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Original Research Article

Evaluation of community-based disease surveillance systems for priority disease detection in Nairobi County Kenya

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ABSTRACT

Background: Community based disease surveillance (CBDS) may be defined as an active process of community involvement in identification, reporting, responding to and monitoring diseases and public health events of concern in the community. The scope of CBS is limited to systematic continuous collection of health data on events and diseases guided by simplified lay case definitions and reporting to health facilities for verification, investigation, collation, analysis and response as necessary.
Methods: A cross sectional study design, interventions study program was adopted to determine the effectiveness of CBDS in detecting of priority diseases. Purposive and random sampling methods was employed to select the respondents.
Results: The results of the study assisted the Ministry of health to understand the effectiveness of Community based surveillance in detection of priority diseases and hence strengthen the community-based surveillance initiative. From the findings, the integrated disease surveillance data for five years from 2014-2018 shows, more cases of priority diseases reported in health facilities linked to a community unit trained on CBDS. Cholera (9/5), Malaria (4757/2789), Neonatal tetanus (27/3) respectively.
Conclusions: The study concluded that, use of community-based surveillance system, improves detection of the notifiable diseases in the community. The study revealed that there is a gap on training of community-based disease surveillance system and therefore there is need for continuous refresher trainings on CBDS to the CHVs and CHAs to accommodate also the newly recruited.

Keywords: Community based disease surveillance, Purposive and random sampling, Cross sectional study

INTRODUCTION

Communicable diseases is the commonest illnesses with high morbidity and great load which results to high quality of life loss both socially and economically in WHO African Region.[1]

A communicable disease surveillance system (CDSS) enables early detection of public health potential threats and monitors certain particular disease or many diseases functions. The function of early warning is important for all level security issues on health. The international Health Regulations (IHR) 2005 requires all member states to have a good surveillance and response system which can be able to detect and control public health hazards of local and global concern.[2]

Kenya is among the countries which have adopted IDSR strategy having 47 counties, 286 sub counties reporting weekly integrated disease surveillance (IDS) data. This calls for every sub county to report to the National level at

weekly basis. The IDS data comprises of 22 priority communicable diseases classified into three broad categories.

In African region, community volunteers are supporting initiatives and programs like guinea worm eradication, trachoma control, polio eradication initiatives, community case management of different diseases, maternal and child health integrated program me and early warning signs and response public health emergencies among others. Early detection signs are important to control of emerging, re-emerging and novel infectious diseases

Countries with weak surveillance systems or without community – based disease surveillance systems are not able to immediately detect and respond timely to public health threats or events. There is therefore need to strengthen disease surveillance at all levels and mostly at the community level.[3]

The volunteers uses a diary during house visits and collect the following information: date, household contacted, patient, age, sex, complaint/disease condition, and remark/comments on what they did to the patient that is either gave health education, gave first aid, refer to the health facility or notified the next level. The report out of this information is aggregated weekly into a data form called Form A, which is given to the CHEW. The CHEW further compiles the data from every volunteer into his or her unit into form B, and sends it to the SCDSC. At the SCDSC level, the data is aggregated by unit per week and send to the MOH and interested partners, like the CDC/AMREF. There are conditions that are reported immediately, acute flaccid paralysis (AFP), Fever and rash (measles), neonatal tetanus, hemorrhagic fever, acute watery diarrhea (Cholera) and life threatening/unusual condition within community. The CHEW and the SCDSC is responsible for confirming if the event is a case, once notified by the volunteer. If the case is confirmed by standard case definition in the facility, samples are taken to reference laboratory and if confirmed response and interventions are initiated at all level.

