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Original Research Article

Access to safe Drinking Water and Sanitary Risks in the Town of Bangangté (West Region of Cameroon)

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Abstract

Due to the inadequate extension of drinking water distribution network, the population of Bangangte town just like other towns of Cameroon, get water from wells, springs and rivers whose quality is questionable. The consumption of this water, infected by micro-organisms, predisposes the population to water borne diseases. Added to the problem of quantity, is that of quality. This study wants to establish a correlation between the difficulties of access to drinking water and the frequency of water borne diseases in Bangangte town. The methodology used is highly based on households' survey, which permitted the researcher to make a difference between the problem raised and the types of water borne diseases encountered. These inquiries were completed by the collection of clinical data, physico-chemical and bacteriological analyzes of six water samples. The outcome was that, elements of the physical and human milieu are incriminated. As such, only the adoption of methods of water treatment at home is the appropriate solution.

Keywords: Access, drinking water, sanitary risks, Bangangte.

INTRODUCTION

Water covers three quarters of the Earth surface. The water needs are at the same time psychological, sanitary and social. Access to drinking water is an essential condition for the socio-economic development of a country. Having drinking water is a human right that is essential for the full enjoyment of the right to life [1]. Despite the remarkable results achieved for the MDG target for drinking water, 884 million people worldwide still did not have access to basic drinking water supply services in 2015. In sub-Saharan Africa, 92 220 000 people draw drinking water directly from surface waters sources. In Cameroon, 65% of people had basic access to an improved water point [2]. The city of Bangangté, due to physical constraints, demographic growth and the inefficient water supply network is not immune to the problem of access to drinking water. Because of the low extension of CAMWATER network or even low production, populations in order to respond to their daily needs, are forced to adapt to the scarcity of drinking water by using water from unimproved waterpoints. Indeed, the question arises: what are the health risks linked to insufficient quantities and poor quality of the water consumed? The purpose of this study is to show that the consumption of water (not subject to control) due to difficult access exposes the populations of the city of Bangangté to health risks.

METHODS AND TOOLS

This study leans onthe hypothetical-deductive method that involves the use of data from secondary and primary sources. The collection of Secondary data sources took place in libraries and on the Internet. As for the data primary sources, the collection was carried out in the field through direct observation, semi-structured interviews with local stakeholders and with the help of a questionnaire administered to 231 householders spread in 4 central districts of Bangangté: Nyamjeu, Mba, Mfetom, Batéla. The 2016 consultation.

Register of the Bangangté Integrated Health Centre was used to identify recurring water-borne diseases in the city. The quality of the water was assessed through physico-chemical and bacteriological analyzes. The number of collected water samples was determined on the basis of 6 criteria: frequency rate of water points, types of water, water use, presence of a potential source of contamination, level of water point development, declared waterborne diseases in

households. In this logic, 6 water samples were taken in 4 districts: Batéla (2), Noumfam (1), Mba (2), Banékouane (1). To better monitor the evolution of pollution over time, water samples were taken in the rainy season and in the dry season. CAMWATER water was sampled at 3 points: dewatering, treatment station and the consumer's tap. The water samples were conditioned in 0.5 liter bottles of mineral water, previously rinsed with distilled water, then 3 times with the water to be sampled. These bottles were filled and hermetically sealed to avoid gas exchange. Two 1.5 bottles of liters of ice-cold water each was placed in a cooler to keep the temperature of the samples of water at 4° C as recommended by Rodier [3].The water with drawn was then conveyed to the University of Dschang, in the soil analysis and environmental laboratory and in the Animal Physiology and Microbiology laboratory of the Department of Animal Production (FASA).

