



Original Article/Research

## The lessons of COVID-19 pandemic for communicable diseases surveillance system in Kurdistan Region of Iraq

Soran Amin Hamalaw<sup>a,\*</sup>, Ali Hattem Bayati<sup>a</sup>, Muhammed Babakir-Mina<sup>a</sup>,  
 Mohammad Mehdi Kiani<sup>b</sup>, Amirhossein Takian<sup>c</sup>

<sup>a</sup> College of Health and Medical Technology, Sulaimani Polytechnic University, Sulaimani, Iraq

<sup>b</sup> Department of Health Management and Economics, School of Public Health, Tehran University of Medical Sciences, Tehran, Iran

<sup>c</sup> Department of Global Health and Public Policy, Department of Health Management and Economics, School of Public Health, Health Equity Research Centre (HERC), Tehran University of Medical Sciences, Tehran, Iran



## ARTICLE INFO

## Keywords:

COVID-19 pandemic  
 Communicable diseases  
 Surveillance system  
 Iraq

## ABSTRACT

**Objectives:** This study aimed to determine the opportunities of and barriers to communicable diseases surveillance system (CDSS) during the COVID-19 pandemic and the extent to which the disease integrated into the CDSS in the Kurdistan region of Iraq.

**Study design:** A descriptive qualitative approach was applied.

**Methods:** We conducted seven semi-structured interviews and seven interviewee in a focus group discussion (FGD) with purposefully identified Key Informants (KI) from June to December 2020. All interviews were digitally recorded and transcribed verbatim. We adopted a mixed deductive-inductive approach for thematic data analysis, facilitated by using MAXQDA20 software for data management.

**Results:** Although the CDSS was considered appropriate and flexible, the COVID-19 was interpreted not to be integrated into the system due to political influence. The main concerns regarding core and support activities were the lack of epidemic preparedness, timeliness, and partial cessation of training and supervision during the pandemic. The existence of reasonable surveillance infrastructure, i.e., trained staff, was identified as an opportunity for improvement. The main challenges include staff deficiency, absence of motivation and financial support for present staff, scarce logistics, managerial and administrative issues, and lack of cooperation, particularly among stakeholders and surveillance staff.

**Conclusion:** Our findings revealed that the CDSS in the Kurdistan region requires substantial enhancement in epidemic preparedness, strengthening human resources, and logistics. The system can be developed by fostering meaningful intersectoral collaboration. We advocate that the health authorities and policy-makers prioritise the surveillance and effective management of communicable diseases.

## Introduction

Despite the substantial progress in medicine, communicable diseases continue to be among the major causes of mortality and morbidity, particularly in developing countries [1]. The early detection and quick response to control infectious diseases are critical for national, regional, and global health security [2]. The principal source of infectious diseases is typically from various pathogens comprising bacteria, viruses, fungi, and parasites. By virtue of their minuscule architecture and swift mode of spreading, there is always a potential risk that a known or unknown pathogen may evolve and spread rapidly to harm any

population at any moment. Even with advanced safety measures and historical medical progress, infectious diseases are arising with more deadly consequences worldwide [3]. What happened in Wuhan, Hubei Province, China, on 31 December 2019 is a true story of the threat of infectious diseases on humanity, when a cluster of pneumonia cases of unknown aetiology was identified. Subsequently, the novel coronavirus, Severe Acute Respiratory Syndrome Coronavirus 2 (SARS-CoV-2), was announced as the causative agent of this acute respiratory disease, so-called coronavirus disease 2019 (COVID-19) on 9 January 2020 by the Chinese Centre of Disease Control and Prevention (CDC). On 11 March 2020, the World Health Organization (WHO) declared COVID-19

\* Corresponding author.

E-mail address: [Soran.hamalaw@spu.edu.iq](mailto:Soran.hamalaw@spu.edu.iq) (S.A. Hamalaw).

<https://doi.org/10.1016/j.hlpt.2022.100717>

a pandemic [4,5], which has affected 223 Countries, areas, or territories, with over 104 million confirmed cases, and more than 2.29 million confirmed deaths [6].

Communicable Disease Surveillance Systems (CDSS) is considered an essential public health mechanism to prevent and control infectious diseases. Surveillance has been defined as “the ongoing, systematic collection, analysis, and interpretation of health-related data, which is the cornerstone of planning, implementation, and evaluation of public health practice” [7,8]. The early detection of infectious disease is a fundamental step for a quick response to outbreaks, which is, in turn, the primary purpose of CDSS to minimise the size of the outbreak and reduce overall mortality and morbidity related to the disease ultimately [2]. Effective assessment of the surveillance system and its competence is vital to ensure the availability of accurate information for evidence-informed decision-making at the right time and limit the communicable diseases’ threat [2].

Investments in infectious disease surveillance and investigations are poorly allocated globally [9]. Worse still, in the context of low and middle-income countries (LMICs), the capacity and available infrastructure for the prevention and timely detection of communicable diseases is generally lower than high-income countries (HICs) [10]. As the most devastating threat to human societies after World War II, COVID-19 has illustrated the urgent need to strengthen the CDSS anywhere, particularly in the LMICs [11]. In Iraq, especially after the US invasion in 2003, as the burden of communicable diseases has increased, the demands for improving the surveillance system have increased [12–14].

