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CASE SERIES

Gastrointestinal toxicity due to bitter bottle gourd (*Lagenaria siceraria*)—a report of 15 cases

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Abstract Traditional medicine is widely practiced in tropical countries. Bottle gourd (*Lagenaria siceraria*) fruit juice is advocated as a part of complementary and alternative medicine. If the bottle gourd juice becomes bitter it is considered toxic. We report 15 patients, who developed toxicity due to drinking bitter bottle gourd juice. Patients presented with abdominal pain, vomiting, hematemesis, diarrhea and hypotension within 15 min to 6-h after ingestion of bottle gourd juice. Endoscopy showed esophagitis, gastric erosions, ulcers and duodenitis. Hypotension was treated with crystalloids and inotropic support. All patients recovered in 1–4 days. Endoscopically the lesions healed in 2 weeks. Bitter bottle gourd can cause gastrointestinal toxicity with hematemesis and hypotension. Supportive management is the treatment and all patients recover within 1 week.

Keywords Bottle gourd · Complementary and alternative medicine · Endoscopy · Erosions · Hematemesis

Introduction

Bottle gourd (*Lagenaria siceraria*) is a herb widely grown in tropical countries like India. The unripe fruit is commonly eaten as a vegetable [1]. Traditional medicine is widely practiced in India. Bottle gourd fruit juice is advocated by traditional healers for flatulence, diabetes mellitus, hypertension, liver diseases and as a diuretic [2]. It is part and parcel of complementary and alternative therapies, and drinking a glass or two of freshly prepared juice on an empty stomach is prevalent in India. Though there are a few beneficial effects of bottle gourd extracts in animal models [3], human studies are few. On the contrary, we observed some serious ill effects of taking bottle gourd juice particularly if it is bitter.

Methods

This is an observational study of 15 consecutive patients with bitter bottle gourd toxicity over a period of 4 years at a tertiary hospital. All patients presented with abdominal pain, vomiting with or without gastrointestinal bleed or hypotension. There was a definite history of intake of bitter bottle gourd that was temporally correlated with the patients' symptoms. There was no history of intake of any other indigenous medications, NSAIDs, alcohol or illicit drugs. Detailed history and clinical examination were done. Complete hemogram, liver function tests, renal function tests, serum electrolytes, coagulogram, chest skiagram, electrocardiogram, blood cultures and stool cultures were done to rule out other causes. Patients who had hypotension were managed in an intensive care unit with central venous pressure monitoring with crystalloids, blood products and inotropes. Upper gastrointestinal endoscopy was done in patients who had hemetemesis. A repeat endoscopy was performed after 2 weeks.

Results

The clinical and laboratory features are shown in Tables 1 and 2, and endoscopic findings are given in Table 3. All patients

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Table 1 Clinical features of patients after ingestion of bitter bottle gourd juice

Case no	Age (y)	Sex	Latent period (min)	Abdominal pain	Vomiting	Hematemesis	Diarrhea	Blood pressure (mmHg)	Time to recovery (days)
1	55	M	30	+	+	+	−	90/60	4
2	38	M	30	+	+	+	+	80/60	2
3	43	M	15	+	+	+	+	60/40	3
4	42	M	30	+	+	+	+	116/82	1
5	36	M	15	+	+	+	+	90/70	1
6	35	M	30	+	+	+	−	110/80	1
7	72	M	60	+	+	+	+	SBP-54	4
8	39	M	30	+	+	+	−	140/80	4
9	30	F	45	+	+	+	+	110/80	3
10	52	F	45	+	+	+	+	80/54	1
11	43	M	60	+	+	+	+	120/80	3
12	61	F	15	+	+	−	+	96/60	1
13	46	M	45	+	+	+	−	130/80	4
14	38	F	360	+	+	−	+	74/56	4
5	45	M	60	+	+	−	+	124/82	2

SBP Systolic blood pressure

required hospitalization. Eight patients were managed in the intensive care unit, whereas the remaining were admitted in a high dependency unit. All were given intravenous crystalloids and proton pump inhibitors (PPI). Six patients had persistent hypotension and needed inotropic support for 2–3 days in the form of dopamine and/or noradrenaline infusion. Two patients who had low hemoglobin were transfused whole blood. On endoscopy in patients who had hematemesis, lesions like hyperemia, erosions and ulcerations were seen in esophagus, stomach and duodenum. Most of the lesions were in the body and antrum of stomach (Fig. 1). Three patients did not undergo endoscopy because they did not have hematemsis. Fourteen patients had hemoconcentration, which improved within 24-h of hospitalization with crystalloids. Raised transaminases was seen in all patients. With conservative treatment clinical features like vomiting, abdominal pain, hematemesis and diarrhea improved in 1–4 days and patients were discharged after 3–5 days. A repeat endoscopic examination showed normal mucosa after 2 weeks.

