

(CASE REPORT)



The challenges of cassava fermentation for Garri production: A case report of a woman with muscle twitching possibly due to cyanide poisoning from poor cassava fermentation

Orhe OG ^{1,*}, Ebereghwa EM ¹, Emuoghenerue EO ² and Anyanwu EB ¹

¹ Department of Family Medicine, Delta State University Teaching Hospital, P.M.B 07, Oghara, Nigeria.

² Department of Radiology, Delta State University Teaching Hospital, P.M.B 07, Oghara, Nigeria.

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Abstract

Cassava is native plant found in the tropical region of Africa and America. The tubers harvested from this plant is a four-runner to a variety of local delicacies. Usually, the tuber is harvested after a period of maturation and is then processed in the local manner before those foods are produced. There are numerous end-product that come out of the tuber, each food article following a particular route of processing. These local techniques had been passed down from generation to generation and all local farmers know them by heart. There are some modern innovations being introduced into this previously all local process. "Garri" is one of these food end-product that is generated from cassava tuber, others being fufu, tapioca, cassava floor and starch. If properly processed, it is a good food and there is usually no ontoward effect on the consumers, but if not done as routine, cyanide which is found naturally in cassava tuber may accumulate in the tissues of the consumer and possibly cause cyanide poisoning over a period of time. This short report is that of a local farmer with muscle twitching which we suspected may have been caused by cyanide poisoning from prolonged consumption of ill-prepared/processed cassava.

Keywords: Cassava Tuber; Processing; Garri; Cyanide Poisoning

1. Introduction

Cassava is an edible tuberous root that contains cyanide glycosides which is toxic to ingest, if not properly detoxified by soaking, fermenting, drying, and scraping before being consumed. The challenge is to ensure that the presence of these cyanogenic glycosides is minimized. The detoxification of the cyanide content may not be adequate due to lack of knowledge or for financial gain, hence food poisoning occurring.

2. Case Report

During a missionary outreach to a village outpost in a Niger-Delta State of the southern part of Nigeria, various types of ailments were identified and managed as best as was possible. Many others were referred out to Government General Hospitals for proper and adequate investigations and then management as may be deemed appropriate and affordable.

One particular mid-aged woman was seen whose only complaint was that she had developed muscle twitching in various parts of her body and that she felt that her strength was reduced.

* Corresponding author: Orhe OG

Department of Family Medicine, Delta State University Teaching Hospital, P.M.B 07, Oghara, Nigeria.

She said that she was not on any medication for any disease conditions, not a known diabetic mellitus patient, nor had hypertension, did not smoke cigarette nor consume alcohol in any form.

She had always been a farmer all her life, born into a large family that was essentially into farming, now married to a farmer husband and together they have four healthy children.

The family engaged in cassava farming, yam farming and had some local fowls that were allowed to roam around and fend for themselves. She processes the harvested cassava tuber when they are matured and from them, produces garri and several other end-products. Together with her husband, they are able to look after their young family adequately.

But she notices these muscle twitching over a period of about two years which had gradually worsened over-time. These were not associated with pains, nor had muscle wasting, but she described a slight loss of strength.

She said that she was still able to do her normal house work and contributed her expected part of the work on the farms.

On further interaction, she revealed that she made garri from her harvested cassava tubers and then sold the produce in their local market. She further revealed that because of the high demand for garri from the market-women that came from the city markets, that they now produce garri from the harvested cassava in just one day, maximum two days flat. This is repeated quickly as the demands may be.

This meant that the usual local fermentation of the cassava (that usually took about four to six days) was not allowed to take its usually pathway and duration.

She further said that they (herself and other farmers) know that this shortened length of the procedure for producing garri may not be alright but that the economic benefit was most helpful to them all.

She sold most of her produce to middle-men from the large cities nearby, who then sold to smaller market women and then onwards to consumers in those cities.

But then, she like all other farmers in these villages fed their families from the same produce that came from an expedited processing.

She did not know of anybody in her village or neighbouring communities that had reported similar problem as hers, and then medical outreach team did not see any other patients with similar problem.

She did not know of any health benefits acquired for allowing the fermentation of the grated cassava to occur over several days.

She never heard of cassava containing cyanide, did not know what cyanide was all about, did not know if cassava had any other chemical contents, but she admitted that garri produced from cassava that had been allowed to ferment as recommended by traditional practices was usually tastier and sweeter and less “biting” in the mouth than the one produced from the shortened process line.

Such garri had a “sharp biting” taste in the mouth of the consumers but anyway still was garri as they knew it.

Examination conducted on her was essentially normal with normal muscle bulk globally, normal power, tone and reflexes and all other systems been normal.

Only negative finding were the occasional muscle twitching or tics which were short-lived and occurred spontaneously anywhere. There were no pains associated with these twitchings.

