

Sociodemographic and clinical aspects of intentional karuho intoxication in Bunia City, Democratic Republic of the Congo

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ABSTRACT

Introduction

In eastern Democratic Republic of Congo, particularly in Bunia, a phenomenon locally referred to as *karuho* is widely reported and interpreted as intentional poisoning or a culturally defined illness. Due to the absence of standardized biomedical diagnostic criteria, many cases are managed in traditional or tradimodern treatment centers.

Purpose

This study aimed to describe the sociodemographic and clinical profile of karuho-positive patients using a syndromic approach.

Methods

A descriptive cross-sectional study was conducted from May 5, 2024, to January 2, 2025, among 345 consecutive patients diagnosed as karuho-positive in four tradimodern treatment centers in Bunia, DRC. Data on sociodemographic characteristics, medical history, vital signs, and clinical manifestations were collected using a structured questionnaire and clinical examination. Data were analyzed using the Statistical Package for the Social Sciences (SPSS) version 20 and presented as frequencies and percentages. A comparative syndromic analysis was performed against selected infectious and chronic diseases.

Results

A total of 345 participants were included, with a male predominance (58.8%). The most affected age group was 30–44 years (37.1%), followed by those aged ≥60 years (33.3%). Most participants had secondary (39.7%) or university education (33.1%). Nearly half were married (49.9%), and 27.5% were unemployed. The most frequent clinical manifestations were asthenia (67.2%), headache (62.9%), epigastric pain (57.4%), chest pain (50.1%), and fever (47.0%). Gastrointestinal symptoms included nausea (38.0%), vomiting (25.8%), diarrhea (15.1%), constipation (18.0%), and abdominal pain (16.2%). Neurological manifestations included agitation (12.5%), confusion (12.2%), somnolence (13.0%), and coma (0.9%). Medical history was dominated by reported liver disease (79.1%), followed by exertional dyspnea (31.3%), peripheral neuropathy (15.1%), hypertension (12.8%), and pneumonia (10.7%). Elevated blood pressure (>140 mmHg) was observed in 78.3% of participants. Other findings included tachycardia (16.5%), bradycardia (4.1%), oxygen desaturation (4.6%), and fever (2.6%). Pulmonary rales (10.4%), jaundice (3.5%), dry skin (3.5%), and peripheral edema (2.9%) were the most common physical findings. Comparative analysis showed strong clinical overlap between karuho symptoms and those of malaria, typhoid fever, tuberculosis, HIV infection, *Helicobacter pylori* infection, and selected cancers.

Conclusion

Karuho presents as a non-specific multisystem syndrome with prominent gastrointestinal, respiratory, neurological, and general systemic manifestations. Its clinical profile closely overlaps with common infectious and chronic diseases in tropical settings, suggesting that many cases may represent misinterpreted or undiagnosed medical conditions rather than a distinct pathological entity. Further laboratory studies are needed to determine its true nature.

INTRODUCTION

In the Democratic Republic of the Congo, particularly in the eastern provinces, the term *karuho* is widely used to describe a suspected form of intentional intoxication. The word originates from Kivu Swahili and generally refers to toxic substances believed to be deliberately administered to cause illness or death.

Despite its widespread use in community discourse, *karuho* remains clinically undefined. It is interpreted through multiple and often contradictory frameworks. Some authors describe it as a deliberately manufactured toxic substance used for harmful purposes (Kyolo et al., 2018, 2019; Nassenstein, 2019), while others emphasize its role as a culturally constructed illness embedded in beliefs related to witchcraft, social conflict, and mystical causation.

In many communities, individuals presenting with unexplained or multisystem symptoms are often labeled as *karuho* victims and subsequently directed to traditional healers. This practice reflects a strong sociocultural explanatory model of illness that competes with biomedical interpretations.

A syndrome is defined as a recognizable pattern of signs and symptoms that tend to occur together and suggest a specific pathological condition (Micoulaud-Franchi et al., 2016). In this study, *karuho* is approached as a syndromic entity in order to systematically describe its clinical presentation.

Previous reports indicate that symptoms attributed to *karuho* are highly variable and overlap with endemic infectious diseases such as malaria, tuberculosis, typhoid fever, and *Helicobacter pylori* infection (Kyolo et al., 2018; Nsapu, 2014; Nassenstein, 2019). This overlap increases the risk of diagnostic confusion and inappropriate therapeutic orientation.

