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## RESEARCH ARTICLE

### EPIDEMIOLOGY OF HUMAN BRUCELLOSIS IN ANIMAL ENDEMIC AREA IN NORTHERN CAMEROON REGION

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#### ABSTRACT

**Background:** Brucellosis is one of the most common zoonoses worldwide and is considered as an re-emerging infectious disease in many parts of the world. In Africa, it remains unknown for a long time, especially in humans compared to animals. **Objectives:** To assess the prevalence of human brucellosis and the associated risk factors. **Methods:** This study was conducted in the northern region, which is a strong pastoral livestock area. It was a descriptive study. Consenting subjects, at least five years old, with unknown fever, were included in the study. Rose Bengal and Human IgG Indirect ELISA tests were used. **Results:** A total of 231 subjects were selected and their blood drawn for diagnosis was taken from each patient. Seroprevalence of 7.8% of cases was identified. The most common symptoms were fevers, headache, nausea / vomiting, sometimes combined with sweating and asthenia. It appears that factors such as the consumption of both raw milk and skewers / grilled meat by the same subjects increase the chances of occurrence of the disease. **Conclusions:** Human brucellosis is present in North Cameroon. The clinical signs and epidemiological data should lead clinicians to suspect the disease in humans. diagnosis is possible in district hospitals with ELISA equipment.

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## INTRODUCTION

Brucellosis is an anthro-zoonosis due to bacteria of the genus *Brucella*. Its extension is global with predominance in the Mediterranean basin, and developing countries where it still poses a real public health problem (1). Six species (*B. abortus*, *B. melitensis*, *B. suis*, *B. ovis*, *B. canis*, *B. neotomae*) are implicated in the infection of several animals like cattle, goats, pigs, rodents, carnivores and other mammals (2, 3). Human attacks are attributed to 4 of 6 species of *Brucella* namely *B. melitensis*; *B. suis*; *B. abortus* and *B. canis*; (2, 4). The penetration of the germ is effected by direct contact of the individual with infected materials such as vaginal secretions, abortion products, urine, manure, carcasses or animal cants (5). If the incidence of the disease is clearly declining in developed countries, it is not so in developing countries where it can reach levels of concern (1, 2, 6, 7), the WHO Expert Committee on Brucellosis had analyzed the economic aspect of

the disease evoking mainly the loss of animal protein as meat, milk and dairy products, due to abortions in cattle. He also mentioned the impact on the cost (direct and indirect) namely medical fees (5). The epidemiology of human disease is closely related to animal infection due to the agro-pastoral activity and consumption of derivative products in developing countries (1). In Cameroon, many surveys were conducted in areas of northern Cameroon from 1966 to 2010 and the results of these analyzes are the infection rate of bovine brucellosis between 10% and 83% (2, 8, 9). Studies conducted in Adamawa, Benue, the Diamaré, and the Menua, have yielded prevalences that ranged from 6.5 to 12.5% in cattle (8-10). As for human brucellosis, whatever the estimates of WHO reported more than 500 000 new human cases per year (5), no study to our knowledge has been conducted concerning human brucellosis in northern Cameroon, area of farms by excellence in Cameroon (11). Thus, given its risk to human health, clinical polymorphism of underreporting, even clinical

ignorance of the disease by clinicians, its important economic impact, especially due to lack of epidemiological data to the human in our country, we conducted the present study. The goal is to assess the prevalence of human brucellosis, describe the symptoms associated with this disease and the risk factors associated in the health district of urban Garoua.

## MATERIALS AND METHOD

**Places and type of study:** This study took place in health facilities Garoua Urban Health District in the Northern Region Cameroon. It's about a descriptive study. It took place over a period of twelve months, from 04 January to 27 December 2023. Individuals included in this study met the following criteria: Any patient with unknown fever, aged at least five years, agreeing to participate in the study by answering the questionnaires and signing the letter of informed consent. Was excluded from this study anyone unwilling. Data were collected using a structured questionnaire to patients. The questionnaire was divided into three parts: patient identification; sociodemographic characteristics and patients' knowledge on human brucellosis. Patients in this study were recruited from non-probability and consecutively in service consultations or in the halls of hospitalizations. After giving their consent or verbal agreement, a blood sample was taken from each patient from whom the individual notification form was completed on the basis of the interrogation.