The healthcare system in Iraq is a mixed public-private system. Iraq has two Ministries of Health (MoH), the Federal MoH in Baghdad and Regional MoH in Erbil, Kurdistan [15,16]. The Kurdistan region is located in the north of Iraq and governed by the Kurdistan regional government. The CDSS in the Kurdistan region is centralised and directed by the Iraqi ministry of health under the WHO supervision. Generally, Iraq lacks an information system capable of integrating data from different information subsystems [17]. Except for Acute Flaccid Paralysis which actively monitored, the communicable diseases surveillance in Iraq is passive or routine. However, once there is an outbreak, active surveillance is initiated, and contact tracing is established. Communicable diseases are classified according to their priority into immediately notifiable, weekly reported, and case-based reporting diseases. The governorates share their data with the national surveillance level using Epi Info software. All Iraqi districts, including the Kurdistan Region use the standard annually updated surveillance plan set by federal MoH. Two leading indicators are used to monitor the CDSS performance; completeness, which means how many surveillance sites are reported, and timeliness, which means submitting the reports at the time. Parallel to this system, MoH and World Health Organization coordinated to apply an Early Warning Alert and Response Network (EWARN) network system in Iraq to face humanitarian crises in 2017 [18]. However, mandatory surveillance is not applied in the private sector in Iraq. Despite substantial efforts to enhance CDSS capability for early detection and effective management of outbreaks, there is limited evidence on how to do so in this context [19,20].

To the best of our knowledge, little evidence exists about the health services in Iraq including the assessment of CDSS [21], and there are even much less information about the CDSS in the Kurdistan region. Our knowledge is scarce about the functioning and drawbacks of the CDSS system, its response to the current challenges, and the real-time requirements. The CDSS in Iraq is performed through a mandatory notification for more than fifty-three communicable diseases in 1450 surveillance sites including primary healthcare centres and all government hospitals, that at least there is one person dedicated to performing surveillance activities in each site, which means thousands of surveillance staff employed [22,23]. Following the principle of “What is worth doing is worth doing right,” providing an overview of the CDSS performance during outbreak emergencies and the assessment of the

current CDSS in a part of Iraq is worthwhile to obtain the necessary benchmark data that can be used to evaluate the system’s effectiveness and identify the areas which need of further development [24].

Human resources for health (HRH) or health workforce is defined as “all people engaged in actions whose primary intent is to enhance health” are the main pillar in the delivery of high-quality services [25]. They also play a central role in the CDSS, whose voice should be heard, and their views should be considered to improve the CDSS. This Qualitative study aims to assess the core functions, barriers to and strengths of the surveillance system according to staff perspective during the COVID19 pandemic in the Kurdistan region of Iraq. Our findings and evidence-based policy recommendations will enhance, we envisage, the flexibility and competency of the CDSS system towards a better response to the ongoing COVID-19 crisis as well as likely pandemics to come in Kurdistan-Iraq and perhaps similar LMICs [26].

## Methodology

**Design:** We used descriptive qualitative research design, which is an appropriate approach to produce more valuable outcomes when attempting to anticipate the desirable characteristics of a changing system, as well as to help increase the probability of compliance [27]. This approach allowed us to utilise a naturalistic perspective to interpret the subject of study by accessing the meanings ascribed by the participants [28]. Our qualitative design helped provide insights and understanding of the surveillance activities through the lenses of staff experience during the COVID19 pandemic.

**Settings:** This study was conducted from June to December 2020 in the Kurdistan region of Iraq.

**Participants and eligibility:** We used open-ended semi-structured face-to-face interviews and focus group discussions (FGDs) for data collection. All staff working with the communicable disease surveillance system was eligible to participate in this study. A purposeful sampling method was used to recruit a total of 14 Key Informants (KIs), seven in one FGD, and seven in-depth interviews. All the participants who were approached agreed to participate in the study. The key informant stakeholders could provide valuable information to uncover more details about their experiences in the CDSS during the COVID19 pandemic. Respondent included surveillance managers, surveillance professionals, surveillance executive team members, and other communicable disease surveillance staff from Erbil, Sulaimani, Duhok, and Halabja provinces. Please see Table 1 for the characteristics of study participants.

**Data collection and data analysis:** Based on a comprehensive review and consultations with key experts, we developed a generic interview guide for data collection Appendix1. The interview question had three parts: (1) the existence of CDSS in the Kurdistan region of Iraq

**Table 1**  
Participant characteristics.

Characteristics	Participants/ total14
Sex	
Male	7
Female	7
District representing	
Erbil	2
Sulaimani	9
Duhok	1
Halabja	2
Key Informants (KI)	
District Surveillance director	3
District surveillance manager	3
Health centre director	1
Surveillance executive staff	7
Workplace	
District CDC	6
Health centre	6
Hospital	2

