Malaria surveillance and use of evidence in planning and decision making in Kilosa District, Tanzania

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Abstract:
Background: Since 2001, Tanzania has been making concerted efforts to strengthen its Integrated Disease Surveillance and Response system. In this system, malaria is one of the priority diseases that are to be reported monthly. The objectives of this study were to (i) assess malaria surveillance system at facility and district levels to identify key barriers, constraints and priority actions for malaria surveillance strengthening; and (ii) to explore the use of evidence in health planning and decision making at these levels.
Methods: The study was carried in Kilosa District in central Tanzania, during October 2012 and involved health facility workers and members of the district health management team. The existing information system on malaria was evaluated using a structured questionnaire and check list. Data collection also involved direct observations of reporting and processing, assessment of report forms and reports of processed data.
Results: Three district officials and 17 health facility workers from both public and private health facilities were interviewed. Of the 17 informants, 15 were familiar with disease surveillance functions. A good percentage (47%, 8/17) received training on disease surveillance during the previous two years. Public transport and motorcycles were the main means of reporting epidemiological information from facility to district level. Most of the health facilities (93%, 14/15) faced difficulties in submitting reports due to lack of resources and feedback from the district authority. Analysis of malaria data was reported in 52.9% (9/17) of the facilities, but limited to malaria incidence per age groups. Challenges in data analysis included unavailability of compilation books; lack of computers; poor data storage; incomplete recording; lack of adequate skills for data analysis; and increase in workloads. Data at both facility and district levels were mainly used for quantification and forecasting of drug requirements.
Conclusion: Malaria surveillance system in Kilosa district is weak and utilization of evidence for planning and decision making is poor. Capacity strengthening on data analysis and utilization should be given a priority at both facility and district levels of the health systems in Tanzania.

Keywords: malaria, surveillance, health management information system, utilisation, Tanzania

Introduction

Disease surveillance is the ongoing systematic collection, analysis, and interpretation of epidemiological data, closely integrated with the timely dissemination of these data to those responsible for preventing and controlling disease and injury (Thacker & Berkelman, 1988). It is a tool to estimate the health status and behaviour of the populations served by the health system. For the same reasons, information on the number and spatio-temporal distribution of malaria cases and deaths is critical for the design, implementation and monitoring and evaluation of malaria control programmes. Surveillance is important to determine which areas or population groups are most affected by malaria, so that resources can be targeted to the populations most in need (WHO, 2012).

During the past 15 years, Tanzania has been making concerted efforts to strengthen its infectious disease surveillance through an Integrated Disease Surveillance and Response (IDSR) strategy. Since 1998, several national assessments of the infectious disease surveillance systems have been conducted in the country (Nsubuga *et. al.,* 1998; Franco *et al.,* 2002; Mghamba *et al.,*

2003). Following the 1998 assessment, the Ministry of Health, in consultation with its partners, developed a work plan for integrating and strengthening disease surveillance (February 1999), and identified 13 priority diseases (Franco *et al.*, 2002) to be included in its IDSR strategy. The list of priority diseases was revised to include 35 diseases and conditions in 2011 (MoHSW, 2011).

Delivering public health services requires functional and effective country-level health systems including capable innovative health leadership, qualified healthcare providers, effective human resource systems, reliable data, adequate physical infrastructure, and many other critical inputs (Anyangwe & Mtonga, 2007). A weak health system has been described as among the critical factors for underutilisation of the health interventions in developing countries (Anyangwe & Mtonga, 2007). In many cases, the failure to deliver affordable and effective interventions to predictable, preventable and treatable diseases like malaria is a major weakness in the health systems of many developing countries. While health systems in general have received worldwide attention, little has been done to strengthen facility, district and national institutions responsible for stewardship of health systems in Tanzania.

Constant malaria monitoring and surveillance systems have been highlighted as critical for malaria elimination (Barclay *et al.*, 2012; Mboera *et al.*, 2013a). Surveillance systems that can gather, store and process information, from communities to national levels, in a centralized, widely accessible system will allow tailoring of surveillance and intervention efforts (Barclay *et al.*, 2012). To motor the trend of malaria morbidity and mortality in space and time, an effective, real-time, on-going monitoring systems are important for rapid detection of existing, new or re-introduced infections (Tatem *et al.*, 2009; Lee *et al.*, 2010); identification of periods of low transmission when the parasite population could be most amenable to elimination (Kamanga *et al.*, 2010; Atkinson *et al.*, 2012); understanding trends in malaria incidence and prevalence and, detection of antimalarial drug and insecticide resistance.

