Article Two

Konzo Disease: A household survey conducted in Mutondo community, Luampa district, Zambia

Authors: *Benaiah S. Simatele [1,2,3*], Kadolo Muntanga [1,2], Davie Simwaba[2], Dabwitso Banda[1,2], Doreen M. Shempela[2], Nyambe Sinyange[1,2]*

Affiliation: [1]Zambia Field Epidemiology Training Program, Lusaka, Zambia, [2]Zambia National Public Health Institute, Lusaka, Zambia, [3]School of Public Health, the University of Zambia, [4]Central Provincial Health Office, Kabwe, Zambia

Corresponding author: *simatelebenaiah@gmail.com*

Cite this Article: *: Simatele B.S., Mutale L., Muntanga K. et al., (2025). Konzo Disease: A household survey conducted in Mutondo community, Luampa district, Zambia. The Health Press 09(3): 13-20.*

Abstract

Introduction:
Konzo is a neglected neurological disease characterized by sudden, non-progressive paralysis of the lower limbs, commonly linked to chronic consumption of cyanogenic cassava combined with protein deficiency. Since 2007, sporadic cases have been reported in Western Zambia, with recent clustering in Mutondo zone of Nakayembe catchment in Luampa District. This study aimed to describe household-level risk factors and provide a crude prevalence estimate for Konzo in Mutondo community.

Methods:
We conducted a descriptive cross-sectional household survey in Mutondo Zone, a rural community under Nakayembe Rural Health Centre in Luampa District. Data were collected using a structured questionnaire administered electronically via KoboToolbox to 50 household heads or their next of kin aged 18 years and above. Information was obtained on demographic and socio-economic characteristics, cassava dependency, processing and consumption practices, protein intake, and knowledge of Konzo. A suspected Konzo case was defined as any individual presenting with symmetric, non-progressive paraparesis consistent with the WHO case definition. Data were analyzed using R software, with categorical variables summarized as frequencies and proportions, and continuous variables as medians.

Results:
Of the 50 households surveyed, 32 (64%) were headed by males. Thirty-six percent (36%) of household heads had no formal education, and all respondents (100%) were engaged in informal employment. Nearly all (94%) depended on cassava as their main staple, and a quarter (26%) reported inadequate processing practices. Protein intake was low, with over 90% consuming protein-rich foods less than twice per week. While most respondents (94%) had heard of Konzo, only 38% recognized its link to cassava or recognised preventive measures. Thirty-seven suspected cases of Konzo were identified, yielding a crude prevalence of about 12% in the surveyed population.

Conclusion:
Konzo remains a significant public health concern in Mutondo Community, driven by heavy cassava reliance, poor processing practices, and low dietary protein intake. Targeted interventions to improve cassava processing, diversify food sources, and enhance community awareness are urgently needed to prevent further cases.

Keywords: Konzo, spastic paraparesis, cyanide toxicity, malnutrition, household survey, Zambia

Introduction

Konzo is a severe paralytic disease that predominantly affects poor rural populations in Africa (1). The World Health Organization defines it as a distinct upper motor neuron disorder characterized by the sudden onset of a symmetric, non-progressive, but permanent paralysis of the legs (2). It is caused by chronic exposure to cyanide from inadequately processed bitter cassava and worsened by protein deficiency. The disease presents

with spastic paraparesis, often affecting the legs more severely than the arms, and in severe cases may also involve blurred vision, speech difficulties, and weakness. Though it resembles other neurological disorders, Konzo is distinct in its rapid onset and lack of progression (3,4). Since it was first identified in 1938, Konzo has been reported in several African countries, including the Democratic Republic of Congo, Mozambique, Tanzania, Cameroon, Angola, and the Central African Republic (5-9).