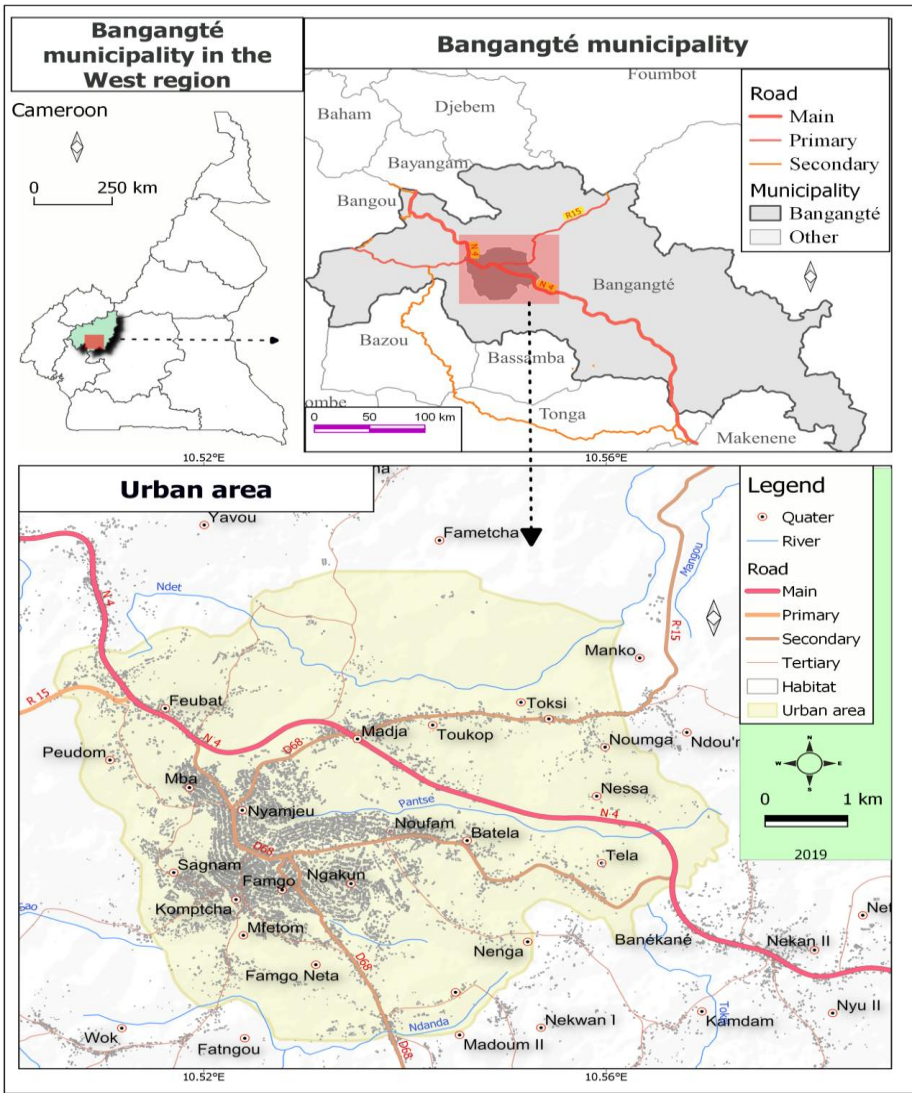
Amongst the tools used, the tablet was a great help in administering the questionnaire and very useful in taking pictures to illustrate highlights. The Dictaphone was very useful during the semi-structured interviews. A GPS receiver was used to take the geographic coordinates of the water points. The Palintest Macro 900 supplied by the Bangangté Municipal Water Authority was used for in situ pH measurement. Quantum GIS software was used to produce the maps.

RESULTS

Conditions of access to drinkable water

Bangangté in its environment

Bangangté is the capital of the Ndé Division. The Municipality of Bangangté has 7 groupings: Bangangté, Bamena, Bangoua, Bangoulap, Bangang-Fokam, Bahouoc and Batchingou. This study focuses on the urban area of the capital of the sub division district. Between 5 ° 09 '00' 'North and 10 ° 31' 00 " East, the town of Bangangté is limited to the north by Bangang-Fokam , to the south by Bangoulap , to the west by Bamena and to the east by the Noun (figure 1).



Source: *Adapted from POS map (2015) and INC (2014)*

Fig-1: Location of the study area

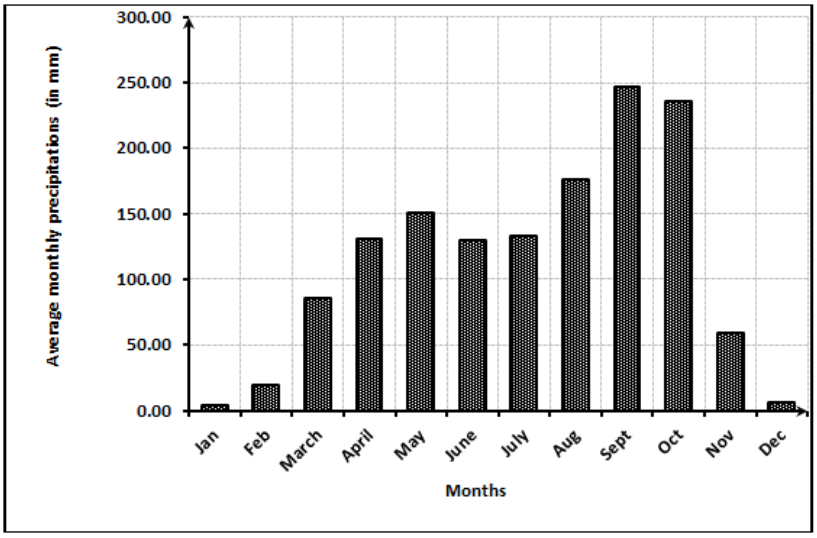
Constraints of access to water consumption in the city of Bangangté

A physical environment as a constraining factor

The availability and the access to water in the town of Bangangté are influenced by climate, topography, hydrography and vegetation.

