

Factors Affecting Water Quality and the Risk of a Cholera Outbreak in Bamenda, North-West Region of Cameroon Communication in Rescue to Public Health

Dr Peguy Ndonko (Ph.D.)

*Medical anthropologist
CADS-FHS-UBa*

Abstract: Most water sources available to the population are polluted by a number of factors. The way in which people use and consume water fosters the re-emergence of water-borne diseases of all kinds. Public health objectives therefore call on individuals to get involved in the fight against water pollution. Carried out in Bamenda using social science research techniques and methods, this study shows that there is a correlation between water pollution and human behaviour. However, the analysis of risk factors suggests that people are less likely to make a real effort to understand the meaning and place of risk in their daily lives. They continue, for example, to defecate in and drink spring water, to pollute the environment with all kinds of waste, to discourage government initiatives to supply water through deviant behaviour, and not to wash their hands before eating. One can foresee that humans will not get rid of water-borne diseases any time soon because of the wide range of transmission factors they keep rubbing shoulders with.

Keywords: Water, Disease, Pollution, Waste, Deviance.

Résumé: La majorité des sources d’approvisionnement en eau disponible pour les populations est polluée par de nombreux déterminants. Les usages et les pratiques de consommation de l’eau par les populations favorisent la réémergence des maladies hydriques de toutes sortes. Les individus sont ainsi convoqués par les objectifs de la santé publique à s’engager dans la lutte contre la pollution de l’eau. Cette étude, réalisée dans la localité de Bamenda à partir des techniques et des méthodes de recherches en sciences sociales montre justement que la pollution de l’eau est liée à des comportements humains. L’analyse des facteurs de risque laisse toutefois penser que les populations sont moins face à un réel effort de compréhension du sens et de la place du risque dans la vie quotidienne. Elles continuent par exemple à déféquer dans les eaux de sources et la boire, à polluer l’environnement par toutes sortes de déchets, à décourager les initiatives gouvernementales dans l’approvisionnement en eau par des comportements déviants, à ne pas laver les mains avant de manger. Toute chose qui laisse entrevoir que les maladies hydriques ne s’éloigneront pas de sitôt de l’homme qui accumule divers facteurs de transmission.

Mots-clés: Eau, Maladies, pollution, déchets, déviance.

Introduction

Water is essential to the well-being and health of the human population. However, the water consumed by the majority of people in sub-Saharan African countries is of dubious quality. The resource is polluted by a variety of factors that endanger the well-being of the population and thwart the implementation of major public health policies in many countries. Yet the relevance of this resource is proven beyond a reasonable doubt. From an environmental point of view, unhealthy environments and polluted water are receptacles for the germs of numerous diseases such as cholera, gastro-enteritis, amoebic dysentery and helminthiasis, on the one hand, and the resource is at the centre of a number of commercial issues, on the other hand. A publication by Travaux Publics Sans Frontières (2022) notes that since 1992, water management, and in particular access to drinking water, is viewed by the United Nations as an essential issue for socio-economic development. However, in 2019, WHO and UNICEF agreed that 2.2 billion people still do not have access to safe, continuous drinking water. Cameroon is one of the countries where the situation is most critical, with 34% of the population lacking access to potable water. Social anthropology is interested in the study of water in order to understand the uses and practices that deteriorate water quality and to understand the water-borne diseases to which people are exposed. The Bamenda city dwellers are under constant threat from water-borne diseases. In some places, there is a mismatch between the availability of drinking water and people's access to this resource. There are many players involved in this water insecurity, and the theory of representations seems best suited to addressing this social malaise. Bernard Mondet (al), (2010:239) were quick to point out that "*Environmental modifications, often due to human activities, have generally been associated with the emergence or re-emergence of infectious diseases. There are many examples of this, most often linked to migrations, exchanges and/or regrouping of*

populations and the changes to the environment that this implies". The aim of this study is to identify the factors that contribute to water pollution in the city of Bamenda and explain the risks incurred by the population, and to propose communication strategies to prevent water-related diseases so that the population can enjoy a healthy quality of life.

1. Background and rationale

Over the last century, health/environment relations have been considered as separate realities by decision-makers and the scientific world. The issue of water was studied in isolation from population, environment and health. At the Stockholm Conference in 1972, the foundations were laid for a debate on the conjunction of these two entities and the links thus established. The Brundtland Report (1987) on sustainable development gave a further impetus, emphasising the links between environment and development, while also mentioning the damage caused by pollution and its impact on health in the context of development. It was only at the beginning of the 21st century that the environment/health link was finally recognised within official circles (Bley, 2001). The first security that the populations of a country must enjoy is water security. It has always been a prerequisite for the existence of civilisations. If in Cameroon as a whole people are grappling with water quality, the situation in Bamenda is more serious. Oswaldo de Rivero (2003:198-199) reports for the World Bank that one billion people in the world do not have enough water to drink, and around 1.7 billion have no sanitation facilities. The lack of potable water and sanitation condemns millions of people living in underdeveloped cities to disease and premature death. Access to water is therefore becoming a determining factor in survival. In 2010, a study by the Global Water Partnership (GWP) revealed that Cameroon's water needs represent only 4.14% of the country's available water resources. So there is variability between regions. This leads to the hypothesis that the nature of the determinants increases the risks of water pollution. In order to understand the environment/health link in Bamenda, we need to take into account the social and cultural factors that poison people's health. The aim of this study is to identify the factors that foster pollution of the water consumed in Bamenda. It will also help people understand the risks they run when they drink dirty water. This locality is in the grip of several crises (security, health, water) and we want to understand what people think about the difficult access to drinking water.