**Materials used:** To carry out the samples, the small sampling equipment was used and the small laboratory equipment. The choice of serological tests was made in light of the literature review like the work of Halimatou made in 2014 in Niger(12), Dantouma in 2008(13), and Chakroun et al in 2007(1), which pointed out that ELISA can be used as a confirmatory test. It is with this realization that we used two tests namely: Rose Bengal test and ELISA.

**Method:** The consultation was carried out by the team of doctors and nurses working in the city's hospitals and health center. It consisted of examining any hyper-thermic patient of unknown origin. Patients meeting the selection criteria were interviewed and filled out questionnaires after informed consent. A venous sample taken from the bend of the elbow was taken under vacuum in a 5 ml dry tube. After collecting the blood samples, the serum was prepared by centrifuging the blood at 1500 rpm for 5 minutes then aliquoted in eppendorf tubes and stored in the freezer at -20 0 C until use.

**Serological examinations:** The collected sera were all subjected to two serological tests including: test the buffered antigen or Rose Bengal (technique described by ROSE and ROEPKE 1957 while respecting the manufacturer's protocol) and indirect ELISA for confirmation previously positive cases. The data were processed by the R Version 3.2.0 software, and Microsoft Excel version 2010. The quantitative variables, we used ANOVA, the Student's T test and statistical differences were considered significant at  $p < 0.05$ .

**Ethical considerations:** This work has the agreement of the Regional Scientific Committee of Medical Ethics of the North and the administrative authorization of the Regional Delegate of Health for the North. All information gathered on individual have been held confidential and anonymous.

## RESULTS

**Population distribution by sex:** During the study, we worked on 231 patients who met the inclusion criteria. The average age of patients was  $30.08 \pm 12.53$  for women and  $27.96 \pm 12.95$  for men with 6 years as minimum and 75 years as maximum. Sex ratio was 1.31 in favor of females.

**Analysis of samples collected:** Of the 231 samples, 19 positive cases and 212 negative cases were registered following the serodiagnostic Rose Bengal; a prevalence of 8.22%. The 19 positive sera Rose Bengal were subjected to enzyme immunoassay ELISA. In the end, 18 of the 19 positive cases of Rose Bengal test were confirmed by ELISA, giving a prevalence of 7.8%, and one was considered doubtful.

### Symptoms associated with positive Test

Headache was the most present in subject's positive Test as shown in Table 1. Table 1: Symptoms associated with seropositivity Test Asthenia, chills and general pain are the least represented.

Symptoms and Signs	YES	NO	P value
Asthenia	3	15	0.4118
Fever	18	0	0001
Thrill	2	16	0.1737
Nausea / vomiting	7	11	0.01177
profuse sweat	6	12	0.2657
general pain	5	13	0399
headaches	17	1	0.0003271

**Symptomatology cumulative per positive:** The association of fever and headache is present in patients (Table 2). In the same way, the triad fever, headache, nausea / vomiting sometimes combined with sweating was found in repetitive positive subjects (33.3%). In contrast, fevers, headache and sweating  $\pm$  general pain or fevers, headache, general pain and asthenia were found among the few positive cases (16.7%).

**Table 2. Consolidation of symptoms presented by positive subjects**

symptoms	Frequency (effective)
Fever, headache $\pm$ sweating and / or asthenia	33.3% (n = 6)
Fever, headache, nausea / vomiting sweating $\pm$	33.3% (n = 6)
Fever, headache, sweating $\pm$ general pain	16.7% (n = 3)
Fever, general pain and asthenia	16.7% (n = 3)
Total	100% (18)

**Impact of the consumption of raw milk and meat grilled on seropositivity Test:** 12 cases with positive serology Test consumed both raw and grilled meat (either  $p = 0.004342$ ). In addition, four cases were related to subjects not consuming raw milk but skewers or grilled meat (Table 3).

