Original Article

Assessment of Knowledge and Practice of Disease Surveillance and Notification among Health Workers in Private Hospitals in Enugu State, Nigeria

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Abstract

Background: Disease surveillance and notification (DSN) has been recognized as an effective strategy for prevention and control of diseases, particularly epidemic-prone diseases. **Aim:** This study assessed the knowledge and practice of DSN activities in private health facilities (PHFs) in Enugu metropolis. **Materials and Methods:** This was a cross-sectional study, utilizing mixed methods. Multistage sampling method was used to select the PHFs and the respondents. Respondents were health-care workers (HCWs) in charge of DSN in PHFs within Enugu metropolis and the state epidemiologist. Chi-square test and multivariate analysis using binary logistic regression were used for analysis. **Results:** Being a medical doctor (adjusted odds ratio [AOR]: 6.567; confidence interval [CI]: 1.250–34.502) was found to be a predictor of good knowledge. Facilities having more than ten patients daily (AOR: 0.012; CI: 0.085–0.739) and poor knowledge of Integrated Disease Surveillance and Response (IDSR) system (AOR: 0.135; CI: 0.028–0.660) were predictors of poor IDSR practice. Four major themes emerged from the key informant interview: the level of involvement of state with DSN in PHFs, support available to PHFs, challenges in assessing DSN data in PHFs, and measures to improve DSN activities in PHFs. **Conclusion:** The HCWs in charge of DSN had good knowledge of IDSR system, but the practice was poor. There is a need for regular training with supportive supervision of the HCWs to ensure they translate knowledge into practice.

Keywords: Disease surveillance and notification, knowledge, practice, private health facilities

Introduction

Disease surveillance is the continuous scrutiny of the occurrence of diseases and health-related events to enable prompt intervention for the control of diseases.[1] Integrated Disease Surveillance and Response (IDSR) strategy was adopted as a regional strategy by the World Health Organization (WHO) in 1998.[1] The aim of introducing IDSR was to harmonize surveillance activities and to strengthen national capacity for early disease outbreak detection by effectively and efficiently utilizing the prevailing human and financial resources.[2] The current disease surveillance and notification (DSN) system in Nigeria was adopted by the Nigerian National Council on Health in 1989, and 11 years later, the IDSR strategy was initiated and is available at each level of health care, from the federal, state to the local government areas (LGAs) with focus on the LGA, being the closest health-care structure to the people.[1] The key objectives of IDSR were (1) to enable early detection and immediate response to acute public health concerns and (2) to assess specific public health problems with a focus on long-term trends and epidemiological patterns to identify the impact of diseases in the country.[3] IDSR also guides, monitors, and assesses the impact of interventions;

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provides a framework for identifying major public health problems in a community; and serves as a planning guide.[3]

Private practitioners is usually the first point of care in emerging economies because of perceived quality, lower costs, speedy care, the flexibility of payments, and accessibility.[4] They already account for over 50%–80% of the out- and inpatient care in countries such as India, China, Brazil, and Nigeria among others, but their contribution to health information systems in most countries is essentially voluntary, resulting in gross misrepresentation and underestimation of disease burdens.[4] In Nigeria, IDSR implementation is continually faced with challenges of disease reporting, especially from the point of the health facilities where inadequate health information is generated, because the health-care workers (HCWs) appear to be reporting diseases ineffectively.[5] Many outbreaks that have occurred in Nigeria over the years are attributed to poor reporting of diseases by HCWs.[6] The weaknesses within the IDSR strategy in most countries had resulted in failures in detecting epidemics, spread of diseases and associated human suffering, and loss of lives.[7]

Based on the structure of IDSR in Nigeria, the emphasis is on public health institutions. Nonengagement of private health facilities (PHFs) in disease surveillance has been reported in Enugu State.[8] Although efforts are now in place to bring the private sector on board, there is a need to assess these facilities to determine their level of involvement currently.[8] Therefore, this study aims to identify gaps in knowledge and practice of disease reporting among HCWs in PHFs in Enugu State. The findings from this study might help to develop programs for improved notification by HCWs in PHFs and also enhance their capacity for early disease detection and response which will consequently reduce morbidity and mortality.