The prevalence of Konzo is influenced not only by dietary practices but also by socio-economic hardships such as war, drought, and poverty, which drive cassava dependence and unsafe processing practices (1). Globally, Konzo and other forms of spastic paraparesis occur endemically in the Tropics, largely driven by chronic malnutrition and dietary reliance on cyanide-producing staple crops such as bitter cassava, yams, and millet, which predispose affected populations to neurotoxicity and upper motor neuron damage (10). In Southern Africa, it is more prevalent in the Congo, with an estimated prevalence of between 0.1% and 17% (11). The earliest cases of Konzo in Zambia, were reported in Western Province (12), where it is commonly known to the locals as "liweyenga", a Lozi term that means loss of voluntary muscle control. To the best of our knowledge, the prevalence of konzo disease in this province has not yet been estimated.

Luampa District, situated in Western Zambia, has been recording cases of suspected Konzo disease. According to disease surveillance reports from the District Health Office (DHO), an increase was observed in the number of reported cases of suspected Konzo, particularly over the past year 2024 (n =37), making it a significant public health concern in the district. This rise was notable in the Nakayembe health center catchment area, where most cases (n = 26) were reported during that period. Mutondo health zone, situated within Nakayembe, accounted for 54% (n=14) in that year alone. Between January and July of 2025, 15 cases were reported in the District. Although no reliable prevalence estimates exist for Luampa, documented risk factors, including high cassava dependency, poor processing methods, low protein intake, and poverty (12-14), are well established in this community. Building on earlier observations, this study was undertaken to estimate the prevalence and explore the demographic, nutritional, and behavioral characteristics that drive Konzo in a localized setting of Luampa District.

Methods

Study Design

We conducted a descriptive cross-sectional study to assess household characteristics and knowledge of Konzo disease, as well as to identify suspected Konzo cases in Mutondo Zone, Luampa District, Western Zambia. Data were collected through household surveys using a structured questionnaire.

Study Setting

The study was conducted in Mutondo Zone, a remote community served by Nakayembe Rural Health Centre in Luampa District, Western Province of Zambia. The zone comprises eight villages, where subsistence farming is the main source of livelihood. Households rely heavily on cassava as a staple food and on unsafe surface water sources, and generally experience poor sanitation conditions. Mutondo Zone was purposively selected due to the high burden of Konzo cases reported by the District Health Office (DHO) between 2024 and 2025.

Study Population and Sampling

The study population comprised household heads residing in Mutondo Zone. From the eight villages in the zone, four villages were randomly selected for inclusion. A total of 50 household heads were targeted for interviews. Eligible respondents were household heads or, in their absence, their next of kin, aged 18 years or older, who had resided in the zone and provided informed consent. Households without an available respondent or those unwilling to participate were excluded from the survey.

Data Collection

Data were collected using a structured questionnaire administered electronically via KoboToolbox through face-to-face interviews with respondents. Information gathered included the age, sex, education level, religion, and employment status of household heads. In addition, data were collected on cassava dependency, cassava processing and consumption practices, protein intake, and knowledge of Konzo disease. Demographic and clinical data were also obtained for all suspected Konzo cases reported within each household.

Case Definition

A suspected case of Konzo was defined as an individual residing in a surveyed household who presented with symmetric, non-progressive paraparesis, consistent with the World Health Organization (WHO) case definition of Konzo (2).

Data Analysis

Data were exported from KoboToolbox and analyzed using R statistical software. Descriptive statistics were applied to summarize the data. Categorical variables were presented as frequencies and proportions, while continuous variables were summarized as medians.

To estimate the crude prevalence of Konzo in Mutondo Zone, the total number of suspected cases identified during the survey was divided by the estimated total number of individuals represented in the surveyed households. Assuming an average household size of six and a population of approximately 800–1,000 people, the 50 surveyed households (about 300 individuals) represented roughly one-third of the community. This descriptive estimate provided a preliminary understanding of Konzo occurrence in the study area.

Ethical considerations

This analysis was based on routine programmatic data collected during a public health emergency. It was covered by the umbrella protocol for the Field Epidemiology Training Program that was approved by the Zambian National Health Research Authority (NHRA) in 2023.

