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Water Accessibility and Cholera in Douala, Cameroon

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Abstract:

Douala is the economic capital of Cameroon. It is at the shore of the Atlantic Ocean and River Wouri that flows into the sea. Apart from the low altitudes and warm temperature, the city also has a very high-water table. These however affect the population in relationship to cholera. Most of the population of Douala use well water. Although most of these wells are not used for drinking but in carrying out house chores, this still exposes these inhabitants to contamination. As the city is found at the bank of the estuary between River Wouri and the Atlantic Ocean, just like most African countries, Douala lacks adequate supply of potable water. Due to the shanty and swampy nature of most of its neighborhoods, potable water installations hardly reach the population. This explains why we wanted to find out the relationship between their accessibility to water and cholera. The approach used is qualitative with the use of in-depth interviews and Focus Group Discussion with the local populations and the authorities. This article explores the main water sources relating them to cholera vulnerability.

Keywords: Cholera, water, Vibrio, Douala, contamination, environment

1. Introduction

In Douala water seems to be abundant but in sources like wells and springs that are not potable due to contamination; whereas the potable tap water is not supplied in all neighborhoods in Douala.

1.1. Literature Review

Under deplorable hygiene and sanitation conditions, cholera flourishes as Pollitzer (1959: 43) and Felsenfeld (1963:28) that slums in the cities become hot houses of cholera. As new people come into the city with less familiarity with urban sanitary customs and facilities, they act as obstacles to the eradication of enteric infections. Apart from living in bad sanitations, most patients have low income and are less well-nourished than other sections of the population (Wallace et al 1994:33).

Doki et al (1964:7) found that water, latrines and flies were infected during the Korean cholera epidemic. They equally said lack of chlorination of water was the main factor in the West Pakistan epidemic. Beg (1961:11) contaminated not only water but foods, milk and flies in the same outbreak. Dizon et al (1963:7) called attention to the effect of shrimps in the beginning of the Philippines epidemic but found that later found that person to person contact got importance later in the cholera epidemic. A similar situation occurred in Malacca where the cholera epidemic was water borne and later propagated through person to person contact.

Davies et al (1963:48) illustrated the difficulties encountered in the Islands as well as Peninsular areas with highly mobile shore dwellers, fishermen and inhabitants of sampans, small vegetable gardeners, an enormously increased and impoverished population, restricted water supply and other factors favouring the spread of enteric infections. Cholera notoriously occurred at the time of festival and pilgrimages, until Saudi Arabian, Indian and other authorities took further steps to provide serious sanitary and surveillance.

The survival of cholera vibrios has been discussed by Abou-Gareeb (1960:58) where he emphasizes on the importance of water in cholera; brackish water is favourable to the survival of the cholera vibrios. Shallow wells and other collections of water may be contaminated by direct deposition of faecal materials in them; by seepage, or the washing of dejecta into them by rain water. Rivers become infected by the deposition of faecal materials directly in to by individuals or by having latrine buckets emptied into them or washed into them; untreated; during rains or when faeces deposited at the bank are washed into them.

Some rivers and canals in the cholera area have brackish water for many miles upstream from their mouths and constitute favourable media for vibrios. Tanks, lakes, water jars are often contaminated due to contact with infected hands, clothes or containers washed in them. It was shown in Hong Kong and Bangkok that areas with reliable community water supply the household jars may be a source of infection because of careless handling and lack of sanitary precautions. It should be remembered that chlorine evaporates quick; thus, chlorinated water may become a source of infection.

During cholera detections, concurrent and final disinfections are required. Yen (1964:8) emphasizes on the use of chlorinated lime for this purpose. Dusting with this chemical is also said to be effective, especially for the floor and furniture. It is important to discard or treat all water and any food from the house after the patient has been removed from the hospital must be well cooked before eating.

Rowe et al. (1998:339-340), Chlorinating well water with liquid bleach was not an effective water disinfection strategy in Guinea-Bissau. A study conducted in 1998 examined the effectiveness of "single shock" dose using liquid bleach and the approximate duration of an acceptable residual chlorine level. Following an outbreak, in Guinea-Bissau and the early identification of contaminated wells, the Ministry of Health (MoH) disinfected 3000 of the city's shallow wells.