1.1. Justification for the choice of subject and study area

Bamenda is blessed with many water catchments, rivers and streams found in all its various district councils. According to the 2021 data from the National Institute of Statistics (NIS), the population of this chief town of the North-West region stands at 573,286 inhabitants in 2022. These rivers and streams take their source in the Bamendankwe hills and flow down through the Up-Station escarpment. However, despite these blessings from nature, the city is most often facing water crisis. The various water governing bodies face a number of challenges which go a long way to hinder the supply of water in the city of Bamenda. These challenges include: climate change, population growth, deforestation, waste disposal, defecation in streams and rivers, etc. What is the source of the water you use at home? Is it surface or ground water? When people are asked these questions, the answers are quick and easy, but they have no idea of the impact of the question on their state of health. Another case is that of the water catchment in Mbatu. A catchment controlled by CAMWATER. It supplies water to most of the areas in town. So with the growing population, this source can't supply water to all the areas at the same time. This compels people to drink and carry water from dirty sources, something which may cause an outbreak of cholera in the long-run. Due to insufficient funds and inadequate personnel, the maintenance of water catchments is a major issue. As water is supplied almost for free or at a very low cost in the city of Bamenda, various water authorities lack finances for maintenance and payment of their workers. Hence, the outright abandonment of some of these catchments across the city. As part of this study, the data collection took place in April 2022. We deemed it necessary to conduct this research in Bamenda because a cholera epidemic was sweeping through the city of Buea claiming many victims (MoH, 2022). The two localities share a linguistic heritage and several behaviours, particularly in terms of food which may usher in cholera (the preparation of Achu and the water used to make the soup). This is the more reason why most of the population complain bitterly about the nature of water flowing from taps. The water is really dirty water due to lack of maintenance. The water catchment in Mbatu is notorious for this.



Photo 1: Water collection source in Bamenda. Peguy Ndonko, Bamenda 2022

2. Materials and Methods

In order to have contrasting situations, the data was collected on 4 different survey sites with a diversity of practices. We choose convenience sampling because, in the context of crisis and insecurity like the one in Bamenda, it is a technique whereby we can easily meet informants. Data collected from the most readily available elements of an appropriate population. We did so on all survey sites until we reached the saturation level. Bambili was chosen because it is a university area where students from various cultural backgrounds meet. The water that these populations use comes from a source used by the Regional College of Agriculture. The water is visibly dirty and polluted by fertilizers. In Bambili, there is a water source which actually provides water in the area. The source is referred to as the Agric Source. Due to water scarcity, people are forced to fetch water from untreated sources, which is the stream that runs through the Agric School which is actually meant for agriculture as inhabitants use it to water their cash crops. In Bambui has a well-controlled water source in the hands of the Bambui Water Authority (BAWA). Due to shortages, the authorities are then forced to resort to water rationing, cutting here and supplying there. This situation forces inhabitants to use water from streams and rivers to carry out their daily activities. In town, particularly in New Layout Street, water is actually managed by CAMWATER. There you have tap water but most often, no single drop to cool one's tongue. During periods of shortages especially during dry seasons, inhabitants have to trek long distances to get water. People in Sonac Street have a good source tap water but most often taps run dry. The reason for this scarcity is that people come from other neighbourhoods to fetch water. For example, people leave New Layout Street and come to Sonac Street. Therefore, homes in Sonac Street do face water shortages. Inhabitants who do not have money to buy mineral water forcibly fetch water from dirty sources like untreated wells, washing points (most water sources actually providing water to washing points are not really clean), streams and rivers, etc. Despite the distance, Sonac Street is the last resort to get portable water. People who cannot go such distances fetch their water from wells, and when the scarcity hits hard, some of them fetch water from streams like the stream around Finance Junction, some see stagnant water and just start fetching without even caring about the source of the water. In all these localities, people individually express their opinions on water quality.

The anticipation approach favoured our vision of prevention. Cluster sampling allowed us to interview women and children who regularly came to these sites to fetch water. An in-depth interview of 22 informants allowed us to question owners of the restaurants and canteens around the campus to find out where they get the drinking water that is served to customers who come to eat. We interviewed a total of 8 women, 7 children, 4 restaurant owners and 3 students who often eat in restaurants on campus. Representation theory will serve as the analytical framework for this study. It focuses on the analysis of the opinions, attitudes and practices of populations. The interactionist theory comes to the rescue of the latter. It stipulates that it is the relationships between individuals and their interactions with their environment that make it possible to better understand human lifestyles and behaviours.

