Evaluation of the Tuberculosis Surveillance System in District Hyderabad, Province Sindh-Pakistan, 2012

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Authors' contributions

This work was carried out in collaboration between all authors. Author MA was the primary researcher, conceived the study, designed, participated in data collection, conducted data analysis and drafted the manuscript for publication. Authors MAB and MNS assisted in data collection and preparation of first draft of manuscript. All authors interpreted the results, and reviewed the initial and final drafts of the manuscript.

Original Research Article

ABSTRACT

Aims: To identify strengthens and weaknesses of Tuberculosis (TB) surveillance system of District Hyderabad and suggest recommendations for improvement.
Study Design: Descriptive evaluative study
Place and Duration of Study: This research work was conducted in Provincial directorate of health, district health offices, and TB sentinel sites of District Hyderabad, between February and March, 2012.
Methodology: A total of 26 stakeholders were identified by using purposive sampling technique based on their involvement in and relevance to the TB surveillance system. Data was collected by review of medical records and stakeholder interviews by using "Centers of Disease Control (CDCs) Updated Guidelines for the Evaluation of Surveillance Systems. Attributes were rated as good, fair and poor on the basis of obtained score.

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Results: System was good in simplicity and flexibility due to simple case definition and adaptation of new changes. Presence of laboratory component and 90% completeness of forms led to good rank in data quality. The system covered limited (n=12) health facilities which caused fair representativeness. The staff was highly motivated to provide accurate, consistent and complete information and suggested good acceptability of system. Due to quarterly reporting, timeliness was poor and led to delays in outbreak identification and mitigation responses. Sensitivity and positive predictive value were 26% and 56.8% respectively. The system was fair in stability as supported by ministry of health with multinational donors.
Conclusion: The TB Surveillance system was satisfactory in all attributes except representativeness, sensitivity, and timeliness. Increased establishment of sentinel sites at public and private health facilities and added frequency in reporting time were recommended.

1. INTRODUCTION

Tuberculosis (TB) is a major public health problem globally, imposing high burden of morbidities and mortalities to health care system. In 2013, an estimated 9 million incident cases with 1.5 million deaths reported from the mycobacterium tuberculosis [1]. Geographically, more than 95% of new cases and deaths reported from low and middle-income countries [2]. The 56% of total incident cases were reported from the two regions i.e. South-East and Western Pacific, while African region attributed to 25% of the world cases [1]. The case fatality rate exceeded 50% in some African countries where HIV prevalence rate was high [3].

Pakistan ranks 5th among TB high-burden countries globally and contributes 61% of the disease load in the Eastern Mediterranean Region. An estimated 273,097 new cases with annual incidence rate of 410/100,000, mortality rate of 0.66/100,000 was reported in 2013 [3]. Possible determinants were rapid shifting of peoples living below the poverty line, overcrowding, poor living conditions, malnutrition, war, inadequate availability of anti-tuberculosis therapy (ATT), poor compliance with drugs, [4] underfunding of National Tuberculosis control Programmes (NTCPs), and non-adherence to programme policies [5].

In Pakistan, the National TB Control Program (NTCP) is developing guidelines and engendering resources to provide preventive, diagnostic and curative services against TB at provincial and district level since 2000. NTCP implemented a surveillance system with the objectives to monitor the disease burden and trends, to assess health status of a specific population, describe the natural history of disease, and evaluate the preventive and control interventions.

Evaluation is an important tool for policy makers that help to improve the performance and productivity of health programs [6]. The rationale of evaluating public health surveillance systems is to determine if the disease is being monitored efficiently and effectively. Every surveillance system should be evaluated periodically with recommendations to improve surveillance system usefulness, quality and efficiency [7]. A literature review suggested that no evaluation of the TB surveillance system has been conducted in this setting. To fill the existing gaps of knowledge, an evaluation TB surveillance system in District Hyderabad was conducted with objective to identify strengthens weakness and proposed recommendation.

2. METHODOLOGY

2.1 Study Design

This was a descriptive evaluative study. In order to evaluate the TB surveillance system, we followed the steps (Table 1) illustrated in "Updated Guidelines for the Evaluation of Surveillance Systems" formulated by Centers for Disease Control and Prevention (CDC) [7].

2.1.1 Study setting and duration

The study was conducted in Provincial Directorate of Health, District Health Offices (DHO) and TB sentinel sites of District Hyderabad Sindh province from 1st February to 30th March 2012.

