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RESEARCH ARTICLE OPEN ACCESS

EFFECT OF HOUSEHOLD HYGIENE TRAINING ON WATER QUALITY TO REDUCE INCIDENCE DIARRHOEA IN GOMA DISTRICT. Specific case of mugunga and lac vert quoter

[1]Kambale Nyondo Jean Pierre, [2]Bernard Abong'o Omondi and [3]Careena Otiena Odawa

[1]Researcher at the Institut Supérieur des Techniques Médicales de Goma/DRC
[2]Great Lakes University of Kisumu/Kenya

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Corresponding author:
Kambale Nyondo Jean Pierre,

ABSTRACT

Water is an essential element for human life, having it in sufficient quantity and quality contributes to the maintenance of human health. The objective was to analyze microbiological quality of drinking water in Goma district. The design of this study includes experimental, qualitative and quantitative approaches. The sample size of this study was 396 adults and water analyses be done, for the total population estimated at 63492 in the Lac vert and mugunga neighborhoods. A survey was used to collect data from respondents. Collected data be processed with the SPSS version 20 software and analysed using the Chi-square test. Results were presented in tables. Results found were useful in reducing the diarrhea incidence in order to prevent health problems in our study environment. In view of the above, the following results were found: the samples taken in the two zones had presented turbidity, 47.8% before center training, 2.79% after training in the intervention zone, the control zone had presented 48.2% turbidity in phase 1 compared to 75.55% in phase 2, the majority of germs identified on gram staining in the intervention zone were gram negative bacilli (88.9% before training against 4.44% after training). On the other hand, the control zone revealed 84.4% in phase 1 against 90.55% in phase 2, the majority of germs identified on MacConkey in the intervention zone were positive (88.9% before training against 4.44% after training), the majority of bacteria identified before training were reduced to 100% after training in our area of intervention with LRV at least 3 which means reduction percentage of 99.9%. Conclusively, laboratory analyses showed that households containers used in the study area are not good for water storage consumption and susceptible to cause health problems.

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INTRODUCTION

The health status of a population is closely dependent on drinking water quality. There are more than 3 million people who die worldwide per year or 7 people per minute because of poor water quality, the majority of victims are children under 5 years old. Waterborne disease caused by contaminated water consumption can affect numerous people in a short time (WHO, 2017). Microbiologically contaminated drinking water can transmit diseases such as diarrhea, cholera, dysentery, typhoid and polio and is estimated to cause 485 000 diarrheal deaths each year in the world. In 2022, over 2 billion people live in water-stressed countries, which is expected to be exacerbated in some regions as result of climate change and population growth. About 2.2 million deaths are attributed to diarrhea alone in India every year. However, a large number of diarrheal cases may be avoided with proper sanitation and hygiene practices. Globally, at least 1.7 billion people use a drinking water source contaminated with feces. Microbial contamination of drinking-water as a result of contamination with feces poses the greatest risk to drinking-water safety (Madhulipika Giri *et al*., 2022). Diarrheal diseases kill 6,000 children per day (UNICEF, 2015). In 2016, there were an estimated 4.5 billion episodes of diarrhea worldwide. Diarrhea ranked eight among the leading causes of mortality globally, accounting for over 1.6 million deaths among all ages and fifth leading cause of death among children younger than five years with 446,000 deaths. Approximately 90% of these diarrheal deaths occurred in South Asia and sub-Saharan Africa (Global Burden Disease, 2016).