Results

1. Household-level Demographic characteristics at the household level

The median household size was six members per household, with a median of three children under age 10 and one woman aged 15–44 per household. Male household heads (HH) made up 64% of the surveyed households, and the median age of household heads was 36 years. The majority (74%) had lived in the area for over 10 years, 60% had attained primary education, and all were engaged in informal employment. Christianity was the only reported religion (Table 1).

Table 1: Demographic characteristics of households and household heads in Mutondo community, Luampa, Zambia, August 2025 (N=50)

Characteristics	Median (IQR*)
Household characteristics	
Household members	6 (5, 8)
Children <10 years	3 (2, 3)
Women aged 15 - 44	1 (1, 2)
Median age (H-Heads)	36 (27, 51)
Characteristics of H-Heads	**Number (%)**
Gender of H-Head	
Female	18 (36)
Male	32 (64)
Years lived	
1–4 years	5 (10)
5–9 years	8 (16)
10+ years	37 (74)
Level of Education	
No formal education	18 (36)
Primary	30 (60)
Secondary	2 (4.0)
Tertiary	0(0)
Type of employment	
Informal employment	50 (100)
formal employment	0 (0)
Religion	
Christian	50 (100)
Other	0(0)

*IQR – Interquartile Range

Dietary and nutritional characteristics at the household level

A cassava-based diet was predominant in 94% of households, with soaking being the main processing method (98%). Most households (86%) lacked access to clean water for processing. Protein intake was low, with 92% consuming protein-rich foods only once or twice per week, mainly beans (Table 2).

Table 2: Dietary and Nutritional Practices at the Household-Level in Mutondo Community, 2025 (N=50)

Characteristic	Number (%)
Cassava-dominated diet	
No	3 (6.0)
Yes	47 (94)
Weekly cassava intake	
Few (1–2 meals)	1 (2)
Moderate (3–5 meals)	2 (4)
Most (6+ meals)	47 (94)
Preferred method of processing	
Other	1 (2.0)
Soaking	49 (98)
Soaking period	
1–2 days	13 (26)
3–4 days	17 (34)
5+ days	20 (40)
Access to clean water (Cooking/Drinking)	
No	43 (86)
Yes	7 (14)
Weekly protein intake	
Few (1–2 meals)	46 (92)
Moderate (3–5 meals)	4 (8.0)
Type of protein	
Beans only	14 (28)
Beans & Fish	3 (6.0)
Beans, Fish, & Meat	1 (2.0)
Eggs only	1 (2.0)
Fish & Other	1 (2.0)
Other	30 (60)

*Categorical variable = n(Percentage)

Knowledge of Konzo disease at the household level

Most (94%) household heads had heard about Konzo, which they commonly referred to as “liweyenga”. The majority (56%) reported that they did not know the cause of Konzo disease, while the rest reported cassava poisoning (38%) and spiritual causes such as witchcraft (6%). Only 38% of the respondents indicated proper cassava processing as a way of preventing Konzo (Table 3).

Table 3: Head of Household Knowledge Assessment on Konzo Disease in Mutondo Community,2025 (N = 50)

Knowledge area	Number (%)
Heard about Konzo	
No	3 (6.0)
Yes	47 (94)
Cause of Konzo	
Cyanide from cassava	19 (38)
Spiritual/witchcraft	3 (6.0)
Don't know	28 (56)
How to prevent Konzo	
Proper processing	19 (38)
Stop eating cassava	4 (8.0)
Other	1 (2.0)
Don't know	26 (52)

2. Case-level

Demographic and clinical characteristics of suspected Konzo cases

A total of 37 suspected Konzo cases were identified across 17 households, with a slight female predominance (54%) and a median age of 8 years. Nearly half (49%) developed symptoms in 2025, and most (59%) remained symptomatic at the time of the survey, while 35% had recovered and 5% had died (Table 4).