3. Determinants of water pollution and health in Bamenda

It is crystal clear that water is one of the most vital resources on earth. Safe water is important to our communities and most of all, our health is greatly impacted by the availability of water. Unfortunately, water is largely polluted across the world and this has become a major crisis we are facing today. Determinants of health are the personal, social, economic and environmental factors that determine the state of health of individuals or populations. It is also a factor, whether an event, a characteristic, or any other definable entity, which causes a change in the state of health or other defined characteristic. These definitions underlie a causal relationship between the determinant and the state of health. This causal relationship can be unifactorial and direct; however, in public health, it is more often multifactorial and indirect, via a more or less complex causal chain. The determinant is one of the key concepts on which the principle of public health intervention is based. Indeed, it is by acting on one or more determinants that we will influence or improve the state of health of the population. The notion of determinant is most often compared to that of risk factor which is said to be an individual or collective characteristic whose presence is associated with a change in the probability (or risk) of occurrence of a health event. Therefore, public health is the science or art of protecting and improving the health of people and their communities. Yet, in a field that relies heavily on population-level surveillance and data collection, humanist research approaches are ever more valuable in determining how to best serve the public health needs of communities. Anthropology simply means the study of the development of human societies and cultures. Both fields present a diverse degree of research opportunities and are tailored to investigate the human condition. Put together, we can earn more in using them in case of serious health issue as multidisciplinary approaches open up important avenues and bring about necessary changes that promote decision-making.

3.1. Population growth an inappropriate sewage disposal in Bamenda

The increase in population without a possible increase in water supply is definitely another major issues. Some areas will be used as case study to explain the factor of population growth. With the case of Bambui, where water is managed by the Bambui Water Authority (BAWA), the population has grown in such a way that water cannot be supplied to all at the same time. As a solution, the relevant authorities are then forced to resort to water rationing, cutting here and supplying there. Hence, shortages here and there. With this, inhabitants are forced most of the times to fetch water from streams and rivers around the area for survival. This water from rivers and streams is definitely not a good source since it is untreated and infected with bacteria. Thus, cholera might be unavoidable in such localities. A similar case is seen in Bambili, a University area crowded with students. With the crowd in this student area, water cannot really be supplied to all areas at the same time. As a result, due to shortages, students are forced to fetch water from the Agric School. This source from the Agric School is certainly not a good source as it is used purposely for farming. Students in the Agric School use it for their farming produce such as vegetables, tomatoes, water melon, cabbages, carrots and many others. This means that of the students' health is at risk as they use this water day in day out. Another determinant of water pollution in Bamenda is rapid urban development. Gerome, a 32-year-old informant explains that: *“Actually, as the world is evolving, people are equally gaining new ideas and technology equally improves. As a huge number of people live in a cramped area, there is likely going to be a physical disturbance of land there. You can see it in places like Nkwen, City Chemist, Hospital Round About and even from Bambui heading to Bambili where there are construction of new houses and roads. This affects cleanliness of water through the use of tools in construction such as detergent, chemicals and many others. When rain falls, these chemicals are washed into streams and rivers and eventually into the drinking water source. Thus, water pollution is inevitable in the city”*.

In Bamenda, an inappropriate sewage disposal greatly fosters water pollution. This sewage disposal is becoming a major problem in this town. There are many poor house sewage facilities. Nowadays, people build houses without making provision for sewage treatment. They put in place very poor facilities. Every time you flush, the waste goes somewhere either into a poor sewage facility or into streams and rivers which are sources of water. You find some houses without any place where to pass faeces. An example is Bambili, a student area where most house owners or landlords are eager building houses to let to students without sewage treatment facilities. They are out to make their money, caring less about the basic amenities. Hence, water pollution when waste is dumped into rivers and streams.

3.2. Water pollution by pesticides

People are of the opinion that the system of agriculture adopted by garden farmers is the root cause of water pollution in the city of Bamenda. This is mainly irrigated farming as they do connect pipes to water their crops (tomatoes, vegetables, carrots, cabbages, spices, etc.). In their day to day activities in these gardens, chemicals are being applied thus causing water pollution. Oswaldo de Rivero (2003:198) states that: *“When water is available, one must determine whether it is drinkable or not. Today, the vast majority of rivers, lakes and streams near large and ever-expanding human settlements are contaminated by agricultural pesticides,*

industrial residues and excrement. This reduction and contamination of available water is even more evident in poor countries. Today, half of the population of underdeveloped countries endures water shortages and suffers from diseases related to water contamination, which cause approximately 25,000 deaths per day. Only 2% of human excrement and industrial residues are treated in any way. The rest, nearly two million tons a day, is now discharged, polluting rivers, lakes, oceans and groundwater”.