Materials and Methods

Study area

This study was carried out in Enugu metropolis, Enugu State, in Southeastern Nigeria. The state is made up of 17 LGAs. Enugu metropolis comprises three LGAs: Enugu East, Enugu North, and Enugu South.[9] The state offers health-care services through a system of formal and informal private and public health facilities. Although there are a total of 233 registered PHFs in Enugu metropolis, only 167 PHFs are functional.

Study design, population, and sampling

This was an analytical cross-sectional study among HCWs in charge of DSN or record keeping in PHFs within Enugu metropolis. Furthermore, the state epidemiologist was interviewed. A minimum sample size of 100 was determined using the prevalence of medical directors of PHFs in Osun State, Nigeria (80%), that had good knowledge of DNS.[10]

Eligibility criteria

Inclusion criteria

A designated HCW in each of the selected private health facility in charge of disease reporting or record keeping and has worked for a minimum of six months was recruited for the study.

Exclusion criteria

HCWs in charge of reporting but too ill to answer questions during the survey were excluded.

A multistage sampling method was used. In stage 1, stratified sampling was used to allocate the PHFs into each of the three LGAs in Enugu metropolis using the list of PHFs obtained from the State Ministry of Health (SMoH). Thus, Enugu South has 70 PHFs, Enugu North has 73 PHFs, while Enugu East has 90 PHFs. In stage 2, simple random sampling by balloting was used to select 30, 31, and 39 PHFs in Enugu South, Enugu North, and Enugu East, respectively, based on the proportionate sampling. In stage 3, a designated officer for reporting was recruited purposively in each of the selected PHF. However, if a selected facility declined participation, the next facility on the list was selected to replace it.

Variables and measurements

A total of 18 questions were used to assess the knowledge of IDSR among HCWs in this study. A scoring system was used in which the respondent's correct and incorrect answers provided for the questions were allocated "1" or "0" points, respectively. Knowledge scores were summed up to give a total knowledge score for each HCW. The total score of knowledge-related questions ranging from 0 to 18 was used to classify the knowledge into two categories: good knowledge (if above the median) and poor knowledge (if equal to or below the median).

The HCWs' IDSR practice was measured using four questions. To analyze the practice, a score of 1 was assigned for each acceptable or correct practice and 0 for unacceptable, hence the total score of IDSR practice ranged from 0 to 4. Accordingly, HCWs' IDSR practice was classified into two categories: good (if above the median) and poor (equal to or below the median).

Data collection

Both quantitative and qualitative study instruments were used for data collection. The instruments were designed by the researchers with questions adapted from previous studies.[11,12]

The interviewer-administered questionnaire, after pretesting in ten randomly selected facilities outside the study area, was used to collect quantitative data from the PHFs. The state epidemiologist was interviewed using a key informant interview guide.

Data Analysis

Quantitative data were analyzed using EPI- INFO version 7. Continuous variables were summarized using means and standard deviation (SD) while categorical variables were summarized as frequencies and percentages. Inferential statistics was performed using Chi-square test of statistical significance and the level of statistical significance was set at a p-value of < 0.05. Logistic regression model was used to determine the predictors of good knowledge and practice.

Qualitative data obtained from the recordings of the key informant interview was transcribed verbatim after the interview. Manual content analysis was used in the analysis.

Ethical consideration

Ethical clearance was obtained from the University of Nigeria Teaching Hospital Health Research and Ethics Committee which can be contacted through E-mail at cmdunth2011@yahoo.com. The clearance certificate was issued on May 24, 2019, and the ethical clearance number is NHREC/05/01/2008B-FWA00002458-IRB00002323. Permission to conduct the study was obtained from the medical directors of the PHFs. The respondents were duly informed about the nature and purpose of the research, after which they signed a consent form indicating their willingness to participate.

Results

Qualitative data

Four major themes emerged from the interview: involvement of state with DSN in PHFs, support available to PHFs, challenges in assessing DSN data in PHFs, and measures to improve DSN activities in PHFs.

Involvement of the government in Integrated Disease Surveillance and Response

The state government is directly involved in DSN in all health facilities including PHFs. At the state level, the state epidemiologist oversees this activity while, at the LGA level, the DSN officers (DSNOs) and assistant DSNOs are involved. "For the state officers, we visit each LGA once a week. The DSNOs visit the facilities within their jurisdiction, both private and public weekly."