It was noted that 58% of diarrheal deaths still occur in Low- and Middle-Income Countries due to inadequate water, sanitation and hygiene (Prüss-Ustün *et al.,* 2014, WHO. 2014). In sub-Saharan Africa, there are over one billion diarrheal episodes and an estimated 606,024 diarrheal deaths annually with nearly half of the deaths occurring in children younger than five years. Unsafe water and unsafe sanitation are the leading risk factors for diarrheal mortality among children younger than five years while unsafe water and unsafe sanitation are the leading risk factors for diarrheal mortality among all ages (Global Burden Disease, 2016). Furthermore, unsafe water and sanitation as well as other risks associated with poverty and poor development have been projected to be major contributors to wide gaps in health outcomes in the sub-Saharan Africa region by 2040, if current trends persist (Foreman *et al.*, 2016). In Nigeria, there are an estimated 151,700 annual child deaths due to diarrhea with the prevalence of diarrhea ranging between 10% and 18.8% (UNICEF/WHO, 2017, Gebru *et al.*, 2014). In the Democratic Republic of Congo, Diarrheal diseases are one of the main public health concerns with over 1.45 million of people having the condition in 2019, and an extremely high death rate for under five years old. As of 2013, 119 deaths per 1,000 live births were reported, surpassed only by seven countries in which diarrheal diseases accounted for about 11% of child mortality (Chao Wang, 2019). According to UNICEF, 33 million people in rural areas did not have access to quality water in DRC, and only 52% of the population had access to adequate water sources (UNICEF, 2020).

Since 2014, attacks and abuses by armed men in the city of Beni in North Kivu province have forced thousands of people to abandon their villages and find a safer place to live in the cities. According to statistics, nearly 34,000 displaced families since 2022 often live in rudimentary mud or wooden plank constructions. In these precarious conditions, having access to water and meeting basic needs is a real headache. To hydrate, cook or do dishes, it is not uncommon for women to draw water from wells (Frédéric Joli, 2022). In 2018, MICS survey showed that, 68.4% of the population of North Kivu had access to water quality (running water, a standpipe, a natural spring and a water pumping point, a well drilled). This report also showed that 31.6% used an unprotected source. However, Regideso water is not drinkable in Butembo city. For drinking water, households must draw from water sources provided by humanitarians (Mukulu Vulotwa Hervé, 2020). Although diarrheal cases occur globally among all regions and populations, majority of cases occur in low resource settings and in places where access to health care, safe water and sanitation are limited.

Understanding the contributions of households water hygiene practices, and microbiological quality of drinking water associated with diarrhea in poor resource settings would help inform policy makers on areas where specific interventions could improve diarrheal disease control and contribute towards achieving the Sustainable Development Goal which aims to ensure access to water and sanitation for all by 2030. The findings from this study would help guide policy formulation towards diarrhea prevention and control in the study area. To prevent diarrhea it is preferable to ensure a good way of hygienic elimination of stools (Good latrines cleaned regularly) and food hygiene (Eat well-cooked foods, Wash fruits and vegetables carefully, Wash plates and utensils well and do not place them on the ground, Always cover food and protect it from flies, Clean all surfaces used for food preparation). A good way to prevent water quality is to adopt a new urban planning and housing policy, so that households can access safe water by treating water at home, the containers used to store water should be protected from contamination and cleaned regularly, encourage handwashing in households with soap at crucial times (before breastfeeding, after changing sanitary napkins, before cooking, before eating and after using bathroom).

MATERIEL AND MÉTHODS

Study area: lac vert and mugunga quoter: This research will be done in the city of Goma. The city of Goma is located in the east of the Democratic of Congo, about 1500 meters above sea level in the Rift Valley. The city of Goma is the capital of North Kivu province. It extends over an area of 66.45 km2 covered with volcanic rocks with undulous relief at the foot of the Nyiragongo volcano. Geographically Goma city is located at an altitude of 1640m on the shores of Lake Kivu., 29°14' longitude East and 1° 45' South latitude (Appendix xxx). Its soil is volcanic. It is bordered in its southern part by Lake Kivu; it is not crossed by any river, or even a water body. It is boarder in the North by the territory of Nyiragongo; in the South by Lake Kivu to East by Rwandan border town of Gisenyi and to the West by the territory of Masisi. Its land area is 75,72Km². For relief, Goma city is located in the western part of Central Africa and overlooked in the northern part by an important range of Virunga volcanoes. It is covered by volcanic soil and very little by slightly sandy soil. It is influenced by the volcanic eruptions respectively of the years 1800, 1977, 2001 and 2021. The temperature is almost constant but often oscillates between 19.6 and 19.9 °C. The height of precipitation is hardly below 1300mm of water per year. The rain-thermal data of the Goma station relate to the existence of two wet seasons, one from March to May and the other from September to December, between which are also interspersed two less humid seasons from June to August, then from January to February. (Source : Goma Volcano Observatory, Department of Geophysics, September 2021)

