A Study Done in Karve road, Pune, India Comparing Effectiveness of the Existing Mode of Malaria, Dengue Fever and Chikungunya Surveillance with a new System - Community Disease Detection and Response Network, (CODREN) System

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Abstract

Introduction: *World Health Organization (WHO) defines disease surveillance as continuous, systematic collection, analysis and interpretation of health-related data needed for the planning, implementation, and evaluation of public health practice. Its aims are to serve as an early warning system for impending public health emergencies, document the impact of an intervention, or track progress towards specified goals and monitor and clarify the epidemiology of health problems, to allow priorities to be set and to inform public health policy and strategies (WHO, 2016). The need for disease surveillance networking in India arose from the challenges encountered in the year 2009 when Pune city experienced the major effect of H1N1 pandemic (Ministry of Health and Family Welfare, [MHFW] 2009). A large proportion of the population was affected. The situation was made worse by a lack of prepared public health surveillance system, unregulated private health sector and a large urban population whose health demands exceeded the available health care (N Prasad, M Mithilesh and G Rao, 2010). Usually, surveillance activities in the ward are done by malaria surveillance inspector from Pune Municipal Corporation, (PMC). The team performs active surveillance by visiting a few designated diagnostic laboratories and hospitals regularly to collect data on laboratory confirmed cases of Vector Borne Diseases, (VBD). Any confirmed case activates standard response from PMC (also referred to malaria officer in the study). By this approach, not all diagnostic laboratories and hospitals in the area are visited, nor are all cases reported. Similarly, suspected cases are neither reported nor followed up. The private sector which constitutes more than 85% of the urban health resources is not involved in disease surveillance. A network, Community Disease detection and Response Network, CODREN, was developed as a tool for collecting surveillance data.This study therefore used CODREN in Karve road ward office area, Pune, India, as a supplement to the existing disease surveillance network system administered by PMC through Malaria Officer while determining its effectiveness.* ***Objective:*** *To determine the effectiveness of CODREN in Karve road ward office area, Pune, as an early disease detection system for disease outbreaks using Malaria, Chikungunya and Dengue virus as an example.* ***Methodology:*** *Design**:** Descriptive cross-sectional study design, Sample size: Three hundred and eighty (380) facilities were selected conveniently to be part of the study, because they had the necessary minimum technological facilities. One person from each of the facilities was recruited into the study. Data collection: The selected person from each facility was to enter data on CODREN as soon as a case was detected, whether confirmed or suspected for a period of three months beginning 1st of October to 31st of December 2012. This was done alongside the existing surveillance system by PMC. Analysis: Resultant data was then analyzed using excel and SPSS version 20.0 whereby descriptive statistics were considered-Frequencies and means of the CODREN data Vis a Vis data from the already existing tool (PMC) in terms of effectiveness' were considered.* ***Results and conclusions:*** *Suspected cases of malaria, (92%) which were not captured by PMC responded to antimalarials drugs indicating that they were missed true cases of malaria. Seven (0.12%) confirmed cases of malaria and five cases (92%) of Chikungunya were also missed out by PMC surveillance system but captured by CODREN. This is an indication that CODREN as a surveillance tool would significantly complement the already existing PMC system of surveillance.*

Key Words: CODREN, VBDs, PMC Surveillance System and Karve road ward office area in Pune India.

Introduction

Background

In the year 2009, the health system of Pune city, India came across a major test when it experienced H1N1 pandemic (MHFW 2009). More than 50% of the city dwellers were affected. The health requirement went beyond the accessible health care. This was compounded by unprepared public health surveillance system, poorly regulated private health sector, and a huge urban population (N Prasad et al, 2010). There was no time and other resources to put in place coordinated efforts involving public and private sector to restrain the outbreak. All this was due to lack of an integrated disease surveillance system, (National Rural Health Mission, [NRHM] 2010).
Hence the purpose of this study was to test the effectiveness of CODREN as a surveillance tool for disease outbreak within Karve road ward office area, Pune city, with an aim of using it in other areas in the world.