We suspected cyanide poisoning based on her history but we were limited by our inability to evaluate her biochemically for the blood levels of cyanide in the index patient, and maybe in other residents of the village and environ.

3. Discussion

Cyanide is a chemical that can be found in nature and is known to be in several types of food such as beans and tapioca.

Cyanides are notoriously poisonous and can cause death. It is found in cigarette smoke, the exhaust fumes from motor cars, and it is known to be available in different forms such as a colourless gas or as a white powder.⁽¹⁾

It can also be produced naturally by some fungi or algae and bacteria⁽¹⁾.

The agent was once used as a warfare agent for mass human destruction, and is still used in pesticides, fumigants, mining activities, dye manufacturing and in certain pharmaceutical products such as citalopram and cimetidine⁽²⁾.

Humans get in contact with this agent by consuming food articles that naturally have low-levels of it, (such as spinach, soy, lima beans and almond), or by excessive smoking of cigarettes or inhaling it from the atmosphere^(1,2).

Cyanide is also a recognized end-product of human metabolism and we breathe it out during normal expiration⁽²⁾.

Symptoms of cyanide poisoning may include;

- Overall weakness
- Nausea
- Confusion
- Headache
- Difficulty breathing
- Seizures
- Loss of consciousness
- Cardiac arrest

The appearance and severity of cyanide poisoning depends on whether the case was due to a sudden and acute poisoning in which case the intensity may be severe as above, or due to low grade exposure over a period of time in which case, the symptoms are subtle, gradual and may not be noticed but worsens over time⁽²⁾.

Acute poisoning manifests suddenly and is severe from the onset.

- Difficulty in breathing
- Seizures
- Loss of consciousness
- Death

While chronic poisoning shows up insidiously and worsens in severity over a period of time and shows as:

- Headache
- Drowsiness
- Nausea
- Vomiting
- Vertigo
- Dilated pupils
- Shallow breathing
- Convulsion

3.1. Ultimately

- Slow irregular heartbeats
- Generalized cyanosis
- Coma
- Death^(2, 3, 4).

Cassava consumption may result into cyanide poisoning if it is not properly processed. Cassava is a tuberous plant grown in over 80 countries of the tropical world, and it serves as a major dietary food for well over 800 million people in these independent countries^(5, 6, 7).

Cassava is edible and was a rich source of carbohydrates and it is eaten prepared in various ways. As an unwritten rule among the producing local cassava is never to be eaten raw as it contains within it a significant amount of cyanide that can be injurious to human health ⁽⁵⁻⁷⁾.

Cassava processing if improperly done can lead to acute and sudden cyanide poisoning and long-term exposure can even lead to thyroid gland disease and disruption of nerve function leading to ataxic neuropathy⁽⁶⁾.

The nation of Nigeria had been reported to be the largest producer of cassava in the world, but the nation of Thailand was the greatest exporter of cassava starch ⁽⁷⁾.

Over the generation, local farmers had their methods of leaching out cyanide from the cassava before consuming it as such products as garri, tapioca, fufu, starch ^(6,7).

Did they know that it was cyanide content that they were removing by the prolonged fermentation that they allowed? Probably not, but they knew that this process gave them the best, tastier and healthy end-products.

Generally, there are many steps involved in cassava processing. It starts from harvesting the cassava tubers from the earth, then;

- Peel the cassava tubers
- Wash and clean the peeled tubers
- Grate the cassava tubers either manually or mechanically
- Ferment the produced mash from above to remove cyanide
- Stack into sacks and press the sacks to drain out water
- Sift the wet cake from above into grits.
- Then fry the grits over a fire to form edible garri.

This process of frying makes the garri to be dry and ready for immediate consumption ⁽⁸⁻¹⁰⁾.

The process of fermentation was an important step in the much-step leading to garri production.

If had been advised that the fermentation be allowed for a period of four to six days so as to allow for proper detoxification of the cassava tubers ⁽¹²⁾.

This is the proper thing to do, but as reported in our index case, for economic benefits, the fermentation duration had been reduced to only one to two days. The detoxification of the cyanide content may not be adequate in those products, hence food poisoning may be a problem.

We therefore suggests that the Federal Ministry of Agriculture need to do rural health education to our teeming farming population on the need for proper fermentation.

We also recommend that the Ministry of Health need to get to those communities and do health screening for cyanide poisoning and offer adequate treatment.

4. Conclusion

This case portrays the fact that a lot still needs to be done in educating our communities' on the dangers of consuming poorly processed cassava. The need for both non-governmental organizations and Ministry of health to be proactive in health screening for cyanide poisoning and offer adequate treatment.

Compliance with ethical standards

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Disclosure of conflict of interest

There are no conflicts of interest.

Statement of informed consent

Informed consent was obtained from the participant in this study.

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