Source. Musée Royal de l'Afrique Centrale, Tervuren, 2016

Data Collection: A pre-tested structured interviewer administered questionnaire consisting of the following sections: household hygiene water quality one-month weeks preceding the survey used to obtain information from community residents. diarrhea was defined as passage of loose or watery stool at least three times per day or more frequently than is normal for an individual at any time within the two weeks prior to the survey. The questionnaire that be conducted in the field allowed us to note details that have been possible if it had been asked by e-mail. The questionnaire was useful for us to ask several questions in order to know an opinion, on a given subject. Given that our respondents do not know the French language, the questionnaire was translated into Swahili to allow them to understand and answer it easily. We carried out a direct and structured interview with households, that is to say that the data collection agent, once arriving in the household, approached the head of household or his representative to obtain his consent and after the consent of the latter, it moved on to filling out the questionnaire. Each collection staff member had a unique identifier. We gave each team the list of all the households they were to visit. The list and cards made it possible to identify the precise numbers of each household to be visited, based on the questionnaire and at the end of each interview, the collection agent verified the veracity of the information as well as compliance with the sampling steps. Every evening, a briefing of the day's collection be done and the completed questionnaire be sent to the supervisors for checking. The questionnaires from each household be collected, packaged and transmitted to coordination during supervision for centralization. We defined the interview time which must not exceed 1 hour 30 minutes due to 10 minutes per question, we can therefore ask 6 to 8 questions on average without counting the introduction and conclusion part of the interview. The focus group allowed us to generate a group conversation around our research topic, we took representatives of our target population and have a meeting with them in a school to raise awareness of the relevance of the problem of diarrhea in their environments and the need and urgency to find an appropriate solution. We combined two methods to increase the effectiveness of collecting information from households, for example: a questionnaire be applied after or before an interview to collect quantitative and qualitative data; observation preceded interviews individual, which served to clarify some of the aspects that have been observed; a documentary analysis may precede the individual or group interviews; a questionnaire may be sent to the respondents indicating that they be contacted by telephone at such time, which gave them time to prepare for the interview and allowed us to gather information to better interpret the meaning of their answers.

Data Analysis

After data extraction, editing, coding and cleaning, both descriptive and analytic statistical analysis be done. For the entry of data be used Word and Excel software and the data processing be done by SPSS version 26. After the encoding process, analyzes be calculated the frequencies translated as a percentage in order to characterize the sample and determine the phenomenon studied. Pearson Chi-square test be used test for difference in proportion or dependence variables while multiple analyze be used to test the association between independent and dependent variables. All tests been two tailed a P-value of ≤ 0.05 be considered statistically significant. To test the significance of the variance of random intercept, likelihood ratio test be applied. Adjusted odds ratio with 95 % confidence level be used to show the strength of the association and its significance. For the quantification of fecal coliforms, the colonies were counted at the reference laboratory, after incubation and their total number was estimated from the formula below:

The use of tarpaulins, on the other hand, decreases considerably in phase II in the two study areas. For other types of containers (pans, basins, pots), the variations are less marked. The chi-square test indicates a statistically significant difference (p=0.001) between the distributions of container types in the two phases. We observed in table 2.3. that was a significant increase in the number of households having stored water for two days in phase II compared to phase I (62% compared to 38%) in the intervention zone compared to 1.5% and 98.5% in the control zone. In table 2.4 the coverage methods identified are: capsule (51.2% versus 48.8%), lid (53.6% versus 46.4%), without lid and metal with cap. We observe a significant increase in the number of households not covering their containers in phase II compared to phase I (14.3% compared to 85.7%) in the intervention zone compared to 0% in the control zone. Correlatively, the use of covers and capsules decreases slightly in phase II in the intervention zone, i.e. (53.6%) compared to 46.4%). The use of metal with caps, for its part, completely disappears in phase II in the two study areas. The chi-square test indicates a statistically significant difference (p=0.001) between the distributions of coverage modes in the two phases in the intervention zone and is less significant in the control zone because p=0.34.The table 2.5 showed that residents of the intervention zone washed their water storage containers, for the

