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# SAFETY PARAMETER AT IMPROVED SOURCES (POINTS) OF DRINKING WATER IN THE ISIRO HEALTH ZONE

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## ABSTRACT

**Introduction:** the demand for water is constantly increasing in the world. The absence of safety parameters around water points would favor water contamination. The purpose of this study is to determine the security parameter at the sources (points) of improved drinking water in the Isiro Health Zone.

**Methods:** This descriptive and cross-sectional study was carried out in the Isiro health zone during the period from March 21 to May 21, 2022. Three hundred and eighty women heads of households, including 240 in urban areas and 140 in rural were selected on an occasional basis. A survey questionnaire comprising variables related to the sources of drinking water supply, the time required for the supply, the existence of a cemetery upstream of the source and access to animals and children at the source.

The data collected were encoded and processed in SPSS 20 software. The Chi-square statistical test was used to compare the proportion of households consuming water from improved sources in urban areas and in rural areas, by a level confidence of 0.05%.

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**Results:** The elements of the security parameters around water supply points were lacking: children and animals had access to 56% of sources, dirty aspects were observed around 50% of water points, the canal of divergence was only present in 11% and the absence of closures in 94%.

**Conclusion:** access to drinking water is a serious problem in the health zone of Isiro. The few improved water sources erected in the area are not well maintained, which means that the safety parameters are not taken into account by the population.

**Recommendation:** The population must appropriate and keep all the development achievements

**KEYWORDS:** Security parameter, improved sources, Isiro Health Zone, DRC

## 1. INTRODUCTION

Worldwide the demand for water is constantly increasing. Every year since 1980 an increase of 1% has been recorded, under the combined effect of population growth, socio-economic development and changes in consumption patterns. In 2020, 2.2 billion people lived in countries with high water stress and lacked safe drinking water [1]. And this despite the rights to water and sanitation, which have been among the commitments made since 2015 as part of the Sustainable Development Goals (SDGs) for 2030 [1].

The organization of several water forums reveals the extent of the problems of access to drinking water in developing countries, and in particular in the countries of sub-Saharan Africa. In these countries, more than 150 million city dwellers do not have access to a drinking water service [2]. The connection rates to the drinking water supply network in certain capitals are low: Dakar (16.7%), Nouakchott (25%), Conakry (15%), Niamey (33.2%) or Ouagadougou (22. 8%) [3].

The study conducted by Partow [4] on water accessibility in the DRC showed that only 26% of the total population have access to drinking water, a figure well below the average of 44% for sub-Saharan Africa.

In the DRC, there is a real geographical disparity in favor of urban centers in terms of the availability of drinking water. Of the 26% of people with access to drinking water, about 70% are urban residents compared to 30% living in rural and peri-urban areas. The main causes of this situation lie in the significant demographic and spatial growth experienced by these cities over the past thirty years [4,5].

Unsanitary water sources and poor general hygiene are environmental factors that increase the risk of developing diarrhea [6]. Waterborne diseases remain a major public health problem in many

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countries [7] and specifically in the DRC in the undismembered eastern province the prevalence of diarrhea was estimated at 13.4% [8].

The results of a study carried out in Isiro in the province of Haut Uélé on the physicochemical and bacteriological quality showed that out of 23 water supply points, 2 or 8.7% deliver drinking water that meets WHO standards. because they are free of any indicator of faecal contamination while 13 water points or 56.52% deliver very polluted water because they contain 3 or 4 indicators [9, 10]. However, most of these sources are developed and should provide drinking water that meets WHO standards. The absence of safety parameters around water points could therefore justify this water contamination.

The purpose of this study is to determine the safety parameter at the level of improved sources (points) of drinking water in the Health Zone of Isiro in the province of Haut-Uélé.

## 2. MATERIALS AND METHODS

### Study environment:

This study was conducted in the health zone (ZS) of Isiro, city of Isiro, province of Haut Uélé located in the North-East of the Democratic Republic of Congo. This HZ has a total population of 336,778 inhabitants distributed in 13 health areas.