Methodology

Setting: Karve road ward office area is found in Pune city, Maharashtra state, India. It is governed by Pune Municipal Corporation which comes under Pune Metropolitan Region. As per 2011 census, population of Pune was 3,124,458; of which male and female are 1,603,675 and 1,520,783 respectively (MHFW, 2009). This is a malaria, Chikungunya and dengue virus prone area as per the ministry of health and family welfare, 2011(National Vector Borne Disease and Control Programme, [NVBDCP] 2010).

*The target population***:** Health practitioners involved in diagnosis and treatment of malaria, Chikungunya and dengue viruses within the Karve road ward office area, Pune city. This ward was selected based on the high incidence of Vector Borne Disease (malaria, dengue virus and Chikungunya virus) in the year preceding the commencement of the study (NVBDCP, 2010) and the need to have proper surveillance tools for effective management of these diseases. The ward has a total of 546 health facilities.

*Facilities selected to participate***:** Three hundred and eighty, (380) health facilities involved in the provision of care to patients diagnosed or suspected with any of the vector borne diseases were recruited.

Design: Descriptive cross-sectional design

Sampling and Sample size: First, all health facilities within the study area were mapped out and characterized. Their details were recorded including ownership status, type of services offered, system of medicine practiced.
The three hundred and eighty (380) health facilities were conveniently sampled and stratified into large hospitals (LH), Small hospitals (SH), Clinics (CL), Diagnostic Laboratories (DL), Pharmacies (PH) and government owned health post. This criterion of characterization was based on the scope of services offered by each type of facility. Large hospitals provide specialized services than Small hospitals. Both provide in-patient services. Clinics and government owned health post provide outpatient services only. Diagnostic laboratories confirmed malaria cases, while Pharmacies issued prescribed medications. One health practitioner, preferably the senior most where possible or the proprietor, from each facility was requested to report cases of VBD.

*Data collection***:** Data collection in the various health facilities of the study area was collected in three months, from 1st October to 31st December, 2013. The clinical case definition of Malaria, Dengue virus and Chikungunya was adopted from Directorate of National Vector Borne Disease Control Programme, Ministry of Health and Family Welfare; Government of India (NVBDCP, 2010). Malaria case was confirmed by laboratory rapid test. Suspected malaria case was defined as joint pain and fever for more than three days which responded to anti malarial therapy of coartem. Chikungunya was clinically defined as joint pains and fever for more than three days not responding to anti-malarial. Dengue virus has almost similar clinical presentation as malaria and Chikungunya. Therefore all unconfirmed cases not responding to anti malarial treatment were assumed to be Chikungunya virus. The head of the facility or proprietor was requested to report the VBD cases according to the guidelines of CODREN.

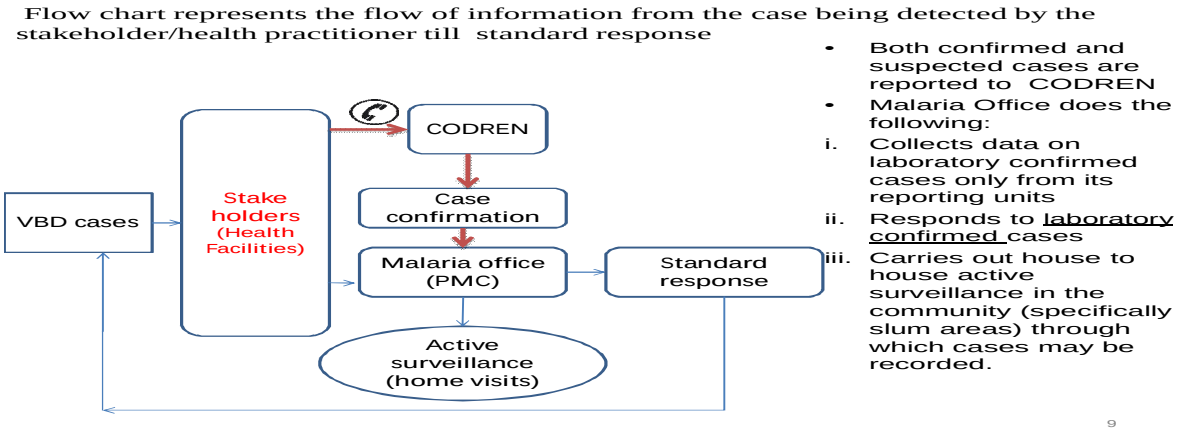
Data collection procedures: Health care practitioners (380) were sensitized on disease surveillance and then given CODREN reporting tools. They used the reporting tools to collect data. Both confirmed and suspected cases were reported. They were encouraged to capture each and every case of the three (3) VBD as soon as it was reported or diagnosed. Those health practitioners who were already participating in the existing surveillance system reported confirmed cases only to PMC whereas both confirmed and suspected cases were reported to CODREN. Health practitioners in private health facilities reported both cases to CODREN only. CODREN would then report to PMC.