and its flexibility “system’s ability to change as needs change. The adaptation to changing detection needs or operating conditions with little additional cost in time, personnel, or allocated funds” [29]. (2) The system’s core functions during the COVID19 pandemic, including case detection, case confirmation, reporting, feedback and supervision, training, and epidemic preparedness. (3) The staff’s views regarding barriers to and strengths of the surveillance system their recommendations for improvement. Each interview lasted 30–45 min, while the focus group discussions lasted 80–90 min. The interview took place in the presence of two research staff only, one of them asking the questions and the other was responsible for recording, note taking and controlling the time. The interviews were conducted and recorded in the Kurdish language, and a verbatim transcript of the records was prepared, then the transcript was translated into English word by word. One author (S. H.) double-checked the accuracy of the English transcript against voice records. Data collection continued until we reached data saturation, and no new theme or concept emerged. A mixed deductive-inductive content analysis strategy was used for data analysis, the final them/code table is shown in the appendix 2. We used MAXQDA version 20.3 for data storage and management. After familiarisation with the data, one author (A. B.) began to identify the main themes and organise them into different categories. Simultaneously, another author (M. B) performed the same task separately and produced his own themes and codes. The emerging themes from both coders were actively reviewed to reflect the research questions. The topics and ideas referred to as a coding index were noted, ordered, and then grouped to initiate themes. The codes and themes reviewed against available data systematically and the themes with insufficient database support were excluded or refined.

**Results**

Our analysis revealed seven main themes regarding the CDSS; the staff’s perception, integration of COVID-19, strengths, barriers, core activities, support functions, and recommendations to enhance the system. The developed themes are classified into sub-themes and codes as presented in Tables 2 and 3.

**Staff’s perspective about CDSS**

The study participants mentioned that despite the existence of an appropriate communicable disease surveillance system in the Kurdistan region of Iraq, all advantages of this system were not taken. They believe that the existence of a surveillance program plan and infrastructure is not enough, but also the implementation and the use of surveillance information for action (prevention and control of outbreaks) are equally important.

*“In my view, there is a system, and it is active .... We belong to the Iraqi surveillance system; what is taking place here is the same as that in other parts of Iraq. Therefore, we have a good, very good system, but the question is to what extent the advantages of it were taken?” participant #3.*

According to the study participants, the system’s flexibility was reasonably good, while the acceptability of the system by the stakeholders was ambiguous:

*“The system is flexible and working, but not acceptable, not acceptable at all, the people do not use it... our system is working perfectly, has the capacity to involve corona and other infectious diseases, but regarding using it, how much it has been used? It is another matter.” Participant #5.*

**Integration of COVID-19 into the communicable disease surveillance system**

Many participants complained that the COVID-19 was not integrated into the CDSS. Instead, a parallel system was established to report

**Table 2**  
Codes related to staff perspectives.

Main themes	Codes	Quotes
<b>Staff perspective about the system</b>	The flexibility of the system	<i>“The system is flexible and working, but not acceptable, not acceptable at all. The people do not use it....”</i>
	The system is not acceptable	<i>“There is a surveillance system but with some deficiencies.”</i>
	The system exists	<i>“At the beginning, the disease became a political issue, and things went in that direction.”</i>
<b>COVID19 integration into the CDSS</b>	System has deficiencies	<i>“I think we did something different and specific regarding data recording and data publishing.”</i>
	Why Covid19 didn’t integrate into the surveillance system	<i>“The existence of the system itself is good.”</i>
	No integration	<i>“Another strength point was the total support of our manager by all available means, by preparing of transporting and administrative facilitating.”</i>
<b>Opportunities</b>	The system infrastructure	<i>“the thing that made the surveillance system work smoothly and easily was the presence of the staff who pledge themselves to work voluntarily in surveillance</i>
	Managerial support	<i>“The problem COVID-19 is a health issue but also before that is an economic issue then it is a political issue, now the COVID-19 is run by the politicians.”</i>
	Dedicated staff	<i>“Due to the overload of work and inability to keep all those files, we chose another mechanism.”</i>
<b>Barriers</b>	Political and economic interfere	<i>“It was hard to copy paperwork, not software or electronic reporting. It was needing time to report the situation to the higher level.”</i>
	Overload due to High No. of cases	<i>“Everything here is centralised. Authority is not decentralised.”</i>
	Timing	<i>“Many did not understand the concept of surveillance.”</i>
	Managerial and planning issues	<i>“In all our meetings, we discussed it. It cannot be solved. The doctors are not cooperating.”</i>
	Insufficient understanding of Surveillance concept	<i>“No encouragement for the workers in communicable disease surveillance”</i>
	Lack of doctors’ cooperation	<i>“It was expected that all logistics and computers to be sent to us, but nothing was received yet.”</i>
	Absent of funding and motivation	<i>“absent of necessary staff, absent of required fund, the barriers regarding logistics, transportation and reductions of training and recent economic issues have a great effect that made the system to be weak.”</i>
	Deficiency in computer and internet access	<i>“We need a guideline for surveillance to be in the Kurdish language, not in Arabic or English.”</i>
	Staff deficiency	<i>“Opening public health units in all hospitals.”</i>
		<i>“Meet the needs of the department, provide employees.”</i>
<b>Recommendations</b>	Translate guides into Kurdish	<i>“When is needed a transport should be available”</i>
	Hospital health focal unit	<i>“More training is needed.”</i>
	More human and logistic support needed	
	More training courses	
	Use of Electronic program	
	Good plan	

(continued on next page)

**Table 2 (continued)**

Main themes	Codes	Quotes
		<p>“Making the surveillance system Electronic will make it tougher than the existing one.”</p> <p>“specific plan is needed, plan to control, plan to the teams work, plan to what program that to be used as Epi Info.”</p>

COVID-19 status to the health authorities. Only specified hospitals and health centres were responsible for reporting the disease. As put by one of the study participants:

“We dealt with covid-19 differently, they announced some staffs for it ... we create excel spreadsheet includes the patient’s name, age, address, symptoms and other information. We gave a copy of it to the ministry of health” Participant #1

“We don’t deal with corona patients. If the patient is suspected, the doctor will send him to other places to do tests. We don’t record or report corona patients” Participant #6.

