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Original Research Article

Availability of Resources for Epidemiological Surveillance during the Second Wave of the COVID-19 Pandemic. Descriptive Study in the Edea Health District, Cameroon

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Abstract

Epidemiological surveillance is a key intervention to break the epidemiological silence of a disease. The complexity and workload of maintaining surveillance systems on an ongoing basis, as well as the ability to mobilize human resources in an alert situation, requires specialized professionals, material resources, and financial resources. In many developing countries, particularly francophone ones, the development of surveillance systems is hampered by a number of difficulties, including a lack of financial means and specialized human resources. This study, therefore, assesses the availability and allocation of resources for epidemiological surveillance in the health facilities of the Edea health district. A descriptive cross-sectional study conducted from January 15 to March 30, 2021, targeted all the 17 surveillance focal points from 17 health facilities in the Edea health district. An observation grid was used to collect data. The coverage of health facilities was 100%. Concerning material resources, 59% (10/17) of health facilities had computer equipment, although this equipment was not always entirely dedicated to epidemiological surveillance. In 47% (8/17) of health facilities, data entry was done on personal tablets and/or smartphones. Concerning human resources, 6% (1/17) of the focal points were trained in epidemiological surveillance. Also, 24% (4/17) of the surveillance focal points were briefed at the Edea district health service on the use of the District Health Information System-2 (DHIS-2). None of the health facilities, or 0%, had operating funds for monitoring surveillance activities. In the Edea health district during the second wave of the COVID-19 pandemic, there weren't enough materials or funds set aside for this kind of work, and even people who work on epidemiological surveillance weren't well trained. This leads to ineffective surveillance and a lack of preparation for public health emergencies.

Keywords: Availability, Cameroon, COVID-19, Epidemiological surveillance, Resource allocation

INTRODUCTION

According to the WHO dashboard, the SARS-CoV-2 pandemic continues to pose a global health challenge, including in Cameroon (https://www.health.gov.au). There are more than 28 thousand confirmed coronavirus disease (COVID-19) cases with more than four hundred deaths. Public health surveillance is very important, especially during the COVID-19 pandemic as a global cause of the community's morbidity and mortality. Public

health surveillance gets worse from time to time (Gebru et al., 2021).

Availability and allocation of resources for epidemiological surveillance needs arise from the state's interference with the allocation function, which seeks to promote the adjustment of resources with the provision of certain public goods and services (Barbosa et al., 2020), especially during the COVID-19 pandemic.

Surveillance is the continuous, systematic collection, analysis, and interpretation of health-related data needed for the planning, implementation, and evaluation of public health practice (World Health Organization, 2012). Event-based and community-based surveillance is being implemented for priority zoonotic diseases and illnesses of public health importance in Cameroon (Communicable disease surveillance and response systems, 2021).

The surveillance strategy depends on the diseases under surveillance, the objectives of the surveillance system, the methods for conducting surveillance and how the surveillance data is used to inform public health policy and practice. For example, an early warning surveillance system needs to be more comprehensive, while a system that serves a program monitoring function could be conducted through sentinel sites (Communicable disease surveillance and response systems, 2021). The important surveillance levels are central, intermediate (province or region, district), peripheral (sub-district, health facility) and community level. Each of these levels may comprise formal and private health-care providers that may or may not be included in the surveillance system. Other stakeholders and implementers include disease-specific programs, public health laboratories, and public health training institutions (Communicable disease surveillance and response systems, 2021). Thus, the establishment of an effective and integrated epidemiological surveillance system requires the existence of an efficient health information system and governance, which in turn require a number of material, human, and financial resources and mechanisms (Ngo Mouaha et al., 2019).

However, enhanced surveillance and response activities can only be performed if the required and appropriate financial, human, and logistical resources are in place. This means identification of the resources needed to implement the various surveillance activities at each level of surveillance during the planning stage. These resources should be mobilized from potential sources and managed and used efficiently (Comm-unicable disease surveillance and response systems, 2021).

In many developing countries, particularly franco-phone countries, the development of surveillance systems is faced with multiple difficulties, including the lack of financial means and specialized human resources (Ngo Mouaha et al., 2019). Very few studies have examined the availability and allocation of resources for zoonotic disease public health interest surveillance and response activities in Cameroon during the end of the second wave of COVID-19 pandemic.