A specific local climate

Due to its geographical location, the town of Bangangté is disadvantaged compared to the other regions of the highlands of the West Region of Cameroon. This town has a sheltered Sub mountainous monsoon climate [4]. The rainfall regime of the Bangangté weather station has only one mode, with a decrease in precipitation in june and july (figure 2). The dry season lasts 3 months and the rainy season 9 months.



Source: *Ndé Divisional Delegation of Agriculture and Rural Development, field surveys (2016)*

Fig-2: Bangangte rainfall regime (1951-2016)

Figure 2 shows that september and october are the rainiest months with an average precipitation greater than 200 mm. The very severe dry season lasts from december to february. The driest month is january, with an average of 4.44 mm. In addition, this climate is characterized by a clear rainfall deficit [5]. The decrease in precipitation is accompanied by a reduction in the number of rainy days. This climatic predisposition influences the supply of the groundwater. The recharge of the water table can only be done in september and october. From december to february, the water table is drained. Irregularities in precipitation throughout the year favour the development of hot and dry periods, which contribute to the lowering of the groundwater level. We can deduce from previous analyzes that a downward trend in the static level of groundwater compromises the availability of water in the town of Bangangte.

b) A tormented relief and a fairly dense hydrographic network

The topography of Bangangté is quite calm, but disturbed by the presence of the hills which culminate up to 1600 m of altitude. The elevation of the relief limits the extension of the public distribution network of drinking water in districts such as Mba and Sagnam. In addition, altitude plays a role in the location, the depth of the groundwater table and the possibility of making gravity adductions from sources. It is very expensive for a household located on a side or at the top of the hill to build a groundwater catchment. The rugged terrain therefore induces fairly deep groundwater with the exception of swampy areas. Hydrography also influences the availability of water.

The Ngam River, a tributary of the Noun, is the main river that drains the town of Bangangte. CAMWATER captures the water from this river to supply the populations of Bangangté with drinking water. There are many rivers in this town. However, the stream flow is irregular and some dry up completely in the dry season. Over time, the Ngam has lost its power due to the gradual decline of the water table. This decrease results partially results from the planation of *eucalyptus* dotting the entire locality [6].

c) A vegetation strongly influenced by anthropogenic action

The primary vegetation in the Municipality of Bangangté is the forest. However, man has left his mark on this original landscape. The *eucalyptus* is dominant in the Nde Division. This species has very harmful ecological effects. It is a plant whose growth rate is proportional to the amount of water absorbed. The production of large quantities of wood of *eucalyptus* concomitantly decreases the water table.

Human constraints of access to drinking water in the town of Bangangté

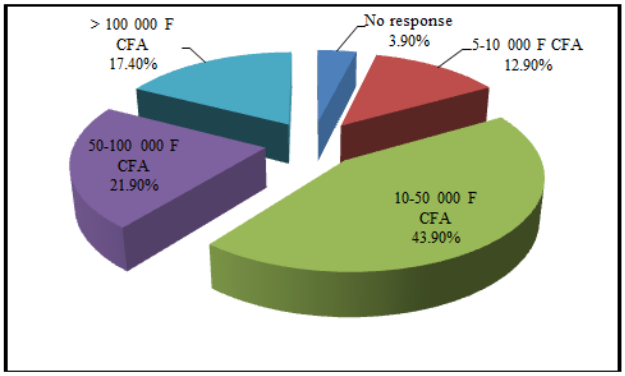
Population growth and economic activities practiced by the populations are the factors that influence access to drinking water in the city of Bangangte.

a) Rapid population growth

Demographically, the urban population has grown from 10 080 inhabitants in 1967 [7] to 28 011 inhabitants in 2005 [8]. With the creation of higher education institutions, this population increased in 2015 to 86,219 inhabitants [9]. However, the high population growth is unfortunately not accompanied by the extension of CAMWATER network. Households located at a high altitude, although having the financial means to subscribe to a connection cannot do so.

b) Low income

The primary sector is dominant in Bangangté. Agriculture employs around 31.1 % of the population [10]. Commerce ranks second in order of activity. The activities carried out do not allow households to have a substantial monthly income that can allow them to access a connection and a subscription from the concessionaire. In fact, the average monthly household income varies between 10,000 and 50,000 F CFA (Figure 3).



Source: *Field surveys, 2016*

Fig-3: **Change in monthly household income**

3.9% of household heads surveyed refused to declare their income. These are people who do not have a fixed activity. Only 17.4% of households have an income above 100,000 CFA francs. Public agents, known as civil servants fall in this category. With these relatively low incomes, households cannot connect to a drinking water supply network. They are forced to find alternative solutions without considering the quality of the water resource.

Problem of access to drinking water in the city of Bangangte

Mode of drinking water supply in the town of Bangangte

According to Decree No. 2005/493 of December 31, 2005 laying down the terms for the delegation of public drinking water services in urban and peri-urban areas, water management has been entrusted to CAMWATER and CDE until since april 2018 where the management of this service became the responsibility of CAMWATER.