This was perhaps because of the dominance of the political considerations in dealing with COVID-19 at the outset of the outbreak:

“at the beginning, the disease became a political issue, and things went in that direction. The things were not as we desired” Participant #1

**Core functions**

The core functions of CDSS have several critical steps: case detection, case registration, case confirmation, reporting, data analysis and interpretation, epidemic preparedness, response & control, and feedback. The presence of the case definition is critical for communicable diseases case detection. Respondents highlighted the importance of having a case definition for COVID 19 and other surveillance priority diseases at all surveillance units. The COVID-19 case definition is adopted from WHO updates, but it is often not applied for case detection in health facilities:

“we as communicable disease department always depended on WHO case definition. Always we generalised the case definition to the health facilities but, they do not depend on it for case detection.” Participant #13.

**Table 3**  
Codes related to core and support functions.

Main themes	Codes	Sub-codes	Participant quotes
<b>Core activities</b>	Case detection	Case definition exists	“the case definition that we have is that the ministry of health of Baghdad has sent to us. it is the same that WHO has approved”
		Source of case-definition lack of case-definition guide in-health facilities	“As our unit, I did not receive anything ... but as the surveillance unit, I didn’t get the case definition.”
	Case-confirmation	Laboratory case confirmation	“regarding the laboratory activities, we didn’t have any problems sampling and transporting, and machines all were good.”
		lab problems	“when much more samples were taken (out of the lab) capacities, more than two weeks were needed to get the results.”
	Reporting	Reporting Mechanism	“The reporting was very clear and obvious indeed where there is COVID-19 how it refers to where how tests and who report and to where is clear. In ... the work is central if it was suspected case, they would take a sample for testing, then they would document it, and report it to us”
		Reporting problems	“It wasn’t arriving on time. It was hard to copy paperwork, not software or electronic reporting. It was needing time.”
Data analysis	Performing data analysis	“The data analysis is just performed at the district level.”	
	Data analysis problems	“We do not have a right to reach the data even to get or analyse our data, under the name of national security.”	
Feedbacks		“I can say there was a regular weekly feedback from Baghdad at the end of the week in Thursday this is nationally, but as a local government, there are no feedbacks from the ministry of health.”	
		“In our district CDC, there is no prepared plan for communicable disease emergencies.”	
<b>Support activities</b>	Epidemic-preparedness		“I love my job surveillance is important needs more support from the authorities.”
	Staff-involvement		“From Baghdad, there are regular visits ... But during this pandemic, due to the busyness of the unit, we were unable to visit all places regularly.
	Supervision Training		“all swap-taking staff were trained before starting their work...The training was done by an expert doctor.”

Case confirmation refers to the capacity of appropriate specimen collection, packing, transportation, and laboratory testing. Most participants mentioned that case confirmation of COVID-19 was convincing; however, there were difficulties:

“We cannot generalise, we talked about here, the lab was okay, I work, here from PPE, materials, sticks, and transportation to the tests. There was no problem, but regarding the number of PCR machines we had a real problem that made people wait days to get their results.” Participant #2

One of the difficulties was the magnitude of the problem, which outweighed the laboratory capacity. Even though the laboratory’s capacity was reasonably good, the high numbers of susceptible cases outweighed the laboratory capacity to perform the tests on time.

“You know lab work; if we compared the load of the problem with the lab capacities, power laboratories had lower capacities... how many suspected cases do we have? Daily we have a lot, but how many samples could we take? A few, so for a while when much more samples were taken, out of the lab capacities, more than two weeks were needed to get the results.” Participant #3.

The reporting mechanism was clear and straightforward, but defining roles and responsibilities and the timeliness was an exact challenge for the staff, mainly due to the primitive paperwork and absence of an electronic system.

“The reporting was very clear and obvious, indeed when there is a COVID-19 case, how to refer it and to where? How to do tests? And who reports and to where? is clear ... but is it timely?” Participant #13.

“It(data) was not arriving on time. It was hard to copy paperwork with no software or electronic reporting. It was needing time to report the situation to the higher level.” Participant # 11

Regarding data analysis, respondents disclosed that hospitals and health centres do not perform data analysis, which is only conducted at the national and district levels:

“We do not analyse the data; we send the data to ... (the directorate of prevention) she will perform the analysis” Participant #8.

Reflecting upon the preparedness plan to face pandemics and other communicable diseases emergencies, the KI participants insist that there are deficiencies in epidemic preparedness.

“in our district CDC, there is no prepared plan for communicable disease emergencies. We in ... think every 2-3 years there is an outbreak of cholera, so we prepare (a plan) for the cholera outbreak. But for other infectious diseases emergencies, there is no plan” Participant #13.