Equally, people have abandoned the animal dung they were using in yesteryears to improve on soil fertility for chemical fertilizers. What happens when these chemicals are utilized in farmlands is that when it happens to rain, the chemicals are washed into streams and rivers which sometimes happen to be the only sources of clean water. Water pollution therefore becomes inevitable when such activities are carried out. An example is Bambui which is blessed with numerous streams that farmers use for irrigation purposes. The water to be consumed is damaged in different ways. Henry Turnaux (2010) read for us a dispatch from the Food and Agriculture Organisation of the United Nations (FAO) and the United Nations Development Programme (UNDP) of September 2004 where he notes that: “It is estimated that there are between one and five million cases of pesticide poisoning each year (worldwide), resulting in the death of several thousand agricultural workers. Most of these poisonings take place in developing countries where health standards are often insufficient or even non-existent. Although these countries use only 25 percent of the world's pesticide production, they account for 99 percent of deaths attributable to them.” Today, it is almost impossible to cultivate without pesticides and agricultural products grown under these conditions are distributed right to neighbouring countries. The North-West region has water which also facilitates the watering of plants in the arid zones, thus during the year, vegetable crops are available in all seasons, but the farming conditions are deplorable as Maureen, 38, Bamenda testifies: “*When you travel through the North West region, you realize that the populations cultivate with chemicals in all ignorance, they do not imagine the risks to which they expose consumers. Carrot no longer has any taste, tomato has lost its value, they are all full of chemicals and have become unfit for consumption”.*

3.3. Water pollution by human and animal excreta

What most of the inhabitants of this area generally see as dirty water is stagnant water. To them it is dirty water because it does not flow and dirty particles like tree leaves and many other particles will drop in the water and remain there. They believe these dirty particles accumulate and form this green alga in water called “Spirogyra”. Also, what they do consider as dirty water is one which is completely dirty. Water that you would not have any thoughts to whether it is clean or not. They do not see water with odour or taste as dirty water. The people in this area do believe that any water flowing from a tap is clean water. Their mindset is that dirty water cannot flow from taps. This results from the scarcity of tap water in most of the communities in this area. Since there is actually scarcity and the people barely have these privileges, they do just believe water flowing from taps is generally clean. Inhabitants of this area generally believe that every running water is clean be it a stream, river or waterfall. They believe as the water is flowing, dirty particles or bacteria cannot be accumulated in the rivers. They actually say that as the water is not stagnant, dirty particles flow along with the water. In most communities in this area, the inhabitants rely more on running water than taps. They are ignorant of the fact that water from streams too might contain bacteria that can cause water-borne diseases such as cholera. Markus, 38 years old, inhabitant of Bamenda reveals that: “*In Bamenda, some people practice open air defecations due to lack of money to fund the construction of toilets, it can also be due to the availability of running water closer to their homes or due to unforeseen circumstances such as an individual being pressed or stranded feeling like to defecate, some do it out of wickedness and ignorance”.*

More than half of the population in this area believe rain water is perfectly safe to drink and to an extent even more safe than the public water supply. They do believe that rain that directly falls from the sky is 100 percent safe to be called clean water. Ignorance is actually the problem here as most of the people do not know that rain water may contain viruses and bacteria that can make one sick and could equally lead to the outbreak of diseases like Cholera. Well water can be suitable for drinking, provided it is tested and treated. In this area, where most of the inhabitants rely on primary activities such as farming, they hardly have those funds to treat this well water but yet they believe that well water is safe water. They do believe so because it is water coming from the underground and does not need treatment nor testing to be deemed drinkable. They do not know that groundwater may contain sulphur bacteria that actually emit a smell in well water. Claudia, 36 years old, inhabitant of Nkwen asserts that: “*In the stream behind Nkwen market, which has become a waste disposal centre for most traders, beside it is a chicken market and every waste from there is dumped in this stream. Few kilometres downstream, the water is being used for other purposes, especially during the dry season”*

Furthermore, we have the issue of open air defecation and defecation into streams and rivers. With open air defecation, when it rains, everything is washed down into streams and rivers. Most importantly, the rains even carry this into water tanks which are not well protected. For example, we have areas like Mbengwi Road and an area like Ntaturu where while going to farms you see inhabitants using farmlands and bushes to defecate

while others equally use streams and rivers. Some even go as far as urinating in streams with the notion that it is not stagnant water. They strongly believe that as the water is flowing it carries the urine away. They do not give a damn about others who use the water downstream. As for open air defecation, most inhabitants here prefer to drop a deuce in their fields, bushes, farmlands, forest, etc. This is an age-old practice spanning generations. It has become a way of life and most people are fond of it. In fact, one might have blamed this on the lack of good toilets, but far from it. There is a common belief that defecating in fields and farmlands is a way to boost soil fertility thereby increasing crop yields. Faeces are viewed as better manure for farming. Defecating in streams and rivers is a common practice. People do so not actually because they lack toilets but because they believe that on its course, the stream will wash the faeces away. They do not have in mind that downstream riparian population also depend on those streams for water. Defecation in streams in most cases is done by children. In some areas, this is somehow a way of life quite difficult to abandon. It is like an element of culture, deeply rooted in the communities. Most of the inhabitants are actually ignorant about the negative effects of such practice. Neither communicators nor health experts are deployed to carry out sensitisation on the dangers of their behaviours. Another determinant or element of water pollution in Bamenda is waste disposal. Waste disposal in the city really plays a great role in water pollution. The behaviour of the population with regard to this issue is really bad. One has the impression that no sensitisation was really carried out on the dangers of drinking polluted water. Most of the population see it fit to dump their waste is by throwing it into rivers and streams as well as into street gutters. The waste dumped into gutters is carried by rain into rivers to add to the one dumped directly into the streams. This actually pollutes their main water sources. Areas like New Layout Street and Food Market are glaring examples of where you see waste being dumped into gutters. We equally have areas like Bambui where inhabitants throw their waste into rivers and streams.