The level of support available to private health facilities

The state government provides various forms of support on DSN to PHFs. They include material, technical, and, in some cases, financial support. The materials provided include surveillance posters and data tools – IDSR 002, 003. "The forms are supplied to the DSNOs in the LGA who distributes to the facilities as soon as they are received from national body. Form 001 for immediate case finding is not provided to the health facilities. It is the local government DSNO that makes use of that."

On technical support, "facility surveillance focal persons are trained as often as we visit them while on the job. Asides from that, we organize training twice yearly for them."

Financial support for DSN is provided by the WHO for acute flaccid paralysis (AFP) surveillance. This support is only available for sites designated as AFP focal sites. "WHO provides one thousand naira as financial support to the surveillance focal persons at designated facilities monthly, as an incentive." Every LGA has about 10 AFP focal sites: about 5–7 public and 3–4 private. There is a mixture. The main criterion for selection is based on patient load. Facilities with heavy patient load are preferred.

Challenges in assessing disease surveillance and notification data in private facilities

The state epidemiologist recounted various challenges in assessing data from PHFs. These include refusal to release data, incomplete data, stockout of forms, and lack of cooperation from the staff. Some PHFs refuse to release data to the state. Although they have the data, they are reluctant to provide it. "They are afraid that if such cases are reported, their facilities will be closed" and also "the staff working at non-designated AFP sites, because no incentive is available for them, have apathy in reporting disease occurrence."

Measures to improve disease surveillance and notification activities among private health facilities

The SMoH is putting some measures in place to ensure compliance and cooperation from defaulting PHFs, some of which include advocacy visits and negotiations with these facilities.

Table 1: Sociodemographic characteristics of respondents and facility characteristics

Variable	Frequency (n=100), n (%)
Age (years)	
20-29	28 (28)
30-39	51 (51)
40-49	15 (15)
≥50	6 (6)
Age, mean±SD	34.67±8.72
Gender	
Male	38 (38.0)
Female	62 (62.0)
Highest level of education	
Secondary	12 (12.0)
Tertiary	70 (70.0)
Postgraduate	18 (18.0)
Occupation	
Doctor	35 (35.0)
Nurse	56 (56.0)
Record officer	9 (9.0)
Work experience (years)	
<5	43 (43.0)
≥5	57 (57.0)
Number of years facility has been in existence (years)	
<5	26 (26.0)
≥5	74 (74.0)
Average daily patient load (patients)	
<10	75 (75.0)
≥10	25 (25.0)
Ever received training on DSN while working in current facility	
Yes	25 (25.0)
No	75 (75.0)
Most current training on DSN (years)	
<1	13 (52.0)
1-2	2 (8.0)
3 or more	10 (40.0)

DSN: Disease surveillance and notification, SD: Standard deviation

Table 2: Knowledge of Integrated Disease Surveillance and Response among health-care workers in private health facilities within Enugu metropolis

Variable	Frequency (*n*=100), *n* (%)
Awareness of notifiable diseases	82 (82.0)
Aware of DSN system	67 (67.0)
Authority to be notified (*n*=82)	
FMOH	30 (36.6)
LGA chairman	3 (3.7)
LGA DSNO	47 (57.3)
State epidemiologist	2 (2.4)
Correctly stated use of IDSR forms (*n*=100)	
Form 001	31 (37.8)
Form 002	25 (30.5)
Form 003	28 (31.7)
Correctly stated diseases reported with IDSR forms (*n*=100)	
Form 001	29 (29.0)
Form 002	15 (15.0)
Form 003	11 (11.0)
Use of IDSR data	
Identification of changes in trend of disease	71 (71.0)
Disease prevention and control	77 (77.0)
Statistics and planning	73 (73.0)
Detection and notification of disease outbreaks	83 (83.0)
Record and reference purposes	79 (79.0)
Research purposes	64 (64.0)
Initiate and monitor interventions	81 (81.0)
Report to DSNO or other authorities	84 (84.0)
For health education or advocacy	75 (75.0)
Overall knowledge of IDSR system (*n*=100)	
Poor knowledge	29 (29.0)
Good knowledge	71 (71.0)

IDSR 001: Immediate case based reporting form used cases in an outbreak, IDSR 002: Weekly reporting for nine epidemic-prone diseases and public health events of international concern, IDSR 003: Monthly reporting for 41 priority diseases. IDSR: Integrated Disease Surveillance and Response, DSN: Disease surveillance and notification, LGA: Local government area, DSNO: Disease surveillance and notification officer, FMOH: Federal ministry of health

Quantitative result

The mean age of the respondents was 34.67 ± 8.72 years. Majority were nurses 56 (56.0%) and more than half 57 (57%) had worked for more than five years [Table 1].