Public distribution of drinking water in the city of Bangangté

This is to analyze the level of people's access to drinking water services.

a) Insufficient quantity of water

The city of Bangangté has benefited from a public water distribution network since 1978. With the aging of production and distribution equipment, the volumes of water produced become insufficient to meet the needs of an ever growing population. The losses recorded in the distribution network contribute to depriving the population of this precious resource (Table 1).

Table-1: State of water production and distribution in the town of Bangangte

Years	Production (m^3)	Distribution (m^3)	Loss (m^3)	Production deficit due to outages (m^3)
201 2	246,996	177,783	69,213	52 205
2013	210,747	158,955	51,792	62,718
2014	338,442	195 171	143,271	82,532
2015	261,487	191,704	69,783	111,344
2016	313,893	219,837	94,056	62,863
2017	523,878	294,404	229,474	114,401
2018	415,748	230,206	185 542	56,055

Source*: West Regional Head Office of CDE, 2018*

It appears from table 1 that the production of water in the town of Bangangte has deficits of various origins. From 2013 to 2015, the production deficit due to power cuts went from 62,718 m^3 to 111,344 m^3 of water. Without these cuts, the year 2017 would have recorded a production of 638,279 m^3 of water. To this already insufficient production is added the poor technical performance of the network. With the rehabilitation of this network in 2016, production increased from 210,747 m^3 of water in 2013 to 523,878 m^3, representing an increase of 209,895 m^3 of water between 2016 and 2017. However during the same period, the distribution of water increased from 158,955 m^3 to 294,404 m^3. Production has nevertheless improved, but the losses in 2017 was huge (229 474 m^3 of water). The small quantities of water produced and distributed are insufficient to meet the population's demand for drinking water.

b) A low spatial coverage of the CAMWATER network

The water service rate is an indicator that allows us to appreciate the number of people who benefit from the drinking water and those excluded. It was calculated for the period 2013 to 2017. To do this, the following formula is applied: Number of subscribers * average household size [1] / total population.

Table-2: Service rate of the ex-CDE network in the city of Bangangté

Years	2013	2014	2015	2016	2017	2018
NAPA[2]	2,693	2,600	2,688	2,939	3,004	3,154
TD [3] **(%)**	19.9	19.2	19.9	21.7	22.2	23.3

***Source**: West Regional Head Office of CDE, 2018*

It appears from table 2 that the number of active subscribers to the CAMWATER network in the town of Bangangté increased from 2,693 in 2013 to 3,154 in September 2018. The prolonged outages and the total seizure of water distribution in some neighborhoods have pushed households to terminate their subscription contracts. The social connection campaigns financed by the ADB in 2015 enabled certain households to connect. However, the proportion of the population benefiting from the CAMWATER network in the city of Bangangté is very low. It went from 19.2% in 2014 to 23.3% in September 2018. Subscribers do not benefit from water services when they are in need. During the surveys, 61 households only claimed to have obtained connection, making a rate of 26.4 %. The number of households subscribed to a connection is higher at Batela, the place of the processing station and at Mfetom fully covered s by the concession network area (64.3 % and 3 3.3%). On the other hand, in the partially covered Mba quarter, this rate is only 12.9 %.

The limited extension of the CAMWATER network, the high cost of connection and the weekly unavailability of the distribution service push the populations of this town to resort to other modes to meet their daily water needs.

Individual solutions to consumable water problems

To make up for the lack of water distribution in the town of Bangangte, the populations use water from essentially springs and wells.

***a)* The wells: a widespread mode**

Wells are the main mode of water supply for the people of Bangangte. Depending on their typology, 134 wells have been identified. There are more wells in the Noufam, Nyamjeu, Mba and Mfetom quarters. The waters coming from these structures are used for domestic activities and rarely for drinking in some neighborhoods, especially when the work is not well done.

b) The springs: privileged water for drinking

People have confidence in the quality of spring water sources because the sources are clean for drinking. Out of 231 households interviewed, 63.7% use these waters for drinking. Batéla is the only district where households do not request this mode of supply. In the Mba quarter, 94.1% of households obtain drinking water from springs. Due to the high attendance of these water points, there are long queues (photo 1).

***Source:** Photo Nya, March 2017*

Photo-1: Spring developed in the Mba district

This photo highlights the daily life of the populations of the town of Bangangte in search of drinking water. This source, developed by the Council

in 2014, operates 24 hours a day. It supplies all the inhabitants of the city. Its flow drops considerably in the dry season.

c) Other sources of drinking water supply in the city of Bangangté

Households most often have very little to do in seeking water drilled water sources, because the realization of this work requires large sums of money. Rainwater and rivers whose usage is dependent on reasons satisfies the needs of a minority of households. In the rainy season, meteoric water is used for all domestic activities while in the dry season, rivers are increasingly solicited for laundry, for bathing and to a lesser extent for drinking. This water source, difficult to control, poses quality problems.