Objectives

This study assesses the availability and allocation of resources for integrated epidemiological surveillance in the health facilities of the Edea health district in Cameroon.

METHODS

Study design and participants

This was a descriptive cross-sectional study conducted from 15 January to 30 March 2021. A total of 17 health facilities were present in the planning of epidemiological surveillance site visits in the Edea health district, namely: Plateau Integrated Health Centre, Mount Charity Health Centre, Domus Mariae Health Centre, La Manne Health Centre, The military garnison Health Centre, Trinity Health Centre, Santa Maria Health Centre, Malimba Gare Integrated Health Centre, Balm in Gilead Health Centre, Esperance Health Centre, Ekite Integrated Health Centre, Malimba urban Integrated Health Centre, Ad lucem Hospital, Regional hospital annex Edea, Delangue Medical District Centre, Sainte Odile Catholic Hospital, Beon Integrated Health Centre. Including 17 surveillance focal points one surveillance from each health facility.

Data collection tools and data processing

Data was obtained using an "observation grid" regarding the disease preventable by immunization like measles, yellow fever, poliomyelitis, neonatal tetanus, cholera, Covid19, and meningitis.

Surveillance type Ndongo and Ongolo-Zogo, 2010

- Active; is a technique in which staff members contact health care providers or the general public on a frequent basis to obtain information on health issues. Active surveillance delivers the most precise and timely data, but it is also the most expensive.
- Passive; A health jurisdiction's passive surveillance system gets reports from hospitals, clinics, public health units, and other sources. Passive surveillance is a low-cost method of covering huge areas while providing vital information for community health monitoring.

Surveillance health center priority levels

The priority level depends on the number of visits per

Table 1. The observational grid regarding the 17 health facilities in the Edea health district

Health facilities	Surveillance (type)	Site priority	Training	Finance	Availability of computer	Briefing on DHIS 2
Plateau Integrated Health Centre	Active	Intermediate	No	No	Yes	Yes
Mount Charity Health Centre	Active	Low	No	No	Yes	No
Domus Mariae Health Centre	Active	Low	No	No	Yes	No
Manna Health Centre	Active	Low	No	No	No	Yes
The military garnison Health Centre	Active	Low	No	No	Yes	No
Trinity Health Centre	Active	Low	No	No	No	No
Santa Maria Health Centre	Active	Low	No	No	Yes	No
Malimba park Integrated Health Centre,	Active	Low	No	No	No	No
Balm in Gilead Health Centre	Active	Low	No	No	No	No
Esperance Health Centre	Active	Low	No	No	No	No
Ekite Integrated Health Centre	Active	Intermediate	No	No	No	No
Malimba urban Integrated Health Centre	Active	Intermediate	No	No	Yes	No
Ad lucem Hospital	Active	High	No	No	Yes	No
Regional hospital annex Edea	Active	High	Yes	No	Yes	Yes
Delangue Medical District Centre	Active	High	No	No	Yes	No
Sainte Odile Catholic Hospital	Active	High	No	No	Yes	Yes
Beon Integrated Health Centre	Active	Low	No	No	No	No
Total	17(100.0%)		1(6.0%)	0(0.0%)	10(59.0%)	4(24.0%)

month.

- The high-level priority has to be visited every week of the month.
- The intermediate level has to be visited twice per month.
- Low is visited once per month (Technical Guidelines for Integrated Disease Surveillance and Response in the African Region: Third edition).

1.) Material resources availability of computer(yes,no)
2.) Human resources:
- Training of surveillance focal points on epidemiological surveillance (yes, and no)
- Focal points briefing on DHIS 2 (yes, and no)

3.) Financial resources: Funds for monitoring surveillance activities (yes, and no)

Data Quality assurance, and analysis

Data collected was protected and stored at the Edea health district and in password-protected software Open Data Kit (ODK), District Health Information Software 2(DHIS 2). We used Micro-Soft (MS) Excel to calculate the proportion of staff trained on epidemiological surveillance; the proportion of staff trained/briefed on DHIS2; the proportion of health facilities with computers and the proportion of health facilities with funds for epidemiological surveillance.