3.4. Pollution by household or domestic waste

The increase in population inevitably generates the abundant production of household or domestic waste. In all nooks and crannies of the city, we find piles of waste deposited by the populations anxiously waiting for the waste collection and disposal contractor. This waste may lie around for several days, causing not only olfactory pollution, but also environmental pollution which can impact the quality of any water within spitting distance. Rene JolyAssakoAssako (al) 2010: 257) stated “*Waste is generally dumped in nature without prior treatment, sometimes even in the immediate vicinity of places of residence. Wastewater and household waste contain toxic products, a high load of pathogens and parasites of all kinds and which, by polluting living, leisure and consumption environments, expose populations to a permanent health risk*”. Waste disposal and defecation in rivers and streams are major factors that cannot be left in the cold. In some areas where there's actually shortage of water to flush toilets, most of these people turn to defecate in streams and rivers. Some do that out of ignorance, they don't know about the negative effects, they do it thinking it's fun. Coupled with the fact that due to insecurity in the city, HYSACAM, the waste collection and disposal contractor closed down business, the denizens of Bamenda have developed the habit of dumping refuse into rivers and streams. Moreover, due to water shortages in most parts of the city, people face difficulties especially those using flush toilets. They hastily go defecating in rivers and streams. They will come back later to fetch this same contaminated water to use in their households without even observing the basic hygienic precaution of boiling it before drinking or use. In the event of a cholera outbreak, imagine what will be the fate of an area under such hygienic conditions.

3.5. Lack of hygiene and sanitation

Hygiene and sanitation in the city of Bamenda is not at its best. Some neighbourhoods will be used as case study to expatiate upon this issue. New Layout and Meta Quarter are known for their poor hygienic and sanitation conditions. The most notable areas are their toilets and the environment. Here, water is actually scarce and thus, inhabitants who are compelled to go on long distances to fetch water are not eager to take good care of their toilets and environments. The inhabitants actually keep using their toilets in horrible conditions. They do not wash their hands after using their toilets, some hardly wash their hands before and after meals, they go on cooking without washing their hands. Healthwise, this is quite dangerous when you look at some of the delicacies whose cooking need proper hygiene and sanitation. These include: *achu*, *waterfufu* and *eru*, *fufu corn*, *ekwang*, *jamajama* and many others. Thus, inasmuch as the hygienic conditions are not good, the consumption of such delicacies also becomes dangerous. They are prepared with dirty water, coupled with poor hygiene like non washing of hands before cooking and the dirty nature of the environment where the food is prepared. With such hygienic conditions, a cholera outbreak will be disastrous as it will spread like wildfire. According to Bernard Mondet(al), (2010:249), “*Water-related diseases are diseases transmitted to humans whose existence is directly or indirectly linked to an aquatic environment. They can be directly related to contaminated water in which an infectious agent develops (diarrhea due to viral or bacterial gastroenteritis, cholera, etc.). They can*

also be indirectly linked to a wastewater environment and the presence of hosts, vectors carrying a pathogenic germ, as is the case for hemorrhagic leptospirosis, the agent of which infects domestic or peridomestic rodents that in turn, contaminate drinking water with their droppings". Finally, infectious diseases through their aquatic environment are related to different types of more or less healthy water collections.



Photo 2: People's activities in a river in Bamenda, Peguy Ndonko, 2023

As we speak, the Bamenda city dwellers barely have water to drink, cook, do laundry, etc. This is coupled with the fact that HYSACAM hardly reaches some areas because of insecurity. This has greatly contributed to the poor hygienic conditions of the town. For example, heaps of refuse litter the streets here and there. Most often, people who sell food pour dirty water in the gutters and on the roads. Since there is no one cleaning the area, a fetid smell pervades the air when it stands there for long. The poor hygienic conditions of this area may definitely provide fertile ground for cholera and in the event of an outbreak, the spread will be at a faster rate. Negligence and ignorance about the dangers of poor hygiene and sanitation is what is killing most of the inhabitants. And this is unfortunate. Those who know about diseases like cholera, do not bother to educate the people at risk. Neither communicators nor health experts are made available to move around to raise awareness on the importance of the basic hygiene practices of washing hands always. Furthermore, no volunteering in this vein is feasible as everybody is busy doing farming.

