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Effectiveness of data collection and information transmission process for disease notification in Anambra State, Nigeria

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Abstract

Background: Disease surveillance and notification (DSN) has been shown to be weak in Nigeria, thus, its inability to promptly detect and control epidemics.

Objective: To examine the completeness and timeliness of data collection and information transmission process for DSN in the Anambra state.

Materials and Methods: The study was of cross-sectional design and employed the multistage sampling method to select 270 health workers who are involved in DSN in Anambra state. Data were collected by a mix method of interviewer administered questionnaire and observational checklist preceded by key informant interviews and desk review.

Results: One hundred (43.9%) health workers reported regular supply of Integrated Disease Surveillance and Response (IDSR) forms, 25% and 16.2% reported it was irregular and usually out of stock, respectively. Most facilities (81.5%) returned completed forms monthly. Secondary health facilities were less likely to submit completed forms, while majority of primary health facilities submitted theirs monthly (X^2 = 4.42, P = 0.035). With respect to correctness of records, Health Management Information System records (55.6%) were the least correct, while out-patient register (88.9%) was the most correct. Only 10.0% of health facilities submitted completed forms 5 days after completion, 88.9% of them submitted completed IDSR002 forms within 2 days of completion, while the remainder was submitted 4 days later.

Conclusion: The health workers were not operating the DSN system in the State to optimal functionality. Recommendations were therefore made for the periodic training–retraining of health personnel on DSN, improved funding, provision of logistics, improved supervision, and feedback of information.

Key words: Data collection, disease notification, effectiveness, information transmission process

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Introduction

The national disease surveillance and notification (DSN) system includes all the diseases and health conditions under national surveillance. Disease reporting through this system is usually classified as passive and generally voluntary at most levels except the Community Health workers level, hence, the weakness globally. Though active surveillance provides more complete and reliable information about a disease and may be needed in special surveillance situations, it is often short term and usually requires more trained and well-supervised personnel with adequate logistics as well

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as funding than passive surveillance. The DSN system is better than nothing and enhancing the surveillance system is dependent on prompt reporting, timeliness, and completeness.

It has been documented that since the introduction of the disease surveillance system in Nigeria, the varying degrees of success that have been recorded in terms of reporting, from 45% in 1990, 85% in 2001 to 83% in 2008, does not represent the actual completeness of reporting at all levels.[1] This implies that despite the increasingly important role of disease surveillance in the planning, assessment, allocation, and mobilization, and for early detection and response to epidemics as well as for quantifying the impact of disease prevention and control programs, the countries in the West African subregion are not producing the required relevant information.[2] There are structural weaknesses in data collection, the analysis and use of information for action at all levels, thereby leading to its inability to detect and control epidemics.[3,4] Data collection forms are often not completely and accurately filled due to complaints that they are complex and too cumbersome to fill.[4]

Completeness of disease reporting refers to the total number of sources of reporting that are expected to report. The compilation of the reports even when received in time may be labeled 'provisional' or incomplete. This implies that they are to be updated when later reports are received. However, whether cases of health conditions are with low incidence or high epidemic potential, there is no consensus on the need for all to be reported. Nonetheless, some authorities are of the view that higher standard of case ascertainment or reporting should apply to highly prevalent conditions.[5] Disease surveillance in Nigeria is weak with duplication of data collection and multiple reporting channels. The completeness of reporting of notifiable diseases is also very low. It was 22% in 1994 and 18% in 1995.[4,6] There is lack of clarity with regard to data submission responsibilities. In 1990, WHO stated that only about 10-20% of all adult cases of AIDS that have occurred in Africa have been reported to the organization.[7]

Timeliness is a key performance measure of public health surveillance system and should be assessed regularly. Timeliness can vary by nature of disease under surveillance, intended use of the data, and public health system level.[8] Timeliness has been determined as the interval between any two steps within a surveillance system and is particularly important for acute diseases that occur in epidemic form.[8] The interval usually considered is the amount of time between the onset of an adverse health event and the report of the event to the appropriate public health authority responsible for instituting control and preventive measures.[9] Timely collection, collation, dissemination, and analysis of data remain important, if the desired objectives of the disease surveillance system is to be achieved. The Epidemiologic unit of the Federal Ministry of Health, Nigeria in 1992, observed that only 19% of the states in the Federation, notified the onset of an epidemic, while the mean lag time between the onset of an epidemic and its notification to the Unit was about 16 days.[6]