Table 4: Demographic and clinical characteristics of 37 suspected Konzo cases in Mutondo zone, Luampa District, Zambia, 2025 (N = 37)

Characteristic	Number (%)
Median age [media (IQR*)]	8 (6, 17)
Gender	
Female	20 (54)
Male	17 (46)
Year of Onset	
2023 or before	14 (38)
2024	5 (14)
2025	18 (49)
Outcome	
Alive - Recovered	13 (35)
Alive - Sick	22 (59)
Deceased	2 (5.4)

*IQR – Interquartile Range

Clinical profile for suspected Konzo cases

Ankle clonus and generalized weakness were two of the most frequently reported clinical symptoms, with each occurring in 46% of cases (Fig. 1). Other self-reported symptoms included impaired gait and disability to walk (Not shown).

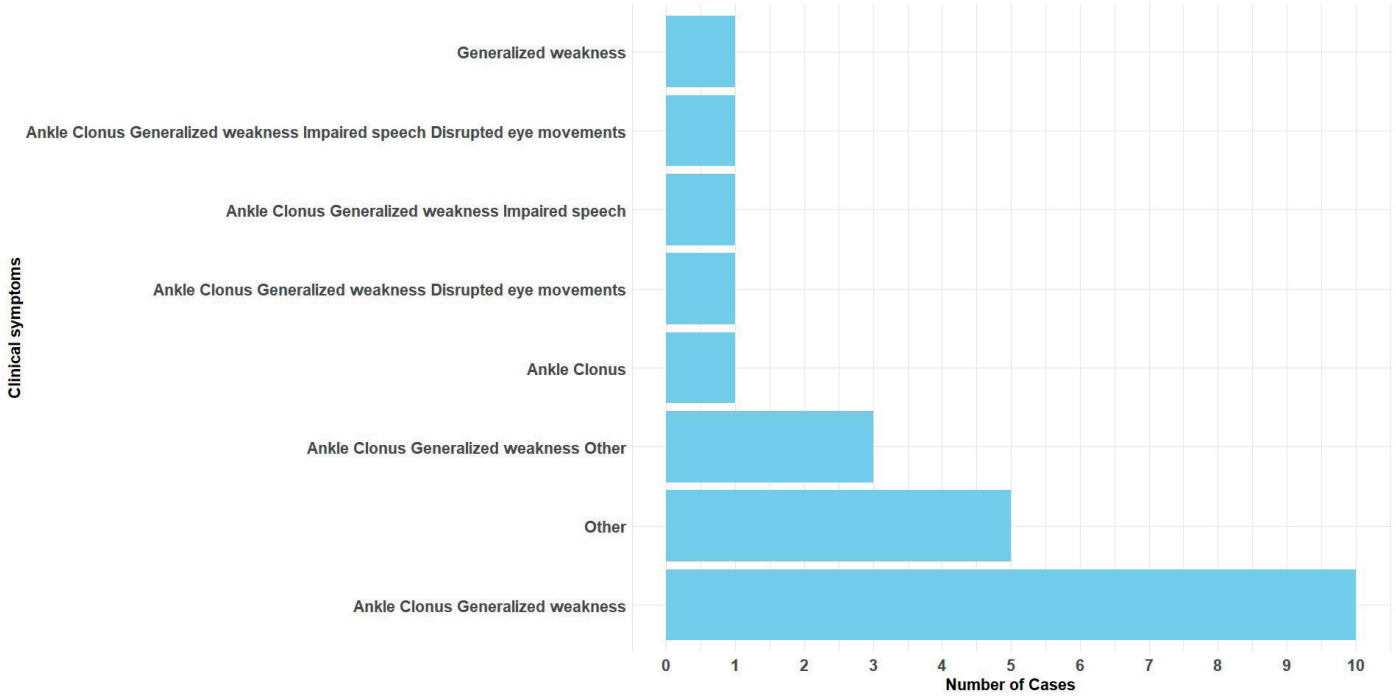

Figure 1: Reported symptoms from 37 Konzo cases in Mutondo Community, 2025 (N = 37)

Estimation of the prevalence of suspected Konzo cases in Mutondo Community

From the 50 surveyed households, a total of 37 individuals met the symptom-based criteria for suspected Konzo. Given an estimated population of 800–1,000 people in Mutondo zone and an average household size of six, the surveyed households represented roughly one-third of the community. This corresponds to a crude prevalence of approximately 12% among the surveyed population.