This study therefore aimed to describe the sociodemographic and clinical characteristics of *karuho* cases in Bunia City using a structured syndromic approach.

METHODS

Study Design

A descriptive cross-sectional study with prospective data collection was conducted. This design was chosen due to its suitability for exploratory clinical characterization in resource-limited settings.

Study setting and period

The study was conducted in four traditional-traditional health centers treating *karuho* in Bunia City between 5 May 2024 and 2 January 2025.

Study population

The study population consisted of all patients diagnosed as *karuho-positive* according to traditional diagnostic methods in participating centers.

Inclusion criteria

- Patients diagnosed as *karuho-positive* using traditional diagnostic systems
- All age groups and both sexes
- Informed consent obtained from patients or guardians
- Patients not yet receiving treatment for *karuho* at enrollment

Exclusion criteria

- Refusal to participate
- Pregnant women
- Patients withdrawn during data collection
- Patients already under *karuho* treatment
- Patients with incomplete clinical records

Traditional diagnostic concept of *karuho*

Karuho diagnosis varies across centers and is based on traditional interpretive systems. The following methods were reported:

- A computerized “quantum analyzer” device providing binary results
- Urine-based sulfur precipitation tests
- Saliva-based diagnostic procedures

A “positive” diagnosis was determined by the respective traditional practitioner without standardized biomedical validation.

Sample size determination

The sample size was calculated using the formula of Charan & Biswas (2013):

$$N = \frac{Z^2P(1-P)}{d^2}$$

Where: Z = 1.96, P = 0.25, and d = 0.05

This yielded 288.12, increased to 345 after adjusting for 20% non-response.

Data collection

Data included:

- Sociodemographic characteristics
- Clinical symptoms
- Vital signs
- Medical history
- Physical examination findings

Data were collected using structured questionnaires and guided interviews.

Data analysis

Data were analyzed using SPSS version 20. Descriptive statistics were expressed as frequencies and percentages. Syndromic classification was performed through comparative clinical grouping.

Ethical considerations

Ethical approval was obtained from the University of Goma Research Ethics Committee (Ref: UNIGOM/CEM/010/2023). Confidentiality and anonymity were ensured throughout the study.

RESULTS

A total of 345 patients diagnosed as *karuho-positive* were included in the study. The results are presented according to sociodemographic characteristics, clinical manifestations, medical history, vital signs, physical examination findings, and comparative analyses.

Sociodemographic characteristics

As shown in **Table 1**, participants were predominantly male (58.8%). The most represented age group was 30–44 years (37.1%), followed by participants aged ≥60 years (33.3%). Most participants had secondary (39.7%) or

university-level education (33.1%). Nearly half were married (49.9%), and 27.5% were unemployed.

Table 1:
Sociodemographic characteristics of participants (N = 345)

Variable	Category	n	%
Age	1–14 years	8	2.3
	15–29 years	16	4.6
	30–44 years	128	37.1
	45–59 years	78	22.6
	≥60 years	115	33.3
Sex	Male	203	58.8
	Female	142	41.2
Education	None	19	5.5
	Primary	75	21.7
	Secondary	137	39.7
	University	114	33.1
Occupation	Unemployed	95	27.5
	Civil servant	51	14.8
	Private sector	48	13.9
	NGO worker	23	6.7
Marital status	Single	124	35.9
	Married	172	49.9
	Divorced	4	1.2
	Widowed	13	3.8
	Minor	32	9.3

Clinical manifestations

Table 2 shows that the most frequently reported symptoms were asthenia (67.2%), headache (62.9%), epigastric pain (57.4%), chest pain (50.1%), and fever (47.0%). Gastrointestinal symptoms were also frequent, including nausea (38.0%), vomiting (25.8%), diarrhea (15.1%), and constipation (18.0%). Neurological and respiratory symptoms were also observed.