RESULTS

Table 2.1. Distribution of respondents according to the source of drinking water supply in the two study areas during the two *phases*

Water supply sources	intervention zone Green Lake district			Control zone Mugunga district		
	Before training	After training	Total	Phase I	Phase II	Total
Standpipes	55(56.1%)	43(43.9%)	98(100.0%)	180(92.8%)	14(7.2%)	194(100.0%)
Tank	105(51.5%)	99(48.5%)	204(100.0%)	0(0.0%)	101(100.0%)	101(100.0%)
Lac Kivu	12(24.5%)	37(75.5%)	49(100.0%)	0(0.0%)	64(100.0%)	64(100.0%)
Rain	8(88.9%)	1(11.1%)	9(100.0%)	0(0.0%)	1(100.0%)	1(100.0%)
Total	180(50.0%)	180(50.0%)	360(100.0%)	180(50.0%)	180(50.0%)	360(100.0%)
Khi-deux= 19.84, dl=3 , P=0.01, V de cramer=0.235 Décision :H1				*Khi-deux= 308.04, dl=3, P=0.001, V de cramer=0.925* Décision :H1		

Table 2.2. Percentage of respondents according to the types of drinking water storage containers in the two zones during the two phases

Types of containers	Intervention zone Green Lake district			Control zone Mugunga district		
	Before training	After training	Total	Phase I	Phase 2	Total
Can	97(43,3%)	127(56,7%)	224(100,0%)	125(47,0%)	141(53,0%)	266(100,0%)
Pan	25(50,0%)	25(50,0%)	50(100,0%)	2(9,1%)	20(90,9%)	22(100,0%)
Basin	7(50,0%)	7(50,0%)	14(100,0%)	0(0,0%)	3(100,0%)	3(100,0%)
Fus	13(68,4%)	6(31,6%)	19(100,0%)	13(54,2%)	11(45,8%)	24(100,0%)
Tarpaulin	16(100,0%)	0(0,0%)	16(100,0%)	3(100,0%)	0(0,0%)	3(100,0%)
Total	158(48,9%)	165(51,1%)	323(100,0%)	143(45,0%)	175(55,0%)	318(100,0%)
Khi-deux= 22,45, dl=4 , P=0,001, V de cramer=0,264 Décision :H1				*Khi-deux= 18.87, dl=4 , P=0,001, V de cramer=0,244* Décision:H1		

Table 2.3. Distribution of respondents according to the duration of storage of drinking water in households in the two zones during the two phases

Storage duration	Intervention zone Green Lake district			Control zone Mugunga district		
	Before training	After training	Total	Phase I	Phase 2	Total
A day	68(61.8%)	42(38.2%	110(100.0%)	178(81.7%)	40(18.3%)	218(100.0%)
Two days	70(38.0%)	114(62.0%	184(100.0%)	1(1.5%)	65(98.5%)	66(100.0%)
greater than two days	42(63.6%)	24(36.4%	66(100.0%)	1(1.3%)	75(98.7%)	76(100.0%)
TOTAL	180(50.0%)	180(50.0%	360(100.0%)	180(50.0%)	180(50.0%)	360(100.0%)
	Khi-deux= 21.57, dl=2 , P=0.001, V de cramer=0.245 Décision :H1			*Khi-deux= 221.417, dl=2 P=0.001 , V de cramer=0.784* Décision :H0		

