

## Knowledge, Practice and Satisfaction of the beneficiaries of the National Program of Sanitized Schools and Villages in post-certification in the province of Tshopo in the DRC

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**ABSTRACT:** The objective of this study was to assess the knowledge and satisfaction of the population on the National Program of Sanitized Schools and Villages (NPSSV) as well as their practice in post-certification.

An analytical cross-sectional study was carried out in 3 intervention Health Zones during the period from November 15 to 27, 2022. The statistics were carried out with Pearson's chi<sup>2</sup>, Fisher's Exact Test, ANOVA Test and Kruskal Wallis Test, according to the conditions of their applications. The knowledge most represented on the NPSSV, regardless of site, was «the drinking water coverage improvement program» (99%), the other components of the program were poorly known ( $p \leq 0.05$ ). The village certification criteria and the tasks of the village committee members were poorly known ( $p \leq 0.05$ ). Almost all of the population currently uses unimproved water sources (92%), indistinctly of Health Zone. Surface water and traditional wells are significantly more used ( $p \leq 0.05$ ). Poor construction, lack of maintenance and sabotage of structures were the most cited causes of the deterioration of water structures ( $p \leq 0.05$ ). Satisfaction with the program and the quality of the works is very good, differently between the Health Zones ( $p > 0.05$ ). Diarrheal episodes were observed in 33% of households, the median number of people with diarrhea and the median number of children under 5 years of age did not differ between Health Zones ( $p > 0.05$ ).

The knowledge of the mothers on the key aspects of the NPSSV is limited, their appreciation of the implementation of the activities is satisfactory and the households no longer use the improved water points. This maintains a high incidence of diarrhea at the household level. Other measures are essential to deal with it.

**KEYWORDS:** Knowledge, practice, satisfaction, post certification, sanitized villages program, Tshopo.

### 1 INTRODUCTION

Sustainable Development Goal number 6 (SDG 6) aims to “ensure access for all to sustainably managed water supply and sanitation services” [1].

The SDGs are globally defined ideal targets, designed to be universally relevant and applicable to all countries; “it is up to each State to set its own targets at the national level to meet global ambitions while taking into account its specificities” [1, 2].

Every day, 1,000 children die from easily preventable diseases caused by poor sanitation and hygiene [3]. In sub-Saharan Africa, childhood diarrhea is a public health problem. These diarrheal diseases have an economic impact that is all the heavier in that they preferentially affect the poorest countries [4].

Current studies show that the construction of water points does not necessarily decrease diarrheal morbidity rates while the emphasis on targeted water quality interventions, at the source or household level, has a significant impact, with a 42% reduction in morbidity [5].

Impact studies have shown that when access to an improved water source was possible, varying proportions of households in the communities studied either did not use it at all, or did not use it for a good part of the year. In all the cases of community water points studied, part of the population continued to use the less safe traditional water sources, even for drinking [6].

The “Sanitized Village” initiative is a Congolese national program that encourages communities and local health authorities to work together to improve the health of children. Thanks to this program, the communities themselves set to work to improve their sanitation and hygiene practices and to maintain sustainable access to drinking water [7].

A study conducted in the DRC (2018) found that 33.9% of the population living in rural areas had access to drinking water at the national level, 32.6% had access to an improved sanitation facility, 11.6% from the population practiced open defecation and 14.9% of the rural population washed their hands with soap and ash [8].

During a recent study conducted in two Health Zones of Tshopo province, covered by NPSSV since 2014, the prevalence of diarrhea among children under 5 was 13% (95 CI: 10%-16%), it was identical with that of children from households not covered by the program ( $p \leq 0.05$ ) [9].

This result attests to the inefficiency of the NPSSV in dealing with the problems for which it was created and raises too many questions about the knowledge of the underperformance factors of this program.

To deal with this problem of low impact of the program with good geographical coverage of the interventions, several studies are necessary. As part of this scientific reflection, attention is focused on the final beneficiaries of the program, the household population, to assess their level of understanding of the program, of its operation at the local level (village) and their practices in terms of supply drinking water, especially post-certification where the maintenance of structures and good water management practices is part of the sustainability of the achievements of the community.

The objective of this study was to evaluate the knowledge and the satisfaction of the population on the program "Healthy Villages" as well as their practice in terms of drinking water supply in post certification.

