

Physicians' Awareness, Knowledge and Compliance with Standard Case Definition in Disease Notification, Aden, Yemen

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Abstract

Introduction: Effective disease surveillance is critical for public health, particularly in fragile settings like Yemen. The Electronic Integrated Disease Early Warning System (eIDEWS), launched in 2013, aims to strengthen outbreak detection and response. However, its success depends on the knowledge and compliance of healthcare providers, particularly physicians, with standard case definitions and reporting protocols. This study aimed to assess physicians' knowledge of standard case definitions and their compliance with notification and reporting procedures within eIDEWS-reporting health facilities in Aden, Yemen.

Methods: A cross-sectional survey was conducted among 187 physicians randomly selected from 80 eIDEWS-reporting facilities in Aden. Data were collected via a structured, self-administered questionnaire assessing physicians' demographics, awareness, knowledge, and compliance related to disease surveillance. Descriptive statistics were used for the analysis.

Results: While 94.1% of physicians reported familiarity with infectious disease case definitions, only 66.8% could accurately define the term "case definition," and correct knowledge varied by disease (e.g., 69.0% for poliomyelitis, 51.9% for cholera). Only 23.0% had received any public health or epidemiology training, mainly through short-term workshops. Compliance with immediate notification protocols was suboptimal, with only 67.4% taking appropriate action. Access to essential surveillance tools was limited: only 22.5% of facilities had all required tools. Despite 98.9% recognizing the importance of disease reporting, only 62.6% reported receiving epidemiological feedback. Barriers to reporting included logistical constraints (21.5%), lack of resources (19.5%), and insufficient training (14.4%).

Conclusion: Although physicians in Aden demonstrate basic awareness of disease surveillance, significant gaps remain in conceptual understanding, training, compliance, and resource availability. Strengthening training programs, ensuring access to surveillance tools, improving feedback mechanisms, and increasing supervisory engagement are essential to improve the performance of eIDEWS and national disease surveillance efforts in Yemen.

Keywords: Disease Surveillance, eIDEWS, Physicians, Case Definition, Reporting Compliance, Yemen, Public Health.

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مدارك ومعارف الأطباء للتعريفات القياسية لحالات الترصد وامتثالهم لعمليات الإخطار والتبليغ في عدن، اليمن

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ملخص الدراسة

المقدمة: يُعدّ الترصد الوبائي الفعال ركيزة أساسية للصحة العامة، لا سيما في البيئات الهشة مثل اليمن. ومنذ إطلاق النظام الإلكتروني التكاملي للإنذار المبكر بالأمراض (eIDEWS) في عام 2013، فالنظام يهدف إلى تعزيز قدرة النظام الصحي على اكتشاف الفاشيات مبكرًا والاستجابة لها بسرعة وفعالية. غير أن نجاح هذا النظام يعتمد بدرجة كبيرة على مستوى معرفة الأطباء بالتعريفات القياسية للحالات، ومدى التزامهم بإجراءات التبليغ والإخطار. هدفت هذه الدراسة إلى تقييم معرفة الأطباء بالتعريفات القياسية للحالات، وقياس مدى التزامهم بإجراءات التبليغ والإخطار في المرافق الصحية التي تُبلغ عبر نظام eIDEWS في محافظة عدن، اليمن.

المنهجية: أُجريت دراسة مقطعية شملت 187 طبيبًا تم اختيارهم عشوائيًا من 80 مرفقًا صحيًا مُبلغًا عبر النظام الإلكتروني للإنذار المبكر eIDEWS في محافظة عدن. جُمعت البيانات باستخدام استبيان منظم وذاتي التعبئة، شمل معلومات حول الخصائص الديموغرافية، ومستوى الوعي والمعرفة، والامتثال لإجراءات الترصد. تم تحليل البيانات باستخدام الإحصائيات الوصفية.

