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Original Article: Timeliness of Reporting in the Community-based Disease Surveillance and Notification System in Anambra State, Nigeria

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Abstract **Background:** Community-based disease surveillance systems (CBSS) help the passive health facility-based systems in providing timely information on the health situations in communities. **Objective**: To determine the timeliness of reporting in the CBSS in Anambra State, Nigeria. **Materials and methods:** A cross sectional descriptive mix method study of the CBSS in Anambra State was done. Quantitative data were obtained using questionnaires, interviewer- administered on 360 community focal points, selected by multistage sampling technique and were analysed with SPSS version 20. Associations were tested using Chi square, Fisher's exact and t tests as appropriate at $p \leq 0.05$. Key informant interviews (KII) were conducted among some officers involved in Disease Surveillance and Notification (DSN), selected using convenience sampling technique and data were transcribed verbatim, thematic content analysis done with key quotes noted. **Results:** The timeliness of reporting was 82.9%. There were associations between timeliness of reporting and person the detected disease was notified to, means through which the detected disease was notified and availability of supervisors for focal points ($p \leq 0.05$). Notification of diseases through means other than phone calls / SMS were 2.5 times more likely to be more timely, while focal points who had supervisors were 4 times more likely to notify diseases more timely. The KII findings, showed that the commonest reason for sub-optimal functioning of the CBSS was lack of funds. **Conclusions**: This study revealed high level of timeliness of reporting of notifiable diseases, and sub-optimal functioning of the CBSS. There is need for improvement in the means of case notification, training cum supervision of the focal points and funding m the CBSS in the State.

Keywords: *community-based surveillance, timeliness, community focal points, Nigeria*

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1. Introduction

The basis for Disease Surveillance and Notification (DSN) is to promptly detect changes in disease trends or distribution in order to initiate investigative or control measures [1,2]. In order to improve public health surveillance and response, there is incorporation of community participation or ownership by linking communities with their local health facilities through an active process referred to as Community-based surveillance (CBS) [3].

The CBS system complements the existing health facility-based surveillance system and relies on a network of lay people, referred to as community focal points (community informants) [3]. It provides regular reports about the prevailing situation, rumours and information on unusual public health events, including clusters of disease patterns and unexplained deaths that are not specifically included in the formal reporting system, occurring in the community [4]. It also provides early warning or alerts of disease outbreaks in the community during the pre-epidemic periods, to actively detect and respond to cases and deaths during epidemics; and to monitor progress with disease control activities during the post-epidemic periods [3,5,6].

Timeliness of reporting is a key performance indicator of public health surveillance systems. It is associated with the system's ability to promptly detect and respond to public health concerns [7,8,9,10]. Timeliness of reporting measures the proportion of all expected reports in a

system received by a given due date or within a specified time frame [2]. This may be within the time frames related to the transmission cycle (incubation period) of the disease(s) in question [11], or within the time frames recommended for transmission of data along the hierarchical order from the communities through local government areas (or districts) and states (regions) to the national health systems [12].

Effective surveillance systems should achieve rates for timeliness of reporting approaching 100% [7]. Several studies report that the timeliness of reporting of notifiable diseases from the passive health facility-based surveillance systems has generally been poor and varied mostly from 8% – 60%, depending on the disease or condition reported [8,11,13,14,15]. This has resulted in outbreaks going undetected as well as other opportunities to respond promptly to public health concerns missed [15,16,17,18].

Several countries have therefore initiated CBSS, though its operational characteristics and performance have varied among countries, depending on the objectives of its formation [3,7]. In Anambra State, the CBSS has been implemented since 2010. However, there is a dearth of data on CBS in Nigeria and in most parts of the African sub-region. Even where studies have been done on surveillance, these were on health facility-based DSN with little or no emphasis on the community-based component [9,19,20,21]. The findings from this study are expected to contribute in bridging this knowledge gap and in providing the information that will bring to the fore the issue of advocacy for enhancing surveillance especially at the community level as well as guide policy makers in strengthening the existing CBSS. This study thus set out to determine the timeliness of reporting in the CBSS in Anambra State, Nigeria.

