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Prevalence and clinical and evolutionary epidemiological profile of chikungunya cases during the first epidemic in Chad in 2020

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Abstract

The emergence and re-emergence of infectious agents is a real threat to public health. In recent years, we have noticed a re-emergence of arboviruses, including chikungunya. In July 2020, Chad experienced its first confirmed outbreak of chikungunya in the Ouaddaï province, more precisely in the Abèche health district. The aim of this study is to determine the prevalence of chikungunya cases in the specified district and to describe their clinical characteristics and epidemiological progression. This cross-sectional study used an operational definition to identify chikungunya cases. Cluster sampling was employed to select participants. Relative frequencies related to sociodemographic characteristics, clinical data, knowledge, attitudes, and practices were calculated. In addition, the prevalence was estimated with its 95% confidence intervals (CI). The prevalence of chikungunya disease among people meeting the case definition was estimated at 78%. The most affected age group was 5-14 years (30%), followed by 15-24 years (27%). Females accounted for the majority of cases (54%). Clinically, fever and disabling arthralgia were found in 100% of respondents. Headaches were present in 87% of respondents. Gastrointestinal signs were dominated by vomiting (44%), and the most frequently reported cutaneous signs were rashes (22%) and pruritus (17%). A significant number of respondents had sought help from a traditional healer (26%). Of the 1,902 chikungunya cases, 1,781 (93%) reported persistent pain lasting more than 3 weeks, but of varying intensity. Chikungunya has a very low case-fatality rate, but a non-negligible impact on the health of the population. In our study, the high prevalence in the Abéché district testifies to the extent of the disease during the first epidemic. Better epidemiological surveillance, coupled with effective vector control, could prevent future epidemics in other towns in the country.

Key words: prevalence, epidemiological profile, clinical, evolution, chikungunya, Chad.

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Introduction

The emergence and re-emergence of infectious agents pose a real threat to public health. In recent years, we have observed a re-emergence of arboviruses such as chikungunya (commonly referred to as chik). It is an infectious disease caused by the Chikungunya virus (CHIKV), an arbovirus of the *Alphavirus* genus of the Togaviridae family.[1] The disease is transmitted by *Aedes aegypti* and *Aedes albopictus* mosquitoes.[2] After an incubation period of four to eight days, the clinical manifestations are characterized by a sudden onset of fever, often accompanied by intense joint pain mainly affecting the small joints (wrists, fingers, ankles, feet), muscle pain, and headaches. Most patients recover completely, but in some cases, joint pain may persist for several months or even years.[3-5] Since the first cases reported in 1952 in Tanzania up to the present, CHIKV infection has been detected in more than 100 countries, and millions of cases have been reported worldwide. Over 70 epidemics and sporadic outbreaks of CHIKV have been recorded across different parts of the globe, mainly in Africa, Asia, and certain regions of the Pacific Ocean.[6] In July 2020, Chad experienced its first confirmed chikungunya outbreak. This occurred in the Ouaddaï province, specifically in the Abéché health district. By week 42, a total of 34,140 cases had been recorded in six health districts of the country: Abéché, Biltine, Abdi Gozbeida, Arada, and Mongo.[7] The majority of these cases were registered in the Abéché district, with 30,700 cases.[7] Located in the east of the country in the Ouaddaï province, this district is the third most populous city in Chad.[8] The objective of this study is to determine the prevalence of chikungunya cases in the aforementioned district, and to describe their clinical, epidemiological, and therapeutic profile.

Materials and Methods

This was a descriptive cross-sectional study of the chikungunya epidemic that occurred in the Abéché district, Chad, in 2020. An operational definition was used to define chikungunya cases.

Operational definition

In this study, a chikungunya case was defined as any person who resided in Abéché during the epidemic period, from early

August to October 19, 2020, and developed the following signs: fever and severe, disabling arthralgia.

Study population and sampling

The study population included the citizens of Abéché; two-thirds of the administrative areas were randomly selected, *i.e.*, six out of nine. Then, 30 clusters of 10 households each were selected randomly and in proportion to the population size. The list of villages/neighborhoods and their populations was available at the Abéché district office. The sampling interval was calculated as follows: the quotient of the cumulative population of the villages/neighborhoods divided by the total number of clusters. In each neighborhood/village, a street was randomly selected, and 10 households were chosen probabilistically. The data were collected by previously trained interviewers, who conducted face-to-face interviews with the heads of households using a paper questionnaire. Relative frequencies related to sociodemographic data, clinical data, knowledge, attitudes, and practices, as well as prevalence, were calculated with their 95% confidence intervals (CIs). Epi 7.2 and Excel 2016 software were used for this purpose.