The participants believed that the feedbacks from the higher surveillance level (central and district surveillance level) regarding their reporting activities, were good and informative. “Generally, the feedbacks were good and useful at the beginning they had some comments about our performance, because of some problems in our data. Then those issues were overcome. Otherwise, everything was good.” Participant #1

### Support functions

Support functions including standards & guidelines, training, supervision and mentorship, communication facilities, resources, monitoring & evaluation, and coordination, are considered the backbone of an efficient system. Many interviewees acknowledged regular supervision and training for staff in the past, which reduced significantly during the COVID19 pandemic, except for some specific occasions. Some mentioned a training course held last year to build staff's capacity in using the Epi Info program, a free statistical software package for epidemiology developed by Centres for Disease Control and Prevention in Atlanta, Georgia. In addition to knowledge transfer and improving staff's skills, this course was an excellent opportunity to communicate with other staff in other surveillance locations. Unfortunately, the use of the Epi Info program has become optional due to insufficient resources, i.e., computer and internet access:

“But the training was very good we met other staffs, and it was a good chance to communicate with other centres and change information. But this year, due to corona, there was no training” Participant #6.

In their view, this course was an excellent opportunity to communicate with other staff in other surveillance locations, in addition to knowledge transfer and improving staff's skills.

Cooperation among CDSS stakeholders (laboratory staff, surveillance officers, doctors, sample collectors, infection control staff, and others) was substandard.

### Strengths of the CDSS

Our participants also identified several strengths of the current CDSS system, including the existence of the system itself, the presence of a trained staff who satisfied with their work in the CDSS, administrative support from the preventive directorate of health, national cooperation and support, accessibility, and convenience with Epi Info program to use for surveillance between the staffs and finally, the awareness of public concerning COVID-19:

“the first strong point of the system is the existence of the system itself. Second is the presence of the staff because the staff working in surveillance have experience and love their work, there is central cooperation. Therefore, there is a central support” Participant #3.

### Barriers to implementing high-quality CDSS

The interviewee recognised the following obstacles to the establishment of a high-quality CDSS: inadequately skilled staff, insufficient motivation from the local health authorities and lack of financial support for surveillance staff, scarce logistics (computers and internet access), managerial and administrative issues, insufficient understanding of surveillance concept, and lack of cooperation, particularly between doctors and surveillance staff in health facilities level:

“absent of necessary staff, absent of required fund, the barriers regarding logistics, transportation, and reductions of training and recent economic

issues have a great effect that made the system to be weak” Participant #11.

### The participants' recommendations to enhance the system

The KI participants of the current study highlighted several points which may improve the system's functionality. They believe these recommendations, which include; better planning, use of an electronic program, more training, better resource allocation, opining a surveillance focal point in the hospitals, and translation of the guideline into the Kurdish language, will have a priority to develop more efficient surveillance system in the Kurdistan region of Iraq for more detail see Table 2.

### Discussion

COVID-19 crisis was an opportunity to assess the CDSS core and support functions during the pandemic. Our findings, which drew upon the key informants' detailed knowledge of the efficiency and functionality of the surveillance system [2], have shed some light on the challenges facing the CDSS in the Kurdistan region and provided reasonable suggestions for strengthening the system.

Our study revealed that the existing surveillance infrastructure in the Kurdistan region of Iraq is satisfactory, despite having some human and physical resources insufficiencies. And the system is flexible enough to adapt to the changing information requirements and operating conditions such as removing or including additional diseases per minimal additional cost.

However, COVID-19 surveillance was expected to be integrated into CDSS, which allows the efficient use of human and other resources. Due to political influences, health authorities preferred a parallel structure to report and respond to the pandemic and classified the related data as national security. Similarly, the impact of political influence on public health decision-making was reported in England [30]. Politicians and other decision-makers have to take actual measures to contain the pandemic, minimize its economic impact, and limit harmful social and political consequences [31]. They will face increasing pressure to develop policies that have diverse balancing interests, values, and demands, while they also should be pretty sure that they rely on sound scientific evidence. However, it seems autocrats can be remarkably swift in stopping the viruses spread, but they can also be quite successful in suppressing information about it [32]. Without a backlash from the concerned public, they may use the health information to exploit repressive control even once the public health threat subsided [33,34].

A study on the Ebola epidemic showed that applying a standard case definition in health facilities will boost the overall sensitivity and specificity of CDSS [35]. Our findings highlighted the absence of a standard case definition in health centers and hospitals that might jeopardize case detection. A Singaporean study demonstrated the importance of case definition, which identified 20% of COVID-19 cases at general practitioner clinics or hospitals [36]. Ignoring case definition may result from prioritizing curative activities as patients' care over preventive activities as surveillance. This supports the previous study that stated, ‘during busy periods there is an assumption that surveillance is less critical than patient's care and could be ‘deferred’ and broad variance in the implementation of case definitions among hospitals and community clinics exists’ [36].

Another system flaw was the insufficient electronic infrastructure that led to inappropriate reporting methods that affected the CDSS in Kurdistan. Similar results were reported in Yemen, Iran, and other settings [20,37–40]. Like many LMICs, the COVID-19 surveillance capacity is restrained by inadequate resources and training [20].