2. Methodology

2.1. Study Area

This study was carried out in Anambra State, South-Eastern Nigeria. With an annual population growth rate of 2.21%, the 2006 census figure of total population of 4,177,828 persons [22], is currently projected to a population of 5,527,809 persons [23]. The State hosts two tertiary health-care institutions, the Nnamdi Azikiwe University Teaching Hospital, Nnewi and the Chukwuemeka Odumegwu Ojukwu University Teaching Hospital, Awka. There are 33 secondary health facilities, 382 primary health centers (PHCs), 14 mission hospitals, 600 private hospitals, 186 maternity homes, 126 registered pharmaceutical premises, nine health training institutions, and 1500 licensed patent medicine vendors in the State [24]. The State has a functional M&E office with a trained M&E officer. Information on surveillance of notifiable diseases in the State are collected by the DSNOs at the LGAs through a network of health facility focal persons who collect and report information to them on all the targeted diseases using surveillance case definitions and designated reporting forms. The DSN process is coordinated by the State Epidemiologist. After analysis of data at the State level, the information, is then sent to the Federal Ministry of Health and the WHO country office every month [25]. The WHO supports the surveillance structure in the State by conducting active surveillance and verifying reported cases as part of the monitoring obligations of WHO member states vis-à-vis the 2015 International Health Regulations requirements [26].

2.2. Study Design

This was a cross-sectional descriptive study of timeliness in the CBSS in Anambra.

2.3. Study Population

This comprised the community focal points in Anambra State.

2.3.1. Inclusion Criterion

Having participated in CBSS in the state for at least a year. This is because they would have functioned long enough to have an opinion and contribute meaningfully to the study.

2.3.2. Exclusion Criterion

Being too sick to participate in the study. For the purpose of this study, severity of ill health was graded on a scale of 1(one) to 5 (five), with 1 (one) being the lowest severity and 5 (five) being the highest severity. Participants who reported 4 (four) or 5(five) were deemed as being too sick to participate and were excluded from the study.

2.4. Sample Size Determination

The sample size of community focal points for this study was determined using the formula for studying proportions with population >10,000 [27]: $n = \frac{z^2 pq}{d^2}$ where: n = the calculated minimum sample size; Z = Standard normal deviate at 95% confidence interval, set at1.96; p = proportion of respondents that sent in reports early (In a study carried out in the northern region of Ghana, 74% of the expected number of village monthly reports were received timely [28], so p= 0.74); q = the complementary proportion of p i.e. 1-p, and d = precision level set at 5% = 0.05. n=295.648 = 296. However, the target population in this study was the community focal points in Anambra State with an estimated population of 1320 [29]. Therefore, the final sample estimate (n*f*) was calculated using the formula [28]:' $nf = \frac{n}{1+\frac{n}{N}}$, where: n*f* = the desired sample size for populations <10,000; n = the desired sample size in populations >10,000; N = the estimate of the size of the target population = 1320;. n*f* (the desired sample size for populations <10,000) was thus - 241.7= 242. An adjustment of the estimated minimum final sample size to cover for non-response was made by dividing the calculated minimum final sample size estimate (n*f*) by 1 – f, where f is the anticipated non-response rate. Anticipating a non-response rate of

10%, the adjusted sample size was = $\frac{242}{1-0.10} = \frac{242}{0.90} =$ 269 respondents. The minimum sample size was increased to 360 in order to increase the power of the study.

2.5. Sampling Technique

2.5.1. Quantitative Aspect of the Study

Multi-stage sampling technique was used to enrol respondents into this study. Anambra State is made up of three senatorial zones (Anambra North, Anambra Central and Anambra South), 21 LGAs (7(seven) urban and 14 rural) and 330 wards (ranging from 10 – 20 wards per LGA). Each of these wards has 4 (four) community focal points. *Stage 1 - Selection of local government areas*: The 21 LGAs in the state were stratified into the 7(seven) urban and 14 rural LGAs, giving a ratio of 1: 2. Using proportionate allocation, 3(three) LGAs were selected from the urban stratum while 6(six) LGAs were selected from the rural stratum through simple random sampling technique by balloting procedure. Thus Onitsha South, Awka South, and Nnewi North LGAs were selected from the urban stratum while Oyi, Anambra East, Njikoka, Anaocha, Orumba North and Orumba South LGAs were selected from the rural stratum. *Stage 2 - Selection of Wards:* There are 20 wards in Awka South LGA, 17 wards in Onitsha South LGA, 10 wards in Nnewi North LGA, 15 wards in Oyi LGA, 15 wards in Anambra East LGA, 18 wards in Njikoka LGA, 19 wards in Anaocha LGA, 18 wards in Orumba North LGA and 18 wards in Orumba South LGA. Proportionate numbers of wards were selected from each of these selected LGAs using proportional allocation formula stated below as follows [30]:

$$Wn = \frac{n(ni)}{N},$$

where Wn = Number of wards selected from each LGA; n = Minimum size for the study =360; ni = Population of each unit (i= 1- 4) i.e. (Total number of wards in the selected LGA); N = The total population i.e. (Total number of focal points in all the selected LGAs) = 600. For Example, the number of wards selected for studying from Awka South LGA was $\frac{360(20)}{600}$ = 12 wards. *Stage 3 - Selection of* community focal points: From each of these selected wards, all the community focal points met the eligibility criteria and were thus recruited into the study. Therefore in Awka South LGA for example, 48 respondents (12 wards x 4 community focal points) were studied.

2.5.2. Qualitative Aspect of the Study

With participants selected using convenience sampling, twenty two KII sessions were conducted on nine health facility focal persons (one selected from each of the nine selected LGAs), nine DSNOs in the nine selected LGAs, the State DSNO, the State Epidemiologist, the M&E Officer and the State WHO Coordinator.

2.6. Study Instruments

2.6.1. Quantitative Study Instrument

A 46-item semi-structured questionnaire adopted and adapted from the WHO's protocol for the assessment of national communicable disease surveillance and response systems [31], and available literature [32] were used to collect information from the (community focal points) on socio-demographic characteristics, timeliness of reporting of CBSS and factors affecting the timeliness at the CBSS.

2.6.2. Qualitative Study Instrument

KII guides adapted from literature [28] were used to conduct the KII sessions on: i) the health facility focal persons; ii) the DSNOs; iii) the M&E Officer, iv) the State DSNO, v) the State Epidemiologist and vi) the State WHO Coordinator.

2.7. Data Collection Methods

2.7.1. Quantitative Data Collection Method

Questionnaires were administered to the community focal points using face to face interviews conducted by trained research assistants.

2.7.2. Qualitative Data Collection Method

Key informant interview guides were used. The KII sessions were moderated by the principal researcher assisted by the note taker/operator of the audio recorder.

2.8. Data Management

2.8.1. Measurement of Variables

The main outcome / dependent variable for this study was timeliness of the CBSS while the independent variables were the factors affecting the timeliness of the CBSS. Timeliness of reporting from the community level to the health facility level was assessed as the proportion of expected reports received on time (notification of the selected diseases immediately or within 24 hours of detection), while notification after 24 hours of detection was considered as untimely. Timeliness of reporting ≥ 80% was considered optimal for the CBSS while timeliness of reporting <80% was considered suboptimal [33]. For the purpose of this study, the CBSS is assumed to be functioning optimally if timeliness and one of other indicators (such as completeness) are up to≥ 80% and to be functioning sub-optimally if both or any of these two indicators is not up to 80%. The factors affecting the timeliness of the CBSS as measured in this survey include: the level of knowledge of the community focal points with regards to data collection and disease notification, the feedback mechanism in the CBSS, the socio-demographic characteristics of the respondents and select factors affecting data timeliness of reporting in the CBSS in the State.

2.8.2. Statistical Analysis

The quantitative data collected were inspected for any data collection or coding errors. It was then entered into

and analysed with the International Business Machines-Statistical Package for Social Sciences (IBM-SPSS) version 20 [34]. Frequency distribution of all relevant variables was developed. Means and proportions were calculated while associations between variables were tested using Chi square, Fisher's exact and t tests as appropriate. Level of statistical significance was set at p-value $\leq$ 0.05 for all infere ntial analysis and standard deviations.

2.8.3. Qualitative Data

The audio recordings obtained from the KII sessions were transcribed verbatim and compared with the written notes of the note-taker in order to improve the reliability of the data obtained. Coding and analysis of the transcripts were done using thematic content analysis [35]. Quotes from the participants that best described the various themes and sub-themes were stated.