Results

The prevalence of chikungunya disease among individuals meeting the case definition was estimated at 78% (CI: 77-80) (Table 1). The most affected age group was 5 to 14 years, followed by 15 to 24 years, accounting for 30% (CI: 28-32) and 27% (CI: 25-29), respectively. Prevalence was lower in the age group of 55 years and older, at 4% (CI: 2-5). Women were the most affected, representing 54% (CI: 52-56) (Table 2).

Clinically, fever and severe, debilitating joint pain were found in 100% of respondents. Headaches were present in 87% of respondents. Digestive symptoms were mainly vomiting (44%), and the most reported skin manifestations were rashes (22%), followed by itching (17%).

Proper epidemic management requires effective case management. The type of healthcare facility utilized by patients was examined, revealing that 38% (CI: 36-40) sought care at public health centers. Additionally, a considerable proportion of respondents (26%; CI: 24-28) consulted traditional healers (Table 3). Of the 1,902 chikungunya cases, 1,781 (93%; CI: 92-94) reported persistent pain, but with varying intensity among individuals.

Discussion

The chikungunya epidemic in Chad has been carefully studied, revealing concerning trends. In this article, we analyze data regarding the prevalence, geographic distribution, and clinical characteristics of patients affected by this mosquito-borne viral disease. This epidemic, officially declared for the first time in Chad, appears to be known to the local population. It is called *Kourgnalé* in the Maba language (local language), meaning "the bent man".

Thus, in our study, the prevalence of the disease is 78.92% (CI: 77.25-80.50). This prevalence is high and similar to that found on Kenya's Lamu Island (75%) following a CHIKV infection epidemic in 2004.[9] It is also close to that of Grande Comore Island in 2005 (63%);[5] However, the prevalence in Cameroon in 2006 was lower than ours (51.4%).[10] Several factors may explain the high prevalence observed in our study: i) limited awareness of the disease led

Table 1. Prevalence of chikungunya cases in the Abéché district.

Cases	N	%	95% CI
Not ill	508	21	19-22
Chikungunya cases	1,902	78	77-80
Total	2,410	100	-

CI, confidence interval.

Table 2. Distribution of people affected by chikungunya according to age group and sex (n=1,902).

Variable	Total (n)	Cases (n)	%	95% CI
Age group (years)				
<5	148	11	8	6-9
5-14	575	172	30	28-32
15-24	527	148	28	25-29
25-34	319	54	17	15-18
35-44	173	15	9	7-10
45-54	68	2	3	2-4
55-64	40	1	2	1.5-2.8
65-95	52	1	2	1.8-3.2
Sex				
Female	1,064	574	54	52-56
Male	838	368	44	41-46

CI, confidence interval.

Table 3. Distribution of chikungunya cases according to the type of treatment received and clinical outcome (n=1,902).

Variable	N	%	95% CI
Place of treatment			
Treatment at the state health center and by the traditional healer	16	0.84	0.52-1.36
Treatment at the state health center and private centers	17	0.89	0.56-1.43
Treatment only at the state health center	734	38	36-40
Treatment by traditional healer and at private health center	7	0.37	0.18-0.76
Treatment only by traditional healer	498	26	24-28
Treatment only at private health center	514	27	25-29
Self-medication	116	6	5-7
Evolution			
Recovery without after-effects	802	42	39-46
Persistence of pain beyond 3 weeks	1,100	58	56-60

CI, confidence interval.