النتائج: أشار 94.1% من الأطباء إلى أنهم على دراية بتعريفات حالات الأمراض المعدية، إلا أن 66.8% فقط تمكنوا من تعريف مصطلح "تعريف الحالة" بدقة. وتفاوتت نسبة المعرفة الدقيقة باختلاف الأمراض (69.0% لشلل الأطفال، و51.9% للكوليرا). وأفاد 23.0% فقط بأنهم تلقوا تدريبًا في مجال الصحة العامة أو علم الأوبئة، غالبًا من خلال ورش عمل قصيرة. كما أظهرت النتائج تدني مستوى الالتزام بالإبلاغ الفوري، حيث اتخذ 67.4% فقط الإجراءات المناسبة. وُجد أن 22.5% فقط من المرافق تتوفر بها جميع أدوات الترصد الأساسية. وعلى الرغم من أن 98.9% من الأطباء أكدوا أهمية التبليغ عن الأمراض، إلا أن 62.6% فقط تلقوا تغذية راجعة حول الوضع الوبائي. تضمنت أبرز العوائق التي تواجه عملية التبليغ: التحديات اللوجستية (21.5%)، نقص الموارد والحوافز (19.5%)، وقلة التدريب (14.4%).

الخلاصة: رغم وجود وعي عام بأهمية الترصد الوبائي بين الأطباء في عدن، إلا أن هناك فجوات واضحة في الفهم النظري، والتدريب المتخصص، والامتثال العملي، وتوفير الموارد الأساسية. إن تعزيز برامج التدريب، وتوفير أدوات الترصد الضرورية، وتحسين قنوات التغذية الراجعة، وتفعيل الدور الإشرافي، تُعد خطوات جوهرية للنهوض بأداء النظام الإلكتروني للإنذار المبكر eIDEWS وتعزيز كفاءة نظام الترصد الوبائي الوطني في اليمن.

كلمات مفتاحية: الترصد الوبائي، النظام الإلكتروني للإنذار المبكر (eIDEWS)، الأطباء، تعريف الحالة، الالتزام بالتبليغ، اليمن، الصحة العامة.

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Introduction

The notifiable diseases surveillance system (NDSS) is an integral component of health information systems. It serves as a nationwide collaborative platform facilitating the exchange of health information across all levels of public health [1]. The application of the notifiable diseases surveillance system has the potential to enhance decision-making in public health, encompassing areas such as prevention strategies, comprehensive planning, health promotion initiatives, quality improvement efforts, and efficient resource allocation. Moreover, this system demonstrates effectiveness in controlling and preventing the emergence and dissemination of both infectious and non-infectious diseases[2] and it is also one of the principal components within the core capacity monitoring framework of the International Health Regulations (IHR) [3,4].

The disease surveillance system heavily relies on the definition of cases and the recognition of illness, the compilation of individual data, comprehensive analysis, and timely reporting. These essential components play a pivotal role in disease surveillance, enabling the identification and monitoring of diseases within populations [5,6].

The disease surveillance system in Yemen was established in August 1998 in conjunction with the beginning of the investigation of cases of acute flaccid paralysis (Polio surveillance) and the system reporting mechanism focuses on communicable diseases[7]. In March 2013, the World

Health Organization (WHO) in collaboration with the Ministry of Public Health and Population (MoPHP) joined forces to introduce the Electronic Integrated Disease Early Warning System (eIDEWS) in Yemen. This initiative aimed to enhance the country's limited surveillance capacity and capabilities to effectively monitor and respond to diseases[8-9]. The eIDEWS is a health facility-based disease surveillance system using electronic platform for effective data collection, management, and visualization [9-10]. Currently, the eIDEWS program provides a coverage of over 3000 healthcare facilities across all 333 districts in Yemen. The program covers a wide range of infectious diseases, with a focus on 27 specific diseases of high importance [11-12]. The effectiveness of eIDEWS relies on the consistent application of standard case definitions by healthcare workers in diagnosing and reporting diseases under surveillance [12], and is directly influenced by their performance and compliance at the facility level [1].

