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ORIGINAL RESEARCH

Practice of Epidemiological Surveillance and Availability of Resources in Health Facilities of the Littoral Region of Cameroon: A Cross-Sectional Study

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Purpose: Epidemiological surveillance is recommended in health systems to monitor existing and emerging health threats and guide the response to epidemics. This study was conducted to assess the distribution of tools and practice of epidemiological surveillance in health facilities in the littoral region of Cameroon.

Materials and Methods: This cross-sectional descriptive study was conducted in the health districts of the littoral region of Cameroon from April to May 2024. This study targeted health facilities selected through stratified random sampling from eight health districts. Surveyors collected data using a face-to-face structured questionnaire administered to the head of each health facility on the implementation of epidemiological surveillance activities.

Results: Of the 345 health facilities reached, 320 (92.8%) consented to participate. Of 320 health facilities, 252 (78.8%) declared that they were involved in the implementation of epidemiological surveillance. None of the eight health districts had all of their facilities involved in disease surveillance. Less than 30% of health facilities conduct surveillance for hemorrhagic fever while approximately 80–90% conduct surveillance for cholera, measles, and yellow fever. Only 14 (5.6%) health facilities declared to conduct surveillance of all events. A total of 200 (79.4%) health facilities had at least one personnel trained in epidemiological surveillance and the mean number of personnel trained per health facility was 2.2 (±1.7). Nurses were the category more frequently involved in epidemiological surveillance (95.2%). A total of 123 (48.8%), 78 (31.0%), and 217 (86.1%) health facilities had registers/line listings, integrated disease surveillance and response guide, and notification forms, respectively.

Conclusion: Health facilities' coverage regarding the implementation of epidemiological surveillance remains limited with the situation being more critical in private confessional health facilities. The implementation of epidemiological surveillance in health facilities needs to be monitored, and personnel training and surveillance tools should be considered.

Keywords: epidemiological surveillance, disease surveillance, Cameroon, health facility preparedness

Background

The available literature reveals that epidemics have been responsible for significant morbidity and mortality globally over the years.[1,2] The occurrence of epidemics depends on several factors, including population movement, economic realities, preparedness of actors involved in surveillance, and the capacity of health systems to respond to possible outbreaks.[3,4] The implementation of an epidemiological surveillance system is recommended in every country for the timely detection and control of diseases through the systematic collection, exploitation, use, and dissemination of health data.[5]

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The Cameroon health system organizes the surveillance of epidemic-prone diseases and health emergencies.[6] This system is mainly organized to enable the detection of suspected cases of epidemic-prone diseases at health facility level, which are then reported to a higher level of the health pyramid through the health district for investigation and response.[7] The implementation of epidemiological surveillance in Cameroon, as in other countries in Africa, is guided by the Integrated Disease Surveillance and Response Technical Guidelines.[5] This guide presents the missions of each body in the health pyramid and procedures expected for effective epidemiological surveillance.[5,7] The effective implementation of this organization in health facilities, programmes, and at different levels of the health pyramid has not yet been evaluated.

Despite the existence of this system, Cameroon has been subjected to a recurrent and wide range of epidemics over the years, with the most recent being cholera.[8–12] Recent outbreaks, such as the 2018–2023 cholera outbreak in Cameroon resulted in over 18000 cases with a case fatality rate of 2.7%, highlighting the urgent need for improved surveillance and rapid response systems in the country.[13] In Cameroon, as in many African countries, the setup system is significantly hindered by a low rate of detection, notification, and investigation of suspected epidemic-prone disease cases, as well as by insufficient coverage, timeliness, and completeness of case notifications.[14–17] Some of the reasons for these performances may be the limited preparedness of health facilities in terms of infrastructure and resources to conduct the expected activities since they are responsible for the initial detection of suspected cases and reporting as per existing guidelines.[18] In Cameroon, the epidemiological surveillance system is additionally challenged by the lack of real-time data sharing from health facilities who report weekly, this could hinder real time data exploitation.