The quality of the water consumption in the town of Bangangte

Physicochemical characteristics of water consumable

The parameters analyzed vary according to the seasons. The pH of the water taken is acidic in the wet season. It varies from 5 at the undeveloped source to 6.5 at the drain located in Batéla. On the other hand, in the dry season, the pH of the water is basic, because > 7. It varies from 7.2 at the unmanaged source to 7.8 at the capture and treatment station. MES is present in the concessionaire's water after treatment. Their concentration is low in the wet season and high in the dry season. It varies from 8.7 mg / l at dewatering to 8.7 mg / l at the consumer's tap in this season. In spring waters, MES is absent whatever the season. The presence of MES in water makes it cloudy. Thus, the turbidity of the water of the network is high in the wet season. It varies from 24.3 NTU to 10.7 NTU. The values recorded at the consumer's tap are higher than those recorded at the treatment station. In spring waters, this parameter is zero, except for the developed source in the Mba quarter where a value of 0.3 NTU is recorded. The iron content in the system water is higher in the wet season. The maximum concentration is recorded at the consumer's tap (1.02 mg / l). On the other hand, in spring waters, the iron concentration is low. It is noted that this parameter is absent in the wet season. In the dry season, it varies from 0.01 to 0.06 mg / l. Phosphore whose concentration varies from 3.61 mg / l to 18.55 mg / l in the water of the network in wet season is present in all the sampled waters and at high levels compared to the norm of the WHO (table 3).

Table-3: The level of physico-chemical parameters of drinking water

Neighborhoods	Type of work	pH		MES (mg / l)		Turbidity (NTU)		Iron (mg / l)		Phosphores (mg / l)	
		Seven	Feb	Seven	Feb	Seven	Feb	Seven	Feb	Seven	Feb
Batéla	Ngam River	6.5	7.8	6.3	8.7	24.3	10.3	0.76	0.46	8.75	6.2
	Water station	6.4	7.8	0	8.1	4.2	6.8	0	0.72	18.55	7.2
Noufam	Tap water	6	7.7	2.1	8.7	10.7	6.8	1.02	0.60	3.61	7.2
Mba	SNA	5	7.2	0	0	0	0	0	0.01	7.35	12.4
	AS	5.4	7.3	0	0	0.3	0	0	0.06	6.42	10.3
Banékouane	HA		7.4		0		0		0		8.2

***Source**: Field surveys, 2016 and 2017*

From table 3 above it emerges that the spring water has good physicochemical characteristics, except for the phosphore which have a high value compared to the accepted standard (5 mg / l). The water from the CAMWATER network is not recommended for drinking from a physico-chemical point of view. The MES present in water and high iron content contribute to the colouring of this water.

Bacteriological analysis of drinking water in the town of Bangangté

Bacteriological analysis aims to determine the presence of microbes of faecal origin. Based on the number of CF in 100 ml of raw water, the WHO [11] classifies the quality of water intended for drinking. The results of the bacteriological analysis show that on the water points sampled, 3 in the wet season are excellent (station water, tap water and ANS), 1 has an acceptable quality (AS) and 1 is not recommended for drinking (river) in the wet season. In the dry season, the quality degrades more. The ANS is unfit for human consumption and the Ngam River is polluted (table 4).

Table-4: Classification of water according to the number of *E. Coli* in 100 ml

Neighborhoods	Type of work	Number of fecal coliforms in 100 ml of raw water			
		September		February	
		Average	WHO category	Average	WHO category
Batéla	Ngam River	35	C	90	D
	Water station	0	A	0	A
Noufam	Tap water	0	A	0	A
Mba	ANS	5	B	9	B
	AS	5	B	9	B
Banékouane	AS			4	B

A = Excellent, **B** = **Acceptable, C** = Unfit for human consumption, **D** = Huge pollution

The ColiformTotals (CT), *Escherichia coli (E. coli)* and the *Salmonella* are absent pathogens in the treated waters of the CAMWATER network. Fecal Streptococci (FS) are still numerous in water after treatment. The concentration is higher in the wet season where it ranges from 40 cfu / 100 ml to 70 cfu / 100 ml (table 5). CT, *Escherichia coli*, FS and *salmonella* are present in all spring water sampled. The maximum concentrations are recorded in the dry season at the ANS (250 CFU / 100 ml). The *salmonella* are abundant in water of AS neighborhood Mba in dry season (25 cfu / 100 ml).

