

Electrolyte abnormalities and acute kidney injury in scrub typhus patients admitted in GGH vijayawada

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ABSTRACT

Introduction:

An acute febrile illness known as scrub typhus is prevalent in many parts of India. Patients with scrub typhus who are not diagnosed and treated in the early stages of the disease are more likely to suffer from acute kidney injury (AKI). Electrolyte abnormalities can also be associated with these patients.

Objectives:

The purpose of this study was to determine the correlation between the severity of acute kidney injury (AKI) and electrolyte abnormalities in scrub typhus patients.

Methods:

38 patients with scrub typhus who were admitted in GGH vijayawada were included in this prospective, observational study. Serum sodium and serum potassium levels of the relative multitude of patients were estimated at clinic affirmation. In addition, patients' serum creatinine levels and other parameters like hemoglobin, leucocyte count, and platelet count were measured on every day of the hospital stay.

Results:

Scrub typhus patients had an AKI incidence of 13.16 percent. However, despite the patients' electrolyte abnormalities, AKI was not correlated with them.

Conclusion:

Patients with scrub typhus frequently experience acute kidney injury (AKI). In these patients, there was no correlation between the severity of AKI and electrolyte abnormalities.

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I. Introduction

The acute febrile illness known as scrub typhus is brought on by Orientatsutsugamushi and is spread through the bite of infected chiggers, which are trombiculid mites. It is a zoonotic disease that is endemic in the tsutsugamushi triangle region of the world. As they move through the vegetation, these insects attach to small mammals and humans by crawling on the blades of grass, shrubs, and other small plants. It is transmitted unintentionally when the mite larvae are walking or lying on infested ground. India was plagued by scrub typhus from 1960 to 1970. In the past ten years, there has been a reemergence of the disease in India. The sub-Himalayan region of India, including Tamil Nadu, Pondicherry, Rajasthan, and West Bengal, has seen a number of outbreaks.

In tropical regions, transmission appears to occur throughout the year, and cases typically cluster during the rainy season. South India has also seen outbreaks during the cooler months¹. This is a critical differential diagnosis for patients who present with an acute, unidentified febrile illness. Fever, chills, headache, myalgia, a maculopapular rash with eschar at the bite site, and lymphadenopathy are the most common symptoms. However, because the symptoms resemble those of other infectious diseases like leptospirosis, malaria, dengue, and malaria, the diagnosis is frequently overlooked. Eschar is a sign of pathognomonic disease, but its presence varies. Eschar is difficult to spot in people with dark skin, and because it usually hides beneath the folds of the skin, it's easy to miss. In a tropical nation like India, scrub typhus is common. When patients have eschar, primary care physicians can clinically diagnose the condition. The scrub immunoglobulin M (IgM) antibody and the Weil-Felix test in serum are used in the laboratory to diagnose scrub typhus. Primary care physicians can use these diagnostic tests for scrub typhus to better manage patients with an acute febrile illness.

Pneumonitis, sepsis, myocarditis, and renal dysfunction are scrub typhus complications. It is thought that sepsis-related multiorgan dysfunction syndrome results in acute kidney injury (AKI). Pre-renal failure, vasculitis, interstitial nephritis, and direct invasion of the organism in the renal parenchyma are other potential

causes of AKI². Patients with the disease experience varying degrees of kidney involvement, ranging from asymptomatic and brief changes in laboratory parameters to decreased urine output and electrolyte imbalance.

Since the prompt administration of highly effective antibiotics like doxycycline and azithromycin can alter the course of the disease and prevent further deterioration of the patient's condition, scrub typhus should be included in the differential diagnosis of patients presenting with fever and AKI³. Various laboratory parameters such as serum sodium and potassium may correlate with the occurrence of AKI in patients with scrub typhus.

II. MATERIALS AND METHODS

this was a prospective observational study that was carried out in the emergency and medicine wards of a GGH VIJAYAWADA for a period of six months (June to november,2022).