Understanding the current state of health facilities' preparedness and practices in terms of implementing surveillance activities is essential for identifying gaps and intervention targets. This study aimed to assess the distribution of resources and practice of epidemiological surveillance in health facilities in the littoral region of Cameroon. This study aims to contribute to the development of strategies to enhance the effectiveness of epidemiological surveillance systems and improve disease control.

Methods

Study Design

A cross-sectional study was conducted in the health districts of the littoral region of Cameroon, targeting health facilities selected by stratified random sampling. Trained surveyors collected data using a face-to-face structured questionnaire administered to the head of each health facility regarding the availability of resources for epidemiological surveillance and the implementation of related activities.

Study Area and Period

This study was conducted between April and May 2024. It covers selected health districts in the littoral region of Cameroon. The Littoral region is one of the Cameroon regions with the highest number of inhabitants, and is often subject to epidemics. It comprises 24 health districts organized into urban, semi-urban, and rural areas. This study was conducted in eight health districts. Figure 1 presents a map of the littoral region of Cameroon with the health districts targeted in the present study.

Study Population

The targeted health facilities from health districts that included Deido, New Bell, Bonassama, Cité des Palmiers, Njombe Penja, Nkongsamba, Edea, and Manoka. All health facilities that officially existed in the targeted health districts were eligible to participate. Health facilities that were closed during data collection were excluded.

Sampling

Eight of the 24 existing health districts were selected by probabilistic sampling and stratified according to the type of health district (urban, rural, and semi-urban). The health facilities were randomly selected from each district. An urban health district is one whose at least 80% of its health areas are located in urban areas, a rural health district is one whose at least 80% of its health areas are located in rural areas, and a semi-urban health district has part of its health areas located in urban areas.