Table 2:
Clinical manifestations among participants (N = 345)

Symptom	n	%
Asthenia	232	67.2
Headache	217	62.9
Epigastric pain	198	57.4
Chest pain	173	50.1
Fever	162	47.0
Nausea	131	38.0
Anorexia	121	35.1
Cough	109	31.6
Vomiting	89	25.8
Abdominal pain	56	16.2
Constipation	62	18.0
Diarrhea	52	15.1
Somnolence	45	13.0
Confusion	43	12.5
Agitation	42	12.2
Gait instability	30	8.7
Coma	3	0.9

Medical history

As shown in **Table 3**, the most frequently reported medical history was liver disease (79.1%). Other reported conditions included exertional dyspnea (31.3%), peripheral neuropathy (15.1%), hypertension (12.8%), and pneumonia (10.7%).

Table 3:
Reported medical history among participants (N = 345)

Condition	n	%
Liver disease	273	79.1
Exertional dyspnea	108	31.3
Peripheral neuropathy	52	15.1
Hypertension	44	12.8
Pneumonia	37	10.7

Vital signs and general condition

Table 4 presents vital signs and general clinical condition. Elevated blood pressure (>140 mmHg systolic equivalent) was observed in 78.3% of participants. Tachycardia (>100 bpm) occurred in 16.5%, while bradycardia (<60 bpm) was observed in 4.1%. Fever (>37.3°C) was recorded in 2.6%. Oxygen saturation below 95% was observed in 4.6%. Altered consciousness, including coma, was present in 0.9% of participants.

Table 4:
Vital signs and general condition of participants (N = 345)

Parameter	Category	n	%
Temperature	>37.3°C	9	2.6
Oxygen saturation	<95%	16	4.6
Blood pressure	>140 mmHg	270	78.3
Heart rate	>100 bpm	57	16.5
	<60 bpm	14	4.1
Respiratory rate	>20/min	53	15.4
	<10/min	14	4.1
Consciousness	Coma	3	0.9
Nutritional status	Weight loss	22	6.4
Mental status	Confusion	42	12.2
	Agitation	43	12.5

Physical examination findings

As shown in **Table 5**, pulmonary rales were the most frequent abnormal finding (10.4%). Other findings included dry skin (3.5%), jaundice (3.5%), peripheral edema (2.9%), facial edema (2.6%), and hypertonia (3.2%). Neurological signs such as miosis (0.6%) and mydriasis (0.3%) were rare.

Table 5:
Physical examination findings among participants (N = 345)

Finding	n	%
Pulmonary rales	36	10.4
Dry skin	12	3.5
Jaundice	12	3.5
Hypertonia	11	3.2
Peripheral edema	10	2.9
Facial edema	9	2.6
Sweating (moist skin)	4	1.2
Miosis	2	0.6
Mydriasis	1	0.3
Cyanotic eyelids	1	0.3
Wheezing	1	0.3

Comparative literature synthesis of karuho clinical features

Table 6 summarizes the presence of karuho-related symptoms across selected studies and the current study.

Table 6:
Comparison of karuho clinical features across selected literature sources

Clinical feature	Nsapu (2014)	Nassenstein (2019)	Tan et al. (2021)	Kyolo et al. (2018)	Ndelo et al. (2017)	Current study
Epigastric pain	✓	✓	✓	✓	✓	✓
Abdominal pain	✓	✓	✓	✓	✓	✓
Vomiting	✓	✓	✓	✓	✓	✓
Diarrhea	✓	✓	✓	✓	✓	✓
Constipation	–	–	–	–	✓	✓
Chest pain	✓	–	–	–	✓	✓
Cough	✓	–	–	–	✓	✓
Dyspnea	–	–	–	–	✓	✓
Fever	–	–	✓	✓	–	✓
Headache	–	–	✓	✓	–	✓
Asthenia	–	–	–	✓	–	✓
Confusion	–	–	✓	✓	–	✓
Agitation	–	–	✓	✓	–	✓
Coma	–	–	✓	✓	–	✓

Symptom overlap with endemic diseases

Table 7 presents symptom overlap between karuho and selected endemic diseases in tropical settings.