Methods: This descriptive and cross-sectional study was carried out during the period from March 21 to May 21, 2022. Three hundred and eighty women heads of households who consented to participate in the study were selected on an occasional basis. in the Isiro health zone, including 240 in urban areas and 140 in rural areas. Data collection was done using a survey questionnaire administered to women and observation at water supply points. The questionnaire included variables related to the main sources of drinking water supply, the time required for water supply, the existence of a cemetery upstream of the source and access to animals and children to the source.

The observation consisted of visiting 23 water points most frequented by the households surveyed to become familiar with the security parameters at the source level (water points). Among these water points, 17 were in the urban part (distributed as follows: 10 improved springs, 3 standpipes and 4 REGIDESO taps) and 6 in the rural part, mainly represented by improved springs.

To allow a good analysis, the water sources have been categorized into 2 groups: Improved sources: which take into account water from the water distribution company (REGIDESO), standpipes, fitted wells and

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Unimproved sources which take into account undeveloped springs and undeveloped wells.

A source was considered to be secure when it was fenced, provided with a diversion channel, no access for animals and children, had a clean appearance and there were no upstream cemeteries and toilets within 100m.

**Data processing**

The data collected was encoded in the Excel 2007 workbook and imported into SPSS software for analysis. The description of the variables was made by means of measurements of absolute frequencies and relative frequencies for the qualitative variables, the statistical test of Chi-square was used to compare the proportion of households consuming water from improved sources in the urban environment. and in rural areas, by a confidence level of 0.05%. The results were presented in tables and graph.

## 3. RESULT

The results in relation to the main water supply sources in urban and rural households are presented in Tables 1 to 2 and the water point security parameters are presented in Figure 1.

**Painting. 1: Sources of supply and time of access to water by place of residence.**

| **Place of residence** | **Urbain (N=240)** | | **Rural (N=140)** | | Total **(N=380)** | | |
|---|---|---|---|---|---|---|---|
| **supply point** | **n** | **%** | n | **%** | n | **%** | P-valeur |
| REGIDESO | 15 | 6,3 | 10 | 7,1 | 25 | 6,6 | |
| Furnished well | 22 | 9,2 | 2 | 1,4 | 24 | 6,3 | |
| Improved Source | 107 | 44,6 | 75 | 53,6 | 182 | 47,9 | <0,001* |
| Undeveloped well | 43 | 17,9 | 14 | 10,0 | 57 | 15,0 | |
| Unimproved source | 35 | 14,6 | 36 | 25,7 | 71 | 18,7 | |
| water stream | 10 | 4,2 | 0 | 0,0 | 10 | 2,6 | |
| Others | 8 | 3,3 | 3 | 2,1 | 11 | 2,8 | |
| **Access time** | | | | | | | |
| Less than 30 minutes | 139 | 57,9 | 125 | 89,3 | 264 | 69,5 | <0,001* |
| More than 30 minutes | 101 | 42,1 | 15 | 10,7 | 116 | 30,5 | |

* Chi-square test

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There is a significant difference between the different sources of water used in households (P<0.001). The improved water source is the main source of water supply in both study settings with a higher proportion in urban areas. However, access to an improved source is more common in urban areas than in rural areas. About 4 out of 10 households have access to drinking water in more than 30 minutes in urban areas compared to 1 out of ten households in rural areas.

**Table 2. Categories of source of water mainly used in households**

| Areas | **Urbain (N=240)** | | **Rural (N=140)** | | **Total (384)** | | |
|---|---|---|---|---|---|---|---|
| Categories source | n | % | n | % | n | % | **P-Valeur** |
| Improved | 217 | 90,4 | 84 | 60,0 | 301 | 79,2 | <0,001* |
| Not improved | 23 | 9,6 | 56 | 40,0 | 79 | 20,8 | |

*Chi-square test

The data in this table show that 217 women or 90.4% use improved spring water in urban areas against 60% in rural areas, the difference is statistically significant (P<0.001). Water point security parameters are shown in Figure 1.