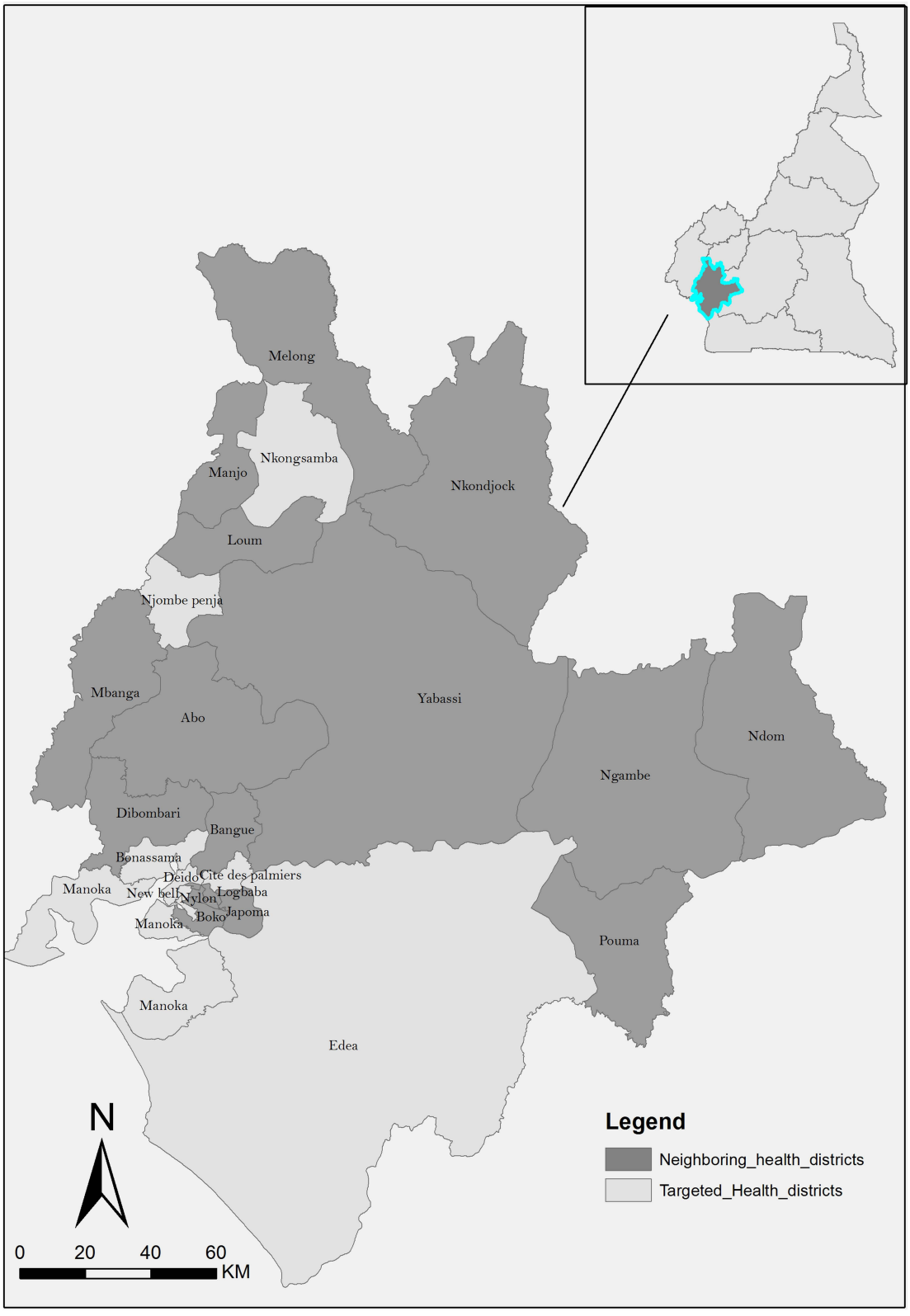

Figure 1 Map of the Littoral region of Cameroon with targeted health districts.

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Sample Size

The minimum sample size was estimated at 225 health facilities, assuming that 77.8% of health facilities have personnel trained on epidemiological surveillance in health facilities, as assessed in a previous study conducted in two littoral health districts, with a relative variance of 0.15, a design effect of 1.2, a non-response rate of 10%, and a 95% confidence interval.[18]

Data Collection Tool

Data were collected using a pretested face-to-face questionnaire administered by trained surveyors to the heads of health facilities via a digital questionnaire integrated into the Kobo Toolbox. The questionnaire was designed to capture information on health facilities' characteristics, availability of personnel and tools for epidemiological surveillance, and activities implemented in health facilities regarding epidemiological surveillance.

Data Collection Procedures

The heads of the selected institutions were contacted, and the aims, targets, and procedures of the survey were presented. Those who consented to participate in the study were invited to provide written informed consent. Participants who consented to participate were administered a face-to-face questionnaire. Those who could not meet after three visits and those who refused to participate were considered as non-respondents.

Data Management and Analysis

The collected data were cleaned prior to data analysis. With a 95% confidence interval, we estimated the proportion of health facilities conducting epidemiological surveillance, health facilities with trained health personnel, health facilities monitoring epidemic-prone diseases per event monitored, and health facilities with surveillance guidelines and tools. The availability of trained personnel and surveillance tools were presented with respect to health facilities' categories.

Ethical Considerations

This study was conducted to assess the availability of resources in health facilities and the activities implemented in epidemiological surveillance. All participants were informed of the objectives and procedures of the survey and only those who consented to participate were included and interviewed. No confidential data were collected from the respondents. Data were coded and accessible only by the data management team and investigator team. All methods related to this study were performed in accordance with the Declaration of Helsinki. The study protocol was approved by the Littoral Regional Ethics Committee for Human Health Research (N°2023/0017/CE/CRERSH-LITTORAL).

Results

Coverage and Characteristics of Health Facilities

Of 345 health facilities reached, 320 (92.8%) consented to participate. Table 1 presents the distribution of health facilities reached and consenting per district. Table 2 presents the general characteristics of consenting to health facilities per health district, with respect to the type and category of health facilities.

Epidemiological Surveillance in Health Facilities

Of the 320 health facilities included, 252 (78.8% [73.9–82.9]) declared being involved in the implementation of epidemiological surveillance, with none of the health districts having all their facilities involved in the surveillance of diseases under surveillance. The Manoka Health District has no health facilities involved in epidemiological surveillance. Figure 2 shows the surveillance events monitored by health facilities. Less than 30% of health facilities conduct surveillance for hemorrhagic fever, smallpox, rabies, and dengue, whereas more than 80% conduct surveillance for cholera, measles, and yellow fever. Only 14 (5.6%) health facilities conducted surveillance of all events. The distribution of health facilities conducting epidemiological surveillance per type and health district are presented in Table 3.