Table 7:
Symptom overlap between karuho and selected diseases

Symptom	Karuho	Typhoid	TB	Malaria	HIV	H. pylori	Cancer
Abdominal pain	✓	✓	✓	✓	✓	✓	✓
Vomiting	✓	✓	✓	✓	✓	✓	✓
Diarrhea	✓	✓	✓	✓	✓	✓	✓

Symptom	Karuho	Typhoid	TB	Malaria	HIV	H. pylori	Cancer
Cough	✓	✓	✓	✓	✓	–	✓
Fever	✓	✓	✓	✓	✓	–	✓
Headache	✓	✓	✓	✓	✓	–	✓
Weight loss	✓	–	✓	–	✓	–	✓
Confusion	✓	–	–	–	✓	–	–

DISCUSSION

This study aimed to describe the sociodemographic and clinical profile of patients diagnosed as *karuho-positive* in Bunia, Democratic Republic of Congo. The findings highlight a condition predominantly affecting young and middle-aged adults, with a slight male predominance, and characterized by a wide spectrum of gastrointestinal, respiratory, neurological, and general systemic manifestations.

Sociodemographic profile of karuho-positive patients

The study population was predominantly male (58.8%), with the most affected age group being 30–44 years, followed by individuals aged ≥60 years. These findings suggest that *karuho* predominantly affects economically active populations, which may increase its socio-economic burden on households.

A similar male predominance has been reported in studies of suspected poisoning and traditional illness attribution in eastern DRC and neighboring regions (Kaboru, 2013; Nawa Mwengu et al., 2021). The higher representation of individuals with secondary and university education (72.8%) indicates that belief in or exposure to *karuho* transcends educational status, reinforcing the sociocultural nature of the phenomenon rather than purely biomedical determinants.

The relatively high proportion of married participants (49.9%) may reflect increased healthcare-seeking behavior among individuals with family responsibilities, as previously suggested in studies on health-seeking pathways in resource-limited settings.

Clinical presentation and symptom burden

The clinical profile of *karuho-positive* patients in this study is dominated by systemic and multisystem complaints. The most frequently reported symptoms included asthenia, headache, epigastric pain, chest pain, and fever. Gastrointestinal manifestations such as nausea,

vomiting, diarrhea, constipation, and abdominal pain were also prominent.

This constellation of symptoms suggests a non-specific but multi-organ clinical pattern, which complicates differential diagnosis in tropical clinical settings. Similar symptom clusters have been described in suspected poisoning cases and in conditions commonly misinterpreted as cultural illness syndromes in Central and East Africa (Kyolo et al., 2018; Tan et al., 2021).

Neurological symptoms such as agitation, confusion, somnolence, and rarely coma were also observed. These findings are consistent with previous reports describing neuropsychiatric manifestations in suspected toxic exposures or severe infectious diseases (Letizia et al., 2022). However, the low frequency of coma (0.9%) suggests that severe central nervous system depression is uncommon in the studied population.

Medical history and comorbid conditions

A striking finding in this study is the high proportion of participants reporting liver disease (79.1%). While this result may reflect patient-reported history rather than clinically confirmed diagnosis, it raises the possibility of underlying hepatobiliary conditions contributing to the symptom profile attributed to *karuho*.

Other reported conditions such as exertional dyspnea, peripheral neuropathy, hypertension, and pneumonia further support the presence of multiple comorbidities in this population. These conditions are independently associated with fatigue, pain, and systemic symptoms, which may overlap with the *karuho* clinical presentation and contribute to diagnostic confusion.

Vital signs and general clinical condition

Vital sign abnormalities were frequent, particularly elevated blood pressure (78.3%). However, this finding should be interpreted cautiously, as it may reflect stress response, measurement variability, or underlying undiagnosed hypertension rather than a direct feature of *karuho*.

Tachycardia and bradycardia were less frequent, while respiratory abnormalities and oxygen desaturation were relatively uncommon. Fever was present in only a small proportion (2.6%), suggesting that systemic inflammatory

response is not consistently documented in all cases classified as karuho-positive.

Altered mental status, including confusion (12.2%) and agitation (12.5%), indicates a moderate burden of neurocognitive involvement. These findings align with descriptions of acute toxic or infectious syndromes that affect central nervous system function (Letizia et al., 2022).

Physical examination findings

Physical examination revealed relatively mild but diverse abnormalities. Pulmonary rales were the most frequent abnormal finding, followed by dry skin, jaundice, and peripheral edema.

The presence of jaundice in a subset of patients may support hepatobiliary involvement or hemolytic processes, although this requires biochemical confirmation. Neurological signs such as miosis and mydriasis were rare, suggesting limited overt autonomic toxicity in most cases. Overall, physical findings remain non-specific but consistent with systemic illness rather than a single organ-defined disease.