A study conducted in an IDP camp in Liberia by Guaranseau et al. (2006:19) investigated several chlorination methods as contaminated hand dug wells were identified as the source of cholera outbreaks. Four types of chlorinators were fabricated and evaluated over a nine-week period; free residual chlorine (FRC) was measured three times a day. Chlorinators were evaluated according to their effectiveness and notably their appropriateness. Appropriateness was defined as the local availability of materials, ease of operation and maintenance, acceptability by communities, cost and logistic issues.

Guevart et al. (2008:507-513) worked on artisanal diffusers of chlorine to disinfect wells during a cholera epidemic in Douala. The third and final well chlorination study was conducted in Cameroon following a cholera outbreak. The well chlorinator evaluated was similar to the device fabricated in the study conducted in Monrovia, Liberia. Similar to the findings reported in the previous study, adequate levels of FRC (Free Residual Chlorine) could be maintained for three days. The chlorinator was constructed using locally available materials.

The authors were contacted regarding whether utilization data was collected, however no reply was received. Neither health education nor hygiene promotion was mentioned. Despite being functionally effective, whether or not the well chlorinator will be utilized by the community is uncertain given that its feasibility and acceptability were not addressed.

Felsenfeld (1961:133-138) confirmed that one of the greatest problems is the provision of safe water and during drought water may not be available in sufficient quantities. Often, it has to be imported into infected areas in lorrytanks or barges, or by emergency pipelines. Closing of shallow and unprotected wells may be necessary. Household jars are often difficult to protect because of the faulty sanitary practices of their users. They should be covered and the water boiled before consumption. Boiling is the safest way of eliminating live cholera vibrios. It is not only drinking water but also water used in washing eating utensils and washing teeth should be made safe. Existing latrines must be equipped with covers and the plate or seats must be periodically cleaned and disinfected. Improvement in water supply service and water consumption, house connections are associated with particularly reasonable reductions in endemic diarrheal diseases (Esrey, 1991).

Vibrio cholerae serogroups O1 and O139 interactions favours the flourishing of the cholera bacterium in the presence of algae in water as pointed out by the study of T. Rawlings (2010:5) in a study carried out in Douala.

An interdisciplinary team consisting of biomedical doctors, anthropologists and so forth on "Déterminants du choléra à Douala" consisting of E. Guévart, J. Noeske, J. Solle, J-M Essomba, Mbonji EDJENGUELE et al (2006) carried out a study which revealed that the network of rivers, streams and man-made ditches waste are poorly maintained and often overflow during the rainy season. In addition, contents of latrines are often discharged directly into the environment. They pointed out that social factors such as the reformation of urban tribes and persistence of traditional attitudes toward waste disposal and water use have not only led to high-risk behaviour but also created barriers to sanitation and hygiene education. They also talk of an inadequate sanitation inspection system, a large but purely accessible public health system and a highly disorganized private health sector exists, effective preventive measures are difficult to implement. The combination of these factors probably account for the endemicity of cholera in Douala.

1.2. Research Method

In order to obtain information (data) on the sociocultural aspects of cholera in Douala, the major type of sampling was purposive sampling where certain categories of informants are targeted so that the collection of data could cover many aspects of the topic. In the study, our main informants were household managers who were mostly women as well as people on the street of which eighty of them interviewed and some through participant observation. The Quarter Heads and some chiefs were also interviewed, the municipal authorities like mayors and collaborators were interviewed formally and informally in all the five municipalities targeted. The research is predominantly qualitative. The qualitative research techniques used in this study are Participant Observation, Direct Observation, In-depth interview, Spontaneous Interview, Focus Group Discussion, Case Studies and documentary research. Content analysis was used to analyze data.