Another issue raised was the lack of timeliness of reporting, which was most likely related to the primitive non-electronic system of reporting. The same issue was documented in Sudan by

Sahal N et al. [37]. Our staff views were comparable to the Khartoum study that said the surveillance data did not use to apply interventions for control and prevention of infectious diseases on a routine basis [37].

The current results confirmed that the directorial incompetency, e.g., lack of meaningful cooperation between doctors and surveillance staff and not prioritizing the surveillance program by the ministry of health, hindered the CDSS in Iraq, similar results reported in Iran and Syria [41–43].

Robust and comprehensive CDSS assessment is critical for advanced communicable disease reporting and response systems [2,44]. And since awareness of the problem is the first step in any problem-solving process. Therefore, identifying and disclosing the surveillance system's weaknesses may pave the way to fill the existing gaps, which may be by recruiting, motivating, and training staff and allocating cost-effective resources. A study in Ghana also concluded that enhancing the attention to and awareness of surveillance activities among doctors, nurses, administrators, and laboratory workers is urgently needed to improve the overall health system's functionality [20].

### Policy recommendations

Participants pointed out six significant recommendations to enhance CDSS in the Kurdistan Region, including more training of surveillance staff; greater cooperation among stakeholders; employing more staff for surveillance units; setting up a focal point in hospitals for surveillance, translating guidelines into the Kurdish language; and ensuring the availability of transportation and technological resources (Table 2).

Respondent appreciated the efforts from the Ministry of Health in Baghdad and surveillance units at the district level in building up their capacities to address communicable diseases and health events in their localities through CDSS. However, there was an overwhelming consensus that more training was needed. The participants also recommended more communication and cooperation between Surveillance staff and those who hold the reins in the health system directors and doctors.

### Study limitations

The interviews were conducted in the native Kurdish language and then translated into English, which might affect the data quality. We compared/contrasted our findings with other quantitative and qualitative approaches that were not necessarily based on the staff's point of view. The purpose of the current qualitative study was to provide contextualized knowledge of some elements of CDSS and explore some aspects of the system that may be utilized to enhance the system, not to test hypotheses or specific research questions and quantify the data and generalize the results. In other words, the results of the current study are not coequally important, for example, several barriers to CDSS are mentioned it should be considered that one barrier may be more important than the other.

### Conclusion

Our findings revealed that due to political barriers, COVID-19 was not integrated into the CDSS. It also highlighted the main facilitators of the CDSS that include reasonable surveillance infrastructure, i.e., trained staff was identified as an opportunity for improvement. Meanwhile, the barriers to CDSS in the region pointed to staffing deficiency, lack of motivation and financial support for present staff, scarce logistics, stewardship, and administrative issues, and lack of cooperation, particularly among stakeholders and surveillance staff. We advocate that health authorities and policy-makers prioritise the surveillance and effective management of communicable diseases. It would be crucial to provide strategic support, mainly through strengthening human resources for health with updated information and surveillance skills and required infrastructure and logistics and fostering meaningful

intersectoral collaboration. Thus to overcome the challenges of the current COVID-19 crisis and prevent the deadly consequences of future likely pandemics,

### A statement regarding consent to participate

The purpose of the study was discussed with the participants then the participants were asked to sign an informed consent. The next page is a copy of the informed consent form

### Funding

None.

### Ethical approval

This study was approved by the Ethics Committee of the Sulaimani Polytechnic University with the project number CH00036/1/June/2020.

### Acknowledgments

We would like to thank the Centres for Communicable Diseases Control in Directorates of Health in the Kurdistan region of Iraq for their invaluable cooperation in data collection.

### CRediT authorship contribution statement

**Soran Amin Hamalaw:** Data curation, Formal analysis, Writing – original draft. **Ali Hattem Bayati:** Data curation, Formal analysis, Writing – original draft. **Muhammed Babakir-Mina:** Conceptualization, Supervision, Data curation, Formal analysis, Resources, Writing – original draft. **Mohammad Mehdi Kiani:** Writing – original draft. **Amirhossein Takian:** Conceptualization, Supervision, Writing – original draft.

### Declaration of Competing Interest

We have no conflicts of interest to disclose.