Table 2 shows that more than half 82 (82.0%) of the respondents were aware that some diseases are notifiable and 67.0% were aware of the DSNO system. Less than half of the respondents could correctly state any of the IDSR forms. Seventy-one (71.0%) had good knowledge of the IDSR system.

Only twenty (47.6%) of the IDSR data collection process were supervised by LGA staff. In general, there was poor practice of the IDSR system in the facilities studied 73 (73.0%) [Table 3].

The most common challenge reported was non-availability of forms (48.0%). Never seen a case of notifiable disease and lack of reporting system were reported by 46% and 42% of the respondents respectively [Figure 1].

Further analysis done using multivariate logistic regression showed that officers in charge of IDSR aged more than 40 years were about five times less likely to have good knowledge of the IDSR system than those <40 years (adjusted odds ratio [AOR] = 0.196, confidence interval [CI] = 0.041–0.945), and this finding was statistically significant ($P = 0.031$). Being a medical doctor was a predictor of good knowledge of IDSR as doctors were found to be about seven times more likely to have good knowledge of the IDSR system (AOR = 6.567, CI = 1.250–34.502) than the rest of the staff. Other factors such as gender, highest level of education, work experience, number of years the facility has been in existence, and average daily patient load were not found to be predictors of good knowledge of the IDSR system [Table 4].

Being in a facility that saw an average number of more than ten patients a day was found to be about four times less likely to practice good IDSR reporting (AOR = 0.012, CI = 0.085–0.739). Similarly, respondents who had poor knowledge of the IDSR system were about seven less likely to have good practice of IDSR (AOR = 0.135, CI = 0.028–0.660). Other factors such as age, gender, highest level of education, occupation, work experience, and number of years the facility has been in existence were not found to be predictors of good practice of IDSR [Table 5].

Discussion

This assessment provides a summary of DSN performance among private hospitals within Enugu metropolis. Although there was a high level of awareness of disease notification (82%), only 57.3% of the HCWs notified the diseases correctly through the local government DSNO. A similar observation was reported in South Africa where majority (92%) of the HCWs had reported notifiable diseases, yet only 51% of these notified the diseases correctly to the designated department.[13] Efforts by the government to boost DSN activities in the state are yielding positive results as awareness of the DSN system has increased from 57.5% recorded within the region five years prior to this study to our recent finding (67.0%).[14] This improvement can be attributed to the supportive supervision and biannual training organized by the government to strengthen disease notification within the state.[14] The overall knowledge (71%) reported in this study is similar to 68.9% recorded among HCWs in Oyo and 80% reported among medical directors in PHFs in Osun states both in Southwest Nigeria.[11,15]

While the overall knowledge of the HCWs in this study was above 70%, the same could not be said about the practice with a reported rate of 27%. It is surprising that only 19% of the respondents had ever used the IDSR forms to report any disease. This is similar to a study done in Southeastern Nigeria where 66.7% of the health-care workers were aware of disease reporting forms. However, between 11% and 24% of them did not know or correctly identify the uses of the forms.[16] This corroborates the concerns raised by the state epidemiologist in assessing data from some PHFs within the state in addition to the poor retention of trained focal surveillance officers. Furthermore, the lack of incentives for the focal persons would have invariably resulted in apathy in reporting diseases. It can thus be inferred that IDSR practices in Enugu State remain short of the standard practice (>80%) recommended by the WHO and Centre for Disease Control assessment protocols.[8] Although modalities are being put in place to ensure the efficiency of the IDSR system, challenges abound. Nonavailability of forms was the greatest challenge reported in this study. This challenge was cited some years ago in a study done within this region where only 11.3% of the facilities studied had a regular supply of IDSR forms.[14] Similar findings were noted in studies done in Nigeria where majority of the respondents reported lack and inadequate reporting tools as a reason for not reporting diseases.[16-18] It is worrisome that this challenge has persisted to date. Similarly, studies done in Nigeria and Uganda documented that the nonavailability of forms and other materials impeded IDSR activities.[3,19]

