



## Konzo outbreak among refugees from Central African Republic in Eastern region, Cameroon

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### ARTICLE INFO

#### Article history:

Available online 9 June 2010

#### Keywords:

Konzo  
Spastic paraparesis  
Refugees  
Cameroon

### ABSTRACT

Konzo is a spastic paraparesis of sudden onset, linked to the exclusive consumption of insufficiently processed bitter cassava as staple food combined with low protein intake.

Around 60,000 refugees from the Central African Republic sought refuge in villages in eastern Cameroon between 2005 and 2007. Médecins Sans Frontières was providing nutritional and medical assistance in the villages affected by displacement. We describe cases of konzo seen at the mobile clinics organized in these villages.

Basic information including demographic data, history and clinical presentation was recorded for each konzo patient. All patients were given nutritional supplements, and selected cases were referred for physiotherapy to a rehabilitation center.

A total of 469 patients were diagnosed with konzo. The majority (80%) were refugees. Children and women of reproductive age predominated. Most of the patients developed symptoms after 2007 in a seasonal pattern with most of the cases occurring during the dry winter season. Most of the patients complained about walking difficulties and weight loss and had exaggerated lower limb reflexes and muscle wasting on observation.

Eastern Cameroon is an area with konzo. More effort needs to be put into preventive and educational measures. In addition, timely balanced food rations have to be provided to refugees.

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### 1. Introduction

Konzo is an upper motor neuron disease, characterized by the sudden onset of non-progressive spastic paraparesis (World Health Organisation, 1996). Outbreaks of konzo have been described in sub-Saharan Africa, linked to the exclusive consumption of high quantities of insufficiently processed bitter cassava combined with low protein intake as a consequence of acute food shortages (Ministry of health Mozambique 1984; Cliff et al., 1997; Banea-Mayambou et al., 1997).

Around 60,000 refugees from the Central African Republic (CAR) sought refuge in Cameroon between 2005 and 2007, fleeing the insecurity caused by the conflict between rebel groups and the national army, and regular attacks of armed bandits. The pastoralist Peul Mbororo were particularly targeted for kidnapping for ransom

and represented the majority among the refugees. Until mid-2007, refugees received no food or non-food item assistance. After August 2007, the World Food Program started general food distributions to registered refugees on a monthly to bi-monthly basis.

Médecins Sans Frontières (MSF), an international non-governmental humanitarian organization, provided nutritional assistance and medical care to the refugees in Eastern region from July 2007. Several cases of acute spastic paraparesis were noticed among patients attending mobile clinics. This paper aims at describing the characteristics of the konzo patients seen in MSF mobile clinics in the region.

### 2. Methods

#### 2.1. Setting

The Eastern region is a vast sparsely populated region in the east of Cameroon. The total population is around 900,000 people with a population density of 8.5 inhabitants/km<sup>2</sup>. Most of the refugees from CAR were living around local communities of two northern districts: Kadei and Lom-et-Djerem (Fig. 1). Mbaya are the predominant ethnic group in the local community, while Mbororo represent the second largest ethnic group. The predominant ethnic group among the refugees is Mbororo.

*Abbreviations:* CAR, Central African Republic; CHW, community health workers; CI, confidence interval; MSF, Médecins Sans Frontières; WHO, World Health Organization.

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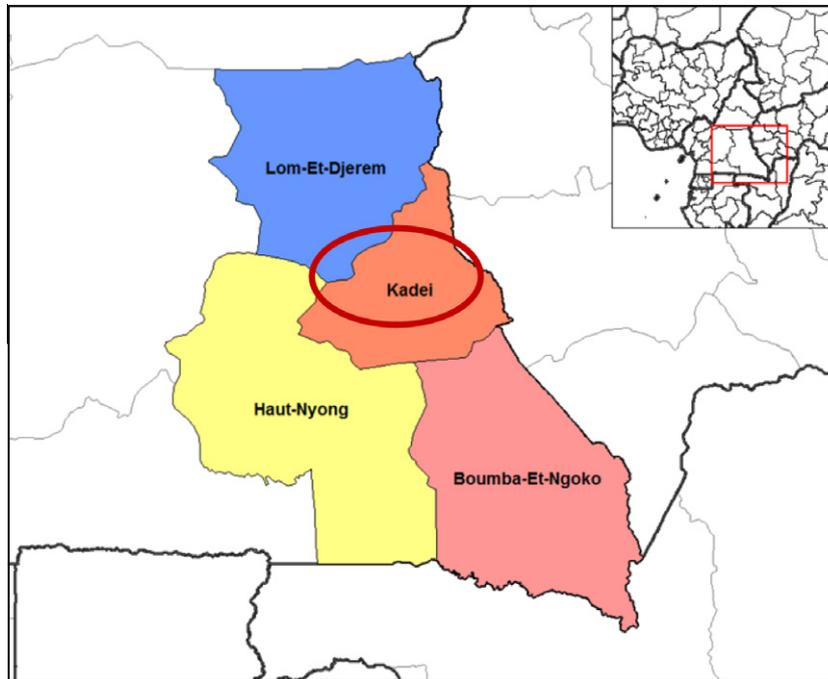


Fig. 1. Map of districts of the Eastern region in Cameroon. Study site encircled.