To complete the cycle of flow of information for action, adequate feedback of surveillance information is needed by health care providers, health agencies, and the public. Current and accurate two-way flow of information among the appropriate authorities who need to know remains the basis of effective surveillance.[10,11] In this loop, a timely and easily comprehended analysis of information is fed back through the various levels of the reporting system. This is used in updating control activities, thus, maintaining interest and motivation among the reporters. Feedback also serves as a control and increases community awareness and participation on the pattern of diseases.[12] Therefore, feedback of information is the bane of disease surveillance and notification. Freund *et al*.[13] reported lack of communication between potential data users and those collecting the data, particularly at the local level. The importance of feedback of information to the success of the disease surveillance and notification system has also been reported.[5,14] However, in a Nigerian study only 21.8% of respondents were shown to have received feedback for diseases they reported.[15]

The availability of accurate, timely, reliable and relevant health information, and good feedback remain the most fundamental step toward informed and effective public health action.[4] Therefore, the objectives of this study include the following:

1. To determine the completeness and timeliness of data collection and disease notification in Anambra State
2. To ascertain the pattern of transmission of information from the health facility level to the Anambra State Ministry of Health
3. To come up with ways in which the system can be improved.

Materials and Methods

Study area

Anambra State that has a total land area of 4815 km^2 is one of the 36 states of Nigeria, located in the South-East geopolitical zone of the country. It has a population of 2 174 641 males and 2 007 391 females and a population density of 869/km^2.[16] There are 21 local government areas (LGAs) and 177 communities in the state. Awka, the state capital is about 30 min from Onitsha a home to the largest market in West Africa and Nnewi, the famed 'Japan of Africa'.[17] The health program of the state conforms to the National Health Policy and has a vast number of health facilities to support it. Anambra State University Teaching Hospital, Awka, presently in its rudimentary form and

Nnamdi Azikiwe University Teaching Hospital (NAUTH) Nnewi is located in the state. There are 32 Government owned general hospitals, 14 mission hospitals, 189 maternity homes, and about 600 private hospitals and clinics. Each of the 21 LGAs has an equitable distribution of the 210 primary health care centers and 166 health posts. There are five schools of nursing and midwifery and a school of health technology.[18]

Study design

This was cross-sectional and the scope includes all health care workers involved in Disease Surveillance and Notification (DSN) in the health facilities including the State Epidemiologist in charge of Disease Surveillance and Health Management Information System in the State. In addition, the health facilities were assessed for practice of DSN as well as availability of resources for the practice of DSN.

Sample size determination

This was determined using the formula for the calculation of the sample size in populations greater than 10 000, $n = z^2pq/d^2$,[19] where n is the calculated sample size, z is the standard normal deviate at 95% confidence interval 1.96, P is the proportion of respondents that ever reported the occurrence of epidemic, q is the complementary probability of P $(1 - p)$, that is, the proportion of respondents that never reported occurrence of epidemic, d is the precision level 5% =0.05. In a study in Yobe State Nigeria, 79% of respondents were found to have ever reported occurrence of epidemic.[15] Therefore, $P = 0.79$, while $q = 1\text{-}0.79 = 0.21$ $n=1.96^2 \times 0.79 \times 0.21/(0.05)^2 = 254$

Adjusting for nonresponse and anticipating a response rate of 95%, the calculated sample size is divided with a factor f, that is, n/f, where f is the estimated response rate.[20] Therefore, the minimum sample size required for the study was given by 254/0.95 = 270. Thus, a sample size of 270 healthcare workers was used for this study.

Sampling technique

A multistage sampling technique was used to select six LGAs from the state (three urban and three rural LGAs). Then nine health facilities were selected from each of these six LGAs and five health care providers were selected from each of them.

Data collection

This was done using interviewer-administered health care provider questionnaires, health facility observational checklist to examine facility record availability, desk review, and key informant interviews (KII). Quantitative data were analyzed with the aid of the SPSS version 16. Tests of statistical significance were carried out using chi square tests for proportions. Qualitative data obtained from the KIIs recordings were transcribed verbatim, translated and field notes made.

Ethical approval

This was obtained from the Nnamdi Azikiwe University Teaching Hospital Ethical Committee (NAUTHEC), while the permission to conduct the study was obtained from the State Ministry of Health, Ministry of Local Government Affairs, and the Local Government PHC Department.