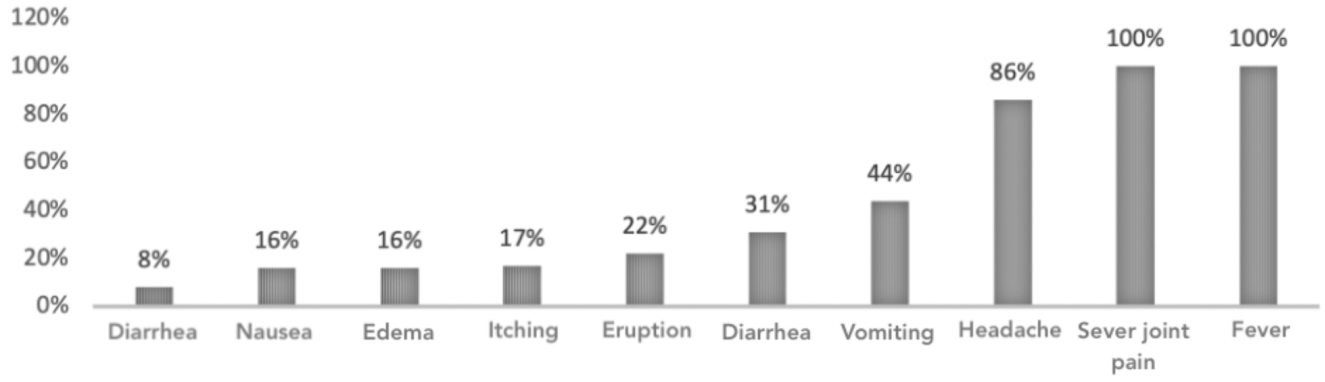

Figure 1. Distribution of patients according to clinical signs (n=1,902).

to delayed diagnosis. At the beginning of the epidemic, patients' symptoms were often mistaken for malaria. Because the outbreak coincided with the rainy season, when malaria cases typically increase, this misclassification was more likely; ii) climate change contributed to heavy rainfall and flooding in the city, creating favorable conditions for vector proliferation;[2] iii) the presence of *Aedes aegypti* mosquitoes in the district.

All urban residential zones in the district reported chikungunya cases, demonstrating the distribution of the disease throughout the district (see Abéché map). The disease affects both sexes and all age groups. Our results are similar to those of a study conducted in Cameroon in 2006.[10] However, the age group 5-14 years was the most affected. This may be explained by the fact that mosquitoes bite more during the day.[2] According to an entomological investigation carried out in Abéché in 2020, the "house" index was 37 for houses infested by *Aedes larvae* and/or pupae; the "container" index was 46, meaning mosquitoes breed in houses; and the Breteau index was 71 positive breeding sites per 100 houses.[11] This shows the proximity of mosquito breeding sites to human dwellings. Therefore, children of this age are more likely to be bitten by mosquitoes than adults.

The most reported clinical signs were fever (100%), intense joint pain (100%), and headaches (86%); vomiting, diarrhea, and skin rash were also reported by patients (Figure 1). These clinical manifestations are classic for chikungunya.[4,5] The clinical presentation of chikungunya resembles simple malaria, making initial diagnosis and management challenging.[12]

Joint pain persisted for more than three weeks in 58 of our participants. The rate of patients suffering from persistent polyarthralgia after the acute phase of CHIKV infection varies depending on several factors, including the genetic susceptibility of affected populations, cultural differences in pain management, and demographic characteristics such as age and sex. These variations are also influenced by the different methodologies used in existing studies.[4] According to most studies, persistence of clinical symptoms after the acute phase of CHIKV infection affects between 50% and 90% of patients. This percentage varies according to the age of affected individuals and is more frequent in people over 40 and in women. Besides sex and age, other factors such as the intensity of acute symptoms (high fever, arthritis affecting six or more joints, depression, and high viremia), lack of rest during the first days of illness, and a history of musculoskeletal comorbidities contribute to the persistence of the clinical condition.[3]

Regarding treatment received, 26% of our respondents stated they were cured thanks to traditional treatments. For many generations, traditional medicine has been an accessible healthcare system for millions of people in Africa. Despite the emergence of so-called conventional therapies, traditional medicine remains the main means of treatment for a significant portion of the African population, largely due to the inaccessibility of modern healthcare and pharmaceutical products.[6] Therefore, disease surveillance during epidemics should take this aspect into account to ensure optimal monitoring and unbiased estimates of the number of cases affected by the disease.

Limitations

Our study may be affected by classification bias due to a lack of biological confirmation of cases; however, this was addressed by applying the case definition correctly. The epidemic context made it possible to confirm cases through epidemiological links.

Conclusions

Chikungunya has a very low fatality rate, but a significant impact on public health. In our study, the high prevalence in the Abéché district demonstrates the extent of the disease during the first epidemic. Improved epidemiological surveillance, combined with effective vector control, could help prevent future epidemics in other cities in the country.

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Conflict of interest: the authors declare no conflict of interest.

Ethics approval and consent to participate: this study received authorization from the Ouaddaï health delegation (Chad) before fieldwork began. Verbal informed consent from respondents was also obtained before administering the anonymous questionnaire.

Availability of data and materials: the datasets used and/or analyzed during the current study are available from the corresponding author on reasonable request.

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