This study included adult patients who had a confirmed infection with scrub typhus and were found to be IgM antibody positive using the enzyme-linked immunosorbent assay (ELISA) method. The study did not include any patients who had AKI from other causes. After receiving their informed, written consent, only those patients who voluntarily agreed to participate in this study were included. The study procedure was explained to the patients in terms that they could understand.

A brief clinical examination, which included a check for lymphadenopathy and the presence of eschar on the body, as well as measurements of temperature, pulse rate, and blood pressure, was done on the study participants.

Leucocyte and platelet counts at the beginning of the study were included as laboratory parameters. Kidney Disease was used to define AKI: Criteria for Improving Global Outcomes (KDIGO)⁴. AKI is defined as either an increase in serum creatinine of less than 0.3 mg/dl within 48 hours; or a rise in serum creatinine that is less than 1.5 times the baseline within seven days; or if urine output is less than 0.5 ml/kg/h for six hours. The severity of AKI is divided into three stages: stage 1 is defined as serum creatinine 1.5–1.9 times baseline or an increase of less than 0.3 mg/dl, and urine output is less than 0.5 ml/kg/h for six to twelve hours. Stage 2 is defined as serum creatinine 2.0–2.9 times baseline, and urine output is less than 0.5 ml/kg/h for twelve or Every single participant in the study had their serum creatinine measured on a daily basis (from the time they entered the hospital until they were discharged) in order to check for AKI.

In addition, all of the study participants' serum sodium and potassium levels were measured upon admission to the hospital. Hyponatremia was defined as a sodium level below 135 mEq/L and hypokalemia as a potassium level below 3.5 mEq/L.

The mean and standard deviation of continuous variables like sodium, potassium, and creatinine levels were used to summarize categorical variables like age, gender, the presence or absence of AKI, and staging.

With a 95% confidence interval, the incidence of acute kidney injury (AKI) in scrub typhus patients was expressed as a percentage. The significance of the relationship between electrolyte abnormalities and AKI severity was evaluated using the Chi-square test. A statistically significant result was deemed to have a P value that was less than 0.05.

There were 38 people in this study, of which 15 were female and 23 were male. Table 1 displays the study subjects' initial laboratory parameters.

According to the KDIGO criterion, five subjects (13.16 percent) in the study population had AKI, and all of them had stage 3 AKI, as shown in Table 2. The mean presenting creatinine of the study population was found to be 1.53 1.70 mg/dL. The remaining 33 individuals comprised the group of subjects without AKI.

Three of the five people with AKI had hyponatremia, it was found. However, as shown in Table 3, 25 of the 33 study participants who did not have AKI also had hyponatremia.

The P value for the correlation between serum potassium levels and the presence or absence of AKI, as depicted in Table 4, was determined to be 0.578.

The study participants' serum potassium levels are shown in Figure 4. Serum potassium levels in 30 of the study participants were within the normal range (3.5–5.5 mEq/L), while 4 of the subjects had hypokalemia (3.5 mEq/L) and 4 had hyperkalemia (>5.5 mEq/L).

Table 1: Baseline laboratory parameters of study subjects

PARAMETER	Mean±S.D	MINIMUM VALUE	MAXIMUM VALUE
Serum sodium (mEq/L)	130.67±6.85	113	144
Serum potassium (mEq/L)	4.21±0.69	3.12	6.4
Hemoglobin (g/dL)	11.56±1.75	7.9	15.4
Leucocyte count (cells/mm ³)	9956.31±4998.68	3070	23500
Platelet count (lakh cells/mm ³)	1.28±0.79	0.11	3.3

Table 2: Severity of AKI according to KDIGO criterion

Severity of AKI	n
Stage 1	0
Stage 2	0
Stage 3	5

Table 3: Correlation of hyponatremia with presence or absence of AKI

Sodium levels	Subjects with AKI(n=5)	Subjects without AKI(n=33)
Normal	2	8
Mild hyponatremia (130-134 mEq/L)	0	13
Moderate hyponatremia (120-129 mEq/L)	3	10
Severe hyponatremia (<120 mEq/L)	0	2