Factors such as limited training opportunities, high workload, lack of resources, and insufficient feedback mechanisms may contribute to suboptimal surveillance performance [13]. Therefore, this study aimed to assess physicians' knowledge of standard case definitions and their compliance with notification procedures in eIDEWS reporting health facilities at Aden, Yemen.

Methods

self-administered questionnaire distributed in eIDEWS-reporting health facilities in Aden governorate. Aden, located in southern Yemen, consists of eight districts. Each district includes a variety of public and private health facilities, such as hospitals, polyclinics, and health centers. Only health facilities that report to eIDEWS were included in the study.

Target population

This study focused on physicians providing direct clinical care across all health facility types, specifically targeting those engaged in patient examination and treatment at eIDEWS reporting sites while systematically excluding surveillance focal point physicians at these facilities to eliminate potential confounding effects arising from their specialized surveillance duties and institutional reporting obligations that could introduce measurement bias.

Sample size

The sample size for this study was calculated using Cochran's formula for cross-sectional studies, considering a 95% confidence level ($Z = 1.96$) and a 5% margin of error ($d = 0.05$). No similar studies found in Yemen; that is why two different

Study design and setting

This descriptive cross-sectional study was conducted using a structured, prevalence rates were considered based on existing data from Nigeria [5]: healthcare workers' awareness (89.8%) and knowledge (17.1%). Using these values, the initial sample sizes were calculated as 138 (for awareness) and 215 (for knowledge), respectively. The mean of these two estimates (176.5) was taken, and an additional 10% (17.5) was added to account for potential non-responses, resulting in a target sample size of 194 physicians.

Sampling method

A universal sampling of all 80 eIDEWS health facilities in Aden governorate was included and then categorized based on their type (hospital, polyclinic, health center/unit). According to the proportion of each category from the total (80 facilities), the required number of physicians from each category was identified using the proportional to population size (PPS) technique. On the day of the health facility visit, a sampling frame comprising all physicians present was prepared. Subsequently, two to three physicians were randomly selected from this list using a simple random sampling technique, as illustrated in Figure 1.

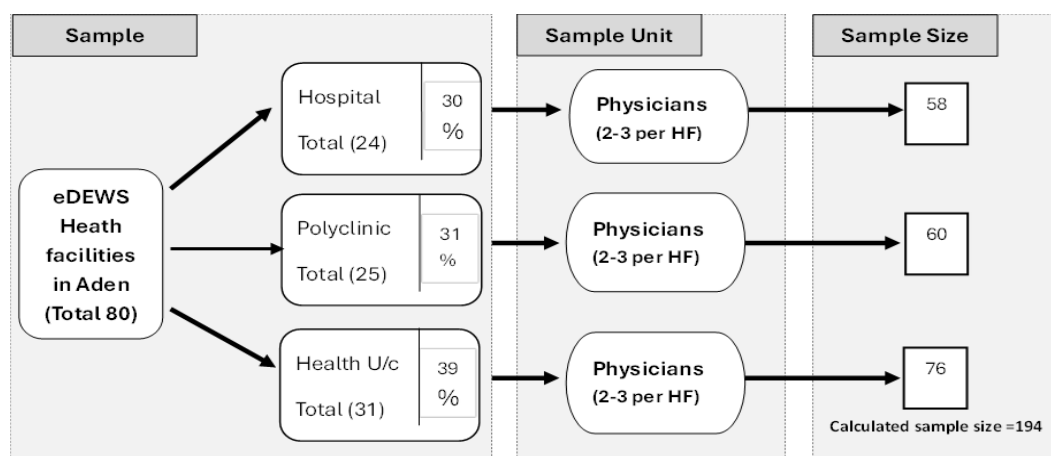


Figure 1: Sampling frame and simple random selection of physicians from eIDEWS health facilities, Aden

