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Case Report

Acute kidney injury in patient with acute gastroenteritis and history of consuming energy drink

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ABSTRACT

An abrupt decline in kidney function is a characteristic of acute kidney injury (AKI), a disorder that affects the structure and function of the kidneys. Hypovolemia from gastroenteritis is known as one of the causes from prerenal AKI. Energy drinks, which are consumed a lot by workers and young people are also known can decrease kidney function and liver function even without having any pre-existing diseases. There were two reported cases of consumption energy drink that worsening kidney and liver function in gastroenteritis patient with mild-moderate dehydration state.

Keywords: Energy drink, AKI, Gastroenteritis, Acute renal failure, Liver impairment

INTRODUCTION

An abrupt decline in kidney function is a characteristic of AKI, a disorder that affects the structure and function of the kidneys. It belongs to the category of acute kidney illnesses and disorders (AKD) and can occur on its own or in conjunction with other acute or chronic kidney diseases. Making the right diagnostic and treatment decisions requires an understanding of the differences between acute and chronic kidney disorders. AKI, formerly known as acute renal failure (ARF), necessitates immediate care to avoid complications.[1] The pathophysiology of AKI has traditionally been divided into three categories: prerenal, intrarenal, and postrenal. Hypovolemia from gastroenteritis is known as one of the causes from prerenal AKI. Each of these categories has many different associated causes, and some causative factors have overlapping mechanisms.[2]

Energy drinks, which contain of caffeine, L-carnitine, taurine, B vitamins, glucuronolactone, antioxidants, trace minerals, guarana, sucrose, Ginkgo biloba, and/or ginseng among their ingredients, may act as stimulants.[3] The energy drink has become a popular beverage among teenagers and workers.[4] Excessive consumption of these beverages has been associated with a heightened risk of psychiatric symptoms, arrhythmias, cardiac arrest, myocardial infarction, convulsions, and potential renal and liver impairment.[5,6]

CASE REPORTS

Case 1

A 19 years-old young woman, patient P, came to emergency room with a complaint of vomiting for five days, worsening one day prior to admission with eight episodes of vomiting, and diarrhea four times in the past one day before. The complaint of fever is denied. Urination frequency has decreased, and there is an increase in thirst. Any history of previous hospital admissions or illnesses and history of medication are also denied by patient. The patient works as an employee and has a habit of consuming energy drinks 4-5 times per week for six years ago.

Physical examination revealed that the patient was conscious, with normal blood pressure 90/65 mmHg, heart rate 107×/minute, respiratory rate 18×/minute,

temperature 37.3ºC, and oxygen saturation of 98% in room air. Sunken eyes, dry oral mucosa, tenderness upon palpation of epigastrium during abdominal examination, and decreased skin turgor, and warmth in extremities were noted. Other physical examination findings were within normal limits.

Lab results showed WBC 12,750/ul, hemoglobin 15.7 g/dL, platelets 167,000/ul, urea 57 mg/dl, creatinine 2.3 mg/dl, SGOT 1925 U/l, and SGPT 1872 U/l. Abdominal ultrasound showed no specific findings provided. The patient was managed with rehydration with 2 kolfs NaCl 9% and continued with 12 drip per minute (dpm).

The patient also received antibiotic ceftriaxone and symptomatic drugs such as omeprazole and ondansetron. On the first day of discharge, urine output was decreased around 0.3 cc/hour over 12 hours. Subsequent investigations showed an increase in urea and creatinine levels, leading to hemodialysis. After hemodialysis, there was an improvement in renal dan liver function, and the patient's condition improved, allowing discharge (Table 1). Three days later, during a follow-up at the outpatient clinic, repeat renal and liver function tests showed improvement. During hospitalization and after discharge, the patient did not consume energy drinks.

Table 1: Laboratorium results.

Variables	Day 1st	Day 5th	Day 8th	Day 11th (Post HD)	Day 13th	Day 16th
Patient P						
Ureum (mg/dl)	57	96	188	62	37	13
Creatinine (mg/dl)	2.3	3.7	6.3	2.7	1.5	0.8
SGOT (U/l)	1925	-	729	-	-	126
SGPT (U/l)	1875	-	194	-	-	45
Variables	**Day 1st**	**Day 2nd**	**Day 4th**	**Day 6th (Post HD)**	**Day 8th**	**Day 15th**
Patient M						
Ureum (mg/dl)	85	85	122	65	68	27
Creatinine (mg/dl)	6.5	5.8	10.1	4.7	2.7	0.7
SGOT (U/l)	-	-	-	54	-	-
SGPT (U/l)	-	-	-	48	-	-

Case 2

A 17 years-olds young woman, patient M, arrived at the emergency room on the same day as patient P, who had been experiencing chief complaint diarrhea for three days prior to discharge. In addition to the diarrhea, the patient also experienced ten episodes of nausea and vomiting per day. Any history of previous hospital admissions or illnesses and history of medication are also denied by the patient. The patient was a student and has had a habit of consuming energy drinks 6-7 times per week since the patient was in junior high school.