Table 1 Distribution of Reached and Consented Health Facilities per Health District

Health District	Existing N=	Reached N=		Consented N=	
		n	%	n	%
Bonassama	108	75	69.4	74	98.7
Cité des Palmiers	99	70	70.7	70	100.0
Deido	153	107	69.9	84	78.5
Edea	60	21	35.0	11	52.4
Manoka	11	8	72.7	8	100.0
New bell	62	43	69.4	43	100.0
Njombe-Penja	15	11	73.3	10	90.9
Nkongsamba	34	20	58.8	20	100.0
Total	542	345	63.7	320	92.8

Human Resources for Epidemiological Surveillance

Of the 252 health facilities involved in the implementation of epidemiological surveillance, 199 (79.0%) declared having personnel that acted as focal points for epidemiological surveillance activities. The average number of personnel involved in epidemiological surveillance per health facility was 3.3 (±1.9). A total of 200 (79.4%) health facilities had at least one personnel trained in epidemiological surveillance and the mean number of personnel trained per health facility was 2.2 (±1.7). Figure 3 presents the qualifications of the personnel involved in epidemiological surveillance in health facilities for each category. Nurses were the category most frequently involved in epidemiological surveillance activities in health facilities (95.2% of health facilities).

Tools for the Implementation of Epidemiological Surveillance Activities

Table 4 presents the distribution of the tools used for epidemiological surveillance in each type of health facility. Only 123 (48.8%) had registers or line listings for epidemic-prone diseases under surveillance and 78 (31.0%) had Integrated Disease surveillance and response guide. Regarding the forms for notification of identified suspected cases of diseases under surveillance, 217 (86.1%) had available forms.

Difficulties Encountered During Implementation of Epidemiological Surveillance Activities

Of the 252 conducting epidemiological surveillance activities, 107 (42.5) reported difficulties in implementing epidemiological surveillance activities. Table 5 presents the difficulties encountered by health facilities during the implementation of epidemiological surveillance activities. The most frequent difficulty was the insufficiency of financial resources dedicated to epidemiological surveillance, as declared by 72 health facilities (67.3%).

Discussion

This study revealed that 78.8% of health facilities were involved in epidemiological surveillance. Less than 30% of health facilities conduct surveillance for hemorrhagic fever, smallpox, rabies, and dengue, whereas more than 80% conduct surveillance for cholera, measles, and yellow fever. Only 5.6% of the health facilities declared that they were conducting surveillance of all events. A total of 79.4% of health facilities had at least one personnel trained in

Table 2 Distribution of Health Facilities per Type, Health District, Category and Location

	Frequency	Proportion (%)	Confidence Intervals (%)
Category of health facility			
Health facilities of referral level	10	3.1	1.7–5.7
Health facilities of intermediate level (regional)	8	2.5	1.3–4.8
District hospitals	78	24.4	20.0–29.4
Sub-divisional medical centers	51	15.9	12.3–20.3
Integrated health centres	173	54.1	48.6–59.4
Health district			
Bonassama	74	23.1	18.8–28.0
Cité des Palmiers	70	21.9	17.7–26.7
Deido	84	26.2	21.7–31.3
Edea	11	3.4	1.9–6.0
Manoka	8	2.5	1.3–4.8
New bell	43	13.4	10.1–17.6
Njombe-Penja	10	3.13	1.7–5.7
Nkongsamba	20	6.2	4.1–9.5
Location of health district			
Rural	38	11.9	8.8–15.9
Semi-urban	70	21.9	17.7–26.7
Urban	212	66.2	60.9–71.2
Type of health facility			
Confessional	34	10.6	7.7–14.5
Private	259	80.9	76.3–84.9
Public	27	8.4	5.9–12.0

epidemiological surveillance. Only 48.8%, 31.0%, and 86.1% of the health facilities had registers or line listings, integrated disease surveillance and response guide, and notification forms, respectively.