3.6. Deviation in the water supply network

Deviant behaviours are observed with regard to water management in Bamenda. Indeed, the civil disobedience noted by our informants in the distribution of water bills is a godsend for companies dealing in the production and distribution of mineral and mineralised water. They thrive on the sale of drinking water around. The resource is increasingly scarce and these dealers generate hefty turnover every day. CAMWATER is facing serious difficulties in providing drinking water to the populations. Water bill distribution agents encounter obstacles that hamper the smooth operation of the company. The fair sex suffers harassment of all kinds (moral, sexual) and runs the risk of abduction by the aggressors. These young women also complain of sexual harassment by company officials due to the fact that as bill distribution agents, they have to start as trainees while hoping to be recruited later. Bill distribution at month end in risky and criminogenic zones is a daunting task. Agents also say that families keeping watchdogs in their compounds, especially German shepherds, use these animals to scare them away. This deterrence is a proof that they are not eager to pay their water bills. Dogs are no longer just for security, but also to intimidate CAMWATER agents who go out to hand water bills to customers. Dogs are no longer friends of man; they are trained against them to fuel civil disobedience.

The testimony of Claudia, a 32 years old, CAMWATER agent in Bamenda between 2018 and 2020 says it all: *"I resigned from CAMWATER because I was already having too much trouble for my life and that of my family. During the distribution of water bills, you had to walk long distances at your own risk. In some households, people would intimidate or threaten us by tearing out the bills and putting them back in our hands, while warning us never to return if we do not want to be brutalized. We were expected to deliver 4000 bills in 4 days, something which was very difficult and the salary was not substantial. We were also receiving insults from*

those who had paid and whose water supply was not yet restored. Company officers did not fail to sexually harass us by promising us a position of responsibility in the office in order to remove us from the difficulties of field work. In some households guarded by security dogs such as German shepherds, we were deterred by their presence in order to prevent us from distributing the bills, not to mention that the risk of aggression by thieves was great". This kind of ordeal could only lead to resignation. This incivility thus takes a heavy toll on the distribution of drinking water in households. Thus, families who subscribe for a water supply cannot be served on time and people are increasingly relying on wells and boreholes for personal use in their homes. It is not surprising, nor rare to see small elevated water tanks built around houses to remedy the water shortage.

3.7. Communication to prevent a cholera outbreak in Bamenda

There are actually many ways to sensitise the population of this town on the dangers of drinking dirty water, ranging from transmitting information right to taking upon ourselves like getting into fields to provide potable water for the population. There is no gainsaying that almost every sub-division, every neighbourhood in the various municipalities do face the problem of water scarcity. As a solution to this type of problem, we could educate the population on the need to take it upon themselves and stop waiting on the government and water management bodies. That is, in a community or a quarter, a water development project can be launched and every household will imperatively contribute to fund it. This will go a long way in solving the problem of water scarcity in the area as well as reducing the chances of contracting the cholera disease. Also, to communicate effectively about the dangers of dirty water and cholera, experts or inhabitants who are conversant with should not only limit their information campaigns to towns. They have to reach the locals in remote areas or villages with the same message. Better still, whilst in those villages, they should not only communicate in English, let them use pidgin and the dialect for people to grasp what they want to put across easily.

Furthermore, in cases where water management bodies are faced with maintenance issues due to inadequate funding and personnel, the people or the community can lend a helping hand by doing some fundraising or making donations. With regard to inadequate personnel, individuals can assist the existing manpower as volunteers. This will be a big push as they will partake in the cleaning of catchments once in a while. From every indication, this will reduce the chances of getting cholera. Equally, social media may be used to sensitise the population of Bamenda on the dangers of drinking dirty water and cholera but, if not properly used, this approach may only be limited to a particular set of people. How can this approach therefore be used effectively to reach the targeted population? For an effective communication, we can broadcast the message over the radio during health programmes. When at it, communicators should speak in pidgin and in the dialects that most of the population will understand easily. Effective communication can also be achieved through family groups, community groups, youth forums, student forums, etc. This may be on WhatsApp, Facebook, Instagram and other social media platforms. Communicating through these groups is a guarantee that the information will reach the targeted population as the youths who have mastered the concept will take it upon themselves to pass this information to their families, friends, loved ones and the community as a whole in a language they will easily understand. Another means which can be used is to launch a cleaning programme. This means that days should be set and communicated to the population for general cleaning of a catchment in case of inadequate personnel. By so doing, tanks will be cleaned and filled with disinfected water. This will help ensure a sustainable supply of potable water, thus wiping out cholera. Paul AnimbomNgong and VictorCheoNgu (2018) have proposed a form of sign communication that would reposition and reinforce public awareness in these terms: "*Visual signs constitute an important aspect and play a significant role in daily communication. Classified as icons, indices and/or symbols, they usually replace oral signs in communication scheme*".

With this case of cholera, health experts have to be dispatched to the various municipalities to educate the population on the various modes of transmission. Therefore, the population will be careful in every activity they carry out. They will need to focus on proper hygiene and sanitation in anything they do like cleaning of their toilets, washing of hands with clean water and soap before and after using toilets, cooking, eating, greeting people, etc. Also, it will be worth sensitising them on basic hygiene practices like boiling water before drinking so as to kill any bacteria in the water, cooking with clean water, keeping the environment clean and equally taking proper care with meals that require good hygienic conditions. Radio houses should start health programmes with health experts and communicators who do have a good mastery of English, Pidgin and local dialects to effectively inform the population. This should equally be done frequently so that the latter will get used to the information, know its importance, and therefore taking it seriously. People can equally take it upon themselves to stop the disease. They could act as volunteers and pass the information in their areas or communities. Drugs and preventive measures should be shared amongst the infected persons so as to help stop the disease from spreading. If all these measures are observed, cholera can effectively be wiped out in the city of Bamenda.