### References

- [1] Lawrence CM, Dennis LK. Basic considerations in infectious diseases. In: Harrison's principles of internal medicine. 18th ed. The McGraw-Hill Companies; 2012. p. 1007.
- [2] World Health Organization. Communicable disease surveillance and response systems guide to monitoring and evaluating. World Health Organization; 2006 [Internet][cited 2019 Jul 14]. Available from: [https://www.who.int/csr/resource/s/publications/surveillance/WHO\\_CDS\\_EPR\\_LYO\\_2006\\_2.pdf?ua=1](https://www.who.int/csr/resource/s/publications/surveillance/WHO_CDS_EPR_LYO_2006_2.pdf?ua=1).
- [3] Akhter S, Akhtar S. Emerging coronavirus diseases and future perspectives. Vol. 31. *VirusDisease*. Springer; 2020. p. 113–20.
- [4] World Health Organization. WHO director-general's opening remarks at the media briefing on COVID-19 - 11 March 2020. World Health Organization; 2021. Internet. cited Feb 7. Available from: <https://www.who.int/director-general/speeches/detail/who-director-general-s-opening-remarks-at-the-media-briefing-on-covid-19---11-march-2020>.
- [5] Wu Y-C, Chen C-S, Chan Y-J. The outbreak of COVID-19. *J Chin Med Assoc* 2020;83(3):217–20. Mar.
- [6] World Health Organization. WHO. Coronavirus disease (COVID-19), World Health Organization [Internet]. cited 2020 Sep 18. Available from: <https://www.who.int/emergencies/diseases/novel-coronavirus-2019>.
- [7] Centers for Disease Control and Prevention (CDC). Introduction to public health. In: Public Health 101 Series. Atlanta, GA: U.S. Department of Health and Human Services, CDC; 2014; 2014 [Internet]. CDC Public Health[cited 2020 Sep 18]. p. 1. Available from: <https://www.cdc.gov/publichealth101/surveillance.html>.
- [8] Thacker SB, Berkelman RL. Public health surveillance in the United States. *Epidemiol Rev* 1988;10(1):164–90. Jan 1.
- [9] Jones KE, Patel NG, Levy MA, Storeygard A, Balk D, Gittleman JL, Daszak P. Global trends in emerging infectious diseases. *Nature*. 2008 Feb 21;451(7181):990-3.
- [10] Kandel N., Chungong S., Omaar A., Xing J. Health security capacities in the context of COVID-19 outbreak: an analysis of International Health Regulations annual report data from 182 countries. *Lancet* [Internet]. 2020 Mar 28 [cited 2021 Feb 7]; 395(10229):1047–53. Available from: <https://doi.org/10.1016/>

