



Alcohol Induced Acute Kidney Injury in A 13-Year-Old Nigerian Boy; A Case Report

Adebukola Ajite

Department of Paediatrics, Ekiti State University,
Ado Ekiti, Ekiti State, Nigeria, and Department of Paediatrics,
Ekiti State University Teaching Hospital, Ado Ekiti, Ekiti State, Nigeria

Ezra Ogundare

Department of Paediatrics, Ekiti State University,
Ado Ekiti, Ekiti State, Nigeria, and Department of Paediatrics,
Ekiti State University Teaching Hospital, Ado Ekiti, Ekiti State, Nigeria

Isaac Oluwayemi

Department of Paediatrics, Ekiti State University,
Ado Ekiti, Ekiti State, Nigeria, and Department of Paediatrics,
Ekiti State University Teaching Hospital, Ado Ekiti, Ekiti State, Nigeria

Olufemi Adebisi

Department of Paediatrics,
Ekiti State University Teaching Hospital, Ado Ekiti, Ekiti State, Nigeria

ABSTRACT

Alcohol misuse has been insinuated to be a cause of acute kidney injury with various patho-mechanisms suggested. We present a case of a 13-year-old Nigerian boy who was admitted on account of vomiting of 4 episodes of 24 hours duration, convulsion of several episodes within 3hrs prior to presentation and associated loss of consciousness. He was apparently well until the outset of symptoms which were preceded by ingestion of about 250mls of 'LORDS' dry gin containing 43% alcohol mixed with Cocacola. The urinary output was 0.67mls/kg/hr on the first day of admission while the peak serum creatinine value was 1425.2 μ mol/l. The random blood sugar at admission was 14mmol/l. He was given intravenous fluid 5% Dextrose /saline, intravenous phenytoin, diazepam 5mg, and antibiotic. He had 2 sessions of haemodialysis within 48 hours apart. Subsequently, he regained full consciousness after the first session of dialysis and the creatinine level at discharge was 73 μ mol/l with urine output of 1.67ml/min/hr. He was co-managed with the Psychiatrist and the duration of admission was 16 days. He is being followed up after discharge at the Paediatric nephrology clinic.

Keywords: alcohol, acute kidney injury, teenager, haemodialysis

INTRODUCTION

In the United States, alcohol use disorder is considered a public health challenge affecting 15.7 million people of age ≥ 12 years [1]. The link between alcohol use disorder and kidney injury has been controversial and this is mainly because there is inconclusive experimental evidence to this effect [2]. However, alcohol misuse has been insinuated to be a cause of acute kidney injury with various patho-mechanisms suggested [2]. One of these mechanisms is the alcohol induced oxidative stress leading to production of excess free radicals that has the capability to cause tissue injury and increase inflammation [2]. Nigeria is a developing country in West Africa with pooled crude prevalence of harmful use of alcohol put at 34.3% (range of 28.6%-40.1%)[3]. In Nigeria the rate of alcohol consumption varies among the various ethnic groups and it was reportedly common among young adults [4]. The likelihood of children having more exposure and access to alcohol is higher now that the young adults who drink alcohol are giving birth to children. Teenagers, especially the early adolescent (10-13years) and mid-adolescent age (14-16years) are vulnerable and are usually willing to try out new ways of life without considering the possible ill effect or outcome. They are readily under peer pressure and strong emotions often continue to drive their decisions when impulses come into play.

CASE REPORT

The patient was a 13-year-old Nigerian boy who was admitted because of 4 episodes of vomiting of 24 hours duration, convulsion of 4 episodes within 3hrs prior to presentation with associated loss of consciousness. He was apparently well until the outset of symptoms when he started vomiting, it was non bloody, non-bilious, non-projectile, contained recently ingested substances. The convulsion was generalised, tonic-clonic in nature, several episodes, each episode lasting for about 5mins, with spontaneous abortion and there was associated loss of consciousness. There was no fecal or urinary incontinence. History of reduction in urine could not be ascertained

There was a history of alcohol consumption about 3hrs prior to onset of symptoms. He was said to have ingested about 250mls of 'LORDS' dry gin, containing 43% alcohol which was mixed with CocaCola at his uncle's birthday party. There was previous history suggestive of illicit substance abuse (name of substance could not be ascertained), peer pressure and inadequate parental supervision. There was no associated fever, prior history of trauma to the head or convulsions, and there was no family history of convulsion. There were no complaints of headaches, chest pain or abdominal pain prior to onset of symptoms. There was no past medical history of hospital admission.