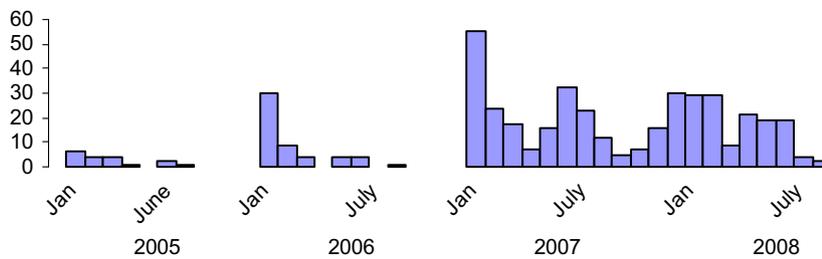


Fig. 2. Month of onset of konzo symptoms.  $N = 428$ . Eastern region, Cameroon, January 2005–October 2008.

Cassava is a staple food in this part of Cameroon, as well as in the western CAR, and is mainly cultivated by Mbya people. Refugees were purchasing already processed cassava on the local market. No change in cassava preparation was reported.

From September 2007 to early 2009 MSF conducted mobile clinics in the six villages in Kadei and Lom-et-Djerem districts hosting the highest numbers of refugees: the number of refugees is estimated between 1000 and 3000 per village. Mobile clinics were targeting refugees and local population from both ethnic groups. They were opened in September 2007 and closed in early 2009.

## 2.2. Case detection

Mobile clinics were providing ambulatory therapeutic feeding to malnourished individuals, as well as primary health care. Mobile teams were visiting each site on average once per week. Patients with suspected konzo were detected passively at the clinic sites. Community health workers (CHW) were selected from local and refugee community and trained for the nutritional program. They were asked to refer patients with typical konzo features to the mobile clinic.

We used the definition of konzo proposed by the World Health Organization (WHO): combination of visible spastic abnormalities in walking, a history of sudden onset in formerly healthy person and bilaterally exaggerated knee or ankle jerks without signs of disease of the spine (World Health Organisation, 1996). All patients were examined by a non-specialized medical doctor.

For each suspected case of konzo, we recorded basic demographic data (age, sex, refugee status, place of origin, family size) and disease history (including month of onset) on the patient form. Basic signs and symptoms at the onset were also recorded. The patient forms were kept with mobile team and were used for the follow-up of the patients.

## 2.3. Intervention

Konzo patients were provided with nutritional supplements (including ready-to-use therapeutic food, vitamin B12 and vitamin and mineral mix as supplement for family food ration). Health education messages were given about the safe prep-

aration of cassava as well as the importance of a mixed diet. Patients were coming for a nutritional follow-up on a weekly basis until the improvement of nutritional status. Patients with severe motor impairment were referred to Batouri rehabilitation centre for physiotherapy.

## 2.4. Data management

Data from patient files were entered in EpiInfo™ version 3.4.3 and analyzed using STATA™ 9.2 software (Stata Corporation, College Station, TX, USA).

## 3. Results

Between September 2007 and November 2008, 469 patients were diagnosed with konzo in the mobile clinics organized by MSF. The majority (80%) were refugees from CAR.

The majority of patients developed the disease during or after 2006 (91%) – 46% of patients developed disease in 2007 and 34% during 2008. Only 41 patients reported disease onset in 2005 or earlier. Among the 41 patients, 36 (88%) were refugees, and 27 (79%) of the refugees developed symptoms while still in CAR.

Table 1

Age and sex distribution of konzo patients.  $N = 468$ . Eastern region, Cameroon, 2007–2008.

Age group	Male	Female	Total
<15 years	110 (45%)	133 (55%)	243
≥ 15 years	30 (13%)	195 (87%)	225
Total	140 (30%)	328 (70%)	468

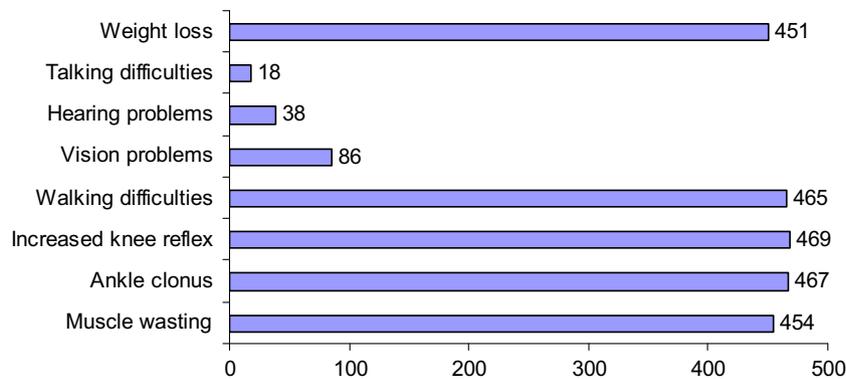


Fig. 3. Distribution of clinical signs and symptoms.  $N = 469$ . Eastern region, Cameroon, 2007–2008.