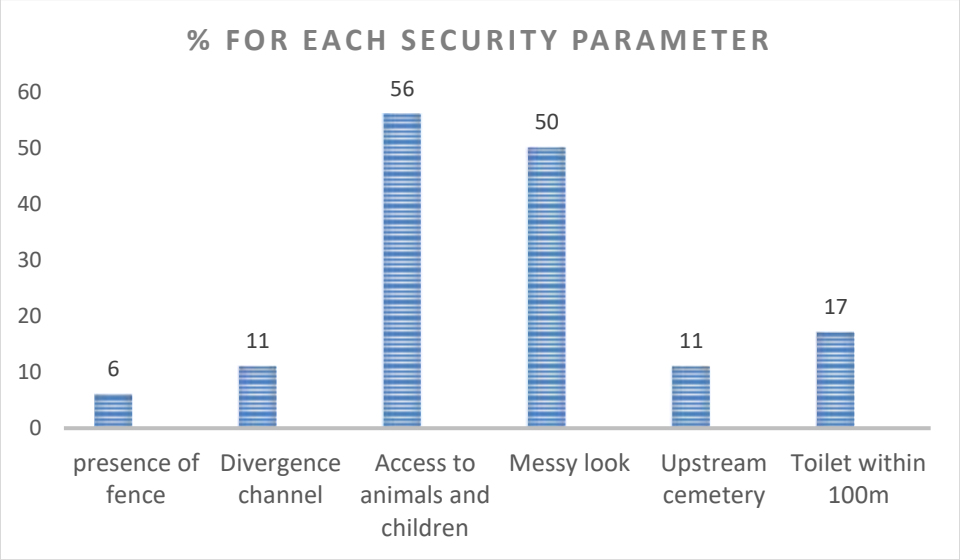


**Figure 1: Security settings at water supply points**

This figure shows that the elements of the security parameters around water supply points were deficient: children and animals had access in 56% of cases, dirty aspects were observed around 50% of water supply

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points. water, the channel of divergence was only present at 11% and the absence of fences in 94% of the water point.

## 4. DISCUSSION

### Source of supply and access time to water

It emerges from the analysis of Table 1 that the majority of the population of the Isiro health zone obtains its water supply from improved sources followed by unimproved sources (see Table 1). However, there is a significant difference between the different sources of water used in households in the two settings ($P<0.001$). According to the study conducted by Kazadi [11], confirms that there are criteria for choosing the source of water supply in households [11]: In particular, the spatial distribution of households and water points to which they have recourse. This is how households' resort to water points that are more easily accessible in terms of distance.

This situation would be due to the presence of wells in most households; and that these are built without great technicality, without coping with anti-mud slab, nor sump. The absence of these safety devices allows rainwater laden with enormous impurities to easily enter these wells. Among those who drink water from the developed springs, some travel great distances in search of it. This state of affairs demonstrates the inability of developed springs to cover the real water needs of local populations.

At the level of supply points, security parameters are lacking: the results of this study show that 94% of water points are not fenced, 89% do not have channels of divergence and only 11% in have, animals and children have easy access to 56% of the water point, half of the source visited was not clean, the cemeteries were upstream of 11% of the source and the presence of toilets 100 meters away in 17%. These elements militate in favor of a high risk of water contamination at the source and confirm the results found by Wembakoy et al [10].

This weakness in relation to safety parameters around collective drinking water supply points was also observed in the Province of Tshopo in a study carried out in the area covered by the Program National Healthy Schools and Villages. Unclean aspects were observed around 83% of water points, stagnant water present in 75% of cases, the presence of a fence in 10% of cases and the absence of a security perimeter in 50% of cases [12]. However, we found a study on this theme at the national level.

As part of the secure management of water supply points, three protection perimeters are recommended: an immediate protection perimeter around the catchment point, whose land is to be acquired in full ownership, a close protection perimeter at the within which any activities or installations directly or

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indirectly affecting water quality may be prohibited or regulated and a remote protection perimeter, within which activities and installations may be regulated (toilet, cemetery) [13, 14].

This precariousness of the conditions around the water supply points would be a major risk factor for water contamination at the source.

On this point, we believe that the population does not manage to appropriate the achievements of certain development projects, because maintaining cleanliness and closing the water supply point would be one of the priorities that the local population should do to sustain the achievements. This would also be justified by the ignorance of this population about the safety parameters of a water source.