Table 2.1.showed that There was a slight increase in the use of hydrants at the expense of tanks between the two phases. The use of Lake Kivu as a water source increased considerably in phase II. Rainwater use decreased significantly in phase II. Tableau 2.2. showed There is a significant increase in the use of cans in phase II compared to phase I in the intervention zone and in the control zone.

two distinct phases (I and II) (50% versus 50%) in the intervention zone versus 51.9% and 48.1% in the control zone. Stability in washing practices is observed; The chi-square test tells us that there is no significant difference between the two phases. This means that the proportion of households washing their containers remained relatively stable between phase I and phase II in the two study areas. We

Table 2.4. Distribution of respondents according to the frequency of cases of diarrhea in the two zones during the two phases

	Intervention zone Green Lake district			Control zone Mugunga district		
Protection of containers	Before training	After training	Total	Phase I	Phase 2	Total
Capsule	42(51.2%)	40(48.8%)	82(100.0%)	45(54.2%)	38(45.8%)	83(100.0%)
Lid	120(53.6%)	104(46.4%)	224(100.0%)	120(50.2%)	120(49.8%)	239(100.0%)
Without cover	3(14.3%)	18(85.7%)	21(100.0%)	0%	0%	0%(100%)
Metal and cap	4(100.0%)	0(0.0%)	4(100.0%)	10(100.0%)	0(0.0%)	10(100.0%)
	169(51.1%)	162(48.9%)	331(100.0%)	175(52.6%)	158(47.4%)	333(100.0%)
	Khi-deux= 15.76, dl=3 , P=0.001, V de cramer=0.218 Décision :H1			*Khi-deux= 1.77, dl=3, P=0.34* Décision:H0		

Table 2.5: Distribution of respondents according to washing of drinking water storage containers in the two zones during the two phases

Washing containers	Intervention zone Green Lake district			Control zone Mugunga district		
	Before training	After training	Total	Phase I	Phase 2	Total
Yes	171(50.0%)	171(50.0%)	342(100.0%)	177 (51.9%)	164(48.1%	341(100.0%)
No	9(50.0%)	9(50.0%)	18(100.0%)	3(15.8%)	16(84.2%	19(100.0%)
	180(50.0%)	180(50.0%)	360(100.0%)	180(50.0%)	180(50.0%	360(100.0%)
	Khi-deux=1, dl=1; p=1 Decision :H0			*Khi-deux=9.39, dl=1; p=0.002V de cramer=0.161* Decision :H1		

Table 2.6 Percentage of respondents according to drinking water treatment methods in the two zones during the two phases

Water Treatment Method	Intervention zone Green Lake district			Control zone Mugunga district		
	Before training	After training	Total	Phase I	Phase 2	Total
Boiling	22(40.7%)	32(59.3%)	54(100.0%)	1(9.1%)	10(90.9%)	11(100.0%)
Filtration	21(55.3%)	17(44.7%)	38(100.0%)	2(40.0%)	3(60.0%)	5(100.0%)
Chlorination	4(16.0%)	21(84.0%)	25(100.0%)	1(11.1%)	8(88.9%)	9(100.0%)
Sun exposure	12(17.4%)	57(82.6%)	69(100.0%)	10(17.9%)	46(82.1%)	56(100.0%)
Chlorination and tablet	2(50.0%)	2(50.0%)	4(100.0%)	1(100.0%)	0(0.0%)	1(100.0%)
	61(32.1%)	129(67.9%)	190(100.0%)	15(18.3%)	67(81.7%)	82(100.0%)
	Khi-deux= 21.61, dl=4, P=0.001, V de cramer=0.337 Décision :H1			*Khi-deux= 6.9, dl=4, P=0.137* Décision :H0		

observed in table 2.6. a significant evolution in water treatment techniques between the two phases. Thus, there is a notable increase in the use of boiling, chlorination and exposure to the sun in phase II with respectively (40.7% versus 59.3%; 16% versus 84%; 17.4% versus 82.6%) and boiling, although still used, seems less favored in phase II in the control zone.