2. Result and Discussion

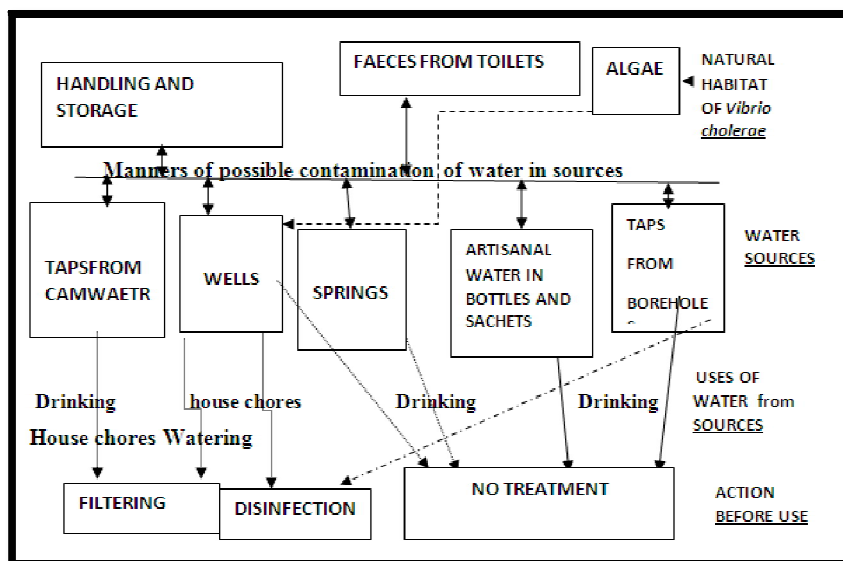


Figure 1: Model of Water Accessibility and Use in Douala (Source: Kah Evans)

2.1. Wells

Wells are the most used sources of water by the population of Douala. This city is said to have more than 70000 wells according to a study carried out by GTZ in this locality.



Figure 2: Well with Algae on Its Walls in Douala (Source: Kah Evans)

This well found in New Bell just as in many neighbourhoods in Douala is slightly deep (about 2metres from the surface); as we can see the walls of the well, there are algae there flourishing. Apparently, it may appear to pose no health problem since it does not change the colour of water. From the ecological aspects of cholera, the literature review of this work is considered, then the algae which is spirogyra is more visible having a direct link with cholera. Our Literature review revealed to us that the Cholera vibrio does not survive in water for more than two weeks under ordinary circumstances. In the presence of the algae, the vibrio can live in water throughout. This is due to the fact that algae are phytoplankton which provides food to zooplankton. The both provide a binding site for cholera; which explains why most wells are infected with vibrios throughout the year in Douala (within and without epidemic periods).

The anthropological concern here lies on the fact that the residents of Douala perceive good water in their respective cultural dimensions as clear or physically clean, so the presence of the algae on the walls of the well are of no problem to them since this does not disturb the cleanliness of water yet a very effective reservoir of cholera. This knowledge is not known by an absolute majority of the population. This does not constitute part of the sensitization message.

Nevertheless, many wells seen in the field have the cement walls nearer the surface and where there is contact with water, it is only the soil, which does not favour the pushing of algae. There are two reasons why there is a contact between water and cement. Some wells are too shallow such that even the cement built to secure the well must have intersection since the well is a few centimeters from the ground surface. Some wells are too deep like in Citè SIC and Makepe\Missoke Uphill. Yet the walls have been cemented many metres underneath, with the aim that no contact with soil will make the water always clean.

Astoundingly, the underlined problem above looks like fundamental to the battle against cholera yet nothing is said about it. To them there is no threat between Man, the algae and water in respect to the cultural universes of the population concerned, so if biomedical perspectives discover such a treat, there is need to make the residents know

through a manner that is meaningful in their respect cultural horizons. The segment of the population that makes use of this water is mostly amongst those having less accessibility to livelihood resources and less educated yet not illiterate in the western point of view (for the lowest educational level was First School Leaving Certificate and expressed themselves in National languages).

Considering the appearance only, the roundness of the well embankment is a reflection of the dominant cultural group of the neighbourhood like in this quarter of New Bell, the are many Bamoun living there. The roundness is having a sociocultural origin tracing right to Islamic and Arabic ties of most of these cultural group. In most neighbourhoods, some wells are surrounded or simply beside a very dirty gutter, containing household refuse and toilet wastes. Such wells are common in Nylon, New Bell and Bepanda. The well is not protected, enabling easy entering of this contaminated water into the well water. The situation is worsened by the fact the protective floor of the well is broken. The well is less than one-meter deep implying that the water sinks inside the well within a very short time. The dominant ethnic group in these neighbourhoods is the Bamileke which makes us to gaze into this cultural universe in the ecological perspective. The dirty gutter close to the well is not really a potential threat to life since for it to be, it needs the intervention of an evil force, which will pass through the dirty water to inflict pains and death to the victim.