In addition, written informed consent was obtained from all the respondents.

The study was however limited to notifiable infectious diseases only because data were not collected on maternal and child health and family planning and noncommunicable diseases.

Results

Table 1 shows supply of forms and registers and submission of report of notifiable diseases. One hundred (43.9%) health workers reported that supply of IDSR forms was regular, while 25% said it was irregular and 16.2% reported it was usually out of stock. However, as at the time of the survey, 68.9% of them reported they have IDSR forms in stock. About 55% of them reported regular supply of

Table 1: Supply of forms and registers and submission of report of notifiable diseases

	N=228	%
Frequency of supply of IDSR forms		
Always	100	43.9
Occasional	57	25.0
Usually out of stock	37	16.2
No response	34	14.9
IDSR forms currently in stock		
Yes	157	68.9
No	44	19.3
DNK	27	11.8
Frequency of supply of in-patient and out-patient registers		
Always	125	54.8
Occasional	36	16.2
Usually out of stock	37	16.2
No response	30	13.2
In-patient register and out-patient registers currently in stock		
Yes	168	73.6
No	30	13.2
DNK	30	13.2
Mode of submission of the DSN report		
Health facility staff	158	69.2
Collected by staff from higher level	39	17.1
Mail	3	1.3
Others	3	1.3
DNK	25	11.0

IDSR=Integrated disease surveillance and response, DNK=Do not know

in-patient and out-patient registers and about 74% of them reported they have stock of the registers currently. Health facility staff (69.2%) most times submitted the completed DSN reports, while in 17.1% of the cases staff from higher level did.

Table 2 highlights the regularity of supply and submission–return of forms by the health facility type. Forty (74.7%) health facilities received regular supply of forms. All the primary health care facilities received IDSR forms regularly, only 52.4% and 33.3% of the secondary and tertiary health facilities respectively, received forms regularly. On submission of completed forms, most facilities (81.5%) returned completed forms monthly, while 12.9% never returned any completed form. Secondary health facilities were less likely to submit completed forms, while majority of primary health facilities submitted theirs monthly ($X^2 = 4.42$, $P = 0.035$).

Table 3 depicts that records in most facilities were found to be correct during the survey. HMIS records (55.6%) were the least correct, while out-patient register (88.9%) was the most correct. Primary healthcare facility records were more likely to have correct and complete records except for in-patient register (59.3%) as shown by Table 3. In secondary health facilities, out-patient register (95.2%) was the most correct, while HMIS records (33.3%) was the least correct. Similarly, out-patient records (83.3%) were the most correct in tertiary health facilities, while AFP records (33.3%) were the least correct. With respect to completeness, AFP records (40.7%) were the least complete, while the most complete record was of out-patient register. In-patient records (51.9%) were the least complete records in primary health centers, while AFP records were least complete both in the secondary health facilities (19.1%) and tertiary health facilities (16.7%).

In this survey, ten facilities were found to have filled IDSR001 forms, out of which eight (80%) forms were submitted. One (10.0%) was submitted 5 days after completion. Nine facilities completed IDSR002 forms, eight (88.9%) were submitted within 2 days of completion, the remainder was submitted 4 days later. Twenty two facilities, comprising 15 PHCs, 6 secondary facilities, and 1 tertiary facilities filled IDSR003 forms. All the facilities submitted their forms within the first week of the following month. Thirteen health facilities filled and submitted their HMIS records within the first week of the following month

Table 2: Regularity of supply and submission/return of forms by health facility type

	Primary HF *n*=27 (%)	Secondary HF *n*=21 (%)	Tertiary HF *n*=6 (%)	HF total *n*=54 (%)	X^2	*P* value
Regular supply of forms						
Yes	27 (100.0)	11 (52.4)	2 (33.3)	40 (74.7)		
No	0 (0.0)	10 (47.6)	4 (66.7)	14 (25.3)		
Regularity of submission of forms						
Monthly	25 (92.6)	15 (71.4)	4 (66.7)	44 (81.5)	4.42	0.035†
Quarterly	1 (3.7)	1 (4.8)	1 (16.7)	3 (5.6)		
Never	1 (3.7)	5 (23.8)	1 (16.7)	7 (12.9)		