PMC initiated standard response to confirmed cases. Suspected cases of malaria were followed up by CODREN and administered with recommended antimalarials drugs, (Coartem). Subsiding of symptoms within three days confirmed malaria case.

Organizational flow chart of CODREN and malaria office (PMC)

The flow chart below (fig 1) only represents the flow of information from the case being detected by the health care practitioner till standard response is activated.

Figure 1: Flow of information on the cases in both networks



Mechanisms of data collection and dissemination

Reporting of the cases was done in two ways, by phone call or short message service and by written submissions on calendar planners and diary books. Whenever there was a suspected or confirmed case, the stakeholder/health practitioner, by phone call, contacted CODREN team and provided patient's details *(name, contacts and diagnosis)*. The CODREN team would then corroborate the case details by contacting the patient. For a confirmed case the malaria surveillance inspector from PMC was immediately contacted by phone call giving patient's details and contacts. After verbal confirmation from the patient, the malaria surveillance inspector activates standard response which consists of 2 field workers and one insect collector. The response, feedback would then be given to the malaria surveillance inspector for further observation.

Results

(a) Characterization of health facilities

Table 1 below, describes the distribution of health facilities in study area

Health Facility n=509	Private (%)	Public (%)
Large Hospitals, LH	4 (0.6)	0
Small Hospitals, SH	36 (6.4)	1 (0.2)
Clinics, CL	293 (47.6)	0
Diagnosing Laboratories, DL	30 (5.4)	0
Pharmacies, PH	144 (22.9)	0
Government run health post	0	1 (0.2)
Total	**507**	**2**

Table 1: Distribution of total health facilities (reporting units) in the study area according to public/private ownership

There were 509 health facilities in the study area. Of these, 2 (0.4%) were government owned facilities; more than 99% of the health facilities were in the private sector. Data on the number of government owned health facilities was obtained from Pune Municipal office. Data on private health facilities was not available. During the setting up and testing of the network, hospitals and clinics used clinician's clinical diagnosis to report suspected cases of malaria, Chikungunya and dengue respectively. Confirmed cases were reported after appropriate test turned positive for the infection. Pharmacies reported patients who had either prescription for the particular diseases or positive laboratory test. Double reporting was prevented by CODREN lead researcher through data filtering.

Whenever a suspected or confirmed case was diagnosed or found, the concerned stakeholder/health care provider informed CODREN lead researcher giving full information of the case. The patient information provided included name, sex and age, physical contact, phone number, date of diagnosis, and place diagnosed and treated. All laboratory cases that were reported to CODREN were directly communicated to the PMC for standard response. Suspected cases were documented and mapped and reasons for laboratory tests not being carried out elucidated where possible.

Suspected cases of malaria were given anti-malarial (coartem) and followed up for three days. Disappearance of clinical signs and symptoms confirmed the patient to be a true suspected case of malaria. Patients with persistent symptoms were referred to government health facility for further investigation.

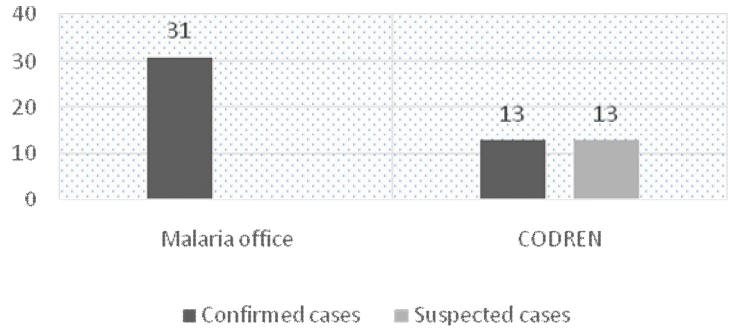
Characterization of cases reported by both networks