## **2 MATERIAL AND METHODS**

### **STUDY SITES**

This study was conducted in the Health Zones (HZs) of Bengamisa, Yakusu and Lubunga located in the peri-urban area of the city of Kisangani. These three HZs have been part of the National Program of Sanitized Schools and Villages since 2010 with funding from UNICEF and other technical and financial partners (TFP) in the Water, Hygiene and Sanitation sector. These HZs were selected on the basis of criteria of geographical complementarity (rural and urbanrural areas, riparian and terrestrial territories) and duration in the implementation of program activities. These two important criteria were taken into account in the stratification of the villages because they can influence the quality of the water works, the behavior and the habits of the population in relation to the drinking water service.

### **STUDY POPULATION**

It is made up of households in the coverage areas of the NPSSV in the province of Tshopo, whose respondents were mothers/caregivers of children under 5 years old.

### **TYPE AND PERIOD OF STUDY**

An analytical cross-sectional study was carried out in the HZs of Bangamisa, Yakusu and Lubunga during the period from November 15 to 27, 2022.

### **SAMPLING**

The size of the sample was calculated according to the LUNCH formula considering the prevalence of diarrhea in children under 5 in the Province Orientale estimated at 13.4%, with the coefficient  $Z=1.96$ , the degree error of 0.05 and an anticipated non-response rate of 10%, it was 180 households. These households were evenly distributed in 3 HZs, i.e. 60 per HZ. In each HZ, three sanitized villages were randomly selected as follows: a village certified at least 3 years ago, a village certified 3 to 5 years ago and a village certified more than 5 years ago.

Households were selected using the systematic sampling technique. After the household count (N), the sampling interval (k) was calculated by dividing  $N/20$ ; then, a random number between 1 and k was drawn, which corresponded to the number of the first household surveyed. The other households were identified by adding the sampling step.

### **VARIABLES OF INTEREST**

- Sociodemographic characteristics of respondents and households: age, level of education, marital status, number of people in the household and number of children under 5 years old.
- Knowledge of the NPSSV: intervention components, village certification criteria, existence of the village committee and tasks of the village committee members.
- Drinking water supply: main source, maintenance of structures, causes of deterioration of improved structures.
- User appreciation: the program, the quality of the works and their location.

- Diarrheal morbidity in households: households having recorded at least one case of diarrhea in the two weeks preceding the survey, number of cases of diarrhea in the household.

#### DATA COLLECTION AND ANALYSIS

The data was collected by the interview technique of mothers/caregivers of children aged 0 to 59 months using a smartphone with the Kobo collect software. The database downloaded in Excel format was exported to STATA 15 for statistical analysis. The description of the sample was made using proportion for the variables in category, average (SD) for the quantitative variables with normal distribution and the median (p75-p25) for the quantitative variables with nonsymmetrical distribution. Statistical inferences were made with Pearson's chi<sup>2</sup>, Fisher's Exact Test, ANOVA Test and Kruskal Wallis Test, depending on the conditions of their applications, at the 5% significance level.

#### ETHICAL CONSIDERATIONS

The study benefited from the approval of the ethics committee of the University of Kisangani, the deanship of the Faculty of Medicine and Pharmacy, the Provincial Health Division, the Central Offices of the Health Zones and the chiefs villages surveyed. Participation in the study was voluntary with written consent. Data analysis and dissemination of results were done anonymously.

### 3 RESULTATS

Table 1. Sociodemographic characteristics of respondents and households

Characteristics	All	Bengamisa	Yakusu	Lubunga	P value
<i>Age (n)</i>	180	60	60	60	
Mean (SD)	36.6 (10.8)	36.2 (11.7)	35.8 (11.5)	37.9 (9.3)	0.151*
18 - 25	31 (17)	11 (18)	13 (22)	7 (12)	0.153**
26 - 35	59 (33)	22 (37)	20 (33)	17 (23)	
36 - 45	50 (28)	12 (20)	13 (22)	25 (42)	
46- plus	40 (22)	15 (25)	14 (23)	11 (18)	
<i>Educational level (n)</i>	180	60	60	60	0.099***
None	24 (13)	10 (17)	3 (5)	11 (18)	
Primary	99 (55)	31 (52)	39 (65)	29 (48)	
Secondary	55 (31)	19 (32)	18 (30)	18 (30)	
Higher/University	2 (1)	0 (0)	0 (0)	2 (3)	
<i>Marital status (n)</i>	180	60	60	60	0.054***
Married	133 (74)	43 (72)	49 (82)	41 (68)	
Free union	32 (18)	14 (23)	8 (13)	10 (17)	
Bachelor	7 (4)	0 (0)	3 (5)	4 (7)	
Divorce	8 (4)	3 (5)	0 (0)	5 (8)	
<i>Number of people in the household</i>					
Median (p75 – p25)	9 (11 – 7)	7 (10 – 5)	9 (12 -7)	9 (11 – 7)	0.001****
<i>Number of children ≤ 5 years old</i>					
Median (p75 – p25)	2 (2 – 1)	1 (2 -1)	2 (3 – 1)	2 (2 – 1)	0.001****