Table-5: Enumeration of pathogenic microorganisms in drinking water

Coded	Total coliforms (CFU / ml)		*Escherichia coli* (CFU / ml)		Fecal streptococci (CFU / ml)		Salmonella (CFU / ml)	
	Sept	Feb	Sept	Feb	Sept	Feb	Sept	Feb
P1	300	500	100	250	200	450	100	80
P2	0	0	0	0	70	10	0	0
P3	0	0	0	0	40	0	0	0
P4	0	250	0	250	50	250	0	20
P5	50	55	20	10	100	150	10	25
P6		18		10		150		1

Source: *Field surveys, 2016 and 2017*

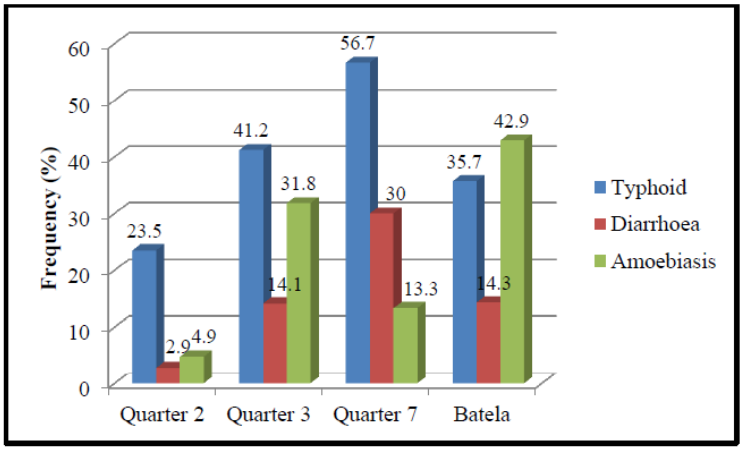
The treated water of the CAMWATER network has good bacteriological characteristics (0 CFU / 100 ml). However, the resistance of FS after water treatment can constitute a health risk. On the other hand, the waters of the springs as a whole are unfit for human consumption, with the exception of the ANS who's CT, *Escherichia coli* and *salmonella* are absent in the wet season.

Consequences of water availability and quality on human health

Insufficient quantities of water available and consumption of poor quality water inevitably lead to water-borne diseases.

A frequency of waterborne diseases in the city of Bangangté

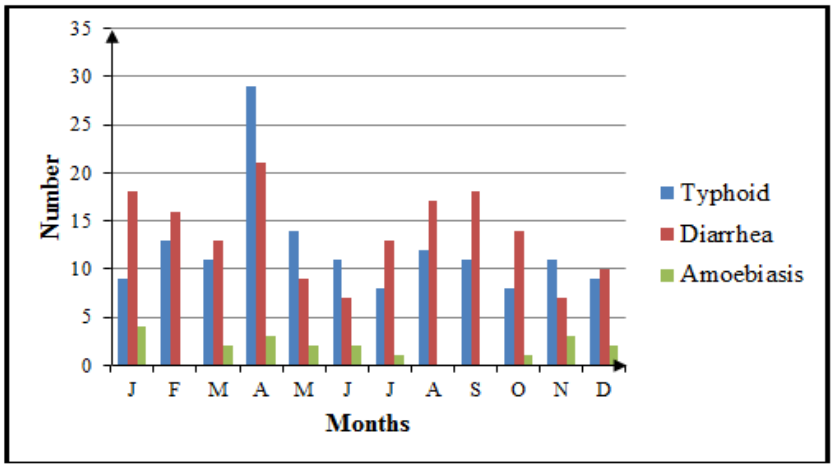
Field surveys have led to the identification of 6 water-borne diseases with the main ones being; typhoid, diarrhea, amoebiasis and helminths. Based on the data collected from household heads, typhoid fever ranks first among water-borne diseases, at a rate of 35.1 %. This pathology is followed by amoebiasis, which affects 18.2% of the households surveyed. 11.3% of households suffer from diarrhea (figure 5, 2016).



Source: Field survey, 2016

Figure 5: Distribution of water-borne diseases in the town of Bangangte

However, households, out of fear or ignorance, still do not report illnesses. As a result, clinical data show that in 2016, typhoid fever occupied the first position in water-borne diseases affecting the population of Bangangté after malaria. The majority of patients suffer from this disease and diarrhea. The majority of the illnesses come from neighborhoods where access to water from the CAMWATER network is difficult and where people get their supplies for drinking from the springs and river. Amoebiasis occupies the third rank. Most of these diseases are subject to seasonal variations.



Source: *Field survey, 2016*

Fig-6: Evolution of water-borne diseases according to seasons

Figure 6 shows that in the city of Bangangte, diarrhea and typhoid are very frequent during the month of april, during the short rainy season and during the long rainy season (August and September).

Cost of treatment of water-borne diseases

The heads of household in the town of Bangangté spend an average of 10 000 F CFA per month for the treatment of water-borne diseases (table 6). Of the 23 households surveyed, 41 confirmed that they spent an amount ranging from 5 000- 10 000 F CFA for treatment. The expenses are very high when it comes to typhoid. 24 heads of households had more than 50 000 F CFA to help the household recover. This cumulative amount can permit the household to obtain a home connection at the end of the year. Furthermore, paying for medical treatment can impoverish the family, which is forced to use family savings and sometimes the sale of their precious goods for medical needs.