Statement of problem

Early identification of diseases plays an important function in control of emerging, reemerging diseases, whether occurring naturally or are introduced intentionally. To control the transmission of such diseases the world requires a vigilant surveillance system which can identify an outbreak early enough and diagnosis its cause, so that an appropriate and efficient rapid response is taken, which has been a challenge to public health.[4]

Kenyan statistics from the Division of Disease Surveillance and Epidemic Response (DDSER), shows that Nairobi County had six waves of Cholera Outbreak since December 2014 up to 2017.The total cases of year 2014 and 2015 were 1792 with 32 deaths giving a CFR of 1.8% which is above the WHO recommended rate of 1%. In year 2016 the total cases were 86 with zero deaths.

In year 2017 total Cholera cases are 1758 with 25 deaths (CFR 1. 4%). The outbreak has spread to all sub counties in Nairobi county between January and September 2017.The most hit sub counties by the outbreaks are Embakasi East sub county reporting 543 cases with 5 deaths (CFR 0.9%) in year 2015, in year 2017, it has reported 466 cases with 6 deaths (CFR 2.2%), Langata sub county reported 263 cases with 10 deaths (CFR 3.8%) in year 2015, in year 2017 they have reported 348 cases and Kibra sub county 40 cases with 3 deaths (CFR 3. 3%) in year 2017. Most of the cases reported from Embakasi East and Langata Sub counties are from Mukuru Rueben, Mukuru Njenga and kibra slums respectively. This are the areas where two community units (Motomoto CU and Gatwekera CU) in Embakasi east and Langata sub counties respectively are based and both CU's were trained on community based surveillance. Other Cholera cases has spread in all sub counties in the county, and in each sub county, one Cu was trained on CBDS.

In year 2016, the Nairobi county also experienced an outbreak of Hepatitis B cases totaling to 1057 and the same year 2 cases of confirmed yellow fever were reported with 1 death (CFR 50%).

One of the most emphasis of community strategy was to improve on early detection and immediate reporting of emerging infectious diseases like Cholera so as to help control spread of the outbreak and allow early response. The CHV's are expected to take active role in the health issues of the households and therefore should be able to detect early enough, do referrals and report any case they get affected in the community. This therefore challenges the effectiveness of CBDS in detection of priority diseases.

The research is therefore meant to look at the effectiveness of community-based surveillance in detection and reporting of priority diseases.

Study objective

To compare the number of reported priority diseases in the health facilities with CBDS and those without enhanced CBDS.

Significance of the study

The study will help MOH to understand the effectiveness of CBDS in detection of priority diseases and hence strengthen the CBDS initiative. The final report is to serve as a reference material for Mt. Kenya University students, lecturers and for further studies by other researchers who might be interested in the in the same field. The study is submitted in partial fulfillment of the requirement for the award of a Degree in Masters in Public Health.

Empirical literature

Reporting structure of community-based surveillance

Currently, Kenya has employed Community extension workers who are attached to the community units in the community who work with the CHVs who link them with the households.

Each community unit (CU) has approximately 5000 people with 50 CHVs. The CU have varied numbers of households ranging from roughly 500 -1000 in rural areas to 1000-5000 households or more in urban areas, although this may be different considering different geographical regions. Each CHV over sees 20-50 households in rural areas to 50-100 households in urban settings. In semi-arid and Nomadic population, the allocation of households varies because of varsity of the area and issue of temporary households for the Nomadic population. One CHV may be allocated 10 households in the Nomadic areas while in semi-arid areas one CHV will have 20 households allocated. A CU has 50 volunteers who are registered and trained on basic community strategy modules. Each community unit is linked to a health facility in their geographical area through two government employed CHEW's, who are qualified health workers. One CHEW is attached to the community and the other CHEW is a health worker in the link health facility. They are supposed to offer support supervision to the CHV's in the community unit. There is also a community health committee which is made of people from the community who are also volunteers. They coordinate the CHV's and also encourage the members of the community to engage in activities related to health.[5,6]

The CHVs collects data from the households attached to them and compiles by the end of the epidemiological week in Forma A tool, then hands over the weekly data to the CHEW. The CHEW compiles the data from all the units under him/her in Form B tool and hands over the data to the SCDSC. The CHEW is supposed to analyse the data at his level and take the necessary public health interventions. The SCDSC them compiles the report for all units in his/her sub county in Form C electronic tool and sends the report through email to the National level (DSRU).(DSRU).This is further explained by figure 1.

