Remarkable Hypokalemia among Sudanese Patients with Jaundice

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Abstract

Background: Impairment of potassium levels is common in clinical practice, mainly encountered among hospitalized patients with a wide spectrum of sickness. Hypokalemia is a potentially dangerous irregularity that may have pernicious actuates. Objective: This study was directed to measure the potassium levels in Sudanese infected with jaundice. Material and Methods: A cross-sectional study recruited in the laboratory center of Port Sudan teaching hospital during the period from the 14th July 2008 to the 5th April 2009. 90 Icteric patients (30 hemolytic Icterus patients, 30 hepatic Icterus patients and 30 obstructive Icterus patients) along with 30 apparently healthy controls were enrolled. Serum potassium and bilirubin levels were evaluated. Results: Hypokalemia noted in 45 (50%) of the Icterus patients. Hypokalemia was significantly associated with hepatic and obstructive jaundice ($P < 0.000$). Hypokalemia was strongly positively correlated with conjugated bilirubin concentration ($P < 0.000/r = -0.736$) and negatively correlated with unconjugated bilirubin concentration ($P < 0.078/r = -0.187$). Conclusion: Hypokalemia is predominant in patients with jaundice and may worsen the morbidity of the illness.

Keywords: Serum potassium; Hypokalemia; Jaundice; Sudan.

Introduction

Potassium is one of the most noteworthy body particles. About 98% of the body's potassium is intracellular [1]. The proportion of intracellular to extracellular potassium is major in marking the cellular membrane [2]. The kidney controls the potassium homeostasis, and an abundance of potassium is discharged in the urine. A diminished level of potassium less than 3.5 mEq/l is called hypokalemia. Hypokalemia may have come about because of numerous conditions, such as renal impairment, gastrointestinal losses, inadequate diet, medications and transcellular move [3]. The judgment of the etiology of hypokalemia is mandatory prior initiating specific therapy [4]. Firstly, we should ensure that this hypokalemia is not spurious. This will assist to avert the inappropriate management that can conduce to adverse outcomes. Spurious hypokalemia refers to an artifactual decrease in serum potassium levels that do not superpose to their actual systemic values [5]. On the other hand, jaundice is a yellow stain that takes office when the bilirubin concentration in the blood rises more than (3 mg/dl) and the bilirubin is precipitated in the skin and sclera of the optics. Whereas Icterus describes the plasma and tissue. Jaundice can be assorted into pre-hepatic (hemolytic), hepatic, and post-hepatic (obstructive) jaundice. Patients with jaundice particularly the obstructive type are at high risk for developing renal impairment which may be a life-threatening complication. A former study has been described that the severe jaundice was related to hypokalemia in a proportion of 63% and hyponatremia 56% [6]. This work has been held away to evaluate the potassium levels in patients with jaundice.

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Materials and Methods

A cross-sectional study included 90 patients with jaundice divided as follows; 30 patients with pre-hepatic jaundice, 30 patients with hepatic jaundice, 30 patients with post-hepatic (obstructive) jaundice admitted to a laboratory unit of Port Sudan teaching hospital during the period from the 14th July 2008 to the 5th April 2009. The cases were picked up among the admitted patients who had indications suggestive of jaundice with serum bilirubin levels more than 2 mg/dl and they looked for medicinal exhortation as long as 3 weeks of disease. Clinically, a general survey and scrutiny of the abdomen, respiratory system, nervous system, and cardiovascular system were taken. Serum potassium and bilirubin concentration levels were assessed.

Inclusion and exclusion criteria

Patients with jaundice documented by laboratory findings, ultrasonography, and magnetic resonance imaging (MRI) were enrolled. Patients with pre-existing renal pathology or other causes of hypokalemia were excluded from the study.

Study sample

Blood samples were withdrawn from each member of the study. 3 ml (non-hemolyzed) venous blood specimens were collected in plain containers (without aggregator). The specimens were forwarded to obtain serum using centrifugation under standard temperature. The laboratory investigations were performed by a fully

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automated chemistry analyzer (Selectra pro S, Switzerland).

Data analysis

The gauging of laboratory chemistry tests of patients with jaundice was statistically tested by a one-way ANOVA and Chi-square test whichever was relevant. Linear regression was used to adjust confounding variable between potassium levels and bilirubin concentration. Significance value $P < 0.05$ were considered statistically significant. Data were analyzed using statistical package for social science (SPSS 24.0 version, IBN, Chicago, USA).

Ethical Clearance

This study was endorsed by the regional ethical review committee. Informed consent was taken from every participant of the study.

Results

This prospective study was carried out during the 8-month period from 2008 to 2009. 90 patients with jaundice and along with 30 controls were enrolled. 55 (61.1%) were males and 35 (38.9%) were females among the Icterus patients, with the mean age being 39.6±17.1 years. While 21 (70%) were males and 9 (30%) were females among the control, with the mean age being 34.6±13.9 years. The main findings for all members, encompassing the Icterus profiles and potassium levels are presented in (Table 1). The mean of Icterus profiles was significantly higher in patients than the control ($P < 0.000$). While the mean potassium levels were significantly lower in patients compared to the control ($P < 0.000$).