If a witch or member of famla knows that Kendre lives in Nylon-Brazzaville fetching water from an unprotected well as the image below, he will pass through this risk to inflict an illness in the same line with this; so as to avoid the least suspicion. As Wafo says "We already know all of this; for a witch can pass through any means to inflict death on people, we don't take any death for granted". The phrase "we don't take any death for granted goes to any issue which concerns autopsy which we will glimpse later". What seems preoccupying is that the informant Wafo does not totally disagree with the biological notion of cholera. He does not also emphasize that all cases of cholera are associated to mystical origins. Perhaps, his position may be due to the fact that he has a certain degree of literacy (BTS) but other residents are of the fact that cholera is not an environmental problem but an invention of the witchcraft from this point of view.



Figure 3: Broken Well Near Disposed Wastes Containing Excrements at Bepanda (Source: Kah Evans)

A well found in Bessengue of the Douala I Municipality seems abandoned but in reality, it is not since it is still used in fetching water to clean the floor, wash dresses and sometimes washing of plates. Laure, a 23 years old female, stays beside this well. They fetch tap water about 80metres from their house in a neighbours compound. She buys tap water at 20 litres for 30 Frs for drinking. Although this water is not usually used for bathing and washing of house utensils, it still remains a potential health risk as it is always used in washing of the floor and dresses. There is the risk of entering in one's mouth during manipulation and some food items fall people pick and eat as well as children playing on the floor.

2.2. Uses of Water

There are various ways of using water in Douala depending on the source and perception.

2.2.1. Uses of Well Water

Informants said that they use well water for house chores including neighbourhoods where taps are present. "We use well water to do all except drinking and some of the wells are clear and others not. We empty well water about once a year of which chlorine and salt were put in the well FGD".

If not all, most wells in Douala are contaminated with Cholera vibrio (though most of the sub species are not virulent but do have the potentialities of becoming so). The Department of Microbiology of the University of Buea, Cameroon carried out a study on wells of Bepanda in 2011. Results show that out of ten wells sampled, eight had vibrio that causes cholera in the dry season. This sample was also having gram-negative curved rod bacteria and the growth of none-sucrose fermenting organism. The presence of gram-negative rod bacteria in other samples labelled as non*vibrios indicated the possibility of the current nonpathogenic organisms to revert to the pathogenic state.

In Nylon, samples of four and five (rainy and dry season samples) had vibrio. Just as in Bepanda, these samples were observed to have gram-negative curved rod bacteria and experienced the growth of non-sucrose fermenting organisms. These observed organisms were an indication that well water remains a deadly threat to health in this neighbourhood as the non -pathogenic organisms can revert to a pathogenic state. In Makepe, non-of the samples had vibrio. However, the presence of potentially pathogenic substances such as the gram-negative rod organisms and all

indicate a potentially deadly situation. Finally, in Bonassama, only sample four (rainy season sample) had vibrio; this sample equally had the presence of non-sucrose fermenting organisms. Again, with the presence of the gram-negative rod, this nonpathogenic sample can revert to a pathogenic state. Generally, all samples that had vibrio also responded positively to the motility tests, had gram negative curved rod bacteria and had NSFO (Non-Sugar Fermenting Organisms). Cholera (*Vibrio cholerae*) is endemic in Bepanda with O1 and non-O1/non-O139 serogroups co-existing in the streams and wells hence the possibility of future outbreaks of cholera if sanitation and drinking water quality are not improved. Temperature and salinity are amongst the factors maintaining the endemicity of the organism. About four percent of the wells in Douala undergo attempted treatment. That is once a while an insufficient quantity of chlorine is put in the water with the aim of disinfecting it. If we consider the results of the study carried out by the University of Buea above, then even the so-called treated wells still contain some subtypes of vibrios.

Although we cannot outrightly deny the fact that some people drink well water, none of the households we met in the study ever talked of doing this. Alternative research techniques like participant observation did not reveal any case of household drinking well water but healthcare personnel affirmed such. As mentioned in the FGD in Nkololoun, it was the common trend. Our preoccupation here is that people do not drink well water yet use it in washing utensils, cooking, bathing and others. The fact that the water is not for drinking, it is hardly disinfected not knowing that they do consume it indirectly in plates or washed fruits for example. The cultural contexts here reveal that there is a kind of symbolism; well water is for washing and potable sources are for drinking that is why no informant ever mentioned of boiling well water to drink.

