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CASE REPORT

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Undercooked bitter yam poisoning in three siblings and the public health implications: a case report

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Abstract: Bitter yam is eaten by the three major tribes in Nigeria, often as a special delicacy. The Ekiti people of Western Nigeria even consume it as a staple diet. It is also used by the locals for medicinal purposes. This tuber crop can however be toxic if consumed in the unprocessed state. Patients with bitter yam toxicity can present with neurologic manifestations such as convulsions and coma; digestive system problems such as vomiting; or allergic reactions such as itching. We present the cases of three siblings with bitter yam toxicity brought to our facility with age-and-dose-related symptoms after ingestion of undercooked bitter yam.

Keywords: Bitter-yam, undercooked, poisoning, siblings, convulsion

Introduction

Bitter yam poisoning occurs when the yam is eaten raw, undercooked or not properly processed.[1,2] Common ways of processing this yam species in our environment include soaking it in water for several hours (usually overnight) and drying.[3] The toxic components include histamines, furanoidnorditerpenes and dioscorine.[1] The histaminic effects are usually those of allergic reactions; the furanoidnorditerpenes (diosbulbins A and B) are responsible for the bitter taste; while the dioscorine effects present as digestive or central nervous systems pathologies.[1,2] Individuals with bitter yam toxicity can therefore present with a range of symptoms from allergic rashes to gastrointestinal conditions such as vomiting and/or diarrhea.[1,2] In severe cases there can be central nervous system involvement in the form of convulsions and/or coma.[1]

It is reported that this yam species among others originated from Latin America, but has now become a regular starchy delicacy in South-east Asia, and Africa.[4] In Nigeria, it is consumed by the three major tribes as special delicacies after due processing, aside being used for medicinal purposes.[5] The yam species is a staple food in South-western Nigeria, particularly among the Ekiti people.[5] It is therefore pertinent to bring to the fore the potential health risk of its consumption in the not-well-processed state. We present and discuss the age and dose -associated symptoms, clinical course and clinical management outcomes of three siblings with bitter yam toxicity who presented at the Federal Teaching Hospital, Ido-Ekiti, Ekiti state, South-west, Nigeria. They all presented at the same time with varying degrees of symptoms.

Case Report

A 2-year-old boy was rushed into the Emergency Paediatric Unit (EPU) of the Federal Teaching Hospital, Ido-Ekiti on account of multiple episodes of convulsions which started 3 hours before presentation and subsequent loss of consciousness of 2 hours duration. The convulsions were generalized tonic-clonic and started about 30 minutes after the ingestion of minimally cooked bitter yam which the family would have had for lunch. The episodes of convulsion were said to be numerous with no regaining of consciousness in-between episodes.

The patient and his older siblings were impatient for the meal to cook properly and helped themselves surreptitiously to some of the undercooked yam while still being cooked. It was not the first time the family would be having bitter yam as a meal. This present bitter yam was bought from the local market. Previously, it was always allowed to cook for about an hour before consumption. The patient was said to have eaten a larger chunk of the yam compared to the 2 older siblings. The quantity ingested by the child was estimated to be about twice the size of his clenched fist. There was no history of fever before presentation and during admission. No history of febrile seizures in the past in the patient, and no family

history of epilepsy. Immediate home intervention instituted by the mother included force-feeding with palm oil which is considered by the locals as antidote for most poisonings. He was initially rushed to a peripheral hospital where attempt to stop the seizure with intramuscular (i.m) paraldehyde failed before he was referred to our facility.

On arrival at our EPU the patient was unconscious with a Glasgow Coma Score (GCS) of 8/15 and hypoxic with an SPO_2 of 74 – 76%. He was tachypnoeic and had widespread transmitted sounds in all lung zones on chest auscultation. He was also tachycardic but had a normal blood pressure. His was hyperglycaemic with a random blood sugar (RBS) of 30mmol/L. Liver function test (total protein, albumin, aspartate transaminase, alanine transaminase, alkaline phophatase, total and conjugated bilirubin), electrolytes (sodium, potassium, bicarbonate, chloride) urea and creatinine were normal. A diagnosis of status epilepticus from toxic encephalopathy following bitter yam poisoning was made. A secondary diagnosis of aspiration pneumonitis was also made. He was administered i.m Paraldehyde stat with convulsion persisting. Thereafter IV diazepam was administered with no improvement. Intramuscular Phenobarbitone was subsequently administered at a loading dose followed by the maintenance dose with seizures finally controlled.