Peak conjugated bilirubin concentration was observed in all hepatic and obstructive jaundice. Whereas the unconjugated bilirubin concentration was also peaked in all hemolytic and hepatic jaundice. Normal unconjugated bilirubin concentration was only detected in 20 (22.2%) in obstructive jaundice, unlike the conjugated bilirubin concentration which was noted only in hemolytic jaundice. Potassium levels were normal in 45(50%) of the Icterus patients, meanwhile 45 (50%) were had hypokalemia in Icterus patients. No hyperkalemia has been associated with Icterus patients (Table 2).

Patients with hepatic and obstructive jaundice had a significantly higher severity of illness as highlighted by the reduced potassium levels (hypokalemia) ($P < 0.000$). On the contrary, patients with hemolytic jaundice had significant slight severity of sickness owing only to 2 (2.2%) Icterus patients had hypokalemia. Furthermore, jaundice was significantly associated with hypokalemia, this association was expressed statistically by regression analysis (Figures 1, 2) which revealed diminished potassium levels with respect to the onset of jaundice. Hypokalemia was strongly positively correlated with conjugated bilirubin concentration ($P < 0.000$, r; -0.736) and at one time negatively correlated with unconjugated bilirubin concentration ($P < 0.078$/r, -0.187).

Discussion

True, in that regard is a paucity of data in our general vicinity respected to hypokalemia with jaundice. Consequently, our work revealed that the patients with hepatic and obstructive jaundice had the peak serum concentration, although there was a slight presentation of hemolytic jaundice. In the current study,

Table 1. Baseline findings of control and Icterus patients

Characteristics	Icterus patients (n=90)	Control (n=30)	P. value
Age (mean±SD)	39.6±17.1	34.6±13.9	0.151
Range	16 – 80 years	16 – 59 years	
Sex (male)	55 (61.1%)	21 (70.0%)	0.386
(female)	35 (38.9%)	9 (30.0%)	
Potassium level mEq/l	3.47±0.49	4.18±0.31	0.000
Range	2.6 – 4.8	3.8 – 4.9	
Total Bilirubin mg/dl	5.42±3.46	0.62±0.24	0.000
Range	1.5 – 16.8	0.20 – 1.0	
Conjugated Bilirubin mg/dl	3.31±2.81	0.21±0.03	0.000
Range	0.20 – 11.8	0.10 – 0.25	
Unconjugated Bilirubin mg/dl	2.15±1.25	0.40±0.22	0.000
Range	0.50 – 5.4	0.10 – 0.80	

Table 2. Characteristics of types of jaundice

Character/ parameter	Hemolytic jaundice (n=30)	Hepatic jaundice (n=30)	Obstructive jaundice (n=30)	Total
Potassium (mEq/l)				
Low	2 (2.2%)	21 (23.3%)	22 (24.4%)	45 (50%)
Normal	28 (31.1%)	9 (10.0%)	8 (8.9%)	45 (50%)
High	—	—	—	—
Bilirubin (mg/dl)				
Unconjugated				
Normal	—	—	20 (22.2%)	20 (22.2%)
High	30 (33.3%)	30 (33.3%)	10 (11.1%)	70 (77.8%)
Conjugated				
Normal	8 (8.9%)	—	—	8 (8.9%)
High	22 (24.4%)	30 (33.3%)	30 (33.3%)	82 (91.1%)

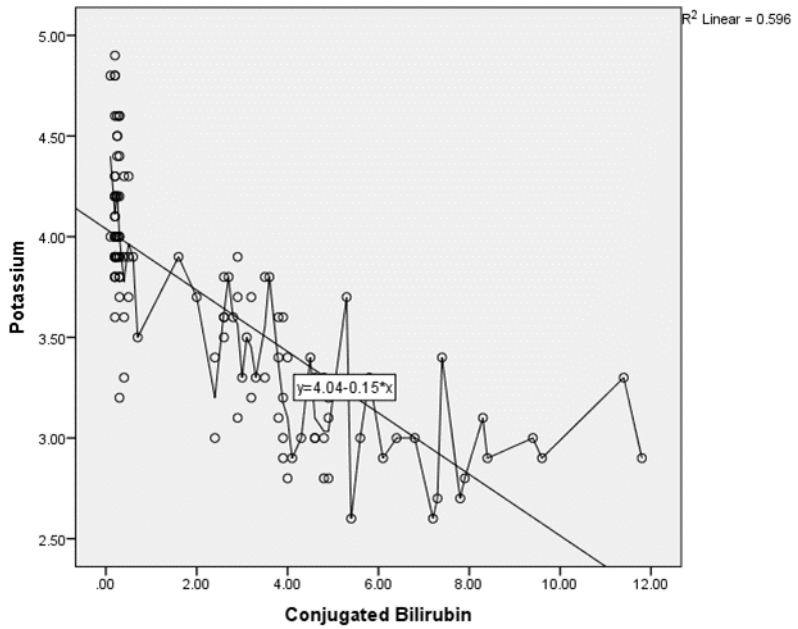

Figure 1. The relationship between potassium level and conjugated bilirubin concentration