Data collection

Data were collected using a structured, self-administered questionnaire developed by the researcher based on the eIDEWS manual user [14] and relevant literatures [1,3,5,6,13]. It has three sections and 26 questions (23 closed- and three open-ended) was used to collect data about physicians' demographic and professional characteristics. The first section contains eight questions on the physicians' age, gender, years of clinical experience, medical qualifications, type of health facility working in, and if they have any public health certificates or participated in public health training or workshops. The second section focused on physicians' knowledge of the infectious disease surveillance system. It comprised eight closed-ended questions assessing familiarity with the national list of notifiable diseases in Yemen, understanding of reporting responsibilities, and awareness of surveillance concepts such as case definitions, alert thresholds, and reporting timelines. The third section examined their compliance with disease notification protocols and related practices. This

section included ten items evaluating previous reporting practices, response actions for immediately notifiable conditions, and barriers to timely reporting. It also assessed the availability of surveillance tools within the facility, including case definition posters, patient registers, and disease-specific reporting forms. Additionally, three questions addressed the frequency of visits from surveillance officers at the district, governorate, and central levels. Respondents selected from three predefined options: at least once a month, approximately one to six times per year, or never visited. These questions were designed to measure the degree of field-level oversight and support provided to healthcare providers. One open-ended question was included to explore challenges physicians face in reporting infectious diseases. This allowed for capturing detailed, context-specific barriers not addressed by closed-ended items. From 187 respondents, a total of 226 discrete challenge statements were collected, as some participants listed multiple issues. Each response was treated as a distinct unit for categorization and frequency analysis.

Questionnaires were distributed in person at selected healthcare facilities by a trained data collector. The data collectors were thoroughly oriented on the study's objectives, inclusion criteria, and ethical protocols. Data collection was conducted in a manner that ensured privacy and confidentiality.

Statistical analysis

Data were entered, cleaned, and analyzed using appropriate statistical software (implied by the use of Python libraries like Pandas, Matplotlib, Seaborn, and Scipy for the analysis performed). Categorical variables (e.g., sex, medical category, facility type, knowledge levels, awareness categories, compliance practices) were expressed through frequency and percentages, while continuous variables (e.g., age, years of experience) by means, standard deviations, medians, and ranges. Results were presented in appropriate tables.

Ethical consideration

The study proposal was approved by the Research Ethics Committee of the Faculty of Medicine and Health Sciences, University of Aden. Prior to data collection, physicians were provided with comprehensive information regarding the study objectives, procedures, and their rights as participants. Informed consent was obtained from all respondents before participation. Participants were assured of the confidentiality of their responses, and all personal data were handled securely and used exclusively for research purposes.

Results

Response rate

Although the calculated sample size was 194, the study successfully collected responses from 187 physicians, representing a 96.4% response rate representing diverse demographic and professional profiles.

Physician's characteristics

In Table 1, the mean age of the participants was 40.58 years (± 10.39). The highest percentage (126; 67.4%) were males. Participants had an average of 15.05 (± 10.19) years of professional experience. The largest proportion (67; 35.8%) had ≥ 20 years of experience, followed by those with less than 5 years (38; 20.3%). Regarding the professional category, general practitioners represented the largest group (61; 32.6%), followed by specialists (57; 30.5%), interns (52; 27.8%), and residents (17; 9.1%). The majority of participants were employed in governmental health facilities, including polyclinics, health centers, or health units (107; 57.2%) and governmental hospitals (46; 24.6%).

Most physicians (144; 77.0%) reported not having received training in epidemiology or public health. Among those trained ($n=43$), the majority had attended short-term workshop training (35; 81.4%), followed by certified intensive courses or Field Epidemiology Training Program (FETP) (4; 9.3%).