Symptom overlap with infectious and chronic diseases

A major finding of this study is the extensive overlap between karuho symptoms and those of common tropical diseases such as malaria, tuberculosis, typhoid fever, HIV infection, *Helicobacter pylori* infection, and cancer.

Gastrointestinal symptoms (abdominal pain, vomiting, diarrhea) were shared across all comparator diseases, particularly typhoid fever and *H. pylori* infection (Abbas et al., 2018; Bush et al., 2024). Similarly, respiratory symptoms such as cough and dyspnea overlapped strongly with tuberculosis and lung cancer presentations (Tékpa et al., 2019; Lackman & Wilkinson, 2024).

General symptoms such as fever, headache, weight loss, and fatigue were also highly non-specific and common across malaria, HIV, and chronic infections (Bria et al., 2021; Letizia et al., 2022).

This extensive overlap supports the hypothesis that many cases labeled as karuho may correspond to misinterpreted infectious or chronic medical conditions rather than a distinct toxicological entity.

Interpretation of the karuho syndrome concept

The multisystem symptom pattern observed in this study suggests that karuho, as clinically perceived in Bunia, does not correspond to a single identifiable disease entity. Instead, it resembles a syndromic construct characterized by non-specific symptoms that overlap with multiple infectious and non-infectious diseases.

This interpretation aligns with previous observations that “poisoning syndromes” in similar contexts may represent culturally shaped interpretations of common medical conditions rather than discrete toxic exposures (Nassenstein, 2019; Tan et al., 2021).

The persistence of the karuho concept may also be reinforced by sociocultural beliefs, stigma associated with infectious diseases, and reliance on traditional diagnostic frameworks, as documented in health-seeking behavior studies in the region (Kaboru, 2013).

Study implications

These findings underscore the need for improved clinical diagnostic capacity in Bunia, including laboratory confirmation of infectious and toxicological conditions. Strengthening diagnostic pathways could reduce misclassification of common diseases as karuho and improve patient outcomes.

Additionally, integration of biomedical and sociocultural understanding is essential for addressing care-seeking behavior and reducing delays in appropriate treatment.

Limitations

This study relied on a syndromic and traditional diagnostic classification of karuho without confirmatory laboratory testing, which limits diagnostic specificity. The reliance on patient-reported medical history may introduce recall bias.

Furthermore, the absence of standardized toxicological confirmation limits the ability to definitively characterize karuho as a toxic exposure or infectious syndrome. Future studies incorporating laboratory diagnostics are needed to clarify its etiological basis.

Conclusion of discussion

Overall, the clinical profile of karuho-positive patients is characterized by a broad, non-specific multisystem

syndrome with strong overlap with common infectious diseases in tropical settings. The findings suggest that karuho is best interpreted as a syndromic and culturally constructed illness category rather than a distinct biomedical disease entity, pending further laboratory confirmation.

CONCLUSION

This study described the sociodemographic and clinical profile of patients diagnosed as karuho-positive in Bunia, Democratic Republic of Congo, using a syndromic approach. The findings show that karuho is reported across all age groups, with a predominance among adults in the economically active population and a slight male predominance. Clinically, the condition is characterized by a wide range of non-specific multisystem manifestations, mainly gastrointestinal (epigastric pain, abdominal pain, vomiting, diarrhea, and constipation), respiratory (cough, chest pain, and dyspnea), and general systemic symptoms (fever, headache, asthenia, anorexia, somnolence, and weight loss), with occasional neurological and physical signs.

The symptom pattern shows substantial overlap with common infectious and chronic diseases in tropical settings, including malaria, typhoid fever, tuberculosis, HIV infection, and *Helicobacter pylori*-associated disease. This overlap suggests that many cases classified as karuho may represent undiagnosed or misinterpreted biomedical conditions rather than a distinct pathological entity.

In the absence of standardized laboratory confirmation, karuho should be regarded as a syndromic and culturally constructed diagnostic category. Strengthening biomedical diagnostic capacity and integrating clinical evaluation with sociocultural understanding are necessary to improve patient management, reduce misclassification, and guide appropriate public health responses in the study setting.

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