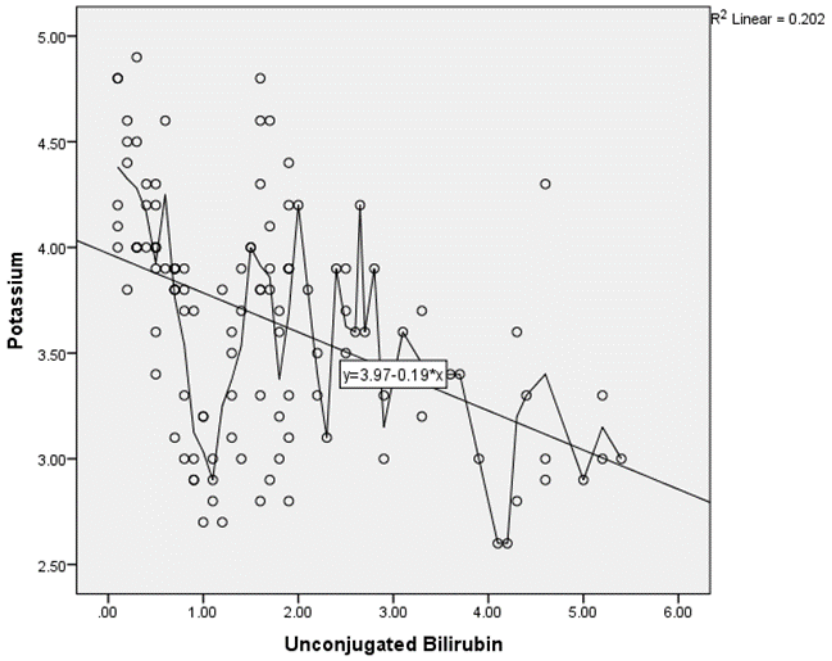

Figure 2: The relationship between potassium level and unconjugated bilirubin concentration

hypokalemia was significantly observed with intrahepatic and extrahepatic jaundice. These findings were strongly consistent with Ahmed *et al* and Souheil Abu-Assi *et al* [7, 8].

Hypokalemia is a gravest complication when associated with jaundice. As mention globally, 50 – 80% of Icterus patients develop hypokalemia. Moreover, hypokalemia was detected in 45 (50%) of Icterus patients that are relatively concordance with the international statement [9]. Hypokalemia yields due to locomotion of potassium from intracellular to extracellular stores. The hydrogen atom outside the cell moves into the cell to conserve the electroneutrality, consequently, ammonia outputting increase due to intracellular acidosis in renal tubular cells. The switched of ammonium is furthered by accompanied contribution of metabolic alkalosis. Ammonium is a chipped element that cannot pass the blood-brain septum, whereas ammonia can engage the brain [10].

Gaduputi V in their study investigates the prognostic findings of hypokalemia in patients with jaundice. These potential prognostic outcomes such as the blood PH, ammonia level, and stay duration in the hospital [11]. Nonetheless, hospital accommodations were significantly longer among Icterus patients with hypokalemia. This finding was considerably similar to our patients. Furthermore, they had established an association of hypokalemia with different types of jaundice. Ahmed *et al* and Mehboob observed hypokalemia in 34% subjects with jaundice and

intestinal bleeding [7, 12]. Other assorted variety studies performed in different places showed hypokalemia in cirrhotic patients (33% to 68%) and other liver diseases (6.4%) [7, 12, 13 – 15]. Referred to literature, numerous different explores completed worldwide have been exhibited variable level of hypokalemia in patients with chronic liver anomalies [7, 16]. The organization of diuretics additionally have been created hypokalemia in patients with liver impairment and ascites [17]. To our knowledge, no study at the country regarding hypokalemia status among the Icterus patients has been performed. Due to short of facilities the other compartments of liver function as well as sodium level and chloride level were not performed in this work. On the other hand, this study neglected the causes of jaundice, which is a strong limitation of this inquiry. Nevertheless, wide studies with relative or other sophisticated method should be viewed in the hereafter.

Conclusion

In light of the aftereffects of this study, the prevalence of hypokalemia among Icterus patients was high. Investigations of electrolytes, especially potassium level ought to be requested for all patients with jaundice to prohibit hypokalemia. Early recognition and critical remedy of hypokalemia diminish the morbidity and the expenses of the drugs.

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