If we consider underemployment here, as most of the exposed population does not have taps or potable water installations, they do buy from neighbours but prefer to fetch well water for general use since it is free of charge. This reflection can be true with most of the people. Yet, cannot be completely factual since many of those who have their personal taps still use well water in washing of dresses, the flour and flushing of toilets (and some even bathing) as Abdullah a man in his late fifties in Bessengue. He is a sacked worker presently doing commercial bike riding, though having a water system in the house he is renting said, "Most often well water fetched up there (about 80metres from home) is used in laundry, flushing of toilets and washing the floor.

Forages, as it is called in French meaning drilled wells or boreholes are used in almost all the neighbourhoods in Douala, either as the only water sources like in Ndopassi, Nyalla, PK 15, Logbaba IV, Quartier CCC, PK 18 and so forth. In Nylon, Ndokoti, most part of Cité SIC and the list continues use drilled wells as a substitute. This is also due to perpetual water seizures with some lasting for almost a year.

The urban Councils in Douala required that when any forage is to be constructed, the council is supposed to be informed for ensuring safety as well as the establishment of the microbiologically laboratory test of a sample of the well. This is mostly respected by enterprises as well as commercial public forages. Most of these water sources are owned by private individuals, mainly often inside their gates and only known by the consumers. Here the council is not even aware of their existence not to talk of the safety, yet they are the most preferred water source to the people.

This preference is due to affordability but is not free as in the case of wells but even appears to be more expensive like in New Bell and Oyack. As Ahadji, businessperson in New Bell said, "We buy water to drink from Brasseries from their forages costing 250 FRS for twenty litres of water because it is cleaner than the tap water from SNEC". They emphasize on the physical cleanliness of water irrespective of its taste or invisible impurities. Just a few have complained of the taste of the forages water. As tap water from CAMWATER is most often criticized to be coloured in most parts of Douala, though this may pose less health threat than most of the local forages. This is because treatment is done according to established norms; the people prefer water in line with their respective cultural universes.

Here we can extract two elements contributing to the people's preferences uncovering the symbolic natures of these cultures. Drinking water is supposed to be clean, so boreholes are clean. The second conception is that potable water is supposed to flow from a tap as colonial masters made them to understand. Now, we have two variables intersecting. When water is flowing from a tap it appears clean. Indeed, tap water used to be clean before now (as infrastructures were not yet aging as is the case now) enabling the easy interiorizing the notion of clean water by the Douala, Bassa ... natives. Now, it is difficult to convince someone that the yellowish water can be potable than that of the sparkling boreholes. The quality of boreholes water becomes questionable due to the fact that they are found around houses where toilets are quite near. That is the same water table of most wells considered unsafe but only differ in the fact that they are protected from surface contamination. Any forage; especially when intended for public use has to dispose this document pasted conspicuously in front. Khan and colleagues (1981:7) had previously suggested that the only effective means to control cholera is protecting water supply and the prevention of using contaminated water.

2.3. Disinfection of Water

Water is being rendered usable through many means as we are going to see below.

2.3.1. Filtering of Well Water

In some neighbourhoods, especially on zones nearer rivers and swarms wells are dirty like in Mambanda, and Sodiko, some people have derived a means of rendering the water clean.

Well water is used in all except for drinking and we allow it to settle. When the water becomes red we filter it before using especially during serious dry season. Like now the water is changing a bit. We burst a plastic recipient, wash a large quantity of sand, we take a tissue of foam on top of the sand and another beneath the charcoal. It should be noted that the order of placing these items is not strictly respected. Despite all this, this method is not the best because when we boil water for fufu, dirt still settles on one side on the bottom of the pot. In Mambanda, it is worse, well water is red even

during the rainy season. In our village, clean water must be clear. In addition, there are water sources that are not drinkable or even usable and visitors are advised not to do same. "Lehchianchi means clean water", "lehchia" means clean and "chi" means water in Bafang(Carole, Grand Hangar).

A young man of 18 was carrying the same of the dirty well water in Derriere Ancient Gare Routier at Sodiko in Bonaberi and was using a similar method like that of Carole in Grand Hangar.He adds a tissue of cloth to ensure more filtering.

Andre living in their family house said this method is practiced by the mother. He thus learned through imitation. Here, we can see that the problem of having dirt particles in their fufu, which is their major preoccupation, is solved. People use the available materials in their milieu to adapt to their environment and we have seen a kind of syncretism where gallons mend for containing liquids, cushion for furniture, a bag for carrying grains have been used to construct a water filter.