†Statistically significant

Table 3: Completeness and correctness of facility records by facility type

	Primary HF *n*=54 (%)	Secondary HF *n*=27 (%)	Tertiary HF *n*=21 (%)	HF total *n*=6 (%)	X^2	*P* value
Correctness						
IDSR001	22 (81.5)	12 (57.1)	3 (50.00)	37 (68.5)	4.21	0.040†
IDSR002	19 (70.4)	11 (52.4)	3 (50.00)	33 (61.1)	1.95	0.162
IDSR003	24 (88.9)	15 (71.4)	3 (50.00)	42 (77.8)	3.86	0.049†
Out-patient register	3 (85.2)	20 (95.2)	5 (83.3)	48 (88.9)	0.75	0.386
In-patient register	16 (59.3)	16 (76.2)	4 (66.7)	36 (66.7)	1.33	0.248
HMIS	20 (74.1)	7 (33.3)	3 (50.0)	30 (55.6)	7.50	0.006†
AFP	23 (85.3)	15 (71.4)	2 (33.3)	40 (74.1)	3.47	0.062
Completeness						
IDSR001	20 (74.1)	10 (47.6)	2 (33.3)	32 (59.3)	4.91	0.026†
IDSR002	20 (74.1)	10 (47.6)	1 (16.7)	31 (57.4)	6.13	0.013†
IDSR003	23 (85.3)	14 (66.7)	3 (50.0)	40 (74.1)	3.47	0.062
Out-patient register	20 (74.1)	19 (90.5)	4 (66.7)	43 (79.6)	1.03	0.310
HMIS	17 (63.0)	6 (28.6)	2 (33.3)	25 (46.3)	6.03	0.014†
AFP	17 (63.0)	4 (19.1)	1 (16.7)	22 (40.7)	11.05	0.000†

†Statistically significant, IDSR=Integrated disease surveillance and response, HMIS=Health management information system, AFP=Acute flaccid paralysis

except for one PHC (7.7%) that submitted 4 weeks after completion. Fourteen facilities completed AFP forms, only 11 (78.6%) of them submitted their forms.

Table 4 highlights the regularity of supply and submission/return of forms by health facility type. Forty (74.7%) health facilities received regular supply of forms. All the primary health care facilities received IDSR forms regularly, only 52.4% and 33.3% of the secondary and tertiary health facilities respectively, received forms regularly. On submission of completed forms, most facilities (81.5%) returned completed forms monthly, while 12.9% never returned any completed form. Secondary health facilities were less likely to submit completed forms, while majority of primary health facilities submitted theirs monthly ($X^2 = 4.42$, $P = 0.035$).

The KII findings showed that each of the LGAs had 4 to 6 focal sites and 6 to 10 reporting sites. These health facilities send disease notification through the DSNOs to appropriate authorities. It was however, noted that there are some irregularities with respect to timeliness of reporting of notifiable diseases. One of the DSNOs stated, 'Do you know that most times one has to even beg these health facility workers before they reluctantly send their reports or let you have it after several visits to their facility. I don't know whether they are aware of the importance of these reports'.

The poor record keeping ascertained from the desk review made it difficult to retrieve data on the coverage with respect to the number of LGAs and health facilities that report. This also made the retrieval of information difficult on the completeness of reporting from the three levels of health care delivery. The DSN System is not computerized both at the state and LGA levels. It also lacks manpower and basic equipments such as computers, photocopiers, printers, and vehicles for transportation that should have facilitated effective data collection and information transmission process for disease notification in the state.

Discussion

Majority (92.6%) of the health facilities studied had records. All the primary and tertiary health facilities had facility records, while 81% of the secondary health care facilities had records. Also 76%, 79.6%, and 83.3% of facilities had IDSR 001, IDSR 002, and IDSR 003, respectively. This quantitative survey finding is quite impressive but runs contrary to the KII findings that depicted lack of relevant forms. The later is more in agreement with result of study by Bawa *et al*.[15] where only 8.0% of facilities have IDSR forms. It is also similar to that of Adindu,[21] which showed that health facilities had inadequate supply of IDSR forms. For data collection to be effective, the forms for disease reporting should be readily available.

Records in most facilities were found to be correct during this study. HMIS records (55.6%) and outpatient register (88.9%) were the least and most correct respectively. In this study, IDSR 001, IDSR 002, and IDSR 003 forms were 59.3%, 57.4%, and 74.1% complete, respectively. AFP records (40.7%) were the least complete while the most complete record is out patient register. This finding is similar to that of Nasidi *et al*.,[7] which showed that reporting of communicable diseases to public authorities in Nigeria is very incomplete.