Epidemiological surveillance is recommended as the key measure to detect diseases under surveillance.[19] In Cameroon's health system, policies and recommendations are decentralized for operational implementation at the district level.[6,20] Health centers (integrated health centers and sub-divisional medical centers) represent the first point of contact between the population and the health system in a given area. Health facilities are responsible for case detection and reporting of diseases that are under surveillance. The present study assessed the implementation of epidemiological surveillance activities in health facilities in targeted health districts. The results revealed that 78.8% of the health facilities surveyed carried out activities to detect events under surveillance, whereas 21.2% declared that they were not involved. None of the health districts included in this study had coverage of 100% of the health facilities involved in epidemiological surveillance. The fact that not all health facilities were involved in this activity is a cause for concern, as it could mean that the epidemic prone diseases in the health facilities' areas of responsibility could be missed, leading to

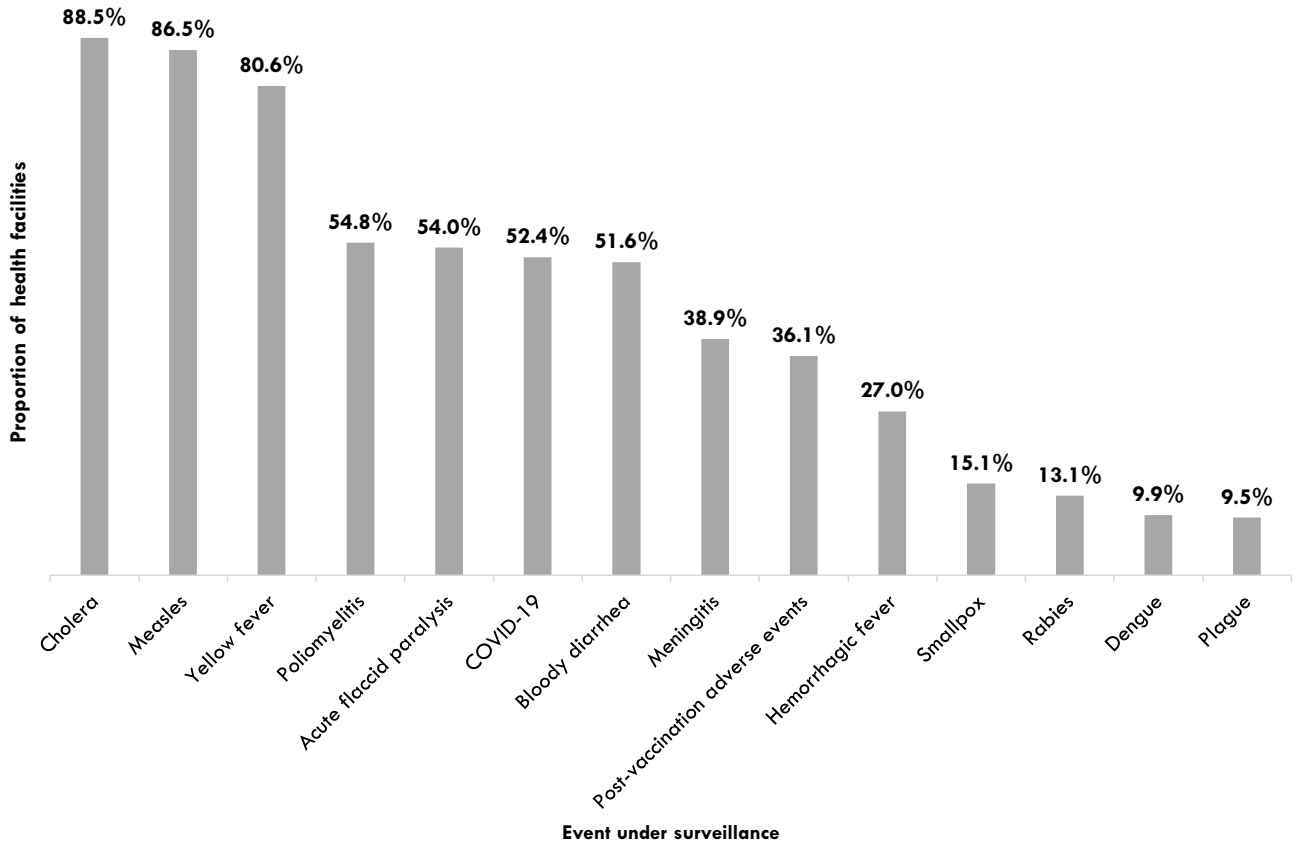

Figure 2 Diseases under surveillance in health facilities of the Littoral region in 2024.