3. Results

3.1. Results of the Quantitative Survey

A total of 360 questionnaires were administered to community focal points in nine LGAs of the State. All the questionnaires were retrieved, giving a response rate of 100%. Table 1 summarizes the socio-demographic characteristics of the respondents. The mean age of the respondents was 40.5 ± 9.8 years. Majority of the respondents were Ibos, females and traders. Only 3.1% of the respondents had no formal education.

Table 2 highlights the timeliness of disease notification among the respondents. Majority of the respondents (84.4%) had ever detected a notifiable disease. Most of the respondents (56.2%) reported the detected diseases to the DSNO in the LGA using phone/SMS (86.1%). Only one (0.3%) of the respondents reported having detected a notifiable disease but never reporting it. The timeliness of reporting in the CBSS was 82.9%.

Table 3 shows the association between socio-demographic and some selected factors and timeliness of disease case notification among the respondents at the bivariate level. The person the detected disease was notified to, the means through which the detected disease was notified and the availability of supervisors for the community focal points were found to have statistically significant association with timeliness of disease case notification ($p \leq 0.05$). The other variables were found not to be significantly associated with timeliness of disease case notification ($p > 0.05$).

Table 4 shows the factors that were found to be significantly associated with timeliness of disease case notification among the respondents at the univariate level using binary logistic regression. Reporting detected diseases through other means apart from phone calls / SMS and availability of supervisors for focal points were found to be significant predictors of timely reporting of notifiable diseases (χ^2 = 6.945, p = 0.03; χ^2 = 6.945, p = 0.000). Community focal points who notified detected diseases through means other than phone calls / SMS were 2.5 times less likely to notify diseases more timely than those who notified detected diseases through phone calls / SMS (OR = 2.498, CI = 1.112-5.523) while community focal points who had supervisors were 4 times more likely to notify diseases more timely than those who did not have supervisors (OR = 4.053, CI = 1.898-8.659).

3.2. Results of the Qualitative Aspect of the Study

Consistent themes emerged from all the KII sessions. These include: the interactions of supervisors with the community focal points the contributions of the community informants to the success of CBSS, challenges faced generally, modalities for improving the CBSS and sustainability of the CBSS. The results with quotations include: The community focal points notify the occurrence of disease cases timely and this has resulted in the institution of control measures that have led to the prevention of outbreaks from being escalated. For instance, *"I interact with the* community focal points notify the occurrence of disease cases timely and that this has resulted in the institution of control measures that have led to the prevention of outbreaks from being escalated. For instance, *"I just got a message this morning that someone in a certain community that knows the state health PRO called to say that four people had already died from something that is currently going on in their community somewhere in Orumba North LGA. I will be going there to investigate the matter immediately. Also, during an outbreak of cholera in a certain community in Anambra West LGA about one to two weeks ago, it was the community members that also alerted us and we responded promptly after being notified"* (state DSNO). *"I used to supervise those people that are around me because I don't have much time as we lack staff here. But each time I have the time, I used to supervise those people that are around me"* (focal person 5 in a rural area). *"I have trained only the two people under me because these are the people that work with me daily and they are the people that see the cases around me. So each day, I tell them that these cases you don't need to treat them, just tell me about them and I will collect the sample and refer. Immediately the DSNO collects the sample and gives me the feedback, I give it to them. As for the others, I don't interact with them actively because of financial constraints.* (focal person 7 in a rural area). *"I think the main challenge is in terms of funds because they might think that they are not being paid or that the money is not enough to make calls……"* (focal person 2 in a rural area). *"They don't have enough funds. So they always complain of funds for transportation. Even to make phone calls is difficult..."* (Focal person 7 in a rural area). *"I suggest more regular trainings and more funds. At least they should be motivated. They should also be given regular stipends as this would motivate them more. They also need more supervision as this gives them a sense of belonging and will help to motivate them more.* (focal person 2 in a rural area). *"They are trained once a year officially but we can visit them and find out how they are doing occasionally."* (DSNO 4 in a rural area). *"Financial constraint is the main problem or challenge. Even the state will always tell you that they don't have money. At the end of the day, it is only WHO that will come to verify the case"* (DSNO 6 in a rural area).