4. Discussion

The behaviour of the population towards the agents of the water distribution company (CAMWATER) is akin to deviance and civil disobedience, and this falls under criminal anthropology. Chemical pollution is a significant variable in water supply. We have not conducted any analysis of water in the localities studied, but a number of scientific studies have rightly shown that water contains bacteria and chemical substances that contribute to the deterioration of water quality. Njoyim Estella BulengTamungang, MengaTchouaneRodrigue, Mofor Nelson Alakeh, Nchofua Festus Biosengazeh, Njoyim Iren Kahnj (2016:63): assert that “*Bacteriological analyses of these water samples during the two sampling periods showed that all the analysed water samples contained indicators of faecal pollution like E. coli and Salmonella. This implies that they undergo infiltration of pathogenic microorganisms from human and animal wastes. The results obtained in this study conform to those of Njoyim et al. (2016) based on physicochemical and bacteriological quality assessment of the Bambui community drinking water in the North West region of Cameroon. It would be advisable for the water authorities to swing into immediate action with regard to treating the water, cleaning and protecting all storage facilities. Furthermore, public health authorities should make the public aware of the potential danger of the public water supply, and encourage in-house treatment of the water before consumption (because of the presence of some coli bacteria, all water should be treated by chlorination before being used). The public is informed that although the water smells and appears clean, it might contain infectious bacteria like V. cholerae O1 and O139 that can cause cholera or other diarrhoea [28]. Thus, they are called upon to respect basic rules of hygiene and sanitation and regularly treat their drinking water either by chlorination, filtration or boiling before drinking*”.

Those who are using springs, wells and boreholes as their major source of water and have never bothered to check the chemical and biological quality of their water may have short term or long term infections if the water properties are far above accepted norms. Mineralogist’s advice people to check their spring, well or borehole for physico-chemical, heavy metals and bacteriological properties before consumption. Sylvanus, a 44-years-old Water Technician in Bamenda points out this: “*I’m very much concerned with poisonous heavy metals (As, Pb, Cd, Hg, Cr) which are naturally present in some environments (rocks) in very high concentrations and if not checked, water consumed from such environment will have serious long term effects on the health of consumers. It happened in some country where a borehole was constructed in an environment where as concentration was very high and with time consumers of the water started suffering from related diseases and investigations revealed that the borehole was the major cause of the diseases*”. Njoyim Estella BulengTamungang, MengaTchouaneRodrigue, Mofor Nelson Alakeh, Nchofua Festus Biosengazeh, Njoyim Iren Kahnji (2019:53): “*Clean water is necessary for life, hygiene and prevention of water-borne diseases. It is also the heritage of a nation. Water is a constant concern of all times and all places. Quite often when there is excess in the case of a flood or shortage in drought periods, water becomes a matter of life and death. Formerly, researchers were concerned only about the microbiological purity of water; nowadays they are concerned not only about its microbiological quality, but also about its physical and chemical characteristics*”

The lack of water has forced people to transgress the prohibitions on the use of river water. In some cultures, (Ndonko Peguy, 2012), a pregnant woman should not go to the river to avoid any contact with spirits of the water which can disturb her pregnancy by adding too much water in the womb or by absorbing the one which is already there (amniotic fluid). If she does, the life of the foetus will be in danger. Among the Beti of the Centre region of Cameroon, a woman at childbearing age should not brush the bed of a stream with her feet at the risk of becoming sterile. Representations no longer pose a threat to populations who give pride of place to water, a vital resource, and care less about transgressions that are mere beliefs. Beliefs waver in the face of crises. Also, the practice is really common in this area because of lack of sanitation infrastructures and services. Despite the availability of toilets, communicators and health personnel are greatly needed to educate the people and change their mindsets or beliefs. This change will make them use the toilets. This is because the common practice of open air defecation for donkey’s years has made it a way of life. Communicators will equally help sensitise the population on the negative impacts of this practice on their communities and the society as a whole.