Unavailability of the IDSR reporting tools will impede the functioning of the disease surveillance and reporting strategy.[3]

Table 3: Practice of Integrated Disease Surveillance and Response in private health facilities within Enugu metropolis

Variable	Frequency (*n*=100), *n* (%)
Practice of reporting IDSR*	
Disease reporting carried out in facility	42 (42.0)
Ever reported any disease using IDSR forms	8 (19.0)
IDSR data collection supervised by LGA staff	20 (47.6)
Designated person for DSN in facility	19 (45.2)
Overall practice of IDSR (*n*=100)	
Poor practice	73 (73.0)
Good practice	27 (27.0)

*Only positive answers were reported. IDSR: Integrated Disease Surveillance and Response, DSN: Disease surveillance and notification, LGA: Local government area

Table 4: Predictors of good knowledge

Variables	Adjusted odds ratio	*P*	95% CI (lower–upper)
Age (years)			
40 or less	0.196	0.031	0.041-0.945
>40			
Occupation			
Medical doctor	6.567	0.013	1.250-34.502
Other health-care workers			
Highest level of education			
Secondary education or below	0.642	0.314	0.271-1.521
Above secondary education			
Work experience (years)			
<5	0.890	0.819	0.327-2.419
>5			
Average number of patients seen daily			
<10	0.780	0.718	0.321-2.207
>10			
Number of years facility was established (years)			
<5	0.569	0.306	0.193-1.675
>5			

Hosmer and Lemeshow significant value=0.437, Nagelkerke *R* square=0.173. CI: Confidence interval

Table 5: Predictors of good practice

Variables	Adjusted odds ratio	*P*	95% CI (lower–upper)
Age (years)			
40 or less	0.438	0.224	0.142-1.618
>40			
Occupation			
Medical doctor	1.020	0.942	0.595-1.748
Other health-care workers			
Sex			
Male	0.559	0.336	0.171-1.829
Female			
Highest level of education			
No formal education	0.972	0.954	0.374-2.524
Primary			
Secondary			
Tertiary			
Postgraduate – for example, Msc			
Work experience (years)			
<5	0.301	0.068	0.960-1.358
>5			
Average number of patients seen daily			
>10	0.012	0.040	0.085-0.739
<10			
Number of years facility was established (years)			
<5	1.041	0.951	0.291-3.726
>5			
Knowledge of IDSR			
Poor knowledge	0.135	0.015	0.028-0.660
Good knowledge			

Hosmer and Lemeshow significant value=0.928, Nagelkerke *R* square=0.244. IDSR: Integrated Disease Surveillance and Response, CI: Confidence interval

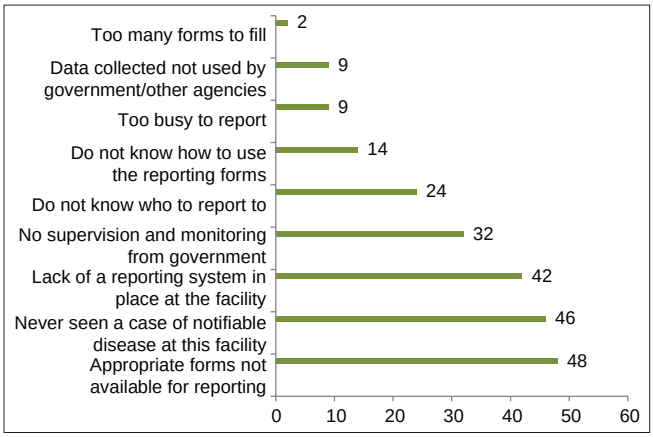

Figure 1: Challenges of Integrated Disease Surveillance and Response system in private health facilities

Therefore, strengthening of the IDSR system in Nigeria must include the production and distribution of all reporting tools to all operational levels.[3] Furthermore, 14% of the respondents acknowledged that they do not know how to use the forms. The reason could be because only 25% of the respondents had received training on IDSR at their current workplaces. Hence, for a surveillance system to function effectively, the different personnel involved should be adequately trained.[3] Lack of training on the use of IDSR forms was also noted in a study done in the state within the past six years as only 8.8% of the health workers reported being trained.[14] Similar studies done in Northern,[3,19] Southwest,[20] and other regions in Nigeria[21] also noted lack of personnel capacity to detect and report cases as hindrances to implementation. Findings from other African countries[22,23] and Jordan[24] have also established a relationship between poor IDSR performance and lack of trained personnel.