2.1.2 Study population

The study was conducted among 26 stakeholders which were identified by using

purposive sampling technique based on their involvement in and relevance to the TB surveillance system including program manager of TB control program (n=1), District TB coordinator (n=1), medical officers of TB sentinel sites (n=12) and microscopicist/data entry person (n=12).

2.2 Data Collection

Face-to-face interviews were conducted to collect information regarding surveillance attributes (usefulness, simplicity, flexibility, data quality, predictive value, sensitivity, timeliness, acceptability, representativeness and stability) by using a structured questionnaire based on CDC guidelines. Other relevant information was collected by review of main documents of TB control program, such as Planning Commission Form One (PC -1), guidelines, patients case reporting proformae of year 2011, and annual reports.

2.2.1 Data analysis

For analysis of sensitivity, Positive Predictive Value, timeliness & representativeness frequency, percentage were used. Attributes with scores greater than 60% ranked as good, in between 51% to 60% ranked as average, and below 50% ranked poor

3. STRUCTURE AND ORGANIZATION OF TB SURVEILLANCE SYSTEM

The National TB Control Program was established in 2000, the objectives were to increase the cure rate of positive cases to at least 85%; sputum smear and increase the detection of new cases to 70%. The federal part of program is responsible for development of policy framework, supervision, technical assistance, co-ordination, research, surveillance, and advocacy, while the provincial part is responsible for planning, programme management, accessing funds, and establishment of TB sentinel sites at different levels of the health care system [8]. These sentinel sites work with one medical officer, one microscopicist/data entry person and two supportive staff with the aim to provide diagnostic and curative services to the community. For data management, the surveillance system uses13 different recording and reporting forms, entered and analyzed only at provincial and federal level. Data originating from sentinel sites shares with district, provinces and national levels. At the

provincial and national level, multiple national indicators are calculated and reported to the Ministry of Health and WHO country Office. The Fig. 1 describes the flow of data from the health care facilities to the provincial directorate within the system's structure. Provincial Ministry of Health and international donor including WHO, Japan International Cooperation Agency (JICA), the Global Fund to Fight AIDS, Tuberculosis and Malaria (GFATM), and some other donor are accountable to provide financial and technical support to the National and provincial TB control programs.

4. RESULTS

The following Table 2 displays the results of the evaluation conducted on the tuberculosis surveillance system in District Hyderabad.

5. DISCUSSION

The surveillance system at sentinel sites is a tool for early detection, monitoring the trend in burden of disease, and generating recommendations for prevention and control of disease. Evaluation of surveillance systems helps the decision makers to set the priorities for future planning, resource allocation and future interventions against disease [9]. The generated information was effectively used by provincial and district focal persons for estimation and trend in burden of disease and to identify distribution of the disease in term of time place and person. The system fails in timely detection of outbreaks as the three months it takes for the TB data to reach from the sentinel sites to the district and provincial level does not allow for timely detection or mitigation response. Similar finding was reported by study conducted in Afghanistan by Saeed et al. [10]. and contrary to finding from other study carried out in South Africa by Heidebrecht C et al. [11] where timeliness was good due to presence of electronic software for registration of TB cases. One of the main strengths of the system was its ability to implement changes in response to alteration in case definitions or diagnostic methodology, procedure, and technology The presence of trained staff makes the system very flexible which causes rapid adoption of any type of changing such as case definition, diagnostic procedure or reporting mechanism. The other determinant of flexibility was simple structure of system (i.e., Health facility → District TB coordinator → Provincial Directorate of TB). The system's good scoring in data quality can be attributed to the highly trained medical officers.