Discussion

This survey, conducted in the Mutondo zone, describes household and community vulnerabilities that predispose to Konzo in Luampa District. It demonstrates that the persistence of Konzo reflects overlapping vulnerabilities driven by food insecurity, inadequate cassava processing, and poor nutritional conditions, which could also be attributed to poor socio-economic conditions, though not assessed in this study (6,15,16). Our study found that households were largely dependent on poorly processed cassava as their staple food, with limited access to protein-rich alternatives. The interplay of these conditions, coupled with the reported low education levels, could provide circumstances that facilitate the prevalence of Konzo, aligning with patterns observed in previous outbreaks in Central and Southern Africa (5,7,8).

Most households were male-headed with low levels of formal education and employment. These factors likely reduce opportunities for dietary diversity and resilience against food insecurity, making communities more dependent on cassava as the primary staple. The persistence of such structural vulnerabilities explains the clustering of Konzo cases in Mutondo and mirrors observations from other affected countries, where poverty and low literacy are correlated with Konzo outbreaks (5,6,17).

Nearly all surveyed households relied on cassava as their primary food source, consuming it daily. Importantly, a significant proportion of households reported shortened soaking times, which compromises detoxification and leaves residual cyanide in the food chain. This pattern of reliance on cassava combined with inadequate processing practices aligns with prior outbreak investigations in the Democratic Republic of Congo and Mozambique, where food insecurity and resource constraints compelled households to cut corners in cassava preparation.

Protein intake was observed to be low, with most households consuming protein-rich foods only once or twice weekly. Since sulfur-containing amino acids are required to detoxify cyanide, this deficiency heightens susceptibility to Konzo (18). Our study findings align with prior nutritional studies that describe Konzo as both a toxicological and nutritional disease (5,18). Addressing protein access challenges through the promotion of livestock, fish farming, or legumes remains critical for ensuring an optimal mix of nutrients, there-

by reducing the risk that comes with relying on cassava consumption.

Although nearly all respondents were aware of Konzo, only a minority linked it to cassava consumption or recognized safe processing practices as preventive measures. This gap between general awareness and specific knowledge reflects a critical barrier to behavioral change and underscores the need for community education that translates awareness into safe food practices (17).

According to our results, most cases occurred in children and women, consistent with the literature, which highlights these groups as being disproportionately affected. Previous studies show that children are more vulnerable due to dietary exposure relative to body weight (9), while women often bear the responsibility for cassava processing and food preparation (13). The long-term disability observed among young victims also has serious socio-economic consequences for affected households.

However, the study also raises important diagnostic considerations. Konzo is defined as a permanent, non-progressive neurological condition, yet some reported cases in Mutondo were described as having "recovered." This discrepancy suggests possible misclassification, likely due to reliance on self-reported histories from household heads without clinical verification. In a community with poor access to healthcare, it is possible that other neurological conditions, such as acute flaccid paralysis, nutritional neuropathy, post-infectious paralysis, or Guillain–Barré syndrome, were mistakenly reported as Konzo (3,4,19). While the risk environment aligns strongly with classical Konzo determinants, the absence of confirmatory neurological examinations or laboratory tests (e.g., blood cyanide or thiocyanate levels) limits diagnostic certainty.