Table 2 Biochemical investigations in patients after ingestion of bitter bottle gourd juice

Case no	Hemoglobin (gm/dL)	PCV (%)	TLC (/mm^3)	Serum creatinine (mg/dL)	Serum bilirubin (mg/dL)	AST (IU/L)	ALT (IU/L)
1	21	58	16,300	1.2	1.6	1,498	613
2	9	50	5,200	0.7	1.0	56	78
3	22	62	19,900	1.2	2.8	76	148
4	16	54	22,000	0.9	1.3	114	64
5	18.4	58	24,600	2.6	1.2	1,156	1,494
6	16.6	60	18,400	1.2	1.3	62	57
7	19.2	60	19,500	1.1	1.0	101	99
8	18.6	56	7,600	0.9	1.3	223	190
9	20.2	62	18,600	1.0	1.2	126	98
10	9.4	57	14,000	0.9	1.0	646	577
11	18.2	40	11,400	1.0	0.9	104	82
12	20.4	54	12,800	1.0	1.6	145	167
13	17.8	55	16,800	1.1	1.2	138	94
14	18.6	57	9,600	0.9	1.4	247	186
15	18.8	52	10,000	1.0	1.0	54	44

PCV Packed cell volume; *TLC* Total leucocyte count; *AST* Aspartate transaminase; *ALT* Alanine transaminase

Table 3 Endoscopic features in 12 patients with bottle gourd juice induced toxicity

Esophageal erosions	6
Stomach	12
Hyperemiaa	12
Erosions	10
Ulcers	2
Site of stomach involvement	3
Fundus	10
Body	12
Antrum	
Proximal duodenum	12
Hyperemia	12
Erosions	4
Ulcers	0

Discussion

Bottle gourd (*Lagenaria siceraria*) which is commonly known as '*Lauki*' in northern India, is a member of cucurbitaceae family. It is cultivated throughout the tropical and subtropical regions of the world for its unripe edible fruit as a vegetable. Other members of this family include cucumber, colocynth, bitter gourd, water melon, etc. The ethanolic extract of *L. siceraria* fruit showed antihepatotoxic and antihyperlipidemic activity in rats [1].

All cucurbits produce trace quantity of complex substances known as cucurbitacins, which are bitter substances, having a tetracyclic triterpenoid structure. Bottle gourd fruit contains trace amount of cucurbitacins specially types B, D, G, and H. Normally, the levels of cucurbitacins do not exceed 130 ppm [4]. These produce a characteristic aroma and protect the plants from insects and animals. Bitter bottle gourds have abnormally high levels of these cucurbitacins. Miro [5] studied the pharmacological properties of cucurbitacins and found them to be cytotoxic. Cucurbitacins inhibit the bindings of cortisol to glucocorticoid receptor in He La cells at 37°C in a dose-dependent manner, which shows a strong correlation with cytotoxic activity [6]. Cucurbitacin D enhances capillary permeability [7], which is associated with a persistent fall in blood pressure and accumulation of fluid in thoracic and abdominal cavities in mice. Cucurbitacin is a strong Signal Transducers and Activators of Transcription-3 (STAT3) inhibitor; cucurbitacins not only inhibit the JAK-STAT pathway, but also affect other signalling pathways, such as the MAPK pathway [8]. Though toxic to animals, the bitter taste prevents poisoning in humans. Higher levels of these cucurbitacins are triggered by environmental stress, like wide temperature swings, low pH, high temperature, too little water, low soil fertility and improperly stored or over-matured vegetables [9].

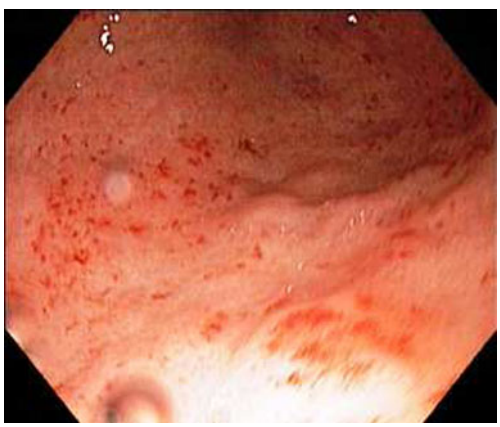

Fig. 1 Endoscopic image showing hemorrhagic areas in stomach

There are a few reports of human toxicity due to cucurbits. In 1981–1982, in Australia and Alabama, and in 1984 in California, 202 cases of human poisoning were reported by bitter zucchini, a cucurbitaceae member [10–13]. Similarly Khan et al. [14] reported 5 cases of bloody diarrhea due to colocynth toxicity. Nadkarni et al. [15] reported hemetemesis due to bitter gourd juice ingestion. Sharma et al. [16] reported a case of bitter bottle gourd toxicity in a 59-year-old man, who was managed conservatively and improved.

Our series of 15 cases is probably the largest series of gastrointestinal bleeding and hypotension following the ingestion of bitter bottle gourd juice. The amount of juice ingested varied from 50 to 300 mL. Most of the patients had onset of symptoms within 1-h, except one who had symptoms 6-h following ingestion. The clinical presentation consisted of abdominal pain, vomiting, diarrhea, hypotension and upper gastrointestinal bleed. As the patients had symptoms which were temporally correlated to intake of bitter bottle gourd juice and good response with conservative treatment suggested the diagnosis of probable bottle gourd poisoning as per Naranjo adverse drug reaction probability scale [17] and WHO-UMC causality assessment criteria [18]. Most patients had hemoconcentration, and eight patients had hypotension requiring fluid infusion and inotropic support. Hypotension with hemoconcentration responding to blood transfusion may be because of the capillary leak due to cucurbitins. There were no significant electrocardiogram changes to suggest cardiac origin of hypotension. Hypotension improved in 1–3 days in all cases. All patients had elevated liver enzymes and this may be either because of cytotoxic effect or due to ischemia of liver.

Eight patients had hemetemesis and had erosions and ulcers in esophagus, stomach and duodenum. They were treated with PPI and blood products were transfused, if required. When re-endoscopy was done after 2 weeks of discharge these lesions had improved.

To conclude, it is important to be aware of this uncommon clinical presentation especially in countries like India, where the practice of traditional medicines is widely prevalent.

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