Table 1. Socio-demographic characteristics of the respondents

Variable	Frequency (N) N = 360	Percentage (%)
Age at last birthday (years)		
20 – 29	76	21.1
30 – 39	124	34.4
40 – 49	114	31.7
≥ 50	46	12.8
Mean age ± SD	40.5 ± 9.8	
Minimum, Maximum	20 years, 67 years	
Gender		
Male	105	29.2
Female	255	70.8
Educational status		
No formal education	11	3.1
Primary	22	6.1
Secondary	193	53.6
Tertiary	134	37.2
Occupation		
Civil service	115	31.9
Trading	123	34.2
Farming	37	10.3
***[1]Others**	44	12.2
Unemployed	41	11.4
Religion		
Christianity	353	98.1
Traditional religion	7	1.9
Ethnic group		
Ibo	358	99.4
Yoruba	2	0.6
Length of service as a volunteer (years)		
1 – 3	252	70.0
4 – 6	76	21.1
7 – 9	12	3.3
≥ 10	20	5.6

*[1]Others – Nursing, patent medicine vendor, traditional birth attendant, artisan.

Table 2. Timeliness of disease notification among the respondents

Variable	Frequency (N) N = 360	Percentage (%)
Ever detected any notifiable disease		
Yes	304	84.4
No	56	15.6
Source of information on detected disease (N = 304)		
Routine visits to villagers	86	28.3
Family of sick person	152	50.0
Health committee	57	18.8
Traditional healer	9	3.0
Person detected disease was reported to (N = 304)		
Community leader	5	1.6
Health facility in my community	125	41.4
The DSNO in the LGA	171	56.2
The LGA chairman	2	0.7
Detected case not reported	1	0.3
Interval between detection and reporting of last detected case (N = 304)		
Immediately after or within 24 hours of detection	252	82.9
1-3 days after case detection	41	13.5
4 days or more after case detection	10	3.2
Detected case but did not report	1	0.3
Means through which notification of detected disease was sent (N = 303)		
Phone/SMS	261	86.1
***Others**	42	13.9

*Others – Letter writing, fax, email, transport by bus.

Table 3a. Association between selected factors and timeliness of disease case notification among the respondents

Variable	Disease case notified timely (Number, %)		Test statistic	p-value
	Yes (N, %)	**No (N, %)**		
Age at last birthday			t = - 0.468	0.64
Mean ± SD	40.3 ± 9.5	41.0 ± 9.4		
Gender			χ^2 = 1.909	0.23
Male	72 (87.8)	10 (12.2)		
Female	180 (81.1)	42 (18.9)		
Highest educational level			Exact = 2.921	0.39
No formal education	7 (77.8)	2 (22.2)		
Primary	17 (94.4)	1 (5.6)		
Secondary	134 (84.3)	25 (15.7)		
Tertiary	94 (79.7)	24 (20.3)		
Length of service in the CBSS			t = - 0.375	0.71
Mean ± SD	3.2 ± 2.4	3.4 ± 3.1		
Occupation			Exact = 1.504	0.84
Civil service	87 (79.8)	22 (20.2)		
Trading	91 (85.5)	15 (14.2)		
Farming	23 (82.1)	5 (17.9)		
***[1]Others**	27 (84.4)	5 (15.6)		
Unemployed	24 (82.8)	5 (17.2)		
Total knowledge score			Exact = 4.474	0.09
Poor knowledge	3 (60.0)	2 (40.0)		
Fair knowledge	56 (77.8)	16 (22.2)		
Good knowledge	193 (85.4)	33 (14.6)		

*Statistically significant (P ≤ 0.05), Exact = Fisher's exact, χ^2 = Chi square, t = t test
*[1]Others – Nursing, patent medicine vendor, traditional birth attendant, artisan.