The observed crude prevalence of approximately 12% among surveyed households indicates a substantial burden of suspected Konzo in Mutondo. This estimate aligns with prevalence ranges reported in other endemic regions such as the Democratic Republic of Congo (11), underscoring the persistent vulnerability of affected communities. Epidemiologically, this suggests that Konzo remains an endemic nutritional neurotoxic disorder in Luampa District, reflecting chronic dietary exposure and socioeconomic deprivation. From a public health perspective, such a high prevalence calls for urgent nutritional surveillance, community sensitization on cassava processing, and strengthened district-level monitoring systems. While this figure provides a preliminary indication of the disease burden in the area, it should be interpreted with caution, given the small sample size and the absence of clinical or laboratory confirmation.

Overall, the study highlights Mutondo as a high-risk setting for Konzo, shaped by cassava dependence, inadequate processing, protein deficiency, and limited actionable knowledge. At the same time, it underscores the need for more rigorous epidemiological investigations with clinical and laboratory confirmation to strengthen the evidence base for surveillance and intervention strategies.

Strengths and Limitations

Our study provides rare, community-based evidence on Konzo disease from a rural, underrepresented setting in Zambia, contributing novel insights into its nutritional and socio-economic determinants. Conducted in a hard-to-reach area, the study captures real-world conditions that shape disease vulnerability. However, several limitations should be noted including the lack of a comprehensive socio-economic assessment that incorporates poverty and income levels of the households The expanded case definition, which included individuals with sudden lower-limb paralysis or neuropathic symptoms beyond classical Konzo, may have introduced misclassification bias. The absence of laboratory confirmation, such as blood cyanide testing, limited diagnostic precision, while reliance on household head reports could have led to recall or reporting bias. Furthermore, the small sample size of 50 households from a single zone constrains the generalizability of findings and limits the statistical strength of conclusions, making these results primarily exploratory rather than inferential.

Conclusion and Recommendations

The findings of this study indicate that Konzo remains a public health concern in Mutondo, primarily driven by cassava dependence, inadequate processing practices, limited access to clean water, and low protein intake. Despite high awareness, few households understood the connection between the disease and cassava, or its prevention.

Addressing Konzo in Luampa requires a coordinated, community-based approach. The District Health Office should strengthen diagnostic capacity, establish local surveillance systems, and promote safe cassava processing through partnerships with stakeholders such as the United Nations Children's Emergency Fund

(UNICEF) and the Churches Health Association of Zambia (CHAZ). Improving food security and access to protein through small livestock, fish farming, and legumes is also essential.

Health education using local languages and community structures, such as Neighbourhood Health Committees, schools, and churches, should reinforce practical prevention messages. Together, these measures can reduce Konzo risk and enhance community resilience.

Acknowledgements

This work was developed with support from the Zambia Field Epidemiology Training Program at the Zambia National Public Health Institute. We also appreciate the assistance provided by the Western Provincial Health Office and the Luampa District Health Office for granting access to their records on Konzo. Finally, we would like to acknowledge the remarkable efforts of the field team deployed in the Mutondo community for data collection.

References

1. Okitundu D, et al. The phenomenology and epistemology of konzo: Readings from the Kahemba Outbreak, Democratic Republic of Congo. Part I: Socioeconomic aspects. Vol. 333, Journal of the Neurological Sciences. 2013.

2. World Health Organization:WHO's first ever global estimates of foodborne diseases find children under 5 account for almost one third of deaths [Internet]. [cited 2025 Sep 30]. Available from: https://www.who.int/news/item/03-12-2015-who-s-first-ever-global-estimates-of-foodborne-diseases-find-children-under-5-account-for-almost-one-third-of-deaths

3. Owolabi JO. Neuroepidemiology: Perspectives from Africa. Vol. 55, Neuroepidemiology. 2021.

4. Mtonga A, Mwaba P, Mazaba M, Chizema E, Kapina M, Mwangala S, et al. Increased Sensitization of Health Workers Leading to Detection of Unintended Cases of Acute Flaccid Paralysis: A Case of a "Konzo" Outbreak in Western Zambia. Med J Zambia. 2016;43(2):57–60.