Physical examination revealed that the patient was conscious, with normal blood pressure 110/67mmHg, heart rate 112x/minute, respiratory rate 18x/minute, temperature 36.2ºC, and oxygen saturation of 98% in room air. Sunken eyes, dry oral mucosa, tenderness upon palpation of the epigastrium during abdominal examination, normal skin turgor, and warmth in extremities were noted. Other physical examination findings were within normal limits.

Lab results showed WBC 11.470 /ul, hemoglobin 17.2 g/dl, platelets 287,000/ul, urea 85 mg/dl, creatinine 6.5 mg/dl. Urological ultrasound showed parenchymal kidney disease bilateral. The patient was managed with rehydration with 2 kolfs NaCl 9% and continued with 12 dpm. The patient also received antibiotic ceftriaxone and symptomatic drugs such as omeprazole and ondansetron. During discharge, urine output was decreased (based on anamnesis). Subsequent investigations showed an increase in urea and creatinine levels, leading to hemodialysis. After hemodialysis, there was an improvement in renal and liver fuction, and the patient's condition improved, allowing discharge (Table 1). Three days later, during a follow-up at the outpatient clinic, repeat kidney function tests showed improvement. During hospitalization and after discharge, the patient did not consume energy drinks.

DISCUSSION

Both of patients in this case have gastroenteritis and vomiting, which cause hypovolemia. The kidneys receive up to 25% of the cardiac output and thus any failure of the general circulation or isolated failure of the intrarenal circulation can have a profound impact on renal perfusion. Hypovolemia can reduce renal perfusion and also GFR (prerenal mechanism).[7] Both patients have hypovolemia, which shows up as signs of dehydration, tachycardia, decreased skin turgor, and dry mucosa. Dehydration is categorized into mild, moderate, and severe dehydration. Patient P showed moderate dehydration, while patient A showed signs of mild dehydration. The report by Marzullo et al. indicates that patients with mild dehydration can also have an incidence of AKI, suggesting that kidney injury can be triggered by mild dehydration, but it was previously established that severe dehydration is associated with a higher risk of AKI.[8]

In two patients that know the history of energy drink consumption, patient P consumes 4-5 times/week and

patient B consumes almost every day. Energy drinks have become a popular beverage among teenagers and workers. Research conducted by Suarilah et al shows that workers and young people consume a lot of energy drinks, which is related to a lack of health knowledge. The impact of energy drinks is currently being widely discussed.[4] Energy drinks also have an impact on changes in kidney, liver, or heart function. Energy drinks are known to decrease kidney function even without having any pre-existing diseases.[9,10]

Some research showed the impact of energy drinks to renal function. Research conducted by Schoffl et al showed the link between energy drink consumption and its impacts to kidney injury. There was a 17-year-old boy who drank 1 liter of vodka along with 3 liters of energy drink, subsequently showing a decline in kidney function with a creatinine level of 6.9 mg/dl. The patient's condition and kidney function improved after dialysis was performed (resulting in a decrease in creatinine levels).[11] Although this role is not well defined, it is known that the excessive amount of taurine implicated in the development of kidney injury caused the loss in kidney function because it can change renal blood flow and regulate osmolarity in the renal medulla.[12]

The research conducted by Lehtihet et al revealed one instance of acute kidney failure with tubular necrosis in a football referee, age 31, which was caused by rhabdomyolysis. An energy drink was identified as the only possible cause of kidney failure.[13]

The research conducted by Greene et al., highlights the case of a 40-year-old patient with various complaints, including difficulty staying awake, stiffness, and shortness of breath while sleeping. Kidney function declined with creatinine level of 5.5 mg/dl from a baseline of 0.9 mg/dl. The patient had a history of consuming 100-120 oz of energy drinks in the past 2-3 weeks. Kidney function improved after 2 days without energy drinks and remained stable within 10 days.[14]

The research conducted by Yacoub et al showed that a 62-year-old patient with acute kidney injury (creatinine 2.83 mg/dl and urea 19 mg/dl) and transaminitis (SGOT 4333 U/l and SGPT 2866 U/l) after a history of consuming 5-4 glasses/day of energy drinks in the weeks before hospitalization. The patient experienced symptoms of nausea, vomiting, and decreased intake. There was an improvement in kidney and liver function during the 10-day hospitalization without the use of energy drinks. It is known that taurine levels can affect worsening kidney function and niacin levels can affect worsening liver function.[3]

There are no known reports of kidney injury related to B vitamins, sucrose, glucose, or glucuronolactone. Taurine is the only ingredient with any hypothesized link to renal injury. Other energy drinks may contain guarana, ginseng, ginkgo biloba, and bitter orange, which are associated with similar effects.[15,16] Large dosages of taurine are necessary for AKI to develop, although the exact levels are still unknown. Research by Yacoub et al., showed that patients developed AKI when consuming 10-12 gm of ED daily.[3] The intensity of energy drink consumption (1-2/weeks, 3-5/weeks, and 6/weeks) is strongly linked to reduced renal function, according to research by Suarilah et al. The incidence of AKI increases with intensity frequency (p=0.029).[4]

CONCLUSION

The history of the consumption of energy drink can affect the worsening of kidney function in patient with gastroenteris acute in mild-moderate dehydration state, and it also can cause the worsening of liver function. Energy drink consumption is high among young community. Therefore, it is necessary to increase knowledge about energy drinks, including their benefits, side effects, dosage, and safety.

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