underdetection. Setting up regulations to make surveillance of epidemic-prone diseases part of each facility's core activities could improve this situation.

Depending on the environmental realities and previous exposure to certain germs, the diseases or events under surveillance vary and are adapted by the country.[5,7,21,22] Currently in Cameroon, there are a total of 34 events and diseases under surveillance according to the Integrated Disease Surveillance and Response Guide.[7] It is expected that these diseases will be monitored simultaneously to achieve maximum coverage. Only 14 health facilities (5.6%) declared conducting surveillance for all events from the selected list of events under surveillance. However, the diseases that were under surveillance in more than 80% of health facilities were cholera, measles, and yellow fever. This is in line with the fact that Cameroon has experienced recurrent epidemics of these diseases, as in the case of cholera, the last epidemic of which started in 2021.[11] The fact that only a small proportion of health facilities monitor multiple diseases is also consistent with the reported under-detection and reporting of diseases under surveillance.[23,24] Similarly, the fact that the surveillance system requires the simultaneous monitoring of several events makes implementation more complex because each event is based on a different definition for suspected cases, which could lead health facilities to prioritize diseases that are more frequent in the current context.[7] This low proportion of health facilities complying with surveillance guidelines could also imply poor follow-up by the body in charge of monitoring and supervising the proper implementation of epidemiological surveillance procedures.

Surveillance of epidemic-prone diseases represents a field with its own procedures and standards, from case finding through investigation to response.[5,19] To this end, the individuals involved in this activity are expected to be prepared accordingly to these requirements. In the present study, we assessed the number of health facilities involved in epidemiological surveillance that had at least one personnel trained in surveillance procedures, and found that 20.6% of health facilities did not have at least one personnel trained in epidemiological surveillance. In addition, 35.5% reported a lack of human resources or staff training owing to difficulties in implementing epidemiological surveillance activities.

Table 3 Distribution of Health Facilities Conducting Epidemiological Surveillance per Type and Health District

	Frequency N=252	Proportion (%)	Confidence Intervals (%)
Category			
Integrated health centres	138	54.8	48.4–61.0
Sub-divisional medical centers	44	17.5	13.0–22.7
District hospitals	54	21.4	16.5–27.0
Health facilities of intermediate level (regional)	6	2.4	0.9–5.1
Health facilities of referral level	10	4.0	1.9–7.2
Health district			
Bonassama	50	19.8	15.1–25.3
Cité des Palmiers	62	24.6	19.4–30.4
Deido	73	29.0	23.4–35.0
Edea	9	3.6	1.6–6.7
New bell	32	12.7	8.8–17.4
Njombe-Penja	8	3.8	1.4–6.2
Nkongsamba	18	7.1	4.3–11.0
Type of health facility			
Confessional	24	9.5	6.2–13.8
Private	202	80.2	74.0–84.9
Public	26	10.3	6.8–14.7

The lack of trained and inadequately trained staff has been reported as a difficulty in integrated disease surveillance and response in other settings.[25–27] Although the training of healthcare personnel was not directly mentioned as an indicator, other studies have revealed that healthcare personnel have inadequate knowledge and practice of integrated disease surveillance and response, which could imply a need for training.[28,29] The lack of trained personnel in health facilities does not necessarily mean that epidemiological surveillance activities are not being implemented correctly, as experience can be considered. However, the standardization of implementation procedures is an asset for the effective use of the resulting information. Moreover, training has already been documented as an effective tool to improve epidemiological surveillance performance; hence, it should be considered as an intervention to improve epidemiological surveillance system.[29,30]