Table 1: Characteristics of Studied Physicians in eIDEWS Reporting Health Facilities at Aden, 2024 (n=187)

Characteristics	No.	%
Age in years Mean ($\pm$ SD)	40.58 ($\pm$ 10.39)	
Gender		
Male	126	67.4
Female	61	32.6
Years of Experience		
<5	38	20.3
5 to 9	29	15.5
10 to 14	33	17.6
15-19	20	10.7
$\geq$ 20	67	35.8
Mean ($\pm$ SD)	15.05 ($\pm$ 10.19)	
Medical Category		
Intern	52	27.8
General practitioner	61	32.6
Resident	17	9.1
Specialist	57	30.5
Type of Health Facility		
Governmental polyclinic/health center/Health unit	107	57.2
Governmental hospital	46	24.6
Private hospital	21	11.2
Private clinic/dispensary	13	7.0
Received a Training in Epidemiology or Public Health		
Yes	43	23.0
No	144	77.0
Type of Epidemiology/Public Health Training among physician who answered "Yes" (n=43)		
Workshop training for days only	35	81.4
FETP training	4	9.3
Diploma degree only	3	7.0
Workshop training for days+Diploma degree	1	2.3

Physicians' awareness and knowledge

The analysis of physicians' awareness and knowledge regarding surveillance standard case definitions and notifiable diseases (Table 2) revealed varied levels of understanding across specific surveillance components. Regarding awareness, 112 physicians (59.9%) correctly identified the number of diseases that are reported weekly in the surveillance system, while 75 of 187 (40.2%) either responded incorrectly or were unaware. A higher proportion (83.4%, n=156) demonstrated correct awareness of the six immediately notifiable diseases in Yemen.

However, awareness of the appropriate reporting timeframe for these immediately notifiable diseases was notably lower; only 85 physicians (45.5%) responded correctly, compared to 102 (54.6%) who were incorrect.

In terms of knowledge, 176 physicians (94.1%) reported familiarity with infectious disease case definitions. When asked to define the term "case definition" within the context of surveillance, 125 physicians (66.8%) responded correctly, while 62 (33.2%) either answered incorrectly or were unsure. Physicians' knowledge of specific suspected case definitions varied by

disease. The correct suspected case definition for poliomyelitis was identified by 129 physicians (69.0%). For measles, 126 physicians (67.4%) responded correctly. However,

knowledge was lowest for cholera, with only 97 physicians (51.9%) accurately identifying the suspected case definition, while 90 (48.1%) answered incorrectly or were unsure.

Table 2: Physicians' Awareness and Knowledge of Surveillance Standard Case Definitions and Notification, Aden 2024 (n=187)

Items	Correct		Incorrect	
	No.	%	No.	%
The number of weekly reported diseases in surveillance	112	59.0	75	40.2
The six immediately notifiable diseases in Yemen	156	83.4	31	16.6
Reporting timeframe for immediately notifiable diseases in Yemen	85	45.5	102	54.6
Familiarity with infectious disease case definitions	176	94.1	11	5.9
Understanding of "Case Definition"	125	66.8	62	33.2
Poliomyelitis standard case definition	129	69.0	58	31
Measles standard case definition	126	67.4	61	32.6
Cholera standard case definition	97	51.9	90	48.1

Physicians Compliance with Disease Surveillance Practices

The majority of physicians (86.1%) were aware about the designated Surveillance Focal Point at their respective health facilities, and 78.6% indicated they had been visited by the health facility surveillance personnel for awareness-raising sessions. Regarding adherence to immediate case notification protocols, 67.4% of physicians reported taking the appropriate action fully documenting the case and notifying the Surveillance Focal Point before the patient left the facility. In contrast, 32.6% demonstrated non-compliance by either recording the case only in the register without further action or notifying the focal point after the patient had departed, which does not align with standard immediate notification procedures.