DISCUSSION

Table 2.4 showed that There was a slight increase in the use of hydrants at the expense of tanks between the two phases. The results of this research agree with those of Anne Briand ***Et al***., who stated that 46% of households used standpipes, 52% used taps and 2% bought water from retailers (carters, water carriers) (Anne Briand ***et al***., 2009). The results of this study are almost similar to those of Anne Briand and Amandine Loyal, who showed that less than 40% of households have access to a tap while 23% used water from standpipes (Anne Briand and Amandine loyal, 2013). Accessibility to drinking water being one of the important conditions for good hygiene in households, we believe that the respondents above use wells, rivers, boreholes more than taps because of their geographical and financial accessibility. We believe that despite the comings and goings, the queues (long waiting times) experienced by the population of our two study groups (control zone and intervention zone), they use the standpipes more because the price of installing a private tap in a household is so high, around 1000 dollars per household, the almost availability of this water at the standpipe and the pricing adapted to the daily income of the heads of household. Table 2.2 showed that There is a significant increase in the use of cans in phase II compared to phase I in the intervention zone and in the control zone. The results of this investigation are similar to those of Franck Lalanne who showed that the majority (95%) of the types of water storage containers mainly used by villagers in the intervention areas and in the control areas were 20 liter plastic containers (Franck Lalanne, 2012) .The results of this investigation resemble those of Julie Ghislaine Sackou Kouakou, according to which 75.6% of drinking water was stored in cans at household level in the Ivory Coast (Julie Ghislaine Sackou Kouakou, 2010). We believe that the high rate of use of plastic materials (cans, basins and plastic buckets) as a means of storing water by households in our two study areas can be explained by the fact that these plastic materials cannot be rusted, they are essential, adaptable, durable, capable of meeting different needs if necessary, easily lifted. They are easily transportable, affordable price, they are easily washable and stackable without a lot of hassle. pains and able to occupy less space in households. However, the use of a good cover and regular cleaning would be desirable to avoid dust, flies, birds, pests and other microbial contamination (shigella, salmonella, Proteus etc). We observe in table 2.3 that a significant increase in the number of households having stored water for two days in phase II compared to phase I (62% compared to 38%) in the intervention zone compared to 1.5% and 98.5% in the control zone. Correlatively, the number of respondents who can store water for one day decreases in phase II. There is a reduction in water storage for more than 2 days in phase I (63.6%) than in phase II (36.4%) by respondents in the intervention zone compared to 81.7% and 18.3% in the control zone. he results of this study are similar to those of TRAORE Drissa which states that 15.33% of households used water stored for one day, 44.53% stored water for two days, 17.52% stored water for three and 22.63% of households surveyed had a water storage duration of more than three days (TRAORE Drissa, 2021). The results of this investigation are almost similar to those highlighted by W. Likilo-Yowa and Awomon *et al*., who confirmed that 62.7% of households stored their water for one day, 17.6% stored it for two days, 13.7% stored it for three days and 6% kept it for more than three days (Likilo-Yowa, 2014; Awomon *et al*., 2018).

Drinking water can be kept in the refrigerator for between 24 hours and a maximum of 48 hours but no more, this also applies at room temperature. Beyond 48 hours and in the presence of light and heat, the water begins to lose its potability and certain germs risk entering it by making themselves happy or at home there and proliferating there. The duration of drinking water storage in households depends on several parameters such as the water supply system (untimely cuts by REGIDESO), the quantity of water drawn per household, the distance to travel between the household and the drinking water supply point but also the number of people consuming this water in the households. The deterioration of water quality is often the cause of diarrheal diseases in households in our study area. We believe that the insufficiency of hygienic practices related to water during its storage in households is at the origin of its deterioration. Therefore, the current behaviors of the community have direct or indirect effects on the microbiological quality of drinking water in households, it is therefore necessary to promote community awareness of good hygiene practices to maintain the potability of water during storage. We observe in table 2.5. that there is a significant increase in the number of households not covering their containers in phase II compared to phase I (14.3% compared to 85.7%) in the intervention zone compared to 0% in the control zone. Correlatively, the use of covers and capsules decreases slightly in phase II in the intervention zone, i.e. (53.6%) compared to 46.4%).