He was taken to a private health facility where IV anticonvulsant was administered before referral to our health institution.

Family and social history showed that he was the last of five children. The parents were separated. He was sharing a room with a 25-year-old brother who was an alcoholic. The mother was a 55-year-old petty trader.

On examination, he was unconscious Glasgow coma score= 3/15, not in respiratory distress, not pale, afebrile- 37.0°C, anicteric, acyanosed, no evidence of dehydration, there was no pedal oedema.

Respiratory system examination revealed a respiratory rate of 29 cycles per minute, the SPO₂ in room air was 98% and breath sound was vesicular.

Cardiovascular system showed a pulse rate of 112 beats per minute, which was regular and of full volume, blood pressure was 130/50 mmHg (systolic hypertension), the first and the second heart sounds were heard and there was no murmur.

On gastrointestinal system examination, his abdomen was flat, moved with respiration, there was no palpable organ enlargement.

Central nervous system examination showed that he was unconscious with Glasgow coma score of 3/15 (had sedative administered prior to examination). Pupils were of equal size, 3mm and slowly reactive to light bilaterally. There was no sign of meningeal irritation, tones and reflexes were normal in all limbs.

An assessment of Coma probably secondary to Alcohol induced Encephalopathy was made to keep in view acute kidney injury.

He was admitted in the Children Emergency Ward, blood samples were collected for random blood sugar, electrolyte and urea, full blood count, urine sample for urinalysis, urine toxicology test, urethra catheter passed for strict monitoring of his urine output, he also had serology for retroviral and hepatitis done while preparing him for dialysis.

RESULTS

The investigation results showed hyperglycaemia (RBS – 14mmol/L), negative retroviral and Hepatitis B surface antigen screenings, urine toxicology was negative for cannabinoids, opiates, amphetamine and cocaine but positive for benzodiazepine (had diazepam injection prior sample collection). His urine output was 0.67ml/kg/hr.

TABLE 1: Result of urinalysis

URINALYSIS PARAMETERS	10-09-2022	11-09-2022
Blood	+++	++
Urobilinogen	-	-
Bilirubin	-	-
Protein	+	+
Nitrite	-	-
Ketones	-	-
Ascorbic acid	+	-
Glucose	+	+
pH	5.0	5.0

Table 2: Electrolyte urea and creatinine (E/U/Cr) results

DATE	Na (mmol/L)	K (mmol/L)	Cl (mmol/L)	HCO ₃ (mmol/L)	UREA (mmol/L)	Cr (μmol/L)
10-09-2022	133	5.0	97.1	21	6.0	221.4
12-09-2022	131	4.3	109	23	34.3	580
13-09-2022	123	4.8	100	15	33.1	506
14-09-2022	133	4.2	110	24	56.7	1425.2
15-09-2022	120	3.7	107	22	32.3	792
16-09-2022	117	2.8	102	24	15.7	316.8
19-09-2022	107	3.3	100	23	15.4	264
21-09-2022	118	3.1	99	23	11.4	193.6
26-09-2022	141.6	3.8	102	19.2	2.3	73.7

Packed Cell Volume (PCV)

10-09-2022 – 49%

15-09-2022 – 37%

16-09-2022 – 37%

21-09-2022 – 36%

The liver function test result was essentially normal.

DIAGNOSIS

Patient was subsequently managed for Alcohol Encephalopathy with AKI

TREATMENT

Patient was given intravenous fluid 5% dextrose/saline 600mls 6hrly (calculated at volume of previous urine output over the last 24 hours added to his insensible fluid loss placed at 400mls/m² (body surface area). He also had the following medications

- IV phenytoin 250mg stat, then 125mg 12hrly – double dilution slowly over 20mins
- IV diazepam 5mg for every breakthrough seizure
- IV Rocephin 1g daily

Patient had 2 sessions of Hemodialysis done, 1st session – 14-09-2022

2nd session – 16-09-2022

Over the course of admission, he became fully conscious after the first session of haemodialysis, with resolution of symptoms by the 7th day on admission. Urinary output increased from 0.67mls/kg/hr at presentation to 1.6mls/kg/hr after the second session of haemodialysis. He was reviewed by the psychiatric unit in the course of admission, and he is currently on follow up in the Paediatric nephrology unit.