Conclusion

At the end of this research on the factors of water pollution and the risks of a resurgence of cholera in Bamenda in a resolutely multidisciplinary approach at the crossroads of public health and anthropology, access to drinking water remains a major challenge. Water pollution determinants are numerous and are mostly related to unhealthy behaviour, human defecation and an unhealthy environment. This reflection establishes a link between the living environment and the occurrence of certain pathogens. The survey data collection is specific to social sciences as well as the analytical methods and tools. Representation theory, which interprets attitudes and practices, seemed best suited for the analysis. Determinants of water pollution and health are multifactorial in Bamenda. They range from human behaviours to the environment. Finally, environment/health relationships are a field of reflection and involvement for social sciences such as anthropology and communication. The

history of epidemics shows that the conjunction of determinants has often been at the root cause of outbreaks. Lucien Abenham (2003) recognizes that: "*The environment has always been part of the public health paradigm, with the host and the germ or the poison, it was even, at the beginning of hygiene, the main explanatory factor the state of health... The Pasteurian revolution caused the role of the environment to be forgotten for a time, favoring that of germs. But bacteria and viruses are quite incapable, on their own, of producing epidemics: for this they must be brought into contact, in large numbers, with those they are going to destroy, often through incompatibility rather than own pathogenic power. And it is the environment, in these different components, which will often produce these exposures*". The lack of drinking water makes it possible to identify inequalities between populations. The wealthy drink bottled mineral water while the poor fall back on poor quality natural resources. The water-borne diseases they suffer from do make a big dent in their already meagre financial resources. To combat this scourge, a frank and permanent communication is the key. How do people manage to have access to quality water?

Bibliography

- [1]. Abenham Lucien., 2003, Environnement et santé publique. Fondements et pratiques. Canada. Editions TEC and DOC, Edisem.
- [2]. AlakehMofor Nelson, BulengTamungangNjoyim Estella, Mvondo-Zé Antoine-David, 2017, Quality Assessment of Some Springs in the Awing Community, Northwest Cameroon, and Their Health Implications. Hindawi, Journal of Chemistry Volume 2017, Article ID 3546163, 11 pages <https://doi.org/10.1155/2017/3546163>.
- [3]. AnimbomNgong Paul, NguCheo Victor, 2018, Communication Implications of Visual Semiotic signs in the University of Bamenda Campus, Bamenda, Journal of Arts and Humanities (JAH), A multidisciplinary journal of the Faculty of Arts, Vol.1, number1.pp 155-172.
- [4]. AssakoAssako René-Jolly, (al), 2010, Risques sanitaires et gestion des eaux usées et des déchets à Kribi (Cameroun), *In Sociétés-environnements-santé*, Paris: IRD Editions, Objectifs Suds, pp 239-255.
- [5]. Biosengazeh, N. F., Mofor, N. A., Tamungang, N. E. B., &Mvondo-Ze, A. D. (2020), Analysis and water quality control of alternative sources in Bangolan, Northwest Cameroon, Hindawi, Journal of chemistry, Volume 2020, Article ID 5480762,12 pages, <https://doi.org/10.1155/2020/5480762>.
- [6]. Biosengazeh, N. F., Mofor, N. A., Tamungang, N. E. B., &Mvondo-Ze, A. D. (2020), Physicochemical and bacteriological quality assessment of the Bambui community drinking water in the North West Region of Cameroon, Hindawi, Journal of Chemistry, Volume 2017, Article ID 3546163, 11 pages <https://doi.org/10.1155/2017/3546163>.
- [7]. Biosengazeh, N. F., Mofor, N. A., Tamungang, N. E. B., &Mvondo-Ze, A.D. (2020), Quality Assessment of Some Springs in the Awing Community, Northwest Cameroon, and Their Health Implications, Hindawi Journal of Chemistry Volume 2017, Article ID 3546163, 11 pages <https://doi.org/10.1155/2017/3546163>.
- [8]. Biosengazeh, N. Festius , Mofor, N. A., Tamungang, N. E. B., &Mvondo-Ze, A. D. (2020). Assessment of Ground Water Quality in Baba I Village, North-West Cameroon. Journal of Geoscience and Environment Protection, 8, 87-104. <https://doi.org/10.4236/gep.2020.84007>.
- [9]. Bley Daniel., 2001, Santé et environnement, abolir le fossé. Discussion with André Aschert, NSS. Vol. 9. No. 2, 51-55.
- [10]. Mondet Bernard, et (al), 2010; L'Etude des risques sanitaires liés à l'eau dans l'environnement urbain, l'exemple de la ville de Chennai, Inde du Sud. *In Sociétés-environnements-santé*, Paris: IRD Editions, Objectifs Suds, pp 239-255.
- [11]. Ndonko Peguy, 2012, Les Représentations en sciences sociales, manuscrit.
- [12]. Oswaldo de Rivero. (2003), Le Mythe du développement : Les économies non viables du XXIe siècle. Paris: Editions de l'Atelier, Enjeux-planète.
- [13]. Tourneux Henry, 2010, Evaluation de la communication en matière de risques liés à l'utilisation des pesticides au Nord-Cameroun. *In Sociétés (environnement- santé ; pp.171-185*.
- [14]. TPSF, 2022, Le difficile accès à l'eau potable au Cameroun, publié le 25 février 2022, mise à jour le 25 février 2022.
- [15]. Vernazza-Licht Nicole, Gruenais Marc-Eric., Bley Daniel., 2010, Les Relations environnement/santé : un champ de réflexion et d'implication pour les sciences sociales, *In Sociétés-environnements-santé*, Paris : IRD Editions, Objectifs Suds, pp 19-31.
- [16]. WHO/UNICEF Cameroun, 2019, L'accès à l'eau potable n'est pas un privilège, mais un droit. Facebook.com.