5. Tshala-Katumbay D, Mumba N, Okitundu L, Kazadi K, Banea M, Tylleskär T, et al. Cassava food toxins, Konzo disease, and neurodegeneration in sub-Sahara Africans. Vol. 80, Neurology. 2013.

6. Howlett WP, Brubaker GR, Mlingi N, Rosling H. Konzo, an epidemic upper motor neuron disease studied in tanzania. Brain. 1990;113(1).

7. Boivin MJ; Caregiver Training to Prevent Konzo Disease in Children in Democratic Republic of Congo. Case Med Res. 2019

8. Kombi JM, Kahemba DLM, Mayambu JPB, Boivin M, Tamfum JM, Ngoy DM, et al. Clinical and biological characterization of konzo forms in children in Kahemba/Democratic Republic of Congo. J Neurol Sci. 2019;405.

9. E-Andjafono DOL, Ayanne MTSS, Makila-Mabe GB, Mayambu JPB, Ngoyi DM, Boivin M, et al. Socioemotional disorders in children living in Konzo-affected areas, an epidemic paralytic disease associated with cyanide poisoning from food in sub-Saharan Africa. Pan Afr Med J. 2018;31.

10. Román GC. Tropical spastic paraparesis. Handb Clin Neurol [Internet]. 2023 Jan 1 [cited 2025 Oct 5];196:149–56. Available from: https://www.sciencedirect.com/science/article/abs/pii/B9780323988179000260

11. Banea J, Bradbury J, Nahimana D, Denton I, N., Mashukano, et al. Survey of the konzo prevalence of village people and their nutrition in Kwilu District, Bandundu Province, DRC. Aust J Fr Stud. 2015 Feb 28;9(2):43–50.

12. Siddiqi OK, Kapina M, Kumar R, Ngomah Moraes A, Kabwe P, Mazaba ML, et al. Konzo outbreak in the Western Province of Zambia. Neurology. 2020 Apr 7;94(14):E1495–501.

13. Baguma M, Nzabara F, Maheshe Balemba G, Malembaka EB, Migabo C, Mudumbi G, et al. Konzo risk factors, determinants and etiopathogenesis: What is new? A systematic review. Vol. 85, NeuroToxicology. Elsevier B.V.; 2021. p. 54–67.

14. Baguma M, Malembaka EB, Bahizire E, Mudumbi GZ, Shamamba DB, Matabaro AN, et al. Revisiting konzo risk factors in three areas differently affected by spastic paraparesis in eastern democratic republic of the congo discloses a prominent role of the nutritional status—a comparative cross-sectional study. Nutrients. 2021 Aug 1;13(8).

15. Adamolekun B. Etiology of Konzo, epidemic spastic paraparesis associated with cyanogenic glycosides in cassava: Role of thiamine deficiency? J Neurol Sci. 2010;296(1-2).

16. Tylleskär T, Howlett WP, Rwiza HT, Aquilonius SM, Stålberg E, Linden B, et al. Konzo: A distinct disease entity with selective upper motor neuron damage. J Neurol Neurosurg Psychiatry. 1993;56(6).

17. Bokundabi G, Haskins L, Horwood C, Kuwa C, Mutombo PB, John VM, et al. When knowledge is not enough: barriers to recommended cassava processing in resource-constrained Kwango, Democratic Republic of Congo. J Public Health Africa. 2023;14(5).

18. Ngudi DD, Kuo YH, Lambein F. Cassava cyanogens and free amino acids in raw and cooked leaves. Food Chem Toxicol. 2003;41(8).

19. Rwatambuga FA, Ali ER, Bramble MS, Gosschalk JE, Kim M, Yandju DL, et al. Motor control and cognition deficits associated with protein carbamoylation in food (cassava) cyanogenic poisoning: Neurodegeneration and genomic perspectives. Food Chem Toxicol. 2021;148.