The implementation of epidemiological surveillance in the WHO Afro Region is guided by the Integrated Disease Surveillance and Response (IDSR) Technical Guidelines, which are occasionally updated.[5] Locally, at the state level, these guidelines are translated into guidelines to accompany the implementation of IDSR in specific countries.[7,21,22] The present study revealed that only 31.0% of the surveyed health facilities had the Cameroon Integrated Disease Surveillance and Response Technical Guide. In addition, other essential surveillance tools such as reporting forms, case notifications, and investigation guides are lacking in many health facilities. Other studies have documented the lack of surveillance tools in the context of cholera surveillance.[18] The lack of these basic consumables calls into question the support and supervision of healthcare facilities in the epidemiological surveillance process. Data on the availability of these tools have been collected cross-sectionally and may not imply that tools, such as reporting forms, are not often present. Given the importance of these tools to guide epidemiological surveillance and ensure the reporting of detected

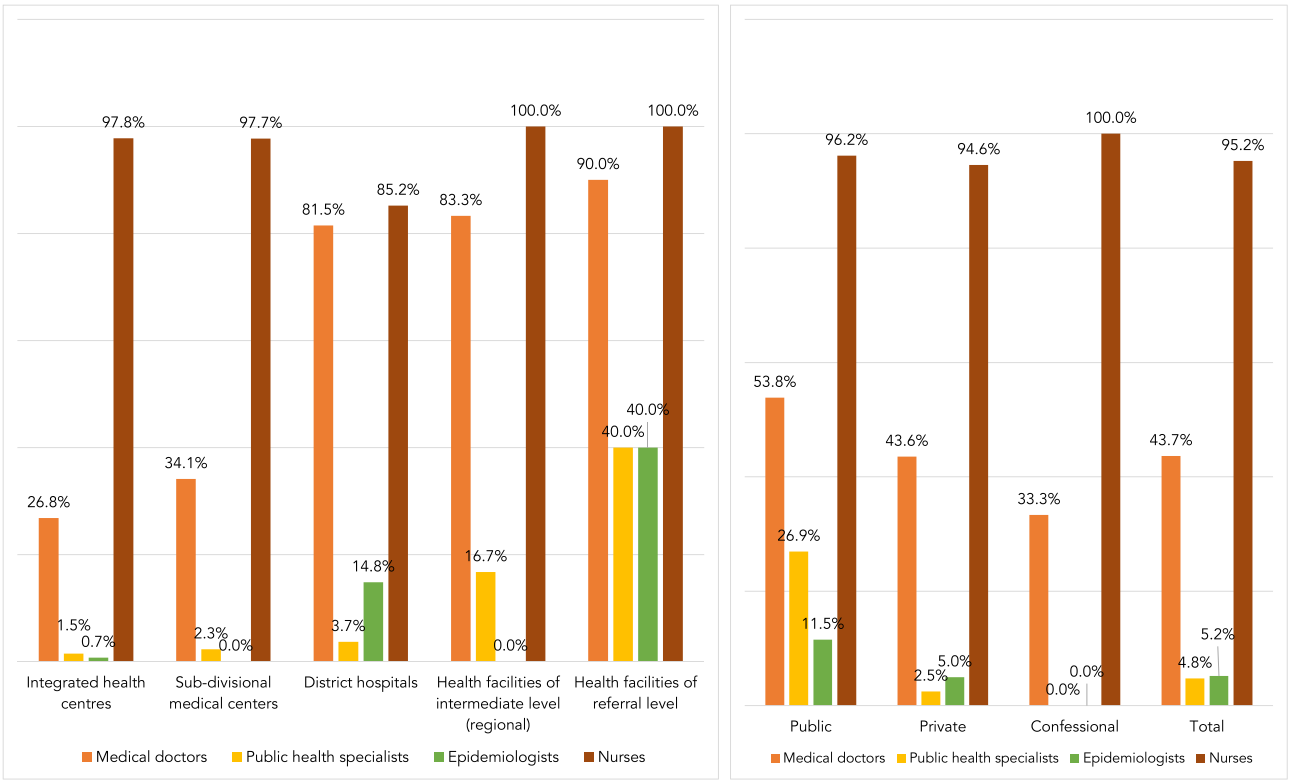

Figure 3 Qualifications of health personnel involved in epidemiological surveillance activities per category and type of health facilities in the Littoral region of Cameroon; 2024.

cases, all health facilities should be provided with a minimum number of tools to ensure the swift implementation of epidemiological surveillance activities.