Area of residence	**Confirmed (%)**		**Suspected (%)**	**Total (%)**
	CODREN	Malaria office (PMC)	CODREN	
Within Karve (n=57)	13 (22.8)	31 (54)	13(22.8)	57 (100)
Outside Karve (n=21)	19 (90.5)	0	2 (9.5)	21(100)
Total (n=78)	32 (41.8)	31 (39.2)	15 (19)	78 (100)

Table 2: Distribution of reported cases according to area of residence

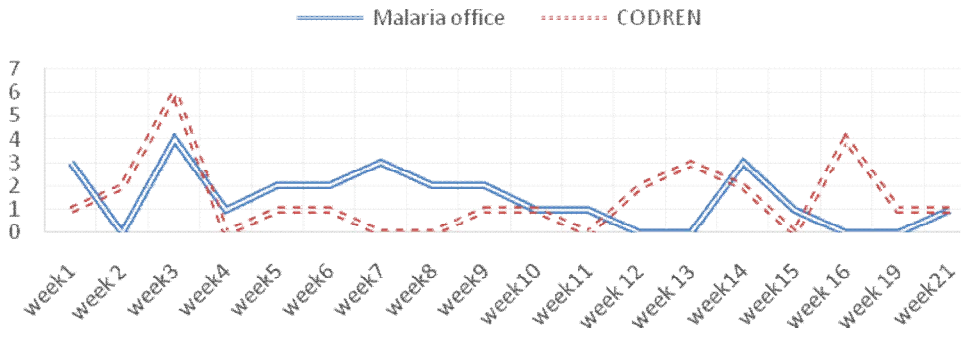
The total number of cases reported from Karve road ward office area in the three months was 100% (57). Out of this, 45.6%(26) cases were reported by CODREN while 54.4% (31) cases were reported by malaria office.

Figure 1: Distribution of VBD cases reported to Malaria office and CODREN



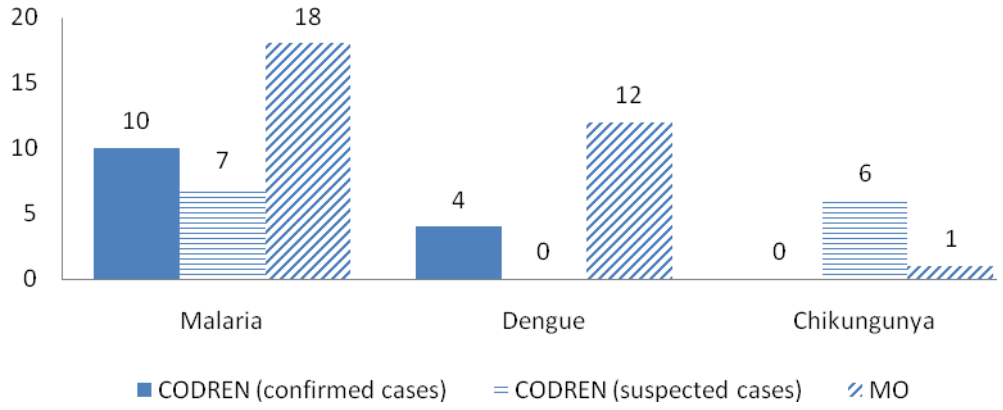
Malaria office only reported confirmed cases, a total of 31(54.4%) cases while CODREN reported both confirmed 13 (22.8%) and suspected cases, 13 (22.8%).

Figure 2: Trends of VBD cases reported to Malaria office and CODREN for 21 weeks



During high transmision period, that is first four weeks, the fluctuations in the cases detected were similar in both networks; however during weeks seven, twelve and sixteen, cases changed diferrently. In general, the cases fluctuated almost in a similar manner in both networks.