Table 3b. Association between selected factors and timeliness of disease case notification among the respondents

Variable	Disease case notified timely (Number, %)		Test statistic	p-value
	Yes (N, %)	**No (N, %)**		
Source of information on detected disease			Exact = 4.818	0.30
Routine visit to the villagers	71 (82.6)	15 (17.4)		
Family of sick person	129 (84.9)	23 (15.1)		
Health committee	45 (78.9)	12 (12.1)		
Traditional healer	0 (0.0)	1 (100.0)		
TBA	7 (87.5)	1(12.5)		
Person detected disease was reported to			Exact = 8.729	0.05*
Community leader	3 (60.0)	2 (40.0)		
Health facility staff	99 (79.2)	26 (20.8)		
The DSNO	148 (86.5)	23 (13.5)		
The LGA chairman	2 (100.0)	0 (0.0)		
Nobody	0 (0.0)	1 (100.0)		
Means of notifying detected disease			χ^2 = 6.945	0.01*
Phone call / SMS	223 (85.3)	38 (14.6)		
***[1]Others**	29 (69.0)	13 (31.0)		
Records of notified disease kept by informant			χ^2 = 2.152	0.16
Yes	100 (87.0)	15 (13.0)		
No	152 (80.4)	37 (19.6)		
Number of times report sent in the last one year			Exact = 4.740	0.54
None	2 (50.0)	2 (50.0)		
Once	101 (80.8)	24 (19.2)		
Twice	86 (85.1)	15 (14.9)		
Three times	22 (81.5)	5 (14.9)		
Four times	26 (89.7)	3 (10.3)		
Five times	5 (83.3)	1 (16.7)		
Six times	10 (83.3)	2 (16.7)		
Number of feedbacks received by informants in the last one year			χ^2 = 0.923	0.65
None	94 (82.5)	20 (17.5)		
1-2	81 (87.1)	12 (12.9)		
3 and above	43 (86.0)	7 (14.0)		
Received feedback given to community members			χ^2 = 1.627	0.22
Yes	191 (84.5)	35 (15.5)		
No	61 (78.2)	17 (21.8)		

*Statistically significant (P ≤ 0.05), Exact = Fisher's exact, χ^2 = Chi square, t = t test
*[1]Others – Letter writing, fax, email, transport by bus.

Table 3c. Association between selected factors and timeliness of disease case notification among the respondents

Variable	Disease case notified timely (Number, %)		Test statistic	p-value
	Yes (N, %)	**No (N, %)**		
Informant trained in CBSS			Exact = 0.123	1.00
Yes	245 (82.8)	51 (17.2)		
No	7 (87.5)	1 (12.5)		
Availability of supervisors			χ^2 = 14.622	0.001*
Yes	231 (85.9)	38 (14.1)		
No	21 (60.0)	14 (40.0)		
Frequency of supervisors visit in the last three months			Exact = 9.946	0.11
None	46 (90.2)	5 (9.8)		
Once	55 (91.7)	5 (8.3)		
Twice	34 (91.9)	3 (8.1)		
Three times	19 (86.4)	3 (13.6)		
Four times and above	39 (83.0)	8 (17.0)		
Volunteer benefit from CBS			Exact = 0.235	1.00
Yes	244 (82.7)	51 (17.3)		
No	8 (88.9)	1 (11.1)		
Challenges with carrying out CBS			χ^2 = 0.320	0.58
Yes	198 (83.5)	39 (16.5)		
No	54 (80.6)	13 (19.4)		
Satisfied with CBS			χ^2 = 0.804	0.70
Yes	164 (83.7)	32 (16.3)		
No	87 (81.3)	20 (18.7)		

*Statistically significant (P ≤ 0.05), Exact = Fisher's exact, χ^2 = Chi square, t = t test.

Table 4. Univariate analysis of statistically significant factors affecting the timeliness of disease case notification among the respondents

Variable	Timeliness of reporting		OR	95% CI	Test statistic	p-value
	Yes (N, %)	**No (N, %)**				
Person detected disease was reported to					Exact = 2.865	
Community leader	3 (60.0)	2 (40.0)	1			0.599
Health facility staff	99 (79.2)	26 (20.8)	0.319	0.048 -2.142		0.240
The DSNO	148 (86.5)	23 (13.5)	0.270	0.040 – 0.816		0.178
The LGA chairman	2 (100.0)	0 (0.0)	0.000	0.000 -		0.999
Means of notifying detected disease					χ^2 = 6.945	
Phone call / SMS	223 (85.3)	38 (14.6)	1			
Others	29 (69.0)	13 (31.0)	2.489	1.112 – 5.523		0.03*
Availability of supervisors					χ^2 = 6.945	
No	21 (60.0)	14 (40.0)	1			
Yes	231 (85.9)	38 (14.1)	4.053	1.898 – 8.659		0.000*

*Statistically significant (p≤ 0.05), Exact = Fisher's exact, χ^2 = Chi square, OR = Odds ratio, CI = Confidence interval.
Others = fax, email, letter writing, transport by bus.