CBDS operates under the larger IDSR structure. At every level, there is a surveillance focal person who has the responsibility of gathering data on priority diseases and give the reported data to the next level.

Integrating surveillance functions are consecrated at the sub county level since it's the first level in health structure where administrative work is done. It's a level which has permanent staffs who are specialized in all fields of public health like monitoring the health of the community and coordinating partners and the government support in order to protect the health of the community. Instead of maintaining vertical activities, yet the resources are scarce, one focal point at every level is appointed to handle many integrated activities and then resources are accumulated to that one integrated activity. An example is resources channeled to AFP activities also handles other needs like NNT and diseases like Guinea worm. This means the focal persons for AFP also does surveillance of other priority diseases. At every level, there is an epidemic response team who should come together in case of disease outbreak and combine resources for response activities (IDSR TG, 2012).[7] This is further explained by figure 2.

Conceptual framework

To assess community based disease surveillance system , it will be important to know the use of the information gathered by the system to all the users which will also involve their acceptance of the system in all levels starting from the household members to the health worker in the facility, whether the system has achieved the desired outcome (whether the indicators have been met), know the use of community based information at all levels and also looking at the barriers and challenges at all levels. These variables will help the researcher to know whether the system has affected the detection of priority diseases in Nairobi County. This is further explained by figure 3.

METHODS

Study design

A comparative cross sectional study design was used to evaluate community-based disease surveillance systems in detection and reporting of priority diseases

Study site

The study was done in nine-sub counties (Langata, Starehe, Makadara, Embakasi, Westlands, Kamukunji, Njiru, Dagoretti and kasarani) Nairobi County in Kenya. This study compared facilities with enhanced CBDS and those without.

Administratively, the county has 17 Sub counties currently after devolution. The sample of the study is drawn from the former administrative units (before devolution) thus, the nine sub counties namely; Starehe, Kamukunji, Kasarani, Makadara, Embakasi, Njiru, Dagoretti, Langata and Westlands.

The study was carried out in a period of 2 years from August 2019 to August 2021.

Study population

Nine sub counties in Nairobi County, one community unit in each sub county, selected CHV's in those community units, one house hold members under the selected CHVs, the CHEWs of the nine units, health workers from the nine link facilities of the Community units, facilities linked to

the selected Community units and other selected facilities without enhanced CBDS.

Sampling

Sampling size determination

The sample size of CHVs and Household members was obtained from the selected community units practicing CBDS.

For sample size determination, Fishers' et al8, formula was applied as follows:

$$n = (Z^2PQ)d^2$$

n- The desired sample size (if the target population is greater than 10,000)

Z –the standard normal deviate at the required confidence level

p-the characteristic of interest been measured in the study (Ethiopia AFP cases reported 30%-59% attributed to CBS)

q= 1-p

d- The level of estimated significance

q= 1-0.4=0.6

z=1.96

p= (30+59/2)/100=0.4

d= 0.05

Therefore,

$$n = ((1.96)^2 \times 0.4 \times 0.6) \div 0.05)^2 = 369$$

n=369

The researcher interviewed 369 respondents (Household members).

Since the total target population for CHV's is less than 10, 000, the following formula was used to determine the actual sample size

N=Target population of CHV'S 7,850

n=n-1÷N will be employed

n=369-1÷7850=369

369 CHV'S were interviewed.

The information is portrayed in table 1 and table 2.