Although regular supervision is claimed to be carried out by the state, 32% of the HCWs reported the absence of supervision and monitoring from the government as their major challenge and surprisingly 42% of the facilities do not have any reporting system in place. This, among other challenges of the surveillance system, has been reported in Nigeria[11,21,25] and Ghana[26] in previous studies. Supportive supervision helps staffs to improve their performance.[21] It ensures that staff perform their responsibilities according to set standards.[21] Lack of supervision, therefore, will have a negative impact on disease surveillance.[21]

Age and occupation were predictors of good knowledge of IDSR in this study. IDSR began its implementation in Nigeria about 18 years ago.[1] Prior to that, there was no coordinated system of disease surveillance and reporting in

the country.[1] Health-care workers above 40 years may have found adaptation to this change difficult. This may explain the poor knowledge recorded among this age group in this study. Medical doctors have the expertise in case identification and disease transmission, and this may explain why being a medical doctor could have attributed to good knowledge of IDSR. Average patient daily load and knowledge of IDSR system predicted good practice of IDSR in this study. Health-care workers that run busy clinics daily are not likely to efficiently practice good IDSR reporting as a result of exhaustion. This was also reported in a study done in Nigeria where one of the obstacles to disease reporting was doctors being too busy to report.[21] Likewise, while HCWs who hither to feel unmotivated are saddled with the responsibility of meeting the health-care needs of an oversized population, optimal performance cannot be expected. Furthermore, it is a proven fact that poor knowledge invariably translates to poor practice. It is, therefore, not surprising that respondents having poor knowledge also performed badly.

Limitation

This study was done in PHFs within Enugu metropolis, therefore, the findings might not be generalized to all private hospitals in Enugu State and other states in Nigeria. Furthermore, poor access to some of the private facilities was a major limitation. While some of the directors of these hospitals declined participation in the study, others requested that they be part of the study as a condition for responding to the questionnaire. Furthermore, since it was a cross-sectional study, temporal relationship cannot be established.

Conclusion

Majority of the health workers in PHFs had good knowledge of the IDSR system. However, there was poor practice of the use of the IDSR system. Some of the factors affecting disease reporting among the PHFs studied were unavailability of forms and patients' load. Refusal to release data, stockout of forms, and lack of cooperation by the PHFs were also noted as challenges of DSN in the state. Involvement of PHFs in IDSR implementation will help to expand the scope of IDSR in Nigeria.

Therefore, for improved practice of the IDSR system by the private health facilities, there is a need for regular provision of IDSR forms and training/retraining of the health workers on the use of IDSR system. We also recommend that incentives should be given to health facilities that report as this will encourage disease reporting by others. There is also a need for all the PHFs to have a designated DSN officer. These measures will help to curtail the recurrent and current disease outbreaks in the country.

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Conflicts of interest

There are no conflicts of interest.