\*Oneway ANOVA \*\* Pearson's chi-square \*\*\* Fisher's Exact Test \*\*\*\*Kruskal wallis

Table I shows that the average age, level of education and marital status of the respondents are not different between the HZs studied. The median number of people and children under 5 in households is statistically lower in the HZ of Bengamisa ( $p \leq 0.05$ ).

*Table 2. Knowledge of NPSSV and the role of village committee members*

Variable	All	Bengamisa	Yakusu	Lubunga	P value
Heard about NPSSV	180	60	60	60	
Yes	144 (80)	52	50	42	0.054*
No	36 (20)	8	10	18	
Knowledge about the Village program sanitized	n=144	n=52	n=50	n=42	
Improvement of water works	143 (99)	51	50	42	0.332**
Latrine construction	57 (40)	17	25	15	0.151*
Hand washing	72 (50)	18	24	30	0.001*
Village clean-up	62 (43)	21	27	14	0.115*
Village committee	10 (10)	4	2	4	0.553**
Sensitization	48 (33)	26	10	12	0.006*
Knowledge about village certification criteria	n=144	n=52	n=50	n=42	
Presence of village committee	19	12	4	3	0.014*
Improved water structures	133	48	45	40	0.244*
Improved Toilets	71	22	28	21	0.368*
Availability of hand washing	69	19	27	23	0.324*
Cleanliness of the village	60	23	28	9	0.001*
Enclosed animal	7	5	0	2	0.072**
Knowledge of the existence of the functional village committee	n=180	n=60	n=60	n=60	
Yes	56 (31)	24 (40)	18 (30)	14 (23)	0.139*
No	124 (69)	36 (60)	42 (70)	46 (77)	
Duties of village committee members	n=180	n=60	n=60	n=60	
Sensitization	40 (22)	20 (33)	8 (13)	12 (20)	0.027*
Mobilization for hygiene work and sanitation	45 (25)	21 (35)	12 (20)	12 (20)	0.09*
Repair/construction of water works	25 (14)	14 (23)	7 (12)	4 (7)	0.025*
Maintenance of structures water	42 (23)	19 (32)	12 (20)	11 (18)	0.17*
Follow-up meeting	10 (6)	7 (12)	2 (3)	1 (2)	0.038*

\*Pearson's Chi-square \*\* Fisher's Exact Test

The widest knowledge that people have of this program, regardless of site, was “the program to improve drinking water supply coverage”. The other components of the program were poorly known in all the study sites. Knowledge of the “hand washing” component is significantly low in Bengamisa and that of “household awareness” statistically low in Lubunga and Yakusu ( $p \leq 0.05$ ).

The village certification criteria was poorly known except for the possession of improved water structures. A significantly small difference was observed in Lubunga and Yakusu for the criterion related to the presence of the village committee and the criterion of village cleanliness for the ZS of Lubunga ( $p \leq 0.05$ ). The non-functionality of the local village committee was mentioned in majority in all the sites without statistical difference.

The knowledge of the respondents was generally very low for all the tasks of the members of the village committee under examination (<30%). Knowledge of the tasks: sensitization, repair/construction of works and holding of meetings was low in the HZs of Lubunga and Yakusu compared to that of the HZ of Bengamisa ( $p \leq 0.05$ ).