To optimize malaria intervention efforts, both practitioners and decision-makers need timely, robust information about epidemiology and distribution of intervention; an ability to access data and to coordinate intervention activities; and, conditions that facilitate data sharing and optimal, group-based decision-making. Since 2005, only a few studies have been carried out to assess that status and its IDSR implementation in the country (Eisele *et al.*, 2006; Rumisha *et al.*, 2007). The objectives of this study were (i) to assess malaria surveillance system (as part of the Integrated Disease Surveillance and Response and Health Management Information Systems) at facility and district levels to identify key barriers, constraints, priority actions for surveillance strengthening; and (ii) explore the use of evidence in facility and district health planning for malaria control.

Materials and Methods

Study area
The study was carried out in Kilosa District (22°17'-32°49'E and 9°127'-9°3339'N) in central Tanzania in October 2012. The district has a total surface area of about 14,400 km² and a population of 489,513 people living in 105,635 households with an average household size of 4.6 people. The district has a tropical climate, characterised by a monomodal rainfall pattern which begins in October with a peak in April-May. The mean annual temperature is 25°C. Agriculture is the main activity of most people in the district and is characterized by predominance of smallholder and estate farms. The main crops are maize, rice, sorghum, beans, cassava, sweet potatoes, cotton, sunflower, sesame and sisal. Free-range livestock production is an important land use in the district. Extensive grazing by the Maasai pastoralists is also found in the open "Miombo" woodland of the undulating plains (Mboera *et al.*, 2013b). The district is served by 3 hospitals, 8 health centres and 62 dispensaries. Malaria is prevalent in the district (Mboera *et al.*, 2015), with a recent study reporting a prevalence of 17.5% (Mazigo *et al.*, 2017).

Study design

The study was cross-sectional in nature, using qualitative methods. In-depth interviews and observation and documentary review were conducted at district and health facility levels. Informants were recruited purposively from district and health facility levels. Criteria for selection included individuals involved in the health information management at the respective levels. The existing information system on malaria was evaluated using established methods that have been used in Tanzania (Franco *et al.*, 2003; Rumisha *et al.*, 2007).

Data collection

In-depth interviews with the recruited informants were carried out to explore the performance of disease surveillance functions such as data compilation, reporting, analysis and actions/response based on the data with special focus on malaria. Interview guides were developed carrying key themes such as familiarity with disease surveillance; training on disease surveillance, means of communication used to submit epidemiological report; challenges faced and possible solutions. The informants were also asked on whether or not data analysis is being done; when is malaria data analysed, what are the variables of analysis; use of analysed data; factors that facilitate or hinder data analysis and whether or not the district provide feedback of the reports submitted by the facilities. Other important information sought included the use of information for quantification of antimalarial drugs and other supplies. During the interviews, detailed hand written notes were taken.

Observation and review of the documents such as registers and reporting forms was done. A checklist was developed to cover important variables of interest during the review. The first activity was to assess availability of registers and forms for IDSR reporting such as routine Health Management Information System Book 2, 5 and 10. Other documents included; Standard case definitions; Laboratory Diagnosis Register; National Guidelines for Integrated Disease Surveillance and Response; National Guidelines for malaria surveillance; Case Management Protocols for malaria at Health Facility; Guidelines for malaria treatment and outputs of analysed data (graphs, charts, tables).

Data analysis

The transcripts from in-depth interviews were carefully reviewed by a competent social scientist to capture the responses on important themes of interest. Matrices with key themes were developed to be able to observe similarities and differences between and within levels of informants. Where necessary, important quotes to represent informants own words were taken.

Ethical considerations

Ethical clearance was sought from the Medical Research Coordinating Committee of the National Institute for Medical Research, Tanzania. At the point of study implementation, Kilosa District authority including the District Medical Officer was informed on the objective and relevance of the study and permission to implement was sought. Before the interviews commenced, the informed consent was sought from each of the study participants. Privacy, anonymity and confidentiality were maintained throughout the study. Participants were assured of their rights to withdraw from the study at any point during the interview without any penalties.

Results

Information on disease surveillance and reporting

A total of 20 health workers were interviewed of which three were from the Council Health Management team (District Focal Person for Malaria and Integrated Management of Childhood Illness, Coordinator for Health Management Information System and Focal Person for Integrated Disease Surveillance and Response) and 17 from health facilities, both public and private (i.e.

hospitals-2, health centres-4 and dispensaries-11) (Table 1). Of the 17 informants from the health facilities, 15 (88.2%) were familiar with disease surveillance and its functions. A good percentage (47%, 8/17) of health facility workers received training on disease surveillance during 2010-2012.