2.3.2. Boiled Water

Boiling water is one of the effective disinfection methods used by the residents. The main reason for this lies on the symbolic aspects of the cultural residing in Douala. If the tap for example is considered potable then it is drinkable. Moreover, if well water is considered non-potable then nothing can be done to render it potable. If well water is disinfected with chlorine, then filtered, it is still not considered drinkable whereas a forage (borehole) that is not treated, the fact that the water is coming out from a tap is considered drinkable. This is applicable in neighbourhoods which are fortunate to have taps but there are neighbourhoods that depend on wells and springs for drinking like Logbaba IV in Douala III Municipality and Afrique de Sud in the Cité de Palmiers Health District found in the Douala V Municipality. Here some people boil well water before drinking especially in households containing little children. Most of the people living in this neighbourhoods are of lower socioeconomic status mostly using firewood to cook of which sometimes the wood gets finished since it is quite expensive to them. Inconsistence of fuel to boil water makes this treatment technique quite unrealistic. Imagine the quantity of water to boil so that ten people can drink, this fuel could be used to cook food. Boiling of drinking water appears to be the most advocated methods by biomedical personnel.

Water is boiled by some people in neighbourhoods where CAMWATER installations are completely absent as they make use of streams and wells. Contrary to wells, springs are considered pure for drinking requiring no treatment. "When a baby is born, we start giving him mineral water but when we no longer have money to continue giving this bottled water which is quite expensive, I start to boil tap water and give him to drink. By this time, the baby is big enough and a time comes when he drinks ordinary tap water as any other member of the house (Said Sylvie in Oyack 5th January 2013).

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Figure 4: Well Water Filtration
Source: Kah, 19th December 2012)Sodiko



Figure 5: Photo Cross Section of the Water Filter

Source: Kah, 19th December 2012)

A young man of 18 called Andre was carrying the same of the dirty well water in Derriere Ancient Gare Routier at Sodiko in Bonaberi and was using a similar method like that of Carole in Grand Hangar. The difference in his is that he adds a tissue of cloth to ensure more filtering.

Andre living in their family house said this method is practiced by the mother. He thus learned through imitation. Here, we can see that the problem of Diane does not occur with the Andre's household of still having dirt particles in their fufu which is their major preoccupation. The anthropological explanation is through the Ecological Theory where people use the available materials in their milieu to adapt to their environment and we have seen a kind of syncretism where gallons mend for containing liquids, cushion for furniture, a bag for carrying grains have been used to construct a water filter. The CMA comes in here to say the adaptation is a reflection of the socioeconomic status of the people as they have derived these methods not simply a cultural attachment but their inability to buy filters or depend only on tap water.

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2.3.5. Treatment of Wells

Treatment of a well is inevitable especially in a densely inhabited environment like that of Douala. Almost all the wells that were used actively by the residents around said the well was treated by the owner. The beneficiaries contribute an amount that ranges from 100 Frs to 500Frs from a period of one to five months. Surprisingly during the study through in-depth interviews, owners of these wells hesitated to say that they collect money for the treatment but when encouraged that it was a necessity then they opened up as Judith says:

I use to collect from users of the well 200 Frs after three months to treat the well. Some contribute and many do not even pay anything yet they continue fetching water. This is exactly the same amount that the user in Bisseke confirmed but doubt the effectiveness of the treatment.

There are wells that are treated as long as once a year whereas the users have been contributing money frequently. This is the case of Sodiko\Bonaberi where in a compound inhabited by tenants of which one of them is assigned the task of collecting money for treatment. Of the exposed well as Ndum Christine says "we contribute 500FRS every three months and give to Christopher but he uses up this money and the well remains untreated most of the time. Whether he thinks that this is the way he will use to get rich". In fact, just the fact that the people contribute money for disinfecting the well, they use the water without further treatment although many know that indeed this is not the case.

People normally fetch the water and wash utensils, dresses, bathing in fact all except drinking. The last categories of wells are those abandoned yet served in washing the floor and dresses at times to some to those around.