Table 3. Drinking water supply and maintenance of hydraulic structures

Variable	All	Bengamisa	Yakusu	Lubunga	P value
<b>Main source of water supply in post certification</b>					
Sources categories	180	60	60	60	
Improved sources	15 (8)	3	8	4	0.55*
Unimproved sources	165 (92)	57	52	56	
<b>Types of water source</b>					
Improved source/sink	15	3	8	4	0.217*
Traditionnal springs	52	32	4	16	0.001*
River/stream	79	17	42	20	0.001*
Traditional wells	34	8	5	21	0.001*
<b>Post-certification maintenance of water structures</b>					
No	35 (19)	12	17	6	0.001**
Sometimes/rarely	131 (73)	39	42	50	
Yes	14 (8)	9	1	4	
<b>Origin of the degradation of the rehabilitated water structures</b>					
Faulty construction	23 (13)	3	13	7	0.023*
Lack of maintenance	104 (58)	20	40	44	0.001*
Improper use	100 (56)	39	34	27	0.086*
Sabotage by incivics	23 (13)	17	5	1	0.001*
Lack of surveillance	31 (17)	11	7	13	0.336*

Table III shows that almost the entire population currently used, regardless of the site, unimproved water sources. Use of surface water was significantly high in Yakusu HZ and reliance on traditional wells significantly high in Lubunga HZ ( $p \leq 0.05$ ). It is declared a rarity in carrying out maintenance works on water sources, the significantly highest frequency of which was observed in the HZ Lubunga. The origins of the degradation of water structures was cited differently between the HZs: poor construction was significantly mentioned in the HZ Yakusu, lack of maintenance was significantly cited in the Yakusu and Lubunga HZs and the sabotage of structures by incivics, significantly reported in the HZ of Bengamisa ( $p \leq 0.05$ ).

Table 4. Level of satisfaction and prevalence of diarrhea

Variable	All	Bengamisa	Yakusu	Lubunga	P value
<b>Assessment of the Healthy Villages Program</b>					
Very useful work	117 (65)	40	44	33	0.103*
Useful work	58 (32)	19	16	23	
Less useful work	5 (3)	1	0	4	
<b>Satisfaction of the way program activities were carried out</b>					
yes	176 (98)	58	59	59	1.00*
No	4 (2)	2	1	1	
<b>Satisfaction of the quality of the rehabilitated works</b>					
Yes	170 (94)	57	53	60	0.018*
No	10 (6)	3	7	0	
<b>Assessment of the location of rehabilitated works</b>					
Appropriate	110 (61)	18	52	40	0.001**
Distant	66 (37)	39	8	19	
Inappropriate	4 (2)	3	0	1	
<b>Diarrheal morbidity</b>					
Households having received at least one case of diarrhea	N=180 n (%)	N=60 n (%)	N=60 n (%)	N=60 n (%)	0.721*
	59 (33)	19 (32)	18 (30)	22 (37)	
	Me (p75 – p25)				
Household cases of diarrhea	1 (1 – 1)	1 (2 – 1)	1 (1 – 1)	1 (1 – 1)	0.492***
Cases of diarrhea in children $\leq$ 5 years old	1 (1 – 1)	1 (1 – 1)	1 (1 – 1)	1 (1 – 0)	0.393***

\*Fisher's Exact Test \*\* Pearson's Chi-square \*\*\* Kruskal wallis Test

The assessment of the NPSSV and the level of satisfaction with the implementation of the activities of this program was favorable for the vast majority of subjects, regardless of the site. Satisfaction with the quality of the rehabilitated water structures is perfect in the HZ of Lubunga, it is significantly different in the HZ of Yakusu. As for the location of the improved water structures, the "appropriate" rating was statistically high in the HZ of Yakusu and "remote" significantly high in the HZ of Bengamisa ( $p \leq 0.05$ ).

Diarrheal episodes were reported in about 1/3 of households, this proportion was not different between the HZs of the program. The median of person with diarrhea and that of children under 5 years old was not different between HZs ( $p > 0.05$ ).

#### **4 DISCUSSION**

The average age, level of education and marital status of the respondents did not differ between the HZs studied. The median number of people and children under 5 in households was statistically lower in the ZS of Bengamisa ( $p \leq 0.05$ ). These socio-demographic characteristics show a certain homogeneity for the variables used and make the results of our observations comparable. The number of people and children in households, on the other hand, was influenced by genetic, socio-cultural and health factors.