Table 1: Means of communication used to submit monthly reports from facility to district level

Type of facility	Name of health facility	Means of communication
Dispensary	Mabwerebwere	Motorcycle
	Kinangali	Public transport
	Chanzuru	Motorcycle
	Ilonga	Public transport
	Tindiga	Public transport; Telephone
	Mvumi	Public transport
	Lumbiji	Motorcycle
	Zombo	Public transport
	Iyogwe	Public transport
	Rudewa	Public transport; Telephone
	Magomeni	Motorcycle
Health Centre	Ulaya	Public transport
	Kimamba	Telephone; email
	Msange	Submit to a nearby (Kisanga) dispensary
	St Joseph Dumila	Public transport
Hospital	Kilosa	On foot- same area*
	Berega	Public transport

*District Hospital and CHMT housed in the same building

Health facility informants confirmed to have a key role in the compilation and submission of reports to the district level. Different means of transport were used for reporting and submission by the facilities. Public transport (58.8%) and motorcycle (23.5%) were the major means of submission of reports (Table 1). However, most of the health facility informants (93.3%, 14/15) had difficulties in submitting reports due to inadequate funds for photocopying the forms and for paying bus-fare, the challenge that was also supported by the district informants. They most often submit their monthly reports when collecting their monthly salaries, so the delay in monthly salary dictates the delays in submitting reports as justified in the following quote: *"When there are delays in getting my monthly salary, there will also be delays in submitting my monthly report. This is because we are using our own money for bus-fare when submitting reports"* (Informant, Dispensary level). At hospital and health centre levels, additional barriers in timely submission of reports were mentioned to include shortage of manpower and workload which were attributed by multiple reports required by vertical programmes. In addition, some informants complained of the misplacement of their reports at the district office making them to incur additional costs for photocopying and submission of another report as revealed in this quote: *"There is lack of accountability at the district office. Many reports are misplaced and later they ask us to re-submit them. This requires you making photocopies at your own costs"* (Informant, dispensary level). While timeliness of report submission was necessary, three informants from district level could not mention specific dates for submission of reports from health facilities. However, they were aware of their role to compile the health facility reports and submit to the higher level on monthly basis. Compilation was said to be done both manually and by use of computers. The IDSR Focal person was mentioned as being responsible for data compilation. District informants mentioned to have done data quality assurance (completeness and accuracy) using a guide provided in the HMIS books.

Challenges in report submission from health facilities included such as poor communication infrastructure was described as the major challenge in report submission from health facility to district level as quote reveals: *Reports are not received on time because of distance from the facility to district headquarters. We do not have money to pay for transport; and*

during rainy season, roads are impassable" (Informant, district level). On their side, district informants confirmed poor data management and low reporting rate by facilities as barriers for them to compile and submit reports to the next level timely. Other challenges mentioned included lack of computer and internet connectivity, lack of capacity on data analysis and too many reporting formats required by various vertical programmes.

Based on the observation and review of data capturing tools, the registers and IDSR forms were available in most health facilities (Table 2). However, some tools could not be accessed by the data collectors for assessment. Many of these were locked by the in-charges who were not around at the time of the interview despite the prior notification on the visit. Surprisingly, HMIS book 5 (main register for out-patients department) was not available in some of the visited health facilities for quite some time as the quote justifies: *"In April 2012, we ordered outpatient register book 5 from Medical Stores Department but we were supplied with dispensing registers. Since that time I haven't received any patient register"* (Informant, dispensary level). Availability of registers and report forms facilitate reporting of the data to the next level.

Table 2: The availability and quality of IDSR forms and Register Books in health facilities

Criteria	IDSR Reporting forms	Register Book
Availability of tools	11	16
Completeness in all registers and report forms	3	3
Record keeping		
• Availability	11	16
• Filled and stored properly	11	15
• Accessibility	11	14

Provision of feedback

Informants from health facilities reported that lack of feedback on the submitted reports was a de-motivating factor for timely submission of reports. Majority of them affirmed not to have received any feedback regarding the reports they submit to the district authority. However, a few staff said to have been consulted in case there were problems in their reports: *"Occasionally, the district might consult you during their supervision visits when some errors are discovered in your report"* (Informant, hospital level). Similar pattern was reported in one of the dispensaries: *"Even when you report a suspected outbreak, the district will respond by asking you to send someone to pick up drugs; no follow-up is being made from the district office. They leave everything to you"* Few informants considered the biannual meetings where health personnel from all facilities meet as the only forum where feedback of their performance is provided by the district authority. As it was for the health facilities, informants at district level affirmed to have rarely received feedback from the regional level authority.