- [11] Raofi A, Takian A, Sari AA, Olyaeemanesh A, Haghighi H, Aarabi M. COVID-19 pandemic and comparative health policy learning in Iran. *Arch Iran Med* 2020;23(4):220–34 [Internet][cited 2021 Feb 7] Available from: <https://pubmed.ncbi.nlm.nih.gov/32271594/>.
- [12] Hussain AA, Lafta R. Trend of cholera in Iraq in the time of unrest. *Mustansiriya Med J* 2019;18(1):1.
- [13] Jaff D. Brucellosis in Iraqi Kurdistan: an overview. ~ 1113 *J Entomol Zool Stud* 2016;4(4):1113–5 [Internet][cited 2020 Apr 3] Available from: <http://www.who.int/csr/resources/publications/Brucellosis>.
- [14] Zhao Y, Lafta R, Hagopian A, Flaxman AD. The epidemiology of 32 selected communicable diseases in Iraq, 2004–2016. *Int J Infect Dis* 2019;89:102–9. Dec 1.
- [15] Al-Mosawi, Aamir Jalal. "Iraq healthcare system: An update." *Lupine Online Journal of Medical Sciences (ISSN: 2641-1725)* 4.3 (2020): 404-411.
- [16] Tawfik-Shukor A, Khoshnaw H. The impact of health system governance and policy processes on health services in Iraqi Kurdistan. *BMC Int Health Hum Rights* 2010; 10(1):14.
- [17] Ministry of Health. Republic of Iraq national health policy 2014–2023, Ministry of Health [Internet]. Baghdad; [cited 2021 Jun 24]. Available from: [https://extranet.who.int/countryplanningcycles/sites/default/files/planning\\_cycle\\_repository/iraq/iraqs\\_national\\_health\\_policy\\_2014-2023.pdf](https://extranet.who.int/countryplanningcycles/sites/default/files/planning_cycle_repository/iraq/iraqs_national_health_policy_2014-2023.pdf).
- [18] Cordes KM, Cookson ST, Boyd AT, Hardy C, Malik MR, Mala P, et al. Real-Time Surveillance in Emergencies Using the Early Warning Alert and Response Network. *Emerging infectious diseases* 2017;23(13):S131–7.
- [19] Steele L, Orefuwa E, Dickmann P. Drivers of earlier infectious disease outbreak detection: a systematic literature review. *Int J Infect Dis* 2016;53:15–20. Elsevier B. V.
- [20] Ibrahim NK. Epidemiologic surveillance for controlling COVID-19 pandemic: types, challenges and implications. *J Infect Public Health* 2020;13:1630–8. Elsevier Ltd.
- [21] Kadhum SA. Assessment of communicable diseases surveillance system activities in PHC centers in Baghdad. *Res Artic Kadhum World J Pharm Res* 2019;8(7):137.
- [22] Hamalaw S, Bayati A, Babakir-Mina M, Benvenuto D, Fabris S, Guarino M, et al. Assessment of core and support functions of the communicable disease surveillance system in the Kurdistan Region of Iraq. *J Med Virol* 2022 Feb;94(2):469-479.
- [23] World Health Organization. Joint external evaluation of IHR core capacities of the Republic of Iraq: mission report: 12–17 March 2019 [Internet]. Government and politics of the Middle East and North Africa. Geneva PP - Geneva: World Health Organization; 2017. Available from: <https://apps.who.int/iris/handle/10665/325488>.
- [24] Nsubuga P, White ME, Thacker SB, Anderson MA, Blount SB, Broome CV, et al. Public Health Surveillance: A Tool for Targeting and Monitoring Interventions. In: Jamison DT, Breman JG, Measham AR, Alleyne G, Claeson M, Evans DB, et al., editors. *Disease Control Priorities in Developing Countries* [Internet]. The International Bank for Reconstruction and Development / The World Bank; 2006. p. 997–1015.
- [25] World Health Organization. Health workforce 2030 a global strategy on human resources for health, World Health Organization.
- [26] Denny E, Weckesser A. Qualitative research: what it is and what it is not. *BJOG Int J Obstet Gynaecol* 2019;126(3):369 [Internet]Feb 1 [cited 2020 Sep 15]–369. Available from: <http://doi.wiley.com/10.1111/1471-0528.15198>.
- [27] Girdler-Brown BV. Evaluation of the notifiable diseases surveillance system in South Africa. *Int J Infect Dis* 2017;59:139–40. Elsevier B.V.
- [28] Chafe R. The value of qualitative description in health services and policy research: valeur de la description qualitative dans la recherche sur les politiques et services de santé. *Health Policy* 2017;12(3):12–8. Dec 24.
- [29] Centers for Disease Control (CDC). Guidelines for evaluating surveillance systems, 37. CDC; 1988 May 6. p. 1–18. *MMWR Suppl*.
- [30] Kneale D, Rojas-García A., Thomas J. Obstacles and opportunities to using research evidence in local public health decision-making in England. *Heal Res Policy Syst* 2019;17(1). Jun 28;61. p 1-11.
- [31] Bonotti M, Zech ST. The Human, Economic, Social, and Political Costs of COVID-19. *Recovering Civility during COVID-19*. 2021 Mar 3:1–36.
- [32] Stasavage D. Democracy, autocracy, and emergency threats: lessons for COVID-19 from the last thousand years. *Int Organ* 2020;74(S1):E1–17 [Internet][cited 2022 Sep 28] Available from: <https://www.cambridge.org/core/journals/international-organization/article/democracy-autocracy-and-emergency-threats-lessons-for-covid19-from-the-last-thousand-years/C4A106463606BE4C0310E56A3A15F5B7>.
- [33] Feldstein S. Beware the implications of coronavirus surveillance - carnegie endowment for international peace. *Carnegie Endowment for International Peace*; 2020 [Internet]. [cited 2021 Aug 26]. Available from: <https://carnegieendowment.org/2020/03/31/beware-implications-of-coronavirus-surveillance-pub-81411>.
- [34] Aase M. Disaster governance and autocratic legitimation in Bangladesh: Aiding autocratization?. *Routledge Handbook of Autocratization in South Asia*. Routledge; 2021. p. 233–45.
- [35] Hsu CH, Champaloux SW, Keita S, Martel L, Bilivogui P, Knust B, et al. Sensitivity and specificity of suspected case definition used during West Africa ebola epidemic. *Emerg Infect Dis* 2018;24(1):9–14. Jan 1.
- [36] Ng Y, Li Z, Chua YX, Chaw WL, Zhao Z, Er B, et al. Evaluation of the effectiveness of surveillance and containment measures for the first 100 patients with COVID-19 in Singapore — January 2–February 29, 2020. *MMWR Morb Mortal Wkly Rep* 2020; 69(11):307–11. Mar 20;69(11):307-311. doi: 10.15585/mmwr.mm6911e1. PMID: 32191691; PMCID: PMC7739977.
- [37] Sahal N, Reintjes R, Mahgoub AE, Aro AR. Staff views about the quality of the communicable diseases surveillance system in Khartoum state, Sudan, 2005-2007: a qualitative study. *East Mediterr Health J* 2011;17(7):565–9.
- [38] Kazerooni PA, Nejat M, Akbarpoor M, Sedaghat Z, Fararouei M. Underascertainment, underreporting, representativeness and timeliness of the Iranian communicable disease surveillance system for tuberculosis. *Public Health* 2019;171:50–6. Jun 1.
- [39] Kazerooni PA, Fararouei M, Nejat M, Akbarpoor M, Sedaghat Z. Underascertainment, under-reporting and timeliness of Iranian communicable disease surveillance system for zoonotic diseases. *Public Health* 2018;154:130–5. Jan 1.
- [40] Jajosky RA, Groseclose SL. Evaluation of reporting timeliness of public health surveillance systems for infectious diseases. *BMC Public Health* 2004;4:1–9. BioMed Central Ltd.
- [41] Moradi G, Asadi H, Gouya MM, Nabavi M, Norouzinejad A, Karimi M, et al. The communicable diseases surveillance system in Iran: challenges and opportunities. *Arch Iran Med* 2019;22(7):361–8.
- [42] Ismail SA, Abbara A, Collin SM, Orcutt M, Coutts AP, Maziak W, et al. Communicable disease surveillance and control in the context of conflict and mass displacement in Syria. *Int J Infect Dis* 2016;47:15–22. Jun 1.
- [43] Abdulrahim N, Alasafteh I, Khader YS, Iblan I. Knowledge, Awareness, and Compliance of Disease Surveillance and Notification Among Jordanian Physicians in Residency Programs. *Inquiry*. 2019 Jan-Dec;56:46958019856508. doi: 10.1177/0046958019856508.
- [44] Alshehri MH, Alsabaani AA, Alghamdi AH, Alshehri RA. Evaluation of communicable disease surveillance system at primary health care centers in Jeddah, Saudi Arabia. *Cureus* 2021;13(11).