Table-6: Cost of disease treatment water in the city of Bangangté

Cost (F CFA) / Pathologies	No cost	Less than 5,000	5-15,000	15-25,000	25-50,000	50,000 and +
Typhoid	3	0	14	15	16	24
Diarrhea	4	2	10	7	0	0
Amoebiasis	11	2	17	9	2	0

Source*: Field surveys, 2016*

DISCUSSION

The concessionaire's access to drinking water is low (less than 25 %). Households connected to the CAMWATER network do not benefit from this service permanently. Water cuts are regular and last several days and even weeks. This result is close to that obtained by Yemmafouo *et al*. [12] in the city of Mbouda. In this secondary town, 42% of households connected to the network had decried at least 4 water cuts per month. In Bangangté, water flows 3 to 4 times a week. Besides the low production of water, a large quantity of this liquid is lost during its transport. The obsolescence of the pipes and the leaks of water that have not been controlled are the cause of these losses. This result affirms that of Tchoumkeu [13], which by analyzing the performance of the network SCANWATER of Bamena, believes that the low water supply is linked to multiple leaks and shedding experienced by most medium-sized cities and rural areas. Households that do not request a

connection are located in inaccessible areas where the cost of access is very high. This is the case of the Mba, Sagnam and Mfetom districts. The high connection cost and poverty explain that 68.3% of the inhabitants are not connected to the CAMWATER network. The inaccessibility of the network at the Mba neighborhood does not encourage 9.7%

of households to subscribe for a connection. Others, because of the frequency of outages for long periods, are not motivated to start the subscription process.

Faced with these difficulties, the populations in the city of Bangangté have recourse to a minimum of 2 modes of water supply. The choice is determined by the availability of water for daily needs. Wells are common in all neighborhoods. This mode of water supply makes the populations independent of the CAMWATER supply network. Spring water is used more for drinking. The queuesare long for this type of water source, especially in the dry season and in case of cuts from the CAMWATER network. The springs are accessible, but some households have to walk long distances or pay a motorcycle driver to have this water. 94,1% of households in the Mba quarter, covered by ¼ of CAMWATER network, are supplied by a spring. Although benefiting from 2 natural sources, the populations of this district to reduce the distances dig wells. This observation was also made in the town of Mbouda, where the presence of sources in a locality does not prevent the inhabitants from drilling a well [14]. In Mfetom, the spring, located in Banékouane, is the main mode of supply of drinking water. The populations leave from other districts to refuel at this point. In Batéla, the district where the capture and treatment station is located, 78.6% of households use network water. The springs are not used, because the water in the network flows continuously.

The high turbidity, the presence of MES and the high concentration of iron and FS in the CAMWATER network are proof of the ineffectiveness in the disinfection and intermittent operation which causes the infiltration of contaminating agents. Turbidity greater than 5 NTU could on the one hand prevent the detection of bacteria and viruses by absorbing them in the particles and on the other hand protecting the microorganisms against the action of disinfectants. It can also lead to unpleasant tastes and odour during consumption [3]. People refuse to drink this water because of its reddish colour. Although it has good bacteriological characteristics, these organoleptic parameters divert the consumer's attention at the benefit of spring water containing bacteria. The preference for spring water is linked to its clear character. In the city of Yaoundé, studies by Nnanga *et al*. [15] at the Mvog-Betiquarter have shown that it is the colour of the water that determines the choice of the type of drinking water. For this population as for the populations of Bangangté, drinking water is that which is clear. The reddish color of the water in the city of Bangangté is indicative of a form of pollution or a malfunction during treatment or distribution.

According to the WHO [16], CT, FS, FC and *salmonella* should be absent in water intended for human consumption. The results obtained show that spring water especially is strongly colonized by microorganisms. The number of bacteria is higher in the dry season. The high temperature (23 ° C in the dry season versus 21 ° C in the wet season) promotes the development of germs. Nanfack *et al*. Nnanga *et al*. [15] analyzing spring water wells and boreholes in the cities of Yaoundé and Mbouda came to the same results. The presence of FS after treatment of CAMWATER network water is linked to the high turbidity (> 1 NTU) which makes disinfection ineffective.

Traditional sources whether developed or not in the town of Bangange are not surrounded by a perimeter of immediate protection. Therefore, they are exposed to the passage of animals that can drink and defecate in it. Runoff or infiltration water can also cause bacteria in the water table [17]. Some activities such as laundry, agriculture and proximity to latrines contribute to the contamination of these waters. The studies carried out by Kemayou [8] in the same city and Njikeu [9] in the city of Tonga have shown that the presence of CF in spring water could be due to the presence of latrines, to contamination by wastewater, and that of SF to contamination of animal origin. The consumption of its water exposes people to contracting water-borne diseases. Typhoid, the main disease affecting households is transmitted primarily by poor water quality. Diarrhea and amoebiasis are transmitted when hygiene and sanitation practices are not followed. Households do not take measures to reduce health risks at home. Only 32.9% treat water against 67.1% who consume it in its raw state.