Table 4: Correlation of serum potassium in subjects with AKI

Potassium levels	Subjects with AKI(n=5)	Subjects without AKI(n=33)
Normal	4	26
Hypokalemia (<3.5 mEq/dL)	1	3
Hyperkalemia (>5.5 mEq/dL)	0	4

III. SUMMARY:

1. AKI was found in 13.16 percent of scrub typhus patients in the study.
2. There were 28 people in the study who had hyponatremia; However, hyponatremia only affected three AKI patients.
3. In eight study participants, potassium levels were found to be abnormal, but there was no correlation between them and the patients' AKI.

IV. DISCUSSION:

A mite-borne disease known as scrub typhus is brought on by a gram-negative intracellular bacterium called *Orientia tsutsugamushi*. It is known that this disease can lead to AKI as a side effect. Prerenal failure, interstitial nephritis, and sepsis are the most commonly accepted causes of AKI, but numerous mechanisms have been proposed to explain its occurrence in this disease.

In the participants in our study who had scrub typhus, the complication rate of acute kidney injury (AKI) was found to be 13.16 percent. In our study, KDIGO guidelines were used to define AKI in the subjects⁴. A North Indian study revealed that patients with scrub typhus experience AKI much more frequently. One study has shown that outbreaks of scrub typhus are very common in Puducherry and Tamil Nadu during the cooler months of the year¹. Previous studies conducted in various regions by using either KDIGO guidelines or RIFLE criterion, a variable incidence of occurrence of AKI among patients with scrub typhus was observed³. In a study that was carried out in Shimla, scrub typhus was found to be a leading cause (18.5%) of sep In a review done by Sun et al., According to Basu et al.'s other study, the incidence of AKI was 21% using RIFLE criteria⁸ revealed a 40% prevalence of AKI. Additionally, their study subjects were found to have a high mortality risk⁹. Attur et al. found that the incidence of AKI was 23.2%, 31.9%, and 35% in other studies conducted in India. Singh and co. and Vikrant and others respectively^{6,7,10}.

A study by Kumar et al. found the highest incidence of AKI, where the incidence was found to be 53% among scrub typhus patients³. A study that was conducted in Nepal found that 35.8% of the subjects had AKI¹¹. A similar study that was conducted recently in south India by Jayaprakash et al. and Premraj and others, In a review conducted by John R. and Varghese GM, the incidence of acute kidney injury (AKI) among patients with scrub typhus admitted to a tertiary care teaching hospital in south India was found to be 18%¹³. The incidence of AKI in our study is comparable to these studies. Some patients with AKI exhibit electrolyte abnormalities in the form of hyponatremia and hypokalemia. However, these variables did not appear to have a significant impact on AKI in the current study.

Scrub typhus patients are at risk for the common complication of acute kidney injury (AKI). Electrolyte abnormalities like hyponatremia and hypokalemia may be associated with it. However, electrolyte abnormalities and AKI in scrub typhus patients were not found to be correlated in our study.

LIMITATIONS:

1. In comparison to other studies, this one has demonstrated a lower incidence of acute kidney injury (AKI) among scrub typhus patients. Empirical antibiotics like doxycycline or azithromycin, which are highly effective against the causing organism, could have been the cause. Scrub typhus patients may have experienced fewer complications as a result of the empirical treatment.
2. There are only a few subjects being studied for scrub typhus complications in this one-center study. Expanded mindfulness among clinicians about this tropical sickness and brief organization of therapy and early reference of patients to a tertiary consideration community might have decreased the event of AKI in the review subjects.

V. CONCLUSION:

Scrub typhus patients had an AKI incidence of 13.16 percent. The affected patients had electrolyte abnormalities such as hyponatremia, hypokalemia, and hyperkalemia, but there was no significant correlation between these variables and the presence or absence of AKI.

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