**Table 3. Seropositivity Test based on the combination consumption of raw milk and grilled meat**

RiskFactors associations	Serology positive Test		
	Do you consume raw milk = NO	Do you consume raw milk = YES	
Consumption meat skewers or Not	1	1	$p = 0.004342$
Skewers or meat consumption: Yes	4	12	$p = 0.004342$

## DISCUSSION

This study was conducted in the Urban Garoua Health District for 12 months (from 04 January to 27 December 2019). In doing so, the main objective of this work was to study the circulation of brucellosis in the human population of the city of Garoua (Garoua I Health District) taking into account the socio-professional characteristics. The serological analysis of 231 serum samples from suspected subjects made it possible to detect 19 positive samples with Rose Bengal, and the confirmation made by the ELISA technique revealed 18 positive cases of confirmation of human Brucellosis, i.e. a prevalence of 7.8% in the population studied. This prevalence is consistent with the work of Gidel et al. 1974 in West Africa (Ivory Coast, Upper Volta and Niger)(14) and Dite Dialla Mama Sidibe, 2011 in Mopti in Mali(15), where they also worked like us in agropastoral areas and noted varying seroprevalence rates from 1% to 17% in men. Our results are, however, far from those observed in France in 2004 by the Institut de Veille Sanitaire (0.05 cases per 100,000 inhabitants)(16), where measures to eradicate brucellosis in ruminants have intensified since the 1970s. Among the 19 positive cases at Rose Bengal, one was declared doubtful by ELISA.

As described in the literature, doubtful cases may be observed due to the interaction between *Brucella* and other bacteria such as *Yersinia*, *E. coli*, *Salmonella* and *Franscisella* (3, 17-20). Regarding the symptomatology of the disease, fever recall here that being part of the selection criteria were accentuated in all cases. Thus, the presences of headache and nausea / vomiting were the most found in our patients. These symptoms have been observed by Boukary in 2010(2) with a prevalence of headache in the reported positive cases. In addition to these major signs were observed other symptoms such as general pain, sweating, headache and asthenia. 33.3% of positive exhibited symptoms involving both fevers, headache, nausea / vomiting accompanied by sweating and asthenia; 16.7% of positive with a symptomatology associating more of the triad fever, headache and sweating; general pain, sweating and weakness. Unlike our observation Boukary in 2010(2) was less observed association headaches General pain, fatigue and sweating while Dantouma reports in its work on the prevalence of brucellosis in Mopti urban center in 2008 (13) that the association of headache symptoms, fever, general pain, weakness and sweating was dominant and was statistically significant ( $p = 0.001$ ).

In our study, the distribution of brucellosis in the population had no link with the profession. Similarly, the contact with the animals had no statistical relationship with the occurrence of the disease. Indeed, of 112 patients with contact with animals only 9.8% were positive; 5.9% of positive cases were observed in subjects having no contact with animals of 119 patients. Unlike our results, Dantouma in 2008(13) reported that the contact with the animals is an important risk factor in the occurrence of brucellosis a factor twice if the agent is *B. abortus* and four times the agent *B. melitensis*. We found no direct statistical link between the consumption of raw milk and the occurrence of the disease unlike Dantouma in 2008(13) which found that unpasteurized milk consumption is a major risk factor in the transmission of brucellosis ( $p = 0.001$ ). Consumption of grilled meat was not a risk factor for the occurrence of the disease. In the same vein, Dantouma in

2008(13) had not found a statistical link between the disease onset and grilled meat. The handling of the animals slaughtered and their carcasses did not influence the occurrence of the disease: data similar to the results of Dantouma in 2008(13). However, the association of both risk factors appears to increase the risk of developing the disease. Thus, it was found that the consumption of raw milk associated with the consumption of grilled meat increases the risk of disease onset ( $p = 0.004342$ ).

## CONCLUSION

These results demonstrate the necessity for medical staff to incorporate in its diagnostic approach of pathologies, the brucellosis especially in areas with high prevalence of farms. Clinical, epidemiological, will suspect the disease in patients from medical consultation, and biological diagnosis can be made through single serological diagnostic tests in laboratory district hospitals just having ELISA equipment

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**Author Contributions:** GAKE BOUBA: collecting, data analysis, drafting the document; DANG'NE MADOUÉ Denis: collecting, biological sample analysis, data analysis, drafting; DIDIERO ZOTI Elie: collecting, biological sample analysis, data analysis, drafting; TCHUENGA KOM Yannick; : collecting, biological sample analysis, data analysis, drafting; OKOMO Marie Claire: data analysis, drafting.

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