Analysis of data

In this study, very little or no evidence was found in proper analysis of epidemiological data at facility and district levels. Over half of the informants from health facilities (52.9%, 9/17) reported to perform minimal data analysis. The most common analyses at health facility included presentation of morbidity and mortality by age group and sex, and identification of top 10 causes of attendance and deaths. Minimal analysis was also done on immunization coverage and outreach programme. Analysis of the outpatients and inpatient data aimed at determining the main causes of facility attendance and deaths. Although they reported that most frequently results were presented in tables, documentation and evidence of the analysed data were not found in most facilities. Specific analysis of malaria data was reported in the same nine facilities. The analysis focused on monthly malaria incidence by age and sex monthly basis as well as on the number of complicated and uncomplicated malaria cases. Factors facilitating data management and analysis at facility level included (i) Availability of registers books, tally sheets and reporting forms. All informants admitted that the fact that it is mandatory to submit weekly and monthly

reports to the district office pushed them to do so. Some challenges in data analysis highlighted during the health facility's interviews included unavailability of compilation books and lack of capacity to carry out data analysis. Others were frequent stock out of tally sheets; lack of computers; poor data storage; poor recording and incomplete recording; and inadequate human resource.

As regards to capacity in data analysis at the district level, the IDSR Focal person reported not to have capacity to carry out data analysis: *"I have not received training on data analysis"* (Informant, district level). On the other hand, while the District HMIS Coordinator claimed to have the capacity, data are not submitted to him and therefore he is not responsible for malaria data analysis. When asked whether there are guidelines on data analysis, the Malaria Focal person and HMIS Coordinator were not aware while the IDSR Focal person admitted that the data analysis section is included in the IDSR Guidelines.

Data utilization and communication

Analysed data in the health facilities was used for drug quantification, drug forecasting and planning. Some informants said that the analysis helps them to monitor progress achieved in some programmes and identify trends in morbidity and mortality as revealed in this quote: *"Analysis helps us to know if there is an increase in number of cases or death that requires action"* (Informant, hospital level). Other data uses include identifying major causes of morbidity and mortality and distribution of disease in space and time and when data is requested by decision and policy makers. Drug ordering was guided by the information stock out, availability of fund, and rate of drug consumption. The majority of the informants (76.5%, 13/17) reported to carry out drug quantification quarterly. However, drug quantification and procurement by private health facilities were done when needs arise.

At district level, malaria data was described to be used for priority setting, planning and monitoring and evaluation (M&E) of the control programme. However, M&E was rarely done as it depends on availability of funds. One of the district informant said that the last M&E was carried out during January 2012. However, the exercise aimed at determining the utilization of insecticide treated mosquito nets and not epidemiological pattern. Of the three district informants, only the Malaria Focal Person was aware of the malaria monitoring indicators. Sharing of epidemiological data between sectors at district level was not a practice. When the district informants were asked of their recommendations to improve data management, the following were suggested: job aids and guidelines to be made readily available; needs for strengthening capacity in data analysis among health workers; and allocation of adequate funds for health management information system.

Table 3: Availability of guidelines and other documents at the health facilities visited

Guidelines/Job aids	No of health facilities
Standard Case Definitions	2
Laboratory Diagnosis Register	6
National Guidelines for Integrated Disease Surveillance and Response	3
Case management protocol for malaria at Health Facility	2
National Guidelines for Malaria Treatment and Diagnosis	11
Standard Treatment Guidelines	3
Analysed data: graphs, charts, tables	5
The National Essential Medicine List	2
National guidelines for home based care services	2
Management of malaria for health service providers	1
Malaria Control Series Booklets	1

Availability of guidelines and job aids

The National Guidelines for Malaria Treatment and Diagnosis was available in 64.7% (11/17) of the visited health facilities (Table 3). However, the informants from private health facilities complained of not receiving Guidelines on time. *"Private health facilities are not provided with the Guidelines on time, making us lagging behind in many things compared to our counterparts in public facilities"* (Informant, Health Centre, level).