As kenkou of Makepe\Missoke says, "when I have money, I treat the well; like last two weeks I bought Javel for 200Fr and put inside, sometimes I buy for 100Fr or 300 Frs." Here we can see that treatment of the well as they often call is mostly the symbolic aspect of it; just satisfy one's conscience and not necessarily getting rid of virulent microorganisms. That is why there is satisfaction to know that the well is treated even it is chlorine for 200 FRs once a year. Educational level alone does not essentially influence one's attitude toward well disinfection except this is accompanied by sensitization. This is because education in the present context here does not obligatorily associate one with his natural environment and practical livelihood but an attempt to render one literate. This aspect is shaded when higher educational level is accompanied by high socioeconomic status like Kameni Samuel holder of a Master Degree working in a well reputed company living in luxurious house with a water system. The standby drilled well is treated regularly because domestic workers are paid for that. What will one tell an educated person who is not sure to feed himself in daily basis? In this light, one can tell here that the cultural aspect and the socioeconomic aspect (CMA) are strongly correlated.

The partial or non-disinfection explains why wells still possess cholera organisms when analyzed in microbiological laboratories despite attempted treatment. This point was brought up in the District Hospitals and the lady in charge of prevention in the Logbaba District Hospital said; "The so-called treatment is better than nothing as this may help to chase the Cholera bacteria toward the bottom of the well".

This aspect of cholera fight is pertinent as it is the core of cholera transmission; since wells infected by nearby toilets are consumed by the inhabitants there who now go and transmit through contact. There are people who doubt the treatment of well water and do attempt to disinfect it. But a majority still do it more as for formality, as the case of Justine through participant observation buy a plastic wrapped chlorine powder for 50Fr and puts in a 50centilitres bottle and then does not untie it then pours water in it each time it gets finished. This woman complained of wells not being treated so she wants to treat her own water, yet allows the chlorine tied in the plastic. In addition, it was noticed that there is inconsistency since when the chlorine gets finished; it can stay for more than one week.

In addition, water disinfection was done only in water that was for bathing at the pit toilet with tiles used by ten households. This well water was used in all house chores except for drinking. Water is not stored in the house since the compound is having a well but water is fetched to wash cups that are used in drinking water from the tap. There is no consciousness of the link between the untreated water from wells through, plates, spoons, cups and so on. Christopher said "this is the water we have been using and we are fine and there is no need to be worried. One can be so careful and still dies. In my life, I do live freely with no constraints".

2.3.6. Filtering Tap Water with Cushion

The fact that water always appears yellow in most quarters in Douala, many have adopted the filtering of this water so as to separate the particles from water considered by these consumers as unsafe. Nylon, Bessengue, Mambanda are some of the neighbourhoods where water from taps often appears densely yellow. Surprisingly, during the study only very few informants actually had a conventional filter, a bulk drank the water without filtering saying they have no choice and a few were actually filtering using local materials meant for other uses, a kind of blending. Diane, a house wife in Mambanda having a four days old baby had this to say;

We cut a mineral water bottle to use the upper part as a funnel. The funnel is put inside where the hole of the opening of the bottle is inserted into the collecting gallon. The hole is blocked by a cushion, so that only clean water passes to the gallon. A cup of water is poured; of which this very cup is used to cover the water to be filtered so as to avoid dirt from entering into it. This is what we have been doing to render the yellow tap water drinkable. As you can see the water is flowing slowly reassuring us that it is well filtered. All the members of the household drink this filtered water. Even this new born is bathed with this filtered water (Diane, Mambanda, 19th August 2012).

This family lives in their house built with permanent materials at the extremity of the Mambanda in marshes with overgrown grass surrounding the home. Here accessibility to water is a serious problem since the tap and wells are quite far from their house. By the time of the interview, she confesses to have had cholera a year ago. During an in-depth interview with this lady she said, "This is the main reason why I started filtering drinking water."

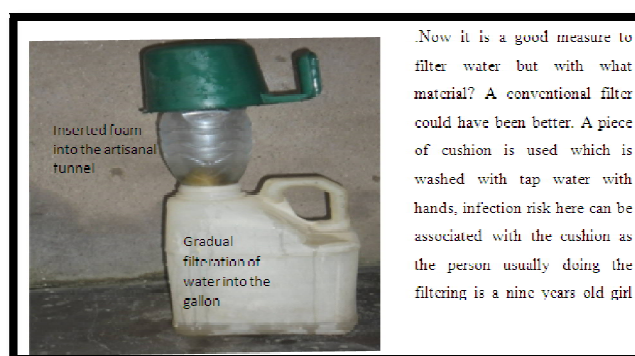


Figure 6: Filtration of Tap Water in Mambanda
(Source: Kah, 19th August 2012)