Regarding the availability of essential surveillance tools, this assessment shows that only 22.5% of respondents reported the presence of all three key tools: disease case definition posters, patient general register books, and patient-specific reporting forms. Tools availability varied across facilities, with the most commonly available single tool was the patient-specific reporting forms (29.4%), followed by case definition posters (24.6%), with fewer facilities (9.6%) only having the Patient general register book.

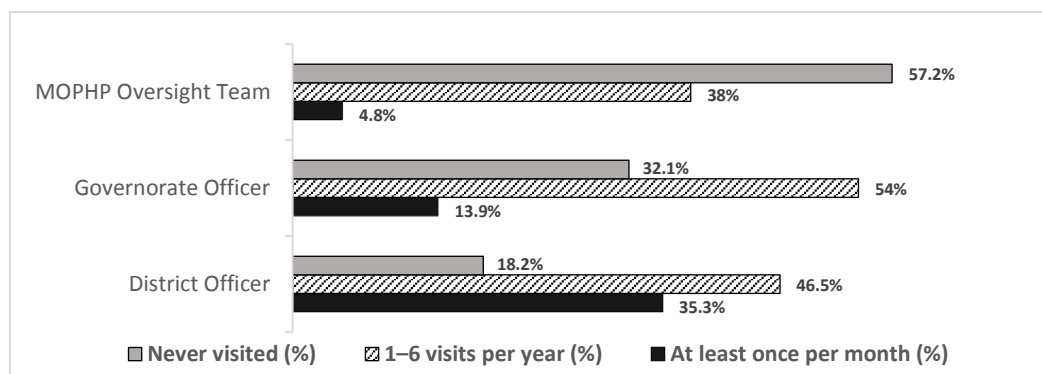
Physicians' perceptions regarding disease reporting were overwhelmingly positive. Nearly all respondents (98.9%) agreed that disease reporting is both important and necessary for the prevention and control of communicable diseases. However, only 62.6% reported receiving feedback on the local epidemiological situation (Table 3).

Table 3: Physicians' Disease Surveillance Reporting Practices and Supportive Resources in Health Facilities, Aden 2024 (n=187)

Indicator	No.	%
Physicians who recognized the presence of the designated surveillance focal point within their health facility	161	86.1
Physicians received orientation sessions from the designated surveillance focal point within their health facility	147	78.6
Action taken by physicians in response to immediately notifiable disease cases		
Appropriate action	126	67.4
Inappropriate action	61	32.6
Availability of surveillance tools at health facilities		
All three surveillance tools available	42	22.5
At least two surveillance tools available	26	13.9
Only patient-specific reporting forms were available	55	29.4
Case definition posters only	46	24.6
Patient general register book only	18	9.6
Physicians acknowledge the importance of disease reporting in preventing the spread of infectious diseases	185	98.9
Physicians who receive feedback on the epidemiological situation	117	62.6

Supervisory engagement varied considerably across administrative levels. District-level surveillance officers demonstrated the highest level of involvement, with 35.3% of physicians reported monthly visits and 46.5% indicated that they were visited between one and six times in the past year. In contrast, governorate-level surveillance teams were less active: only 13.9% of

physicians reported monthly visits, while 32.1% stated they had not been visited at all over the past year. The central-level oversight team from the MoPHP showed the least field presence, with just 4.8% of physicians reported monthly visits and 57.2% reported no visits within the year as shown in Figure 2.

**Figure 2.** Frequency of Supervisory Visits to health facilities by Surveillance Teams at Different Administrative Levels, Aden 2024 (n=187)

Physicians reported a range of challenges impacting their ability to effectively report infectious diseases. The most cited barriers were related to logistics and infrastructure (21.5%) and constraints in incentives and

resources (19.5%). Other frequently mentioned issues including insufficient training and knowledge (14.4%), patient-related barriers such as incomplete disclosure of address and contact information (12.3%), and

human resource limitations including staff shortages and workload (10.8%). Additionally, poor cooperation among staff (8.7%) and administrative issues (7.2%) were

noted. On the other hand, 15.4% reported no significant challenges, (6.2%) provided non-specific or unclear responses as seen in Table 4.