Figure 4: Distribution of type of cases reported to each network



KEY MO- Malaria officer

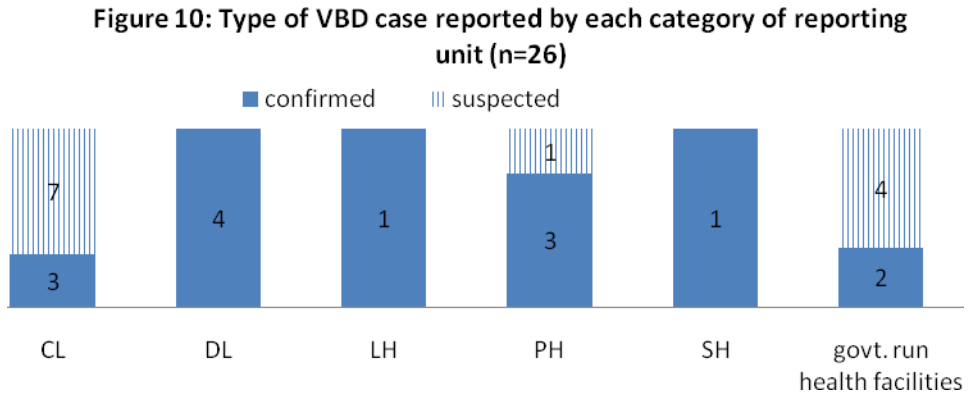
The highest numbers of VBDs were malaria cases followed by dengue. Malaria office (PMC) only reported confirmed cases, most of which were malaria cases followed by dengue and chikungunya. CODREN reported confirmed cases of both malaria and dengue and suspected cases of malaria and chikungunya. There were no suspected cases of dengue reported by CODREN. Malaria office missed 5 cases of chikungunya which were captured by CODREN

Facility	Reporting units	Total cases reported per facility (n=26)
CL(n=293)	7 (2.4)	10 (38.5)
DL (n=30)	2 (6.7)	4 (15.4)
SH (n=35)	1 (2.8)	1 (3.8)
LH (n=3)	1 (25)	1 (3.8)
PH (n=17)	2 (1.4)	5 (19.2)
Total (n=380)	14 (2.8)	26 (45.6)

Table 3: Distribution of facilities which reported to CODREN and number of cases

Out of 380 facilities, 2.8% reported at least a case to CODREN. Of the 293 clinics, 2.4% of clinics reported 10 (38%) cases

Figure 5: Type of VBD case reported by each category of reporting unit (n=26)



Diagnostic laboratories, large hospitals and small hospitals only reported confirmed cases of VBDs, whereas suspected cases were reported by clinics, pharmacies and government run hospitals.

Total number of malaria cases reported by CODREN	26
Total number of cases reported by Malaria officer	31
Out of these, total number of malaria confirmed cases reported by CODREN	13
Out of these 13 confirmed cases, common cases reported by both Malaria officer and CODREN (overlapping cases)	6
Number of confirmed cases reported by CODREN alone	7

Table 4: Testing the efficacy of the network

Therefore CODREN reported 7 cases that would not have been reported by the existing PMC surveillance system. By adding the common cases to Malaria Officer, using one-sided binomial test, at 95% confidence interval, p value< 0.005 CODREN would report 0.08 to 0.1 % more cases than Malaria office. CODREN significantly contributed to report VBD cases to the Malaria Office

Discussion and Conclusion

As the study shows, except for one (1) case, all suspected malaria cases, 92.3% (12) responded to anti-malarial medication of coartem indicating that they were none diagnosed cases. These cases were also not reported (to PMC) by health care providers in public health facilities due to the existing case definitions. Also among the confirmed cases, 7 (0.12%) cases of malaria and 5(71.4%) cases of Chikungunya were missed out by the PMC surveillance system.

In a multi system of medicine like India, it is crucial to involve all stakeholders in disease surveillance. A large number of health facilities not designated in the existing surveillance system were able to report a case of the VBD. Therefore, the government through Integrated Disease Surveillance Program, (IDSP), should integrate both public and private sector by involving the private practitioners, hospitals, laboratories, and Non Governmental Organizations, (D Bloom, P Craig and M Mitchell. 2000). Similarly, syndromic surveillance system is effective in capturing all cases of VBD. Similar findings were found in a study done in Baltimore-Washington, D.C (J Henry, S Magruder, and M Snyder. 2002). As has been found out by this study, all suspected cases of malaria, except for one, turned out to be true cases when followed up.

The fact that 2.8% of the stakeholders had reported at least one case to CODREN during these low months of transmission may be encouraging in the early stages of the network formation.
Since the purpose of our system was to strengthen the existing surveillance system, this encourages the further testing of this network for a longer period so as to establish its true efficacy.

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