The interpretation of the results of this study should take into consideration some limitations. All the targeted health facilities of the health districts did not consent to participate and thus could be a source of bias. The reasons of refusal were not collected. This study did not collect data on all aspects of the implementation of epidemiological surveillance,

Table 4 Availability of Tools for the Implementation of Epidemiological Surveillance Activities

Tools	Confessional		Private		Public		Total	
	n	%	n	%	N	%	n	%
Integrated disease surveillance and response guide	7	29.2	58	28.7	13	50.0	78	31.0
Reporting forms for suspected cases of diseases under surveillance	24	100.0	168	83.2	25	96.2	217	86.1
Registers or line listings (physical or electronic)	16	66.7	88	43.6	19	73.1	123	48.8
Case notification guides for diseases under surveillance	16	66.7	127	62.9	18	69.2	161	63.9
Case investigation guides for diseases under surveillance	14	58.3	83	41.1	16	61.5	113	44.8
AEFI notification forms	24	100.0	154	76.2	22	84.6	200	79.4
Telephone line	19	79.2	158	78.2	22	84.6	199	79.0
At least one computer	18	75.0	144	71.3	17	65.4	179	71.0
Data analysis software	9	37.5	69	34.2	9	34.6	87	34.5
Operating budget	6	25.0	47	23.3	13	50.0	66	26.2

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Table 5 Difficulties Encountered During Implementation of Epidemiological Surveillance Activities

Difficulties Encountered	Frequency	Proportion
Insufficient financial resources	72	67.3
Insufficient technical resources for case notification	48	44.9
Insufficient equipment	44	41.1
Lack of access to implementation tools	39	36.4
Low case notification rates in the field	37	34.6
Lack of human resources	35	32.7
Staff not trained in epidemiological surveillance	3	2.8
Poor completion of consultation registers	1	0.9
Other	6	5.6

such as the actual reporting process and data analysis. Moreover, the reasons for the non-implementation of epidemiological surveillance and the reasons for the lack of guidelines were not collected. Qualitative studies investigating reasons of non-implementation of epidemiological surveillance in health facilities should be conducted to allow better understanding. The survey questions were administered directly to the respondents rather than observed, which could have led to an information bias.

Conclusion

This study revealed issues surrounding the implementation of epidemiological surveillance in health facilities with a reported history of high exposure to epidemics. Not all health facilities were involved in epidemiological surveillance, which could lead to delayed oubreaks'detection. Approximately three-quarters of the health facilities had at least one personnel trained in epidemiological surveillance. Gaps in the availability of surveillance tools, such as guides, have been noted. The various gaps observed in the present study should be considered to improve disease prevention and response to surveillance. The implementation of surveillance activities in health facilities should also be monitored and supervised by assigned regulatory bodies such as district health services and regional delegations to ensure compliance with policies. Continuing training programs for personnel in charge of epidemiological surveillance should be established and renewed regularly.

Data Sharing Statement

The datasets used and/or analyzed during the current study are available from the corresponding author upon reasonable request.

Ethical Approval and Consent to Participate

All participants were informed of the objectives and procedures of the survey and only those who provided informed consent were included and interviewed. The protocol of this study was approved by the Littoral Ethics Committee for Human Health Research (N°2023/0017/CE/CRERSH-LITTORAL).

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Author Contributions

All authors made a significant contribution to the work reported, whether that is in the conception, study design, execution, acquisition of data, analysis and interpretation, or in all these areas; took part in drafting, revising or critically reviewing the article; gave final approval of the version to be published; have agreed on the journal to which the article has been submitted; and agree to be accountable for all aspects of the work.

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Disclosure

The authors declare that they have no competing interests.

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