Sampling technique

Purposive sampling method was used to select the community units, which practice CBDS in each of the nine sub counties in Nairobi County. Purposive sampling was employed in selecting the health workers in facilities linked to the CU and the CHAs attached to the units practicing CBDS, thus one health worker in the each of the link facilities and one CHEW for every unit. The health facilities practicing CBDS were selected purposively thus those linked to the community units and the other facilities that are not practicing CBDS were selected randomly. Then quota sampling was applied to select the actual respondents, the CHVs and House hold members, then starting point was selected randomly

Recruitment of subject/respondents

Inclusion criteria

The study included selected CHV's doing CBDS in the selected sub county, Health workers in facilities with enhanced CBDS and in other selected facilities without enhanced CBDS, CHEWS attached to the CBDS units and selected household members under the CHVs.

Exclusion criteria

CHVs where CBDS has not been adopted. None selected facilities not linked to the CBDS units, CHEWs not attached to CBDS units and household members not selected by the CHVs.

Data collection tools

Interview schedule was used to collect information from the respondents.

Data collection procedures

Data was collected by the researcher herself and assisted by trained research assistants and was facilitated by the use of interview schedules all designed in English though both English and Kiswahili languages was used during the interview.

An average of ten respondents were selected at random at every section each day until the desired number is interviewed. The investigator explained the purpose of the study to the respondents requesting for their co-operation and assuring them of the confidentiality of the information they are to give before the interview. Then the investigator ticked the most appropriate answer given by the respondent.

Data analysis and presentation

The data was analyzed by use of Statistical package for social sciences (SPSS), Stata, Epi info soft ware's, excel computer packages, and applied measures of central

tendency like mode and mean, measure of variation like skewness, correlation as well as percentages. The data presentation was in form of tables, charts, frequencies, figures and texts

Ethical considerations

Authority to pursue the study was sought from Mt Kenya University ethical committee in liaison with the Director of Medical services Nairobi county and Ministry of Education. Research permit was obtained from NACOSTI. The researcher obtained a consent form for the respondents. The respondents were informed of the right to withdraw consent of participation without any penalty. The respondents were assured of security of all information that it will be kept private and confidential.

RESULTS

Research findings

Response rate

The study sample of 369 for both CHV's and household members was not reached to a 100%. CHVs interviewed was 80.7% (298) while the household members interviewed was 87% (320).

Table 1: Population of the CHVs selected.

Sub county	Population of the CHV'S(N)	No. to be selected (n) n=N/J×369
Ruaraka	1000	47
Kamukunji	350	16
Starehe	800	38
Makadara	750	35
Langata	1200	56
Dagoretti	1200	56
Embakasi	1600	75
Westland	350	16
Kasarani	600	28
Total	7850	369

This was because of big drop out of the targeted CHV's who were trained on community-based surveillance system.

Number of reported priority diseases in the facilities with CBDS and those without CBDS.

Table 2: Population of household members selected.

				Sample size by social demographic class	
Sub County	**Population of the CHV'S**	**No of Households allocated (N)**	**No of households to be selected (n) n=N/J×369**	**Urban poor (slums)**	**Urban rich**
Ruaraka	1000	50000	48	24	24
Kamukunji	350	17500	16	8	8
Starehe	800	40000	38	19	19
Makadara	750	37500	36	18	18
Langata	1200	60000	56	28	28
Dagoretti	1200	60000	56	28	28
Embakasi	1600	80000	76	38	38
Westland	350	17500	16	8	8
Kasarani	600	30000	28	14	14
Total	7,850	39,2500	370	185	185

Table 3: Number of reported priority diseases in the facilities with and those without CBDS.

Year	Cholera	Confirmed malaria	Measles	AFP	Malaria in pregnancy	Neonatal Tetanus	Suspected malaria
Facilities with CBDS							
2014	0	735	79	0	85	0	434
2015	0	193	1	0	35	0	48
2016	0	1686	27	1	141	27	290
2017	9	1573	23	0	31	0	213
2018	0	570	14	0	9	0	624
Total	9	4757	144	1	301	27	1609
Facilities without CBDS							
2014	5	825	27	0	68	0	332
2015	0	145	20	0	9	0	127

Continued.