One of the major strengths of TB surveillance system was its high level acceptability among the users of TB surveillance system estimated by stakeholder participation quarterly and annual meetings, on time transmission of information from one level to next level and over 90% completeness of reporting form. The identified factors were willingness and trainings of staff. All stakeholders agreed that TB surveillance system was the primary source of TB data and told that system had no feedback mechanism. So, it is recommended that policy maker develop a mechanism for feedback within surveillance system. The Sensitivity of TB surveillance system was 26%. This means that information does not indicate the magnitude of the disease and miss a large number of cases. The factors for this low sensitivity was decrease number of sentinel sites for whole population of district, covered only public health facilitates, poor health seeking behavior and decrease utilization of services by population. So, it is highly recommended that program establish new sentinel sites, develop a mechanism for including private stakeholders and initiate Behavior Change Communication in district. The current system was average in term of PVP; improve by broadness (specificity) of the case definition and establishment of good communication system between senders (medical officers at health facilities) and receiver (district focal person for TB at District health office) of TB reports. The timeliness of surveillance system was poor; a case of TB was brought to attention of district coordinator after three month. A typical case of TB was brought to attention after three month responsible for delayed interventions. Similar timeliness was also reported in study conducted in Afghanistan [10], so it is recommended that replace this quarterly reporting to daily reporting. The system was average (66.6%) in stability because it was using financial and technical support resources from the multinational donors. this finding is continuation of study conducted in Afghanistan [10].
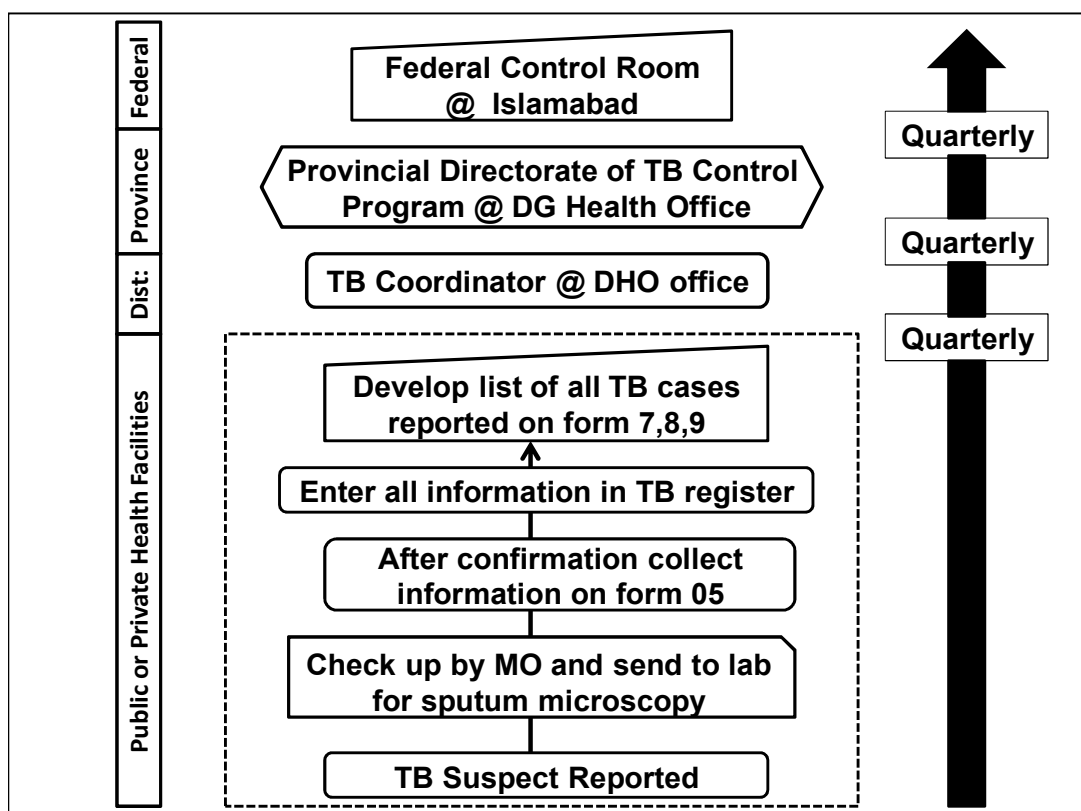

Fig. 1. Structure and organization of TB surveillance system of Hyderabad

Table 1. Adaptations of CDC guidelines for evaluation of TB surveillance system in district Hyderabad