DISCUSSION

Alcohol consumption by early and middle adolescents is gradually becoming a public health concern confronting developing countries including Nigeria [4]. The patient in this index case report was 13-year-old which is early adolescent age. Alcohol consumption has been shown to be seen in such young children in earlier study. Obot et al [5] and Alex-Hart et al [6] reported alcohol consumption in 11-year-old children in Central Nigeria and Port Harcourt respectively.

Peer pressure and the influence of an adult have been documented as some of the reasons children engage in alcohol consumption [4,5]. This is what played out in this index patient as he was living in the same room with his 25-year-old elder sibling with record of binge drinking of alcohol. Children are often readily influenced by adults who associate with them or who they see as their role model. Experimentation and socialization were some of the other reasons documented for alcohol consumption by children [6]. The social restriction by the community that frowns at alcohol consumption in young children has been eroded by the clamour for a taste of urbanization [5]. Other factors involved are absence of alcohol policy, easy accessibility, aggressive advertising/marketing which is sophisticated and unregulated, there is no definition on what a standard alcoholic beverage is and lack of implementation of the minimum age for drinking alcohol [6].

The male children are usually adventurous and are more likely to want to experiment with new exposures. The patient in the index study was a male and previous studies [4,7-9] have found greater prevalence of alcohol consumption among male children, though a study [10] in South-western Nigeria reported that female children consumed alcohol more. The variation may be due to difference in cultural practices, social values that differ from one place to another.

Acute kidney injury (AKI) is a life-threatening complication that is associated with high death rates in alcohol intoxicated patients [11]. AKI is defined as an abrupt (within 24–48 h) decrease in glomerular filtration rate due to renal damage that causes fluid and metabolic waste retention and alteration of electrolyte and acid-base balance [12,13]. The KDIGO (Kidney Disease Improving Global Outcome) Clinical Practice Guideline for AKI, defines AKI as any of the following: increase in serum creatinine by ≥ 0.3 mg/dl (≥ 26.5 $\mu\text{mol/L}$) within 48 hours; or increase in serum creatinine to ≥ 1.5 times baseline, which is known or presumed to have occurred within the prior 7 days; or urine volume < 0.5 ml/kg/h for 6 hours. In the case study, AKI was defined by the rise in serum creatinine with the peak at 1425.2 $\mu\text{mol/L}$. There was reduction in urine output (0.67ml/kg/hr), haematuria, proteinuria, uraemia and metabolic acidosis (serum bicarbonate was 15mmol/l) on the 3rd day of admission. The convulsion was treated with Phenytoin and diazepam and the AKI was managed with fluid restriction to insensible fluid loss added to the previous day output. The biochemical indications for haemodialysis were serum urea level above 25mmol/l, serum creatinine level above 500 $\mu\text{mol/L}$ in this index patient.

There are inconclusive epidemiological as well as experimental evidences linking alcohol use disorder with AKI [2,14]. However possible mechanisms suggested [15,16] include; alcohol induced oxidative stress leading to production of excess free radicals that has the capability to cause tissue injury and increase inflammation [2]. Alcohol use disorder has been implicated in the promotion of adverse pathological processes on other major organs such as the liver, heart, intestine and skeletal muscle, which has a harmful effect on the kidneys [15,16]. There is a need for more research work in this field.

Alcohol use in adolescent is associated with increase in social vices and moral decadence according to the respondents in the study conducted by Agofure et al [4], there were instances of unprotected sex while under the influence of alcohol, some of these children have been taken advantage of sexually and also have taken advantage of others sexually while under the influence of alcohol. All these may lead to increase in the occurrence of sexually transmitted

diseases and aid its spread like wildfire among these children. A survey [17] found that among people ages ≥ 26 years, drinking at an early age of < 15 years is associated with 5 times likelihood of developing alcohol use disorder as an individual grows older. These show that the ills of alcohol consumption in underage are alarming. Changes in the pattern of alcohol consumption in the contemporary Nigerian society have been reported with increased and alarming daily consumption of alcohol among adolescents and young adults [2,18].

In conclusion, the teenager in this index case report had unrestricted access to alcohol because of the influence of adults in his immediate environment. The clinical presentations were managed symptomatically in this teenager and there was resolution of features of renal impairment following haemodialysis. Laws restricting alcohol consumption in children should be enacted and the potential dangers of alcohol consumption in children should be emphasized in schools and in the society.

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