Table 4: Reported Challenges to Disease Surveillance and Case Reporting, Aden 2024 (n=187)

Challenge Category	No.	%
Logistics and Infrastructure Challenges	42	21.5
Incentive and Resource Constraints	38	19.5
Lack of Training and Knowledge	28	14.4
Patient-Related Barriers	24	12.3
Human Resources and Workload	21	10.8
Poor Cooperation Among Staff	17	8.7
Administrative Issues	14	7.2%
No Challenges / Not applicable	30	15.4%
Other non-specific	12	6.2%

Discussion

Disease surveillance is a cornerstone of effective public health response, especially in settings affected by conflict and limited resources. In Yemen, the eIDEWS serves as a vital tool for detecting and responding to outbreaks. However, the success of such systems relies heavily on frontline physicians’ knowledge, training, and compliance [3,4,5]. This study explored these aspects among physicians working in eIDEWS-reporting facilities in Aden. The findings provide insights into current practices and highlight key areas for strengthening surveillance capacity.

The study included 187 physicians of varied demographic and professional backgrounds, with a mean age of 40.58 years and an average of 15 years of experience. The majority were males and general practitioners. Most were employed in governmental

health facilities. The results demonstrate both strengths and areas for improvement in the implementation of disease surveillance at the facility level.

Only 23% of physicians reported having received training in epidemiology or public health. Among them, short-term workshop training was the most reported form (81.4%), while certified intensive courses or FETP training and diploma degrees accounted for only 9.3% and 7%, respectively. More structured or advanced training, such as workshops combined with diploma or master's degrees, was extremely rare or absent. These findings suggest that most training remains limited in scope and depth, which may hinder physicians’ ability to fully understand and implement disease surveillance protocols. Similar training gaps have been reported in other low-resource contexts, such as Ethiopia and across other African countries, where the predominance of workshop-based

training reflects broader limitations in funding and institutional capacity [3,4]. Even in relatively better-resourced settings like Jordan, structured epidemiological training among physicians remains limited [13].

Awareness and knowledge levels among physicians showed a mixed pattern. While most respondents (83.4%) correctly identified the six immediately notifiable diseases, only 45.5% demonstrated knowledge of the correct timeframe for reporting such diseases. Additionally, although 94.1% claimed familiarity with infectious disease case definitions, only 66.8% could correctly define the term "case definition" in the context of surveillance. This suggests that while terminology may be familiar, deeper conceptual understanding remains limited. Knowledge of specific suspected case definitions also varied by disease, while 69.0% and 67.4% of respondents correctly identified the definitions for poliomyelitis and measles respectively, only 51.9% could accurately define suspected cholera cases. This discrepancy was reported from Kenya, where knowledge of standard case definitions was uneven across diseases, with lower performance for less frequently encountered conditions [6].

A substantial proportion of physicians (78.6%) reported receiving direct orientation visits from the designated health facility surveillance focal point, and 86.1% recognized the surveillance focal point within their facility, demonstrating strong institutional visibility and active communication of surveillance roles. Similar findings were reported in rural Kenya [6], highlighting how

structured supervision and focal-point systems reinforce provider awareness, an important factor associated with adequate reporting [15]. Despite high awareness among physicians, compliance with immediate notification protocols was inadequate. Only 67.4% of physicians reported taking appropriate action, fully documenting and notifying the Surveillance Focal Point before patient departure. This gap mirrors findings from Nigeria, where many healthcare providers demonstrated poor adherence to reporting procedures despite knowing their responsibilities [5].