	Task within CDC guidelines	Adaptations of task to evaluation of TB surveillance
Task A	Engage the stakeholders in the evaluation	This task was achieved by with the help of Provincial Manager & district focal person of TB control program, after informing the aim and objective of this evaluation. **Operational definition of stakeholder**: A person or organization that was involve in TB surveillance system or use data for the prevention and control of TB.
Task B	Describe the surveillance system to be evaluated	Literature review, in depth interviews with key stakeholders PC 1 and review of the program data was conducted to find the • Public health importance of TB. • Rationale and operation of the TB surveillance system and • Resources used to operate the TB surveillance system
Task C	Focus the evaluation design	The purpose of this evaluation to determine the adequacy, productivity of TB surveillance system and make some recommendation for improving quality, efficiency, effectiveness, usefulness of surveillance system. A list of stakeholder was obtained after discussion with district TB coordinator. Who will receive the findings and recommendations of the evaluation and effectively use of resources in right direction It was decided prior to the conduction of evaluation the strengthens and weakness will be discuss to the higher health authorizes for the improvement in surveillance system. A pretest questionnaire was used which developed by using "Updated guidelines for the evaluation of surveillance systems 2001"
Task D	Gather credible evidence regarding system performance	This task was achieved by conduction of in depth interviews with key stakeholders to assess quantitative & qualitative attributes of surveillance system by using questionnaire. • Simplicity: assessed by method of notification of surveillance system. • Flexibility: accessed by ability of adaption to any change in information needs or operating conditions without need of any funds. • Acceptability: assessed by proportion of individuals who are willing to participate in the surveillance system • Data quality: assessed by completeness and validity of surveillance. • Sensitivity: assessed by proportion of cases detected by surveillance system. • Predictive value positive: assess by the proportion of reported cases that actually have the health-related event under surveillance. • Representativeness: assessed by accurately describes the occurrence of a health-related event over time and its distribution in the population by place and person. • Timeliness: Timeliness reflects the speed between steps in a public health surveillance system. • Stability: assessed by system reliability and availability.

Table 2. Justification for attributes of TB surveillance system of District Hyderabad

Attributes	Justification	Score
Usefulness (Good)	1. Surveillance System detect TB cases and have ability to identify, prevent or treat contacts(2/2) 2. Estimates the magnitude of morbidity and mortality (2/2) 3. Identify trends but unable to detect outbreak (1/2) 4. Does assess the effect of prevention and control programs (1/2) 5. Improved clinical practices and policy but has no effect on behavioral, social, or environmental practices (1/2) 6. Does stimulates research intended to lead to prevention or control (1/2)	8/12 (66.6%)
Simplicity (Good)	1. Use standardized case definition (2/2) 2. Simple flow of information i.e. sentinels sites to district TB coordinator office and then provincial office. (2/2) 3. Effective functional integration with public health facilities and limited integration with HMIS and private sector. (1/2) 4. Passive reporting nature via email and hard copies. (2/2) 5. Collect basic information regarding demographic, exposure, contacts and treatment. (2/2) 6. Follow up and updating of cases. (2/2) 7. Have time delayed in entering, storing, backing up, editing and transferring, unable to detect any outbreak.(1/2) 8. Use any specific computer software for analysis of data.(1/2) 9. Staff were trained in filling of multiple reporting form, but required refresher course.(2/2)	16/18 (88.8%)
Flexibility (Good)	1. Accommodate/ response to other event. (2/2) 2. Staffs are skilled, can accommodate changes in case definition. (2/2) 3. System accepts process and forwards another system's information. (2/2) 4. Variation in funding will badly on performance. (0/2)	6/8 (75%)
Data Quality (Good)	1. Completeness of the case reporting form is more than 90%. (2/2) 1. No mechanisms for monitoring/controlling any errors (0/2) 2. Diagnosis made on the bases of case definition well supported by laboratory confirmation. (2/2) 3. Data is entered and transferred in patients register than transferred in reporting forms by trained persons (2/2)	6/8 (75%)
Acceptability (Good)	1. Full participation of Local, national and multinational agencies. (2/2) 2. Completeness of reporting forms are more than 90%. (2/2) 3. Timely reporting from all sentinel sites reported (2/2) 4. Quarterly reporting system, unable to detect an outbreak. (1/2)	7/8 (87.5)
Sensitivity (Poor)	1. Sensitivity of the TB surveillance system was calculated by using the recommended formula of CDC updated guideline for evaluation of surveillance systems which is A/A+C, where A represent the true positive cases and C used for false negative cases and A+C is the total number of positive cases (true and false). 2. In 2011, TB surveillance detected 1601 laboratory confirmed cases among a total 6121 cases so the sensitivity rate is calculated as: 3. Sensitivity (%) = 1601/6121×100=.26%	26%
PVP (Average)	1. PVP of TB surveillance system is calculated as per the CDC guideline. The formulae of PVP is A / (A+B), where A is true positive cases and B is false positive cases. 2. In 2011, TB surveillance system report 1601 laboratory positive	56.8