##### **KNOWLEDGE OF NPSSV**

The knowledge most represented on the Sanitized Villages program, regardless of site, was "the drinking water coverage improvement program" (99%), the other components of the program were poorly known ( $p \leq 0.05$ ). The village certification criteria and the tasks of the village committee members were poorly known ( $p \leq 0.05$ ).

The lack of knowledge of the intervention package activities by the beneficiaries certainly had an impact on the effectiveness of the program's implementation and had a negative impact on the low ownership of the program's activities in the post-certification period. The purpose of implementing NPSSV was for the communities themselves to work to improve their sanitation and hygiene practices and maintain sustainable access to safe drinking water [7].

The NPSSV includes seven standards: presence of a dynamic village committee working for village sanitation, at least 80% of the population having access to drinking water, at least 80% of households using hygienic latrines, at least 80% of households disposing of their waste in a hygienic manner, at least 60% of the population washing their hands before meals and after using the latrines, at least 70% of the population understanding the faecal-oral route of disease transmission and villages cleaned at least once a week [7].

This corroborates the results of the study conducted in South Kivu in the NPSSV area where the weak appropriation of the program was significantly associated with households' ignorance of the existence of NPSSV in their village ( $p < 0.001$ ) and dissatisfaction of more than half of the households with the village certification process ( $p = 0.0187$ ). Households that had a negative opinion of NPSSV did not adopt the program after certification ( $p < 0.001$ ) [10].

Even if the populations' participation in decision-making is intermittent, the results of Kam's work (2011) had shown that in Côte d'Ivoire, the failure of the drinking water supply project in rural areas was linked on the one hand, to the non-participation of the populations in the installation of hydraulic infrastructures and on the other hand, to the failure to take into account the socio-economic and cultural realities of the beneficiary communities. Whereas in the absence of prior mobilization, the local authority will have to create the conditions for dialogue with users and their representatives by inviting them to consultation or decision-making bodies [11].

It is a question of politicizing the question of water by trying to bring users out of their position of strict consumers, but also to show them the technical and economic stakes. Prior sensitization may seem necessary [12].

##### **POST-CERTIFICATION DRINKING WATER SUPPLY**

Almost all of the population currently used unimproved water sources (92%), without distinction from HZs. The use of surface water was significantly high in the HZ of Yakusu and the use of traditional wells significantly high in the HZ Lubunga ( $p \leq 0.05$ ). It was declared a rarity in carrying out maintenance works on water sources, the significantly highest frequency of which was observed in the HZ Lubunga. Poor construction, lack of maintenance and sabotage of structures were the most cited causes of the deterioration of water structures ( $p \leq 0.05$ ).

No improved water point is functional in all the villages visited, regardless of the postcertification period. A deplorable situation which subjects the population to the conditions before implementation of the NPSSV and reflects the failure of the sustainability mechanism. Poor management affects the sustainability of infrastructure and therefore considerably affects the level of access to drinking water [13].

The level of ownership of NPSSV in the post-certification phase was also found to be low in South Kivu province, this was associated with negative community perceptions of NPSSV ( $p = 0.0294$ ) at insufficient and/or lack of financial means ( $p = 0.0327$ ); the absence/nonexistence of grassroots community committees in certain villages and schools ( $p = 0.001$ ); the lack of motivation of the members of the existing committees and of the effectiveness of these committees ( $p = 0.0134$ ) [10].

This corroborates the results of other studies. In Cameroon, the maintenance of water structures was defined as an essential function to guarantee the state of functionality of water structures. In the 1980, most Cameroonian localities were equipped with drinking water equipment which quickly broke down due to lack of maintenance [14].

In Burkina Faso, it was reported that village hydraulic structures were broken down or abandoned by local populations for economic, technical, political or sociological reasons [15].

The direct consequences of the failure of the management system mentioned in Burkina Faso were the lack of money to ensure repairs in the event of a breakdown, the absence of preventive maintenance of the structures, the long duration of the breakdowns and the abandonment of certain structures. This is in line with our data regarding the lack of maintenance of structures, the long duration of breakdowns and the abandonment of hydraulic structures [13].

For Korogo (2012), the supply of drinking water to households was made difficult due to inappropriate management and lack of monitoring of equipment. The community exploitation of hydraulic hand pumps came up against a major obstacle, that of raising the necessary funds for the maintenance of the pumps by the replacement of parts, eg out of order [16]. However, the most developed models of fundraising, such as the family contribution or even payment by bucket, often resulted in tensions within the communities (some considering that they paid more than others), leading to repair times that were poorly controlled and ultimately disappointing for the families who ended up abandoning the water point [17].