CONCLUSION

Access to drinking water remains a major concern for the populations of the town of Bangangte. Natural predispositions and socio-economic factors largely influence the availability and access of the population to drinking water. The use of well water, springs, the drilled water, rivers and rain are many alternative strategies developed by households to obtain water. However, it follows from the analysis of water samples taken that this water contain pathogenic bacteria such a s the CT, the *E. Coli*, the FS and *salmonella* . The presence of these germs, indicator of faecal contamination, is the cause of diarrhea, typhoid and amoebiasis which affect the population of this locality. The availability of water in sufficient quantity and good quality can contribute to the reduction of these diseases. CAMWATER must expand its network, increase production and supply permanently connected households. In addition, this stakeholder must improve the water treatment and carry out regular cleaning of the distribution tanks and reservoirs. To improve the quality of available water, preventive risk management is essential through the security of water collection points and water treatment at household level. Given the organoleptic parameters, the water network must be filtered before

use. Spring water sources must be filtered and disinfected before consumption.

REFFERENCE

1. United Nations Office on Drugs, & Crime. (2010). *World drug report 2010*. United Nations Publications.
2. OMS, Unicef. (2017). *Progrès en matière d'eau, d'assainissement et d'hygiène, Mise à jour 2017 et évaluation des ODD*, 116.
3. Rodier J. (2009). *L'analyse de l'eau*, 9ème édition, Dunod, Paris, 1579.
4. Suchel, A. (1973). *Étude sur les intoxications par les insecticides organophosphorés: à propos de vingt-six observations* (Doctoral dissertation, Association corporative des étudiants en médecine).
5. Tsalefac, M., (1999), Variabilité climatique : Crise économique et dynamique des milieux agraires sur les hautes terres de l'Ouest du Cameroun, Thèse de Doctorat d'État-es Lettres, UYI, 564.
6. Tchindjang, M. (1985). *Le rebord du plateau bamiléké autour de Bangangté*, Mémoire de Maîtrise en Géographie physique, UY, 125.
7. Champaud, J. (1983). *Villes et campagnes du Cameroun de l'Ouest* (Vol. 98). IRD Editions.
8. Kemayou, Tchamako, E. (2012). Influence de la lithologie et de l'activité anthropique sur la qualité des eaux : Cas du bassin versant du Ngam (Bangangté-Cameroun), Mémoire de Master II, UY 1, 84.
9. Njikeu, O. (2015). Influence de la lithologie et des activités anthropiques sur la qualité des eaux du bassin versant du Ndé (Ouest-Cameroun), Mémoire de Master II en Science de la Terre, UY 1, 76.
10. PSEAU. (2016). *Les services d'eau et d'assainissement dans les Objectifs du Développement Durable*, Document de travail, 26.
11. Howard, G., Bartram, J. (2003). *Domestic water quantity, Service Level and Health*, WHO, Geneva, 39.
12. Yemmafouo, A., Ngouanet, C., Tepoule, Ngueke, J.O. (2009). *Difficultés d'approvisionnement en eau potable dans la ville de Mbouda (Ouest-Cameroun): Une conséquence des changements d'utilisation du sol sur le versant de la Tsé deng-Tamétap ; approche multisource de télédétection*, Recherches africaines, Annales de la Faculté des Lettres, Langues, Arts et Sciences Humaines de Bamako, 14 p.
13. Tchoumkeu, L. P., (2014), Maîtrise des pertes d'eau potable et analyse de la qualité des eaux des réseaux Scan-Water de la Commune de Bangangté : Cas du groupement de Bamena, Mémoire d'Ingénieur de conception en hydraulique et maîtrise des eaux, Université de Maroua, 65.
14. Nanfack, N.A.C., fonteh F., anyangwe V.K.P., katte B., fogoh J. Muafor. (2014). *Eaux non conventionnelles, un risque ou une solution au problème d'eau pour les classes pauvres*, In Larhyss Journal, n°17, pp 47-64.
15. Nnanga N., Ngene J.P., Tsala, D.E., Ngoul, A.C., Lamare, N. (2014). *Relation entre pollution des eaux de sources, forages et maladies hydriques enregistrées au Centre Hospitalier Dominicain Saint Martin de Porres (CHDSMP) du quartier Mvog-Betsi à Yaoundé*, In Sci ; Dis., Volume 15, n° 3, 8 p.
16. OMS.(1985). *Directives de qualité pour l'eau de boisson*, Volume 1, Genève, 129 p.
17. Geldreich, E. E. (1996). *Microbial quality of water supply in distribution systems*. CRC Press.