References

1. Isere EE, Fatiregun AA, Ajayi IO. An overview of disease surveillance and notification system in Nigeria and the roles of clinicians in disease outbreak prevention and control. Niger Med J 2015;56:161-8.
2. World Health Organization. Protocol for the Assessment of National Communicable Disease Surveillance and Response Systems Guidelines for Assessment Teams. Geneva: World Health Organization; 2001. p. 76.
3. Ibrahim LM, Stephen M, Okudo I, Kitgakka SM, Mamadu IN, Njai IF, *et al*. A rapid assessment of the implementation of integrated disease surveillance and response system in Northeast Nigeria. BMC Public Health 2020;20:600.
4. Phalkey RK, Butsch C, Belesova K, Kroll M, Kraas F. From habits of attrition to modes of inclusion: Enhancing the role of private practitioners in routine disease surveillance. BMC Health Serv Res 2017;17:599.
5. Abdulraheem L, Monehin J, Akanbi A, Onajole A, Bamgbala A. Disease notification among physicians in a Nigerian tertiary health institution. Niger Med Pract 2003;45:111-5.
6. Osibogun A, Jaksic J, Idowu JA, Alausa OK, Oluwole FA. For Better Data, Better Utiilized. World Health Forum. 1996;17:274-6.
7. Quinn SC, Kumar S. Health inequalities and infectious disease epidemics: A challenge for global health security. Biosecur Bioterr 2014;12:263-73.
8. Author M, Augustine A, Saleh CJ, Saddiq A, Rex M, Wondimagegnehu A. An evaluation of the integrated disease surveillance and response (IDSR) in Enugu state, Nigeria. J Health Med Nurs 2018;48:32-46.
9. National Population Commission. Nigeria Demographic and Health Survey. National Population Commission. Federal Ministry of Health; 2013. p. 59.
10. Adebimpe W, Oluremi A. Knowledge and practice of disease notification among private medical practitioners in Osun State, Southwestern Nigeria. Niger J Gen Pract 2019;17:16.
11. Dairo MD, Bamidele JO, Adebimpe WO. Disease surveillance and reporting in two Southwestern states in Nigeria: Logistic challenges and prospects. J Public Heal Epidemiol 2010;2:125-9.
12. Nnebue CC, Onwasigwe CN, Adogu POU, Onyeonoro UU. Awareness and knowledge of disease surveillance and notification by health-care workers and availability of facility records in Anambra state, Nigeria. Niger Med J 2012;53:220-5.
13. Benson FG, Levin J, Rispel LC. Health care providers' compliance with the notifiable diseases surveillance system in South Africa. PLoS One 2018;13:1-16.
14. Aniwada E, Obionu C. Disease surveillance and notification, knowledge and practice among private and public primary health care workers in Enugu State, Nigeria: A comparative study. Br J Med Med Res 2016;13:1-10.
15. Jinadu KA, Adebiyi AO, Sekoni OO, Bamgboye EA. Integrated disease surveillance and response strategy for epidemic prone diseases at the primary health care (PHC) level in Oyo State, Nigeria: What do health care workers know and feel? Pan Afr Med J 2018;31:19.
16. Iwu A, Diwe KC, Merenu IA, Duru CB, Uwakwe KA. Assessment of disease reporting among health care workers in a South Eastern State, Nigeria. Int J Community Med Public Health 2016;3:2766-74.
17. Masiira B, Nakiire L, Kihembo C, Katushabe E, Natseri N, Nabukenya I, *et al*. Evaluation of integrated disease surveillance and response (IDSR) core and support functions after the revitalisation of IDSR in Uganda from 2012 to 2016. BMC Public Health 2019;19:46.
18. Makinde OA, Odimegwu CO. Compliance with disease surveillance and notification by private health providers in South-West Nigeria. Pan Afr Med J 2020;35:114.
19. Lar LA, Afolaranmi TO, Tagurum YO, Uzochukwu BSC, Zoakah AI. Challenges of integrated disease surveillance response reporting among healthcare personnel in Mangu, Plateau State, Nigeria. J Public Health Epidemiol 2015;7:108-13.
20. Ilesanmi OS, Babasola OM. Clinical sensitization on Integrated Disease Surveillance and Response in Federal Medical Center Owo, Ondo State, Nigeria, 2016. Public Health Indones 2017;3:41-9.
21. Lafond KE, Dalhatu I, Shinde V, Ekanem EE, Ahmed S, Peebles P, *et al*.

Notifiable disease reporting among public sector physicians in Nigeria: A cross-sectional survey to evaluate possible barriers and identify best sources of information BMC Health Serv Res 2014;14:568.
22. Sow I, Alemu W, Nanyunja M, Duale S, Perry H, Gaturuku P. Trained district health personnel and the performance of integrated disease surveillance in the who African region. East Afr J Public Health 2011;7:16-9.
23. Francis Mugisha J, Mwende Kajungu T. Role of remuneration in retention of health workforce in a rural district setting in Uganda. Int J Public Health Res 2015;3:94-100.
24. Abdulrahim N, Alasasfeh I, Khader YS, Iblan I. Knowledge, awareness, and compliance of disease surveillance and notification among Jordanian physicians in residency programs. Inquiry 2019;56:1-6.
25. Ofili AN, Ugwu EN, Ziregbe A, Richards R, Salami S. Knowledge of disease notification among doctors in government hospitals in Benin City, Edo State, Nigeria. Public Health 2003;117:214-7.
26. Adokiya MN, Awoonor-Williams JK, Beiersmann C. Muller O. The integrated disease surveillance and response system in northern Ghana: Challenges to the core and support functions. BMC Health Serv Res 2015;15:288.