4. Discussion

This was a cross sectional descriptive mix method study that determined the timeliness of reporting of the CBSS in Anambra State, Nigeria. This study showed that the timeliness of reporting of notifiable diseases in the CBSS in Anambra State was (82.9%), out of (84.4%) that had ever detected a notifiable disease. This high timeliness of reporting obtained in the index study is comparable to the 74% found in a study by Maes and Zimicki [28] in northern Ghana. This implies that there is provision of timely information in the State. This inference is further supported by the results of the KIIs in the current study in which some of the interviewees stated that the community focal points notify the occurrence of disease cases timely an act that has culminated in the institution of outbreak control measures. For instance,*"...I just got a message this morning that someone in a certain community that knows the state health PRO called to say that four people had already died from something that is currently going on in their community somewhere in Orumba North LGA. I will be going there to investigate the matter immediately. Also, during an outbreak of cholera in a certain community in Anambra West LGA about one to two weeks ago, it was the community members that also alerted us and we responded promptly after being notified"* (state DSNO). This statement however contradicts the claims to promptness of response to timely notification of disease cases by the respondents in this study. Perhaps, competing priorities and lack of dedicated time could explain this scenario.

This study also examined the influence of socio-demographic and some other factors on the timeliness of the CBSS in Anambra State. The age, gender, educational status and occupation of the respondents were found not to be significantly associated with timeliness of reporting in this study. There was however a direct relationship between levels of knowledge of the respondents on CBS with timeliness of reporting, a finding similar to those seen in other studies [36,37]. Even though there was no

statistical significance, it confirms that the community focal points are knowledgeable about CBS and could successfully detect and report notifiable diseases as expected.

Providing adequate training increases the awareness and knowledge of the community focal points and enables them to report cases to the appropriate authorities in a more timely manner [38,39,40]. Almost all the respondents in this study have been trained at least once on the principles and practice of CBSS This could be an explanation for the high level of knowledge exhibited by the respondents in this study and is buttressed by the findings from the results of the KIIs which affirmed that the focal points receive trainings at least once a year. This finding in the index study is similar to those from several other studies which showed that providing trainings for community focal points enhanced their knowledge base and resulted in improvement in their diagnostic abilities [40,41]. Providing training for community focal points however had no statistical significance with the timeliness of notifying diseases in this study. Similar to the need to provide training is the need to provide supervision for the focal points as this strengthens their motivation and reinforces the knowledge they have gained as well as ensures that the right skills are used appropriately, that the necessary logistics are in place and that planned activities are implemented according to schedule [28,38,42,43]. This has been confirmed in this study by its significant association with timeliness of disease notification. The frequency of supervisors visit however did not achieve statistical significance with timeliness of reporting. This finding is confirmed from the results of the KIIs in this study in which the participants mentioned that the presence of supervisors gives the community focal points sense of belonging and encourages them to participate more actively in CBS. Worthy of note however, is that the analysis of the suggestions for improving the CBSS in this study showed that only 5.3% of the respondents mentioned provision of supportive supervision. This could be explained by the finding in the index study that majority of the respondents (88.6%) had supervisors and therefore no longer see it as a need.

Similar to findings elsewhere [28,42], the main reason given by the respondents for volunteering in this study was altruistic i.e. a desire to help their communities save lives and educate them on the causes of disease. Only 8.1% of the respondents volunteered with the hope of being employed while only 2.5% of them volunteered with the hope of achieving visibility in the community in this study. Even though the reason for volunteering did not achieve statistically significant association with timeliness of reporting in this study, it could be the explanation for the sustained interest in CBS by some of the respondents despite the challenges encountered in the system. It could also be the explanation for the high rate of volunteer turnover seen in the system as volunteers who had other reasons for volunteering became disappointed when those needs were not filled. It is therefore very necessary to clearly define the terms of reference to the volunteers before being recruited as community focal points [42].