The maintenance dose of phenobarbitone was continued for 48 hours since barbiturates have been reported to be efficacious in managing bitter yam poisoning[12]. Patient also received intranasal oxygen and SPO_2 rose to between 92 – 95%. The hyperglycaemia resolved within the first 3 hours on admission. Fluid management was initially with normal saline; which was subsequently changed to 5% D/S when the patient became euglycaemic.

The patient regained full consciousness after 9hours on admission though with some residual staggering gait which resolved over the next 3 days.

Presentation of the 2 Other Siblings: The patient's older siblings, a 3 year old girl and a 5 year old boy were brought to the EPU of the FETHI at the same time as patient. Both presented with vomiting, passage of loose stool and one episode of convulsion each with no loss of consciousness. Their vital signs were normal at presentation, and they had no repeat of the presenting symptoms. They received no medications but were observed at the EPU for 12 hours before discharge.
Toxicological screening could not be done for any of the siblings for logistic reasons.

Fig 1: Raw bitter yam newly harvested

Fig 2: Cooked bitter yam from which the siblings ate

Discussion

Yams (*Dioscorea spp*) are edible starchy tubers which serve as staple food in many cultures, with over 600 species eaten in various parts of the world.[1,6]Bitter yam ,one of the over 600 yam spp grows in well drained, fertile and high textured soil with anannual rainfall ranging between 25 and 175 centimetres.[5] The bitter yam species native to Africa is *Dioscorea dumetorum*, while *Dioscorea bulbifera* is more commonly found in Asia.[7] In Nigeria, bitter yam go by the following local names: kosanrogo, ji-ona and esuru among the Hausas, Igbos and Yorubas respectively.[5] It is generally regarded as "adult food", and can be considered a delicacy among the Yorubas and Igbos.[3] In south-east Nigeria it is regarded as food of choice for diabetics as it is believed to lower blood sugar, while in the south-west it is used by the locals in the treatment of malaria[3,5,8] Other common names of the yam are three-leaved yam (trifoliate yam) and cluster yam.[5]

Bitter yam can be unpalatable or out rightly toxic causing vomiting, diarrhoea or even central nervous system problems when large amounts are ingested without proper processing or if eaten raw.[1] Processing is usually by soaking in water for long hours or boiling till fully cooked.[3] The yam is particularly hard to cook.[9] This is

as a result of the difficulty in achieving separation of the yam tissue cells during cooking. The difficulty is brought about by phytate hydrolysis, resulting in the deposition of a lignin-like material, causing strengthening of cell wall.[9] Dioscorine content of bitter yam has been shown to decrease from an average of 168.7mg/100g to 124.2mg/100g after prolonged cooking.[10] The 30% decrease in this alkaloid content of the yam species *inter alia* has been postulated to be responsible for its safety after prolonged cooking.[10]

The toxic ingredients in the yam species include the toxic alkaloid called dioscorine.[1] Others include histamine and saponins.[1,2] Dioscorine triggers convulsion among other central nervous system symptoms when a fragment of the tuber weighing about 100g or more is ingested.[1]It was reported that locals once used extracts from wild bitter yam in making poisoned arrows. The dioscorine component was this extract.[11] Histaminehas been reported as the principal allergen in bitter yam, causing mild inflammation and itching.[2] The unpalatable nature of the tuber has been linked to furanoid-norditerpene group of compound found in it.[1]It has been reported that barbiturates produces remarkable result in managing symptoms referable to dioscorine – though there is paucity of data on this - while allergic symptoms are managed conservatively with anti-histamins and other anti-allergic medications. [2,12]

The bitter yam species is however not without nutritive value, asides being consumed for medicinal purposes. It is found to have a lipid content of 0.7-0.6%, higher than that found in many other yam species.[13] Its fibre content of 1.2-0.9% (significantly higher than that of water yam and sweet potato) makes it a good source of roughages, which aids digestion.[13] The high carbohydrate content of 78.8-82.3% and protein content of 6.0-3.4% is noted.[13] It is also found to have adequate amount of sodium, potassium, calcium, magnesium and phosphorus.[13] These nutritional values though inviting, the potential toxicity is enough reason for concern.

Conclusion

It is quite frightening that the same crop that served as staple food to a family can possess potential toxicity with near fatal consequence if not well processed before consumption. There is therefore the need to promote public awareness in areas where this crop serve as staple food or is used for medicinal purposes. Indeed, if there are alternative tuber crops/other yam species, the crop could be totally avoided as a household staple food.

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