Year	Cholera	Confirmed malaria	Measles	AFP	Malaria in pregnancy	Neonatal Tetanus	Suspected malaria
2016	0	1052	3	0	62	3	253
2017	0	365	4	0	20	0	265
2018	0	402	3	0	8	0	493
Total	5	2789	57	0	167	3	1470
Total	14	7546	201	1	468	30	3079

Source: Field Data (2019)

Table 4: To compare the number of reported priority diseases in the facilities with CBDS and those without enhanced CBDS.

	Median (IQR)		P value
	CBDS	Non CBDS	
Confirmed malaria	735.0 (570.0-1573.0)	402.0 (365.0-825.0)	1.000
Malaria in pregnancy	23.0 (14.0-27.0)	4.0 (3.0-20.0)	0.999
Measles	35.0 (31.0-85.0)	20.0 (9.0-62.0)	0.991
Suspected malaria	290.0 (213.0-434.0)	265.0 (253.0-332.0)	1.000

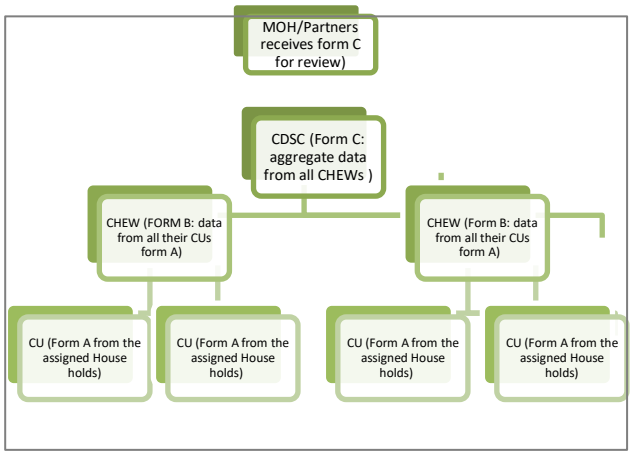


Figure 1: Data collection and reporting.
Source: DSRU (2011).

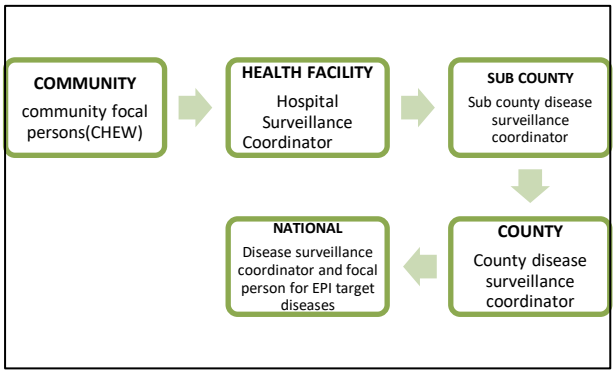
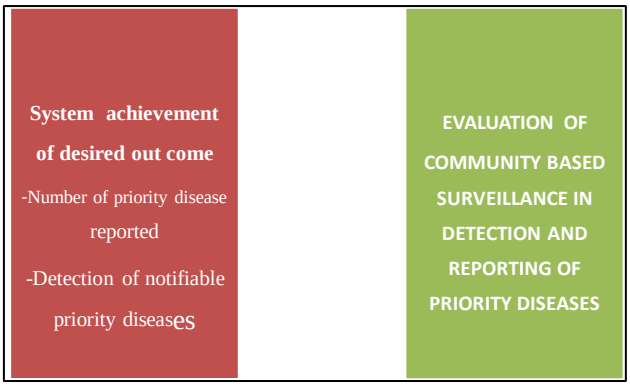


Figure 2: Surveillance structure.
Source: DSRU (2012).

The study sought to compare the number of some of the priority diseases reported in the health facilities with CBDS and in the facilities without CBDS in the same vicinity. The Table 3 shows the data.