More patients developed the disease during the dry months between January and April (Fig. 2).

Children under 15 years and women of child-bearing age predominated among the patients (Table 1).

At admission, the majority of patients complained about functional impairment of lower limbs (walking difficulties) and weight loss. Few patients reported difficulties in hearing and seeing or difficulties in speaking. During physical examination, almost all patients had increased knee and ankle reflexes (ankle clonus) and had muscle wasting (Fig. 3).

Nutritional indexes were recorded only for 116 out of 469 patients. Among those with recorded data, 20 (17%) were severely malnourished (body mass index below 16, or weight for height below 70% of the median, National Centre for Health Statistics reference) and 61 (53%) were moderately malnourished (body mass index 16–18.5 or weight for height 70–80% of the median).

Among the 445 patients with follow-up data, 364 (82%) showed improvement of functional status (ability to walk).

#### 4. Discussion

We describe the characteristics of 469 patients diagnosed with konzo between September 2007 and November 2008 in MSF mobile clinics in Eastern region in Cameroon. Konzo was previously described in this area: in the Garoua Boulai district of the Eastern region (Lantum et al., 2010), and in the bordering western CAR (Tylleskar et al., 1994; Mbelesso et al., 2009). It is known by the population and has names in both local languages.

Most of our patients were refugees. Outbreaks of konzo were previously linked to war and displacement (Cliff et al., 1997). About half of the patients reported onset of the disease during the first half of 2007. Nutritional and retrospective mortality survey conducted among refugees in the Eastern region in August 2007 has shown mortality rates above emergency threshold (Sphere Project 2004) (crude mortality rate 1.8/10,000/day (95% CI 1.6–2.1) and under five mortality rate 5.5/10,000/day (95% CI 4.3–6.0)) (Page 2007). The recall period for mortality covered most of the first semester of 2007. The high numbers of new konzo cases, together with the high mortality rate in the general population both show the very precarious situation refugees during this period. General food distribution became only available in August 2007. Until then most of the patients reported a diet consisting almost exclusively of cassava. Most of the refugees were pastoralists who had lost their cattle in CAR. They were relying on cassava from the local community and it is likely that the preparation of cassava had changed while demand increased.

The demographic and clinical findings are similar to those described in the literature (Ministry of health Mozambique, 1984,

Bonmarin et al., 2002). Most of our patients were either children or women of child-bearing age. Patients presented walking difficulties and had increased reflexes and ankle clonus present during clinical examination.

The majority of our patients improved their ability to walk following nutritional supplementation and physiotherapy for selected cases with severe functional impairment. This improvement might also be due to the natural evolution of the disease. However, similar functional improvement after nutritional supplementation and physiotherapy was observed in Mozambique during the large konzo outbreak in 1981, while little improvement was observed in patients who did not receive treatment (Ministry of Health Mozambique 1984). Further research is needed to document the impact of nutritional and rehabilitation treatment on the evolution of konzo.

This description has several limitations. The data were collected as part of a routine program addressing the general needs of displaced population. As we did not conduct active case finding, we can not estimate attack rates. Patients were assessed by a medical doctor without specific skills in neurology; misclassification of patients is likely, especially for mild cases. Data on nutritional status were missing for 75% of the patients; the high rates of malnutrition should thus be interpreted with caution. Assessment of disease outcome was particularly prone to bias, as it was based on the judgement of the clinician without objective measurement. In addition, the evolution of physical signs during follow-up was not documented.

In conclusion, we describe a large outbreak of konzo in an area where the disease was already known. The increase of konzo cases followed population displacement from CAR and was probably linked to the lack of adequate food for displaced people and associated protein-energy malnutrition. Preventive and educational measures should be implemented in this community known for the presence of konzo. In addition, timely balanced food rations have to be provided to refugees.

#### Conflict of Interest

None declared.

#### Acknowledgments

We would like to thank the medical teams in the field who took care of patients and recorded data. We thank the district and regional health authorities who supported our work in the area and provided information about the disease. Special thanks to Silvy-Jacky Sen, who entered the data. Many thanks also to Dr. Julie Cliff and Dr. Renato Souza for their valuable comments on the manuscript.

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