Discussion

An analysis of the malaria surveillance systems in Kilosa District revealed the following weaknesses: poor data management; delayed and inefficient reporting; shortage of data collection and processing tools; lack of data analysis capacity, over-burdened health staff; weak communication systems; weak capacity for facility level decision making; and multiple surveillance systems demanded by different vertical programmes. Like in this study, it has been shown elsewhere in Tanzania that routine recording of patient information into the registers is inconsistent with a number of health workers complaining of lack of tools for recording when attending to patients and other clinical duties (Franco *et al.*, 2002). Many providers complained about the time required to record all the HMIS information properly. Some health care providers who are also involved in handling facility data have not received training on HMIS or IDSR. Most respondents complained of the burden of compiling and submitting weekly and monthly reports. Similar findings have been reported elsewhere in Tanzania (Franco *et al.*, 2002). Similar to other studies in Tanzania (Franco *et al.*, 2002; Mghamba *et al.*, 2003) the current findings indicate that some important contextual barriers to an efficient surveillance system at both facility and district levels of the health system.

Usually, health activities in the districts and facilities are planned and implemented on the basis of the requirements of the comprehensive council health plan. To achieve this, baseline health information is required to provide basis for performance improvement. However, this study indicated poor utilisation of routine health information in planning and monitoring of the facility performance. Data analysis and interpretation is an important component of disease surveillance because it transforms the collected raw data into meaningful information, which can be used in making decisions (Mboera *et al.*, 2004). Due to its importance, data analysis and interpretation need to be done at all levels of the health information system right from the facility to district and national levels. The kind of analysis done at each level varies according to what can be done at that particular level. At whatever level, data are normally analysed by time, place and person. Time analysis enables the comparison of cases reported for the current time (week/month/year) with the number received in the previous time (week, month or year). This enables the detection of any abrupt or long-term changes in disease occurrence. A study by Mboera *et al.* (2001) have shown that only a few districts of Tanzania were utilizing analysed data for disease surveillance and planning.

According to WHO (2012) a malaria surveillance system consists of the tools, procedures, people and structures that generate information on malaria cases and deaths, which can be used for planning, monitoring and evaluating malaria control programmes. An effective malaria surveillance system enables programme managers to: (i) identify the areas or population groups most affected by malaria; (ii) identify trends in cases and deaths that require additional intervention, e.g. epidemics; and (iii) assess the impact of control measures. However, findings from this study, and a further analysis of the disease surveillance systems in Tanzania, has shown that in most districts there is shortage of data processing tools, over-burdened health staff and weak communication systems (Franco *et al.* 2002; Rumisha *et al.*, 2007; NIMR, 2011). Although, to-date HMIS is available throughout the country and that IDSR has been implemented for over 15 years, health data collection, analysis, reporting and utilisation in disease surveillance is still poor. Surveillance information is analysed by time, place, and person. Knowledgeable technical personnel should review data regularly to ensure their validity and to identify information of use

to managers. Simple tables and graphs are most useful for summarizing and presenting data. Timely dissemination of data to those who make policy and implement intervention programs is critical to the usefulness of surveillance data.

Surveillance systems in Tanzania and many other developing countries suffer from a number of common constraints. The system is often impaired by shortages of human, finance and material resources (GAO, 2001). Key positions in health facilities often are filled by people who do not possess the necessary qualifications. Similar to findings in this study, poor roads and communications make it difficult for health workers to submit to higher authority epidemiological and other health information timely. Multiple surveillance systems are still common in Tanzania and often poorly coordinated. The idea of the term feedback as far as surveillance is concerned is clearly misinterpreted. In many instance back communication or acknowledging receipt of report or need for clarification on the submitted report have been termed as feedback. The difference in the understanding between health facility and district officials should be taken with serious consideration. The absence of a clear feedback from the higher authorities discourages lower level officials from putting their efforts in surveillance leading to poor quality of data, poor use of surveillance data in evidence-planning and decision making. It is therefore important that the government of Tanzania strengthen the capacity of health facility, district and national levels on all aspects of health information systems. As malaria incidence decreases, active case detection using appropriate tests need to be given its due importance to ensure identification of new cases is improved. However, an effective surveillance system requires a level of infrastructure including communication networks, absent in many districts of Tanzania (NIMR, 2011). In many districts of Tanzania, like elsewhere in Sub-Saharan Africa, there are few landline telephones, computers, internet-accessibility, or roads in good conditions, for the rapid transfer of reports (Barrington *et al.*, 2010).

In conclusion, malaria surveillance in Kilosa District is weak. An efficient and effective surveillance system from facility, district to national levels should be able provide valuable insights needed to understand, forecast, and evaluate malaria control programme at all levels. In order to meet malaria elimination objectives, monitoring systems must be able to respond rapidly to the heterogeneity in malaria epidemiology. It is important therefore, efforts been made to strengthen the integrated disease surveillance and response system to able to provide reliable data for monitoring and evaluation of health programmes in Tanzania.

Acknowledgements

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