibiotics are particularly effective for basic uncomplicated cystitis (a lower UTI);

studies show that antibiotic-treated UTIs have better clinical outcomes than placebo-treated UTIs. Cystitis should be handled by distinguishing between acute, uncomplicated forms and severe, usually obstructive UTIs that necessitate early, appropriate imaging in pyelonephritis treatment. Urosepsis can be avoided with prompt and effective treatment.

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