The results of this research agree with those of Hélène HIGGINS *et al*., who showed that the majority, 58% of the gourds, glasses or cups for drawing water were placed on the water storage container but without any protection against children or dust in the intervention zone and in the control zone (Hélène HIGGINS *et al*., 2016) .The results of this research are almost consistent with those of Flavien Edia DOVONOU1 *et al*., which states that 76% of households covered the water stored in households compared to 24% who did not cover it (Flavien Edia DOVONOU1 *et al*., 2018).

We believe that it is preferable that once the water storage container is filled with water when supplying it, the protection system must be directly removed and attached and the user must place this container in an appropriate location to avoid microbial contamination of this rare commodity which must remain drinkable for as long as possible. The proportion of households washing their containers remained relatively stable between phase I and phase II in the two study areas. The results of this study are lower than those of Hélène HIGGINS *Et al*., which reveal that households cleaned water storage containers with soap, i.e. 70%). (Hélène HIGGINS *et al*., 2016). According to Sobsey, M.D. (2002) occasional cleaning may still be necessary, and it is particularly advisable to clean all Containers to ensure that they are not the source of recontamination (Sobsey, M.D., 2002).

We therefore believe that users of narrow-mouthed water storage containers should be encouraged to clean them frequently with a warm soapy solution, or disinfectant and gravel. Narrow-mouthed containers avoid contamination, but are more difficult to clean. While for containers with wide openings, they should be encouraged to cover them and set up a way to collect water without touching it with their hands because containers with wide openings are contaminated more quickly, but are more easily cleaned. Table 2.6. showed that there is a notable increase in the use of boiling, chlorination and exposure to the sun in phase II with respectively (40.7% versus 59.3%; 16% versus 84%; 17.4% versus 82.6%) and boiling, although still used, seems less favored in phase II in the control zone. The results of this survey are almost similar to those of Julie ghislaine sadoukou kouakou *et al*., who said that the maintenance of water storage equipment at home was generally done weekly with water and detergent before and after storage of water at home, i.e. 98% (Julie ghislaine sadoukou kouakou *et al*., 2010). It is therefore very important to wash the containers before and after storing water to prevent alteration of the microbiological quality of the water because over time, dirt, dust with its contents, debris and fungi can accumulate. It is also preferable that users of these containers make an effort to carry out regular cleaning in order to eliminate and guarantee the cleanliness, safety and conformity of the drinking water. We believe that this low rate of cleaning of containers in the two study areas may be the cause of diarrhea and deserves special attention from the population.

Conclusion

The health of communities is a direct function of the quality of the water consumed and the lifestyle. The study of the Effect of household hygiene training on water quality to reduce incidence diarrhoea in goma district. Specific case of the Mugunga and Lac Vert districts has highlighted the existence of several drinking water supply systems by the inhabitants of the Mugunga and Lac Vert districts. The poor choice of water storage containers in households, long periods of water storage, poor cover system of water storage containers, and scarcity of washing systems promote the contamination of water storage containers.

(cliché Nyondo , Septembre 2024)

Photo 1. ***Water stockage materials***

CONCLUSION

The health of communities is a direct function of the quality of the water consumed and the lifestyle. The study of the Effect of household hygiene training on water quality to reduce incidence diarrhea in goma district. Specific case of the Mugunga and Lac Vert districts has highlighted the existence of several drinking water supply systems by the inhabitants of the Mugunga and Lac Vert districts. Poor choice of water storage containers in households, long periods of water storage,

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Authors' Contributions

BERNARD ABONG'O OMONDI contributed to the data collection, study methodology and data analysis sections, as well as to the writing of the manuscript; CAREENA OTIENA ODAWA contributed to the literature review and data analysis; and editing the manuscript. All authors read and approved the final manuscript

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