Ethical considerations

We proceeded through a series of steps to obtain the various authorizations necessary for data collection. In addition, all health personnel in the health facilities concerned were informed of the purpose of the study and had voluntarily agreed to participate.

RESULTS

All the 17 health care facilities in the Edea health district, active surveillance using an "observation grid" regarding diseases preventable by immunization like measles, yellow fever, poliomyelitis, neonatal tetanus, cholera, COVID-19, and meningitis. There are 23% (4/17) high priority sites, 18% (3/17) medium priority sites, and 59% (10/17) low priority. (Table 1, and Figure 1)

Material resources

Fifty-nine percent (10/17) of health facilities had computer equipment, although this equipment was not always entirely dedicated to epidemiological surveillance. (Figure 2)

Human resources

Six percent (1/17) of the focal points were trained in epidemiological surveillance. (Figure 3)

Twenty-four per cent (4/17) of the surveillance focal points were briefed at the Edea district health service on the use of the DHIS 2. However, at least one of the health personnel in these facilities had been trained or briefed on the use of the DHIS 2. (Figure 4)

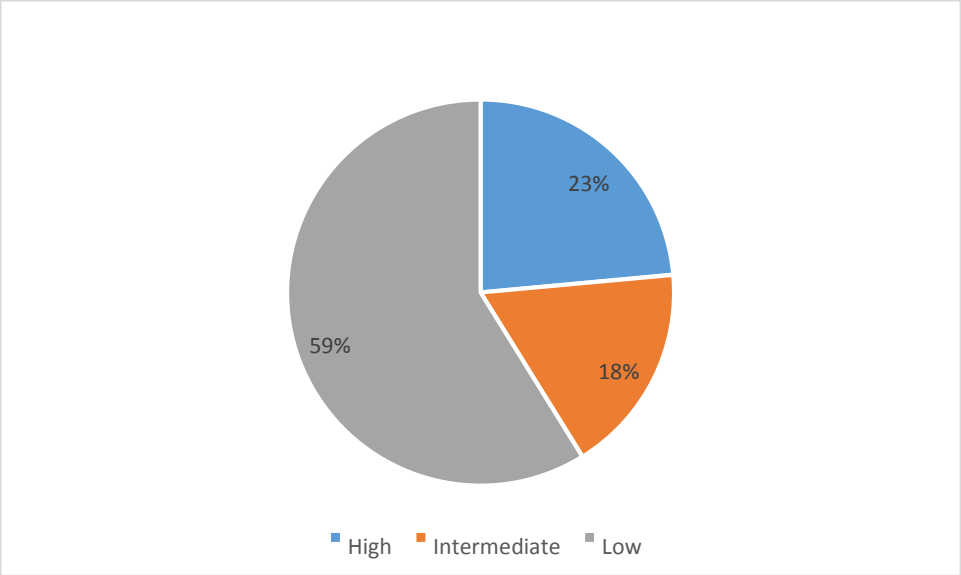

Figure 1. The frequency of surveillances priority level of health.