Looking at the data for the five years,more cases of diseases are reported in the facilities linked to a community unit trained on CBDS.This is a clear indication that the CHV's are identifying the diseases in the community and refferring the to the facility.



Source: Researcher (2019)

Figure 3: Conceptual framework.

The chart shows comparison of the accumulated cases for the five years 2014-2018(up to may) for the health facilities with CU's practicing CBDS and those without CU's practicing CBDS. This indicates that most diseases are reported in health facilities with CBDS, showing that the CU's practicing CBDS are actively doing surveillance in the community and referring patients to the health facilities. This is as shown in Figure 4.

Association

The Table 4 below outlines information as indicated. Chi square test was test was done to determine difference in median for the number of reported priority diseases in the facilities with CBDS and those without CBD. There was no statistically significant difference among the four diseases.

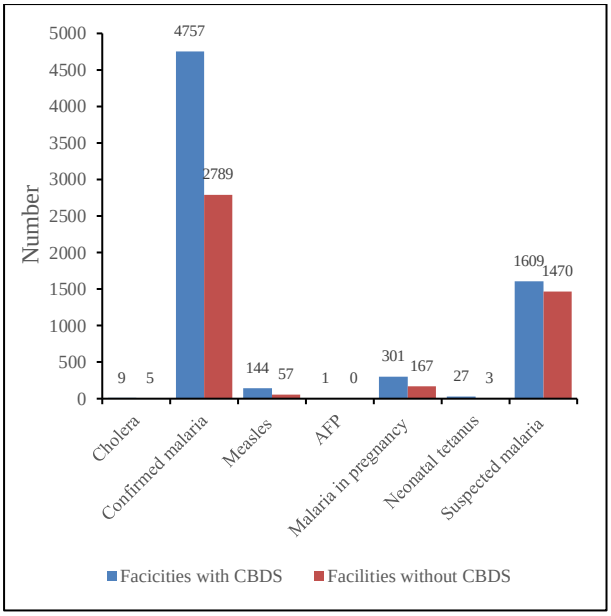


Figure 4: Number of reported priority diseases in health facilities.

DISCUSSION

On reported priority diseases in the health facilities with CBDS and those without enhanced CBDS, the study established that more cases of priority diseases are reported in health facilities linked to a community unit who had the training on community-based disease surveillance. This will then enable early detection and identification of the emerging and re-merging diseases and events with potential to cause disease outbreak which has remained to be a constant threat to global health security, conquering with Wallerstein et al; who said that community involvement in health contributes to effective health programmes.[9] When the health facilities are able to report most of the priority diseases then it is an implication that the community health volunteers are finding the cases in the community and referring them to the health facility for treatment.

Limitation of the study

This was a facility based and should therefore be replicated in community settings so that the findings can be generalized. Another limitation was that some of the respondents declined to participate in the study for various reasons like low knowledge level, while some were sceptical. Others gave incorrect or dishonest information. To minimise this, the researcher explained the reason for the study as being purely academic using a simple language and where need be translated to local language so as to win trust and consent of most respondents. The respondents were able then able to respond to the questionnaire anonymously and this encouraged honest responses.

CONCLUSION

The study concluded that community-based surveillance system is key in supporting the reporting of the priority diseases in the health facilities. The system increases the health service seeking behaviour of the community. Therefore, if all Community units in Nairobi County embraces community-based surveillance system, there will be improvement of reporting of priority disease in all health facilities in the County.

Recommendations

The study revealed that there is a gap on training of community-based disease surveillance system and therefore there is need for continuous refresher trainings on CBDS to the CHVs and CHAs to accommodate also the newly recruited. The study established that most of the health care workers are not trained on integrated disease surveillance and community-based disease surveillance, therefore need for IDSR training in the facility level with combination with CBDS to the health care workers to support the system.

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Ethical approval: The study was approved by the Institutional Ethics Committee

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