From our study, most facilities (81.5%) returned forms they completed monthly while 12.9% never did. It was also revealed that Secondary Health Facilities were least likely to submit completed forms. During the survey, ten facilities were found to have filled IDSR001 forms, out of which 80% of the forms were submitted. Also 10.0% of the forms were submitted 5 days after completion. Nine facilities completed IDSR002 forms, out of which 88.9% were submitted within 2 days of completion, the remainder was submitted 4 days later. Twenty two facilities, comprising 15 PHCs, six secondary facilities and one tertiary facilities filled IDSR003 forms. All the facilities submitted their forms within the first week of the following month. Several studies have shown variations in the completeness of reporting.[21-23] A study in New South Wales revealed a very low reporting rate (20.2%) among medical practitioners. Orienstein *et al*.[11] observed that cases of measles reported passively represented only about 10% of the total cases occurring in the United States. Bawa *et al*.[15] reported that only 65.9% and 8.0% of facilities had up-to-date registers and IDSR forms, respectively. It has been reported that lack of timeliness and completeness affects the sensitivity of the

Table 4: Regularity of supply and submission-return of forms by health facility type

	Primary HF *n*=27 (%)	Secondary HF *n*=21 (%)	Tertiary HF *n*=6 (%)	HF total *n*=54 (%)	X^2	*P* value
Regular supply of forms						
Yes	27 (100.0)	11 (52.4)	2 (33.3)	40 (74.7)		
No	0 (0.0)	10 (47.6)	4 (66.7)	14 (25.3)		
Regularity of submission of forms						
Monthly	25 (92.6)	15 (71.4)	4 (66.7)	44 (81.5)	4.42	0.035†
Quarterly	1 (3.7)	1 (4.8)	1 (16.7)	3 (5.6)		
Never	1 (3.7)	5 (23.8)	1 (16.7)	7 (12.9)		

†Statistically significant

DSN system as it is expected to be a tool for action that is time dependent.[6,11] The aforementioned description shows that the DSN system was not complete and timely. Complete and timely reports are required for prompt response to the occurrence of epidemics. The frequency of submission of routine IDSR forms also varied among respondents. This consequently diminishes the completeness and timeliness of reporting in the surveillance system.

In this study, majority (83.7%) of respondents sent their reports to the LGA while others were sent to the Hospital Management Board (5.9%), to the State Ministry of Health (2.6%), while 7.8% did not specify. Multiple reporting channels lead to duplication of data collection, retards flow of information, and thus weaken the effectiveness of the DSN system as buttressed by the findings of Nasidi and others,[6] which showed that multiple data pathways affect the reporting of information to higher levels. Prompt and accurate reporting aids early recognition and necessary control measures and as well forestalls further spread of diseases.[24]

Out of the 153 respondents who had ever reported occurrence of notifiable diseases, 86.3% had ever received feedback on diseases notified. This finding is contrary to that of a Nigerian study where only 21.8% of respondents were shown to have received feedback on diseases they notified.[15] It also differs from the finding by Freund *et al*.[13] who reported lack of communication between potential data users and those collecting the data, particularly at the local level. It has been reported that lack of feedback negatively affects reporting from health facilities resulting in underreporting of notifiable diseases.[21] Other studies have also emphasized the importance of feedback of information to the success of the disease surveillance and notification system.[5,14] Feedback boosts motivation and confidence in the reporting system by health facility staff. It also encourages the practice of disease surveillance and notification. Feedback has been shown to be paramount to the success of DSN.[5]

Conclusion

Effective and timely public health responses to disease outbreak and health emergencies depend on the ability of the health system to provide accurate, up-to-date, reliable, and relevant health data, information and feedback. This study showed that the health workers were not operating the DSN system in Anambra State, Nigeria to optimal functionality as evidenced by lack of timely and complete information needed for informed public health action. Therefore, for effective management of health and health resources, governments at all levels should have overriding interest in supporting and ensuring the availability of health data, information, and good feedback as a public good and for efficient disease surveillance and notification. Recommendations were therefore made for the periodic training–retraining of health personnel on DSN, regular in-house training of workers, having a defined agency to provide the needed forms and other logistics on regular basis, improved funding, transportation, improved supervision, and feedback of information as well as by expanding sources of reporting.

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