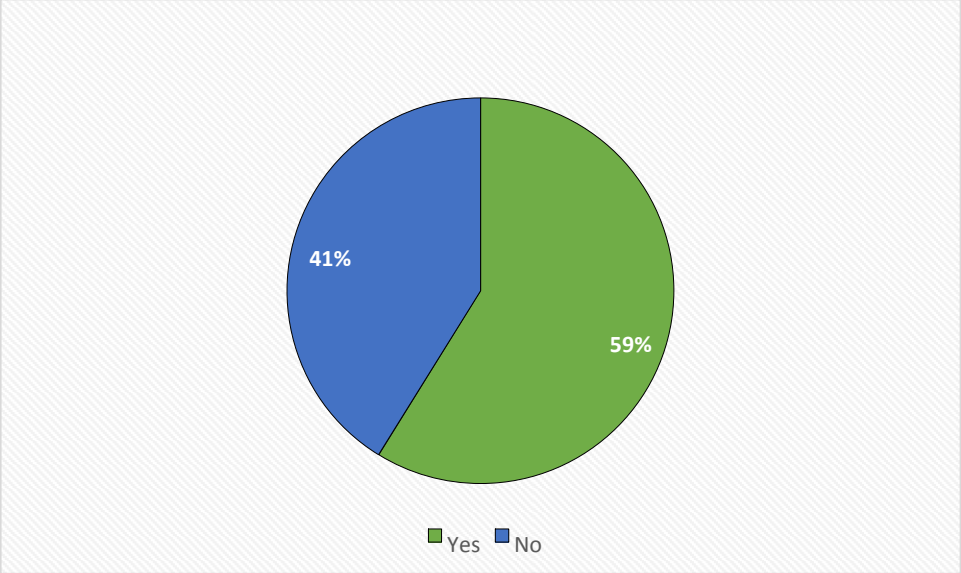

Figure 2. The frequency of Availability of computer in the facilities

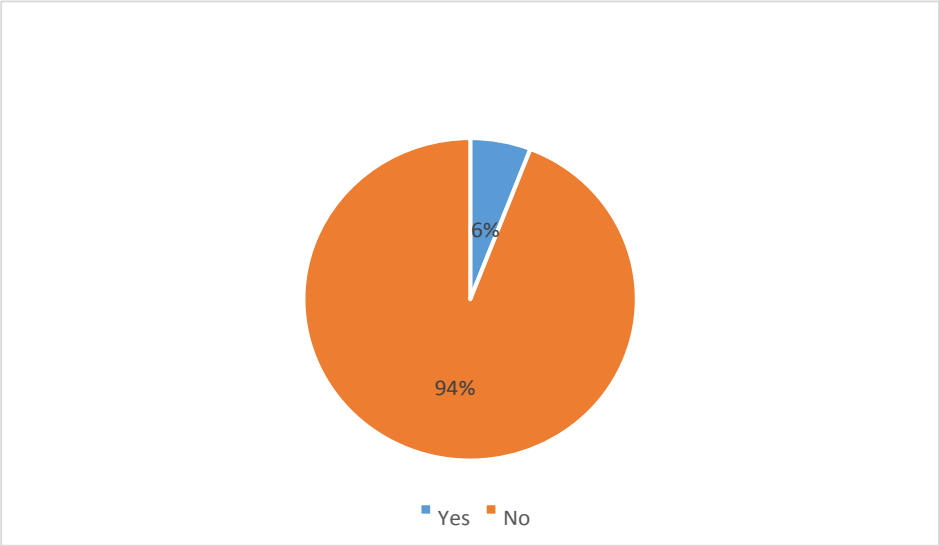

Figure 3. The frequency of training of surveillance focal points on epidemiological surveillance