In the event of failure of the water works, the contract of use with the population is broken and the latter is subject to arbitration of recourse to the alternatives at hand.

Thus, the inhabitants of the Yakusu fluvial HZ, with the Congo River and the various tributaries that surround it, are exposed to the temptation to use it as a source of drinking water, unfortunately without any measure. However, interventions such as water treatment and hygienic water storage would obviously accelerate progress towards the achievement of the Millennium Development Goals (MDG) target 10 in situations where families have access to quantities of water sufficient but where it is of mediocre or dubious quality [18]. On the other hand, those of the HZ Lubunga use traditional wells. In the end, the consequent provisions were not taken into account during the execution of the project to prepare the post-certification period which is chaotic.

#### **LEVEL OF SATISFACTION**

The assessment of the Sanitized Villages program and the level of satisfaction with the implementation of the activities of this program was favorable for the vast majority of subjects, indistinctly from HZs. Satisfaction with the quality of the rehabilitated water structures was perfect in the HZ Lubunga, it was significantly different in the HZ Yakusu. As for the location of improved water structures, the "appropriate" rating was statistically high in HZ Yakusu and "remote" significantly high in HZ Bengamisa ( $p < 0.05$ ).

Contrary to the situation in Burkina Faso, the results of the household survey revealed that in rural areas, 64.3% had a good appreciation of management procedures related to water [13]. which is different from our results.

In this case, the observation is that there is a good appreciation of the population on the procedures for the implementation of the NPSSV and the quality of the water, which is a good thing for the acceptance of the program activities, even if there was an information deficit on the other components of the NPSSV interventions, in particular sanitation, hand hygiene, the leadership of local village committees. In South Kivu in the NPSSV area, the beneficiaries were less satisfied with the inefficiency of the village committees [10].

The choice of location for water structures must be unanimous and take into account sociocultural considerations. In Côte d'Ivoire as in South Kivu, the failure to take into account the socio-economic and cultural realities of the beneficiary communities was identified among the elements that led to the failure of the drinking water supply project in rural areas [11].

#### **DIARRHEAL MORBIDITY**

Diarrheal episodes were observed in 33% of households, the median of person with diarrhea and that of children under 5 years old is not different between HZs ( $p > 0.05$ ).

The persistence of high cases of diarrhea in the NPSSV area was a logical consequence of the massive use of unimproved water sources.

This corroborates the results of a study conducted recently in two HZs of Tshopo province, covered by NPSSV, where the prevalence of diarrhea among children under 5 was 13% (CI 95: 10%-16%) with no statistical difference with that observed among children from households not covered by the program ( $p > 0.05$ ) [9]. The sanitized villages were no longer in name, the effects of the program had disappeared.

A systematic study carried out in 2005 concluded that diarrheal episodes were reduced by 25% when the water supply was improved and by 39% by treatment and good storage of water at home [19]. In the current post-certification context, it is essential to consider alternative strategies for improving the quality of drinking water in households to control diarrheal diseases in the PNEVA areas [20].

## 5 CONCLUSION

The knowledge of the mothers on the key aspects of the NPSSV is limited, their appreciation of the implementation of the activities is satisfactory and the households no longer use the improved water points. This maintains a high incidence of diarrhea at the household level. Other measures are essential to deal with it.

## LIST OF ABBREVIATIONS

DRC: Democratic Republic of Congo  
HZ: Health Zone  
MDG: Millennium Development Goals  
NPSSV: National program of Sanitized Schools and Villages  
SD: Standard Deviation  
SDG: Sustainable Development Goal  
TFP: Technical and Financial Partners.

## CONFLICTS OF INTEREST

The authors declare that there is no conflict of interest.

## SOURCE OF FINANCING

The study was funded by the researcher himself.

## AUTHORS' CONTRIBUTION

All the authors contributed to the conduct of this research work and to the drafting of the manuscript. They all read and approved the final version.

- **Basandja Longembe**: writing the protocol and tools, collecting and analyzing data and writing the manuscript.
- **Panda Lukongo** and **Losimba Likwela**: protocol validation and final reading.

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