This study has shown a relationship between means through which detected diseases were notified and timeliness of disease notification, as those who notified disease cases using other means were twice more likely to notify more timely than those who notified using phone calls or SMS. After adjusting for possible confounders, means other than phones was found to be an independent predictor of notifying diseases timely in the index study. This finding in this study is contrary to findings from several other studies which showed that the use of mobile phones makes for a more effective and efficient data transmission process [10,11,12,13,43]. It is however consistent with findings from some other studies which reported that in as much as the use of mobile phones may sound promising to the functional potential of communication between community health workers and their supervisors, it may not always be feasible in countries that are not well developed where challenges involved in internet-based systems, electricity, finance and other factors may be obstacles to implementation [12,28]. These explanations are well articulated in the findings of KIIs in this study in which many of the participants mentioned that many of the community focal points do not possess mobile phones, and that those that possess phones may not have the network connections or the resources to charge their phone batteries or to recharge their phones. This is made worse in a country like Nigeria where power supply is almost non-existent or very epileptic. In order to ensure that reports get to the next level timely, there may be the need to explore other options for reporting including the reporting of detected diseases to only nearby health facilities and from thence to the DSNOs. However, findings from the KIIs in this study show that mandatory weekly reporting from health facility focal persons to the DSNOs is obtainable only from health facilities that are designated as focal sites whose focal persons are given monthly stipends for reporting and that these focal sites are few in the state. Reports from other health facilities, which are not designated focal sites, are obtained at irregular intervals because their focal persons do not feel motivated to send in regular reports since they are not given monthly stipends. There may therefore be the need to extend the provision of monthly stipends to all the focal persons in at least all the government- owned health facilities so that mandatory reporting will be obtained from all of them. Alternatively, the logistics (including alternative sources of electricity like solar panels) for the use of mobile phones for data transmission should be provided by the government.

Several studies report that providing incentives which may be financial or non-financial has been shown to keep volunteers satisfied [5,9,28,38,42,44]. Findings from the results of the KIIs across all the levels of the CBSS in this study echo the need to provide regular monthly stipend to the community focal points and to increase the stipend attached to notifying diseases. This they said will boost the morale of the community focal points and encourage them to participate more actively in CBS. It has been said that an individual's real motivation results from their personal accomplishments through the challenge of work itself and not necessarily from the working conditions in the environment. However, for the individual to function optimally, the working conditions must be made adequately enabling [45]. Therefore the government should make provisions for adequate amounts of stipends

or incentives to be given to the community focal points in order to make the system more functional.

Strength and limitations: The strength of this study lies in the 100% response rate achieved. It also employed a mixed method survey to provide detailed information on the characteristics and perceptions of the participants in the CBSS. This was not the case in previous studies in the study area [9,19]. Limitations include use of cross-sectional design and the fact that the study did not assess the public health actions from CBSS. More research needs to be conducted in order to provide more evidence for policy making.

5. Conclusions

This study showed high level of timeliness of reporting of notifiable diseases in the CBSS in Anambra State, implying that the system can provide timely information on the occurrence of disease outbreaks which could lead to the initiation of prompt control measures by the appropriate authorities. However, sub-optimal functioning of the CBSS was reported .The age, gender, educational status and occupation of the respondents were found not to be significantly associated with timeliness of reporting in this study. The commonest reason given for the sub-optimal functioning of the CBSS in the state from the KII was lack of funds. In order to make the CBSS in Anambra State to function optimally, the researcher therefore recommends as follows: There is need for improvement in training cum supervision of the focal points, record keeping and funding m the CBSS in the State The government should sustain the high level of knowledge of CBSS by the community focal points by providing periodic and sustained trainings on all the diseases targeted for surveillance in the state. The government should fully own the CBSS and provide adequate funding. This will ensure the provision of all the logistics needed for making a functional and efficient CBSS.

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Competing Interests

The authors declare that they have no competing interests.

Ethics Approval and Consent to Participate

Ethical approval for this study was obtained from the Nnamdi Azikiwe University Teaching Hospital Ethics Committee. Permission to conduct the study was obtained from the State Ministry of Health and the selected Local Government PHC Departments. In addition, verbal and written informed consents were obtained freely and without coercion from the respondents.

Authors' Contributions

This work was carried out in collaboration among all authors. All authors read and approved the final manuscript.

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