The use of the local filtering method can be attributed to the socioeconomic status of the household. This factor is negligible as some cannot be considered poor when many aspects are taken into consideration like habitats, monthly income and other expenditure. First of all /ncheh ne loh/ (clean water) is a requirement of the Bangante culture which she identifies herself of. If other rudimentary methods can render them satisfaction, then there is little need to spend money buying a filter for 20 000Fr which could have been used on investment projects. Reason for not buying the filter was "it is expensive, so I don't have money to buy the filter". Really there is money but for something else; this goes further to support the perception toward people of the Bamileke ethnic group and others as they are prepared to manage, that is consume less and invest more. If we go back to the history of their first arrival in Douala and the degree of progress they have made, then the desire for investment by all means is a remarkable cultural item. Many other informants found themselves in the similar situation as Diane but her own case represents due to some peculiarities as we have seen .



Figure 7: Adapted Local Cushion Filter of Tap Water in Nylon, (Source: Kah, 19th September 2012)

In reality, this pattern was rare in Douala, even in Nylon where this tap is found. they decided to filter the commercial tap water through that means because it is what they have been doing.

2.3.7. Distance between Water Source

There are neighbourhoods having water sources very far from many users. The reason for the distance is due to the scarcity of wells like Cité SIC because it requires tedious digging to arrive at the water table like in most zones of Cité SIC, some sectors of Makepe\Missoke and very marshy neighbourhoods like Bisseke, some parts of Mambanda, Sodiko\Derrere Ancient Garre Routier, Makepe\Missoke Lac and so forth.

Although people move distances in search of well water, in Mambanda toward the shore of River Wouri, there is no well; just as in other marshy areas, it is impractical to dig a well as Mirreille, a housewife and resident of Mambanda just as other residents said; "it is impossible to dig a well here because the place is too marshy such that once you start digging, you see water and the water is very dirty". Here people have to walk for more than 700meters to fetch from a public well that is relatively at a dryer place; most often children. While others have wells in their doors, some trek for long distances. This aspect is very important as Lynda in Mambanda, a lady of 19 said; "water everywhere but none to drink or use". This is because when water; even well water is scarce people tend to minimize wastage up to the extent that they are exposed to cholera; as little or no water is used to wash hands and at times utensils are wiped instead of washing them.

The potable water source is another preoccupation most of those of the cholera stricken population do not have potable water at their disposal. Remarkably, many people in neighbourhoods like Mambanda, Derriere Gare Routiere, Bisseke and so forth have taps nearer to them than wells. This is because the source of tap water is external and supplied by enclosed pipes. Taps hardly go above 300metres walk when there are no water cuts. The distance that separates most people is economic hardship as Lynda in Mambanda just as many others prefer to trek additional 200metres to fetch tap water for 25Fr than at 50Fr for 20litres.

3. Conclusion

In conclusion, water use and accessibility correlate with cholera because cultural items do not easily quit; resulting to less adaptability of people possessing them in a new environment but can be facilitated by accompanying measures provided by the authorities. Potable water supplied by the National Water Corporation is less accessible to a greater part of the population and wells are the most used water source for house chores in Douala. Most of the water is untreated but used in activities like washing of utensils, hands, bathing, though they hardly drink it, possibility of infection is undermined. Wells with cemented internal walls provide a surface for the flourishing of algae which attract zooplanktons that are binding sites of cholera. This explains the presence of *Vibrio cholerae* in most wells in Douala within and without epidemic periods. The cultural consideration on springs often as clean and safe make many people to

fetch this water usually called la source to drink with no treatment forgetting the fact that the sociodemographic situation has changed with nearby toilets and other wastes; leading to a high possibility of contamination.

Relationship with hygiene and sanitation because they are determinant aspect whose absence do not only favour cholera transmission but can also result to the propagation of dormant cholera bacteria to an epidemic or sporadic level. People leave their respective villages and settle in Douala and keep on with initial practices that are justified in one hand by the difficult economic situations of many and in other hand the persistence of old habits. This characteristic is present in all the municipalities of Douala but in particular neighbourhoods as we will present and analyze this ethnographic data. Unfortunately, villages are being carried to the city, making the disease situation to be exponentiation.

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