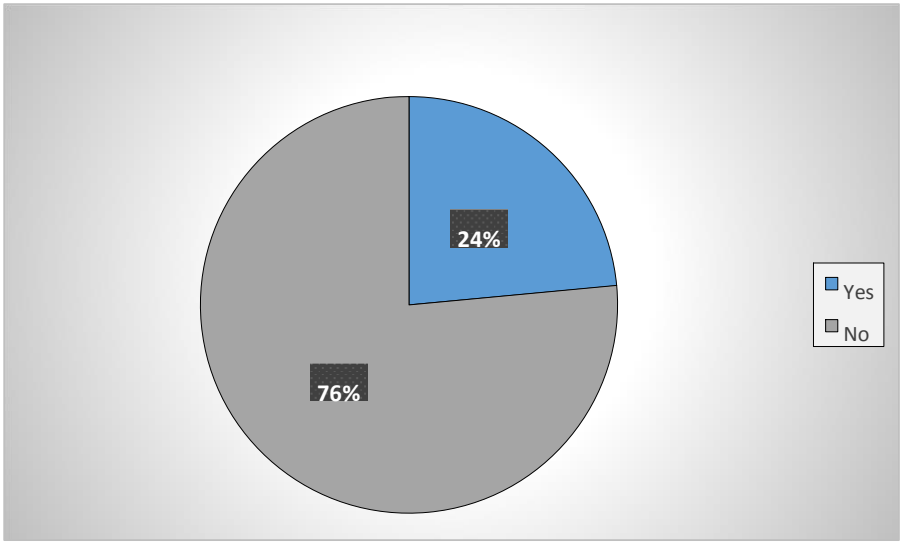

Figure 4. The frequency of focal points briefing on DHIS 2

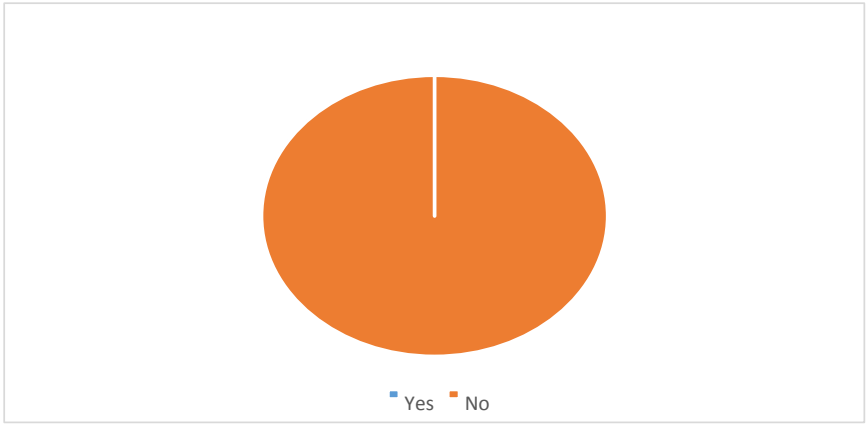

Figure 5. The frequency of funds for monitoring surveillance activities

Financial resources

None of the health facilities, or 0%, had operating funds for monitoring surveillance activities. Figure 5

DISCUSSION

Public health surveillance is a critical tool for ministries of finance, ministries of health, and donors to allocate resources and manage public health activities effectively and efficiently. Public health surveillance must be addressed as a scientific study, with rigorous methodologies applied to address major challenges in this public health practice in order to be useful (Peter et al., 2006).

As a result, we conducted this study to assess the availability and allocation of resources for epidemiological surveillance in the Edea health district's health facilities during the COVID-19 pandemic's second wave, 2022. This aligns with a study conducted in Cameroon in 2019 (Ngo Mouaha et al., 2019) to analyze the availability and allocation of resources for epidemiological surveillance in the country, as well as a study conducted in Brazil in 2020 (Barbosa et al., 2020) to review resource allocation in public health. This shows the need, as shown by the amount of money given to epidemiological surveillance, even though international literature shows that the topic hasn't been fully explored and there isn't a strong theoretical basis for it yet (Barbosa et al., 2020).

In this study, we surveyed 17 health facilities that cover 100 percent of the Edea health district's health facilities, which is contrary to the study by *Ngo Mouaha et al.,* which surveyed 68.4%. This is certainly due to the difference in sample size, which was quite large (118/17) (Ngo Mouaha et al., 2019). The findings are representative and generalizable.

As regards the type of surveillance studied at all the Edea health district's health facilities, all 17 (100%) were active surveillance. This can be attributed to the fact that in developing countries, including Ethiopia, ensuring the quality and effectiveness of surveillance and public health response in a decentralized setting is a major challenge. Managers of national programs and surveillance systems may lose control over the quality and timeliness of data collected locally. Public health surveillance plays a critical role in a public health system, according to the WHO and the World Bank. Therefore, Active Surveillance will benefit from adopting a systematic approach to data content standards.

As regards the surveillance priority level of the health centre, in the Edea health district, we reported that the majority (59%, 10/17) were low priority sites and only 23% (4/17) were high priority sites. The federal government should play a less active role in providing direct health care and instead direct resources to local governments and communities that are better equipped to meet their health requirements. As a result, the healthcare sector will be more effective and efficient (Health-care-Decentralisation-in-Cameroon.pdf (nkafu.org).

As regards the material resources, fifty-nine percent (10/17) of the health facilities had computer equipment, although this equipment was not always entirely dedicated to epidemiological surveillance. This result corroborates that of a study conducted in Cameroon in 2019 in which none of the public health facilities had computer equipment entirely dedicated to the event and community-based epidemiological surveillance (Ngo Mouaha et al., 2019).

In 47% (8/17) of the health facilities, data entry was done on personal tablets and/or smartphones. However, on December 3, 2013, WHO handed over 1,200 telephones to the Ministry of Public Health for the extension of the telephone surveillance fleet to the health areas, that is, equipment to strengthen epidemiological surveillance worth 67,000,000 CFA francs, and the 2013 e-Health Award for the "Telephone Fleet" initiative was presented to the Minister of Health. These telephones were supposed to enable the finalization of telephone coverage in the health areas of the regions, with a view to increasing the telephone fleet on a national scale, with the hope of further improving the circulation of health data and information between the different levels of the health pyramid "at zero cost" (Renforcement de la Surveillance Epidémiologique au Cameroun, 2021).