## CONCLUSION

Safety parameters around water points must be reinforced; Household practices related to the type of collection and storage containers and water handling need to be improved to ensure safe water throughout the water supply cycle.

Municipal policies, in collaboration with the hygiene office of the Provincial Division of Health, must be developed for the improvement of the environment of the water supply spaces, the periodic organization of quality monitoring of water at supply points and continuous sensitization of the population for safe management of water in households.

## REFERENCES

[1]. Abis S., Eau potable, dans : éd., Le Déméter 2022. Alimentation : les nouvelles frontières. IRIS, p. 367-372. URL : https://www.cairn.info/--0011662118-page-367.htm. Consulté le 05/08/2021 à 17 heures 35 minutes.

[2]. OMS/UNICEF : 'Eau Potable et Assainissement : Progrès en matière d'Assainissement et d'Alimentation en Eau. Genève 2010

[3]. ENDA, : Stratégies pour l'approvisionnement en eau et l'assainissement dans les zones urbaines défavorisées des pays en développement. http://www.oiseau. fr/ciedd/contributions. Consulté le 05/08/2021 à 17 heures 42 minutes ;

EMIUB., 2002 : Enquête sur les Migrations, l'Insertion Urbaine et l'Environnement au Burkina Faso, Atelier de Ouagadougou 19- 21 juin 2006, 40 p

[4]. Partow H., 2011 : Problématique de l'Eau en République Démocratique du Congo. Défis et Opportunités Rapport Technique, Programme des Nations Unies pour l'environnement, 98p.

[5]. PNEVA, 2016 : Programme National École et Village Assainis Atlas, outil pour atteindre l'objectif ambitieux de couverture universelle défini par les Objectifs du Développement Durable

ISSN: 2582-6271

Vol. 4, Issue.3, May-June 2023, page no. 01-08

[6]. Djelloulih.m., Taleb s. : Qualité chimique et bactériologiques des eaux de consommation du Sud Algérien, CIRESS,2005, 26p

[7]. CRDI ; : Hydrogéologie et contamination de la nappe phréatique alimentant la ville de Bamako, 2005, p.10

[8]. Ministère du Plan et Suivi de la Mise en œuvre de la Révolution de la Modernité, Ministère de la Santé Publique et ICF International (MPSMRM, MSP et ICF Int). Enquête Démographique et de Santé en République Démocratique du Congo 2013-2014. EDS 2014.

[9]. OMS, 2004 : Directives de qualité pour l'eau de boisson. Recommandations. Troisième Edition. Volume 1. Genève, Suisse. 110 p

[10] Wembakoy OA, Lusamaki MF, Kombelemba KD, Nyamaifofa LD, Tshitenge EA, et al. physicochemical and bacteriological quality of drinking water consumed by the population of isiro health zone. Vol.2 No.4; JASER, July-Aug 2021 p:101-113

[11]. Kazadi', M.Z.A. Contribution à l'étude de la qualité et de la gestion de l'eau de boisson dans la région de Kisangani. Thèse de doctorat. Faculté des Sciences. Université de Kisangani. Dep. Sciences Biotechnologiques. Kisangani. 2012, 145 p.

[12]. Basandja, E.L., Mabela, G.K., Mulumba, Z.-A.K., Kitronza, J.P.L. and Likwela, J.L. (2021) Quality of Water Adjusted Sources and Storage in the Households of the Sanitized Villages in Area of National Program of Sanitized Schools and Villages at Tshopo Province in Republic Democratic of Congo. Journal of Biosciences and Medicines, 9, p: 43-54. https://doi.org/10.4236/jbm.2021.96004

[13]. Vernoux J.F, Wuilleumier A, Perrin J. Délimitation des aires d'alimentation des captages d'eau souterraine et de leur vulnérabilité vis-à-vis des pollutions diffuses. Version révisée du guide méthodologique. Rapport final 2014 (Rapport BRGM/RP-63311-FR): p. 145.

[14]. Marchal J.P. Eaux destinées à la consommation humaine. Guide pour la protection des captages publics. Département du Gard et de l'Hérault. Rapport final. 2007(BRGM/RP-55699-FR): p. 156.