Supportive resource availability for disease surveillance was inadequate across health facilities in Aden. While 22.5% of respondents reported the presence of all three essential surveillance tools (case definition posters, patient-specific disease reporting forms, and general patient registers) at their health facilities, nearly four out of five facilities (77.5%) lacked at least one of these tools required for effective disease reporting. This mirrors findings from Nigeria, Kenya, Tanzania, and the Democratic Republic of Congo, where studies similarly identified major deficiencies in the availability of printed case definitions and standardized reporting forms [5,15,16,18]. These shortages undermine the consistency and accuracy of surveillance data and suggest an essential need to ensure the availability and accessibility of standardized tools at all reporting sites.

Most physicians (98.9%) in this study recognized the importance of disease reporting for the prevention and control of infectious diseases,

demonstrating a strong sense of professional responsibility. This positive perception aligns with findings from Saudi Arabia and Jordan, where physicians similarly expressed high levels of awareness and supportive attitudes toward notifiable disease surveillance systems [1,13]. However, only 62.6% of respondents reported receiving feedback on the local epidemiological situation. The absence of feedback can diminish healthcare providers' motivation and reduce engagement over time. Similar issues have been noted in Ethiopia, where feedback loops are inconsistently applied, affecting performance and accountability [3,4].

The study identified significant gaps in supervisory engagement, particularly at higher administrative levels. While 35.3% of physicians reported receiving monthly visits from district-level officers, a concerning 32.1% indicated they had never been visited by governorate-level teams, and 57.2% had not received any oversight visits from central MoPHP teams in the past year. These findings are consistent with results from other fragile or conflict-affected settings. For example, an evaluation of the IDSR system in Zanzibar found that although 97% of health facilities received at least one district-level supervisory visit in six months, only 40% of districts were supervised by national-level teams within the same timeframe [16]. Similarly, in Ghana and Kenya, supervisory visits from central or subnational levels were often irregular, reactive, and limited in scope, contributing to weak performance in surveillance data quality and reporting consistency [15,17]. These comparisons highlight

that insufficient higher-level engagement is a common barrier in under-resourced contexts and suggest that regular, structured supervisory visits at all levels are essential to reinforce compliance, build capacity, and ensure the integrity of disease surveillance systems.

Multiple barriers influenced effective disease surveillance reporting in Aden. Logistical constraints were the most frequently reported challenge (21.2%), followed by lack of resources or incentives (8.2%), insufficient training (6.5%), and administrative obstacles (4.3%). Additionally, 42.4% of physicians cited other unspecified barriers. These findings are consistent with those from Eastern Oromia, Ethiopia, where a study identified similar obstacles to IDSR implementation, including logistical shortages and lack of training. That study also emphasized the importance of supportive supervision and formal training in improving surveillance performance [3], closely reflecting the relationships observed in Aden between supervision, training, and improved compliance. The systematic review of IDSR implementation across 14 African countries reinforces this pattern, reporting that health workers commonly encounter inadequate training, poor logistical support, and weak supervisory structures [4]. These regional insights suggest that the challenges identified in Aden are part of broader systemic issues across low-resource health systems. Addressing these through coordinated policy, workforce development, and logistical investment is essential to enhance the effectiveness of disease surveillance systems.

Conclusion

This study highlights key strengths and challenges in physicians' knowledge, awareness, and compliance with disease surveillance and notification protocols at eIDEWS-reporting health facilities in Aden, Yemen. While most physicians recognized the importance of disease reporting and demonstrated basic familiarity with notifiable conditions, significant shortcomings remain in structured epidemiological training, accurate understanding of standard case definitions, and full adherence to notification procedures. Inadequate access to essential surveillance tools, insufficient feedback mechanisms, and irregular supervisory visits at various administrative levels continue to hinder the overall effectiveness of the system. Enhancing disease surveillance in Aden requires a multifaceted approach that prioritizes capacity-building through structured training programs, ensures consistent availability of standardized reporting tools, institutionalizes supervision across all administrative levels, and strengthens feedback mechanisms. Addressing these systemic gaps is critical to improving reporting accuracy, outbreak responsiveness, and the overall performance of public health surveillance.

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