There is no doubt that hardware resources such as computers, smartphones, and tablets will allow health workers to have access to all information in real-time, to consult data via the internet and thus check consistency and quality, analyze data, and ensure interoperability between different databases (Redaction L, 2018).

In terms of human resources, only 6% (1/17) of the focal points had received epidemiological surveillance training. The fact that the virus was proven to have entered Cameroon on March 6, 2020, explains this. Both are significant issues, as untrained personnel may miss cases of infections under epidemiological surveillance, particularly during the COVID-19 Pandemic. The Minister of Public Health, Manaouda Malachie, prescribed the reinforcement of epidemiological surveillance during his visit to the district medical centres of Ambam and Kye-Ossi in the South region of Cameroon, drawing the attention of staff to the recognition of cases of diseases of epidemiologic potential (Cameroun: le Minsanté prescrit le renforcement de la surveillance épidémiologique, 2021).

Training for epidemiology and laboratory personnel and/or community health agents is a support function of integrated surveillance systems. Capacity building and training refer to the needs for engagement and empowerment of staff involved with integrated surveillance and response systems through workshop training and knowledge transfer. Surveillance staff at

different levels have varying training needs. An assessment can help to identify the training needs for different categories of staff, which in turn can be used to draw up a training plan. The implementation of the training plan and the proportion of surveillance staff (epidemiology, laboratory, and community resource persons) trained on the different aspects of surveillance and response can then be improved and monitored. Evaluations could look at the training's quality, usefulness, impact, and value for money since these resources should be gathered from all possible sources, managed, and used well (Communicable disease surveillance and response systems, 2021).

It was in this context that, following the establishment of 47 Epidemiological Surveillance Centres, the Mérieux Foundation and the Centre for International Cooperation in Health and Development (CICIHD) organized several training workshops in West Africa; at the end of this training, one staff member declared: "The 14 days of training had a real impact on my life and my career." During the training, I learned the importance of my role in the laboratory. I was trained on the main diseases with epidemic potential, such as measles, cholera, shigellosis, meningitis, E. coli, etc. In the lab and at home, I learned the importance of biosafety and biosecurity. We also covered equipment maintenance and data management. Before the training, I was only dealing with one of the diseases with epidemic potential: Ebola virus disease (REDISSE, 2013). This statement highlights the impact of the epidemiological surveillance training for health staff in general and for the epidemiological surveillance focal points of the health facilities in the Edea health district.

Also, 24% (4/17) of the surveillance focal points were briefed at the Edea district health service level on the use of DHIS 2, which is a software tool to facilitate the collection of individual or primary data; the aggregation, storage, sharing and analysis of data (Renforcer le système de collecte et traitement des données sanitaires, 2021). It is also a database that can be consulted by all health workers to facilitate decision-making in the event of epidemics. Its use is important because it allows the collection of all the data needed to improve epidemiological surveillance (Redaction L, 2018). However, at least one of the health personnel other than the focal points of these health facilities had been trained or briefed on the use of the DHIS 2. This result is in line with the previous study, which found that at least one staff member in each of the visited sites had been trained in the use of the DHIS 2, but was not systematically in charge of the data (Ngo Mouaha et al., 2019). This can be explained by the fact that the National Health Information System (NHIS) in Cameroon is fragmented and not very efficient due to the absence of an organic framework for coordination and management of health information, the absence of mechanisms that promote the use of health information in decision making, the archaic nature of the data collection and processing infrastructure, and the absence of norms and standards for the use of health information (Ndongo and Ongolo-Zogo, 2010).

Passive surveillance is a low-cost method of covering huge areas while providing vital information for community health monitoring. Passive surveillance is hard to control when it comes to data quality and timeliness because it depends on people from many institutions to give data.

Thus, this deficit influences the efficiency of the system, the quality of the data collected, and its use. Surveillance of a disease or health-related event requires careful monitoring based on a network of actors and well-coordinated sources of information. It entails observing the emergence of pathologies based on people, time, and place; alerting on acute problems that require immediate action; assessing epidemiological trends over time; and evaluating the impact of health policies. Collect, analyze, interpret, and disseminate this knowledge to those who need it for public health decision-making. Basically, data is generated by health care providers who continuously record procedures, diagnoses, and treatments. Depending on the information and the time needed for decision-making, the organizations that centralize the collection and analysis of data set up various collection and analysis systems; these concern the choice of actors, the data to be collected, the collection tools, the data transmission circuit, and the periodicity of collection and transmission operations (Astagneau and Ancel, 2012).

In terms of financial resources, none of the health facilities in Edea district had operating funds for monitoring surveillance activities, which is in line with the study by Ngo Mouaha et *al*., which showed that no operating funds were available for monitoring surveillance activities in the sites visited (Ngo Mouaha et al., 2019). Despite the fact that epidemiological surveillance should be an integral part of all professional activities, particularly on the front lines.

Healthcare facilities should not be overburdened with data collection because it is an essential duty to learn about the population we are caring for, its state of health, and the factors that influence it through data in order to take measures to improve it (Médicales, 2021). When there aren't enough funds for epidemiological surveillance, health workers don't do their jobs and don't keep an eye on related activities.

According to Tonia Marek, health outcomes in Africa are often disappointing, as are most government-funded projects, and some health indicators are struggling while others are stagnating because only half the picture in terms of resource allocation for health has been considered. This would be due to the concentration of interventions in the public sector, without taking into account that half of the health spending in Africa goes to the private sector. It is time to look at the health system as a whole, not just the public sector (Marek, 2008). This

idea is not consistent with the results of our study because no funds were allocated to either public or private hospitals.

Surveillance and response activities can only be performed if the required and appropriate financial, human, and logistical resources are in place. This means identification of the resources needed to implement the various surveillance activities at each level of surveillance during the planning stage. These resources should be mobilized from potential sources and managed and used efficiently (Communicable disease surveillance and response systems, 2021).

Enhanced and integrated epidemiological and laboratory surveillance and response activities can only be performed if the required and appropriate financial, human, and logistic resources are in place. This means that during the planning and implementation stage, the resources needed to carry out the different surveillance activities at each level of surveillance must be found for public health emergencies.

Strength

This is a novel baseline study in Cameron during the COVID-19 Pandemic. Cameroon is often known as "Africa in miniature" because of its geographical and cultural diversity. Since all health care facilities were covered, the results can be used at both the local and containment levels.

Limitations

There haven't been enough studies done before to compare different health conditions and times in a good way.

CONCLUSION

Event-based and community-based surveillance and response systems are critical components of programs aimed at preventing and controlling persistent zoonotic diseases and emerging epidemics. Our study, therefore, assessed the availability and allocation of resources for epidemiological surveillance in the health facilities of the Edea health district. It was found that the availability and allocation of material, human, and financial resources were very inadequate in the health facilities of the Edea health district. It is with this in mind that it is urgent to remedy the lack or limitation of material resources and the lack of financial resources, coupled with the lack of training of focal points on epidemiological surveillance and the DHIS 2 dedicated to epidemiological surveillance, which contribute to the inefficiency of epidemiological surveillance in the Edea health district and the lack of anticipation of potential public health emergencies. This fix will make it easier to find suspected cases of diseases that are under epidemiological surveillance. Suspected cases will then be reported and investigated, and the data will be sent quickly to the health district.

RECOMMENDATION

Future research should therefore focus on the factors associated with the lack of availability and poor allocation of resources in the health facilities of the Edea Health District.

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Abbreviations

DHIS 2 District Health Information Software 2
ODK Open Data Kit
NHIS National Health Information System
CICIHD Centre for International Cooperation in Health and Development.
COVID 19 Coronavirus disease 2019
SARS-CoV-2 Severe Acute Respiratory Syndrome Coro- navirus 2
MS Micro-Soft
WHO World Health Organization

Availability of data and materials

All the data is available on request.

Ethics approval and consent to participate

These research authorizations were obtained from Edea health district. Informed consent was obtained from the participants.

Competing interests

The authors declare no conflict of interest.

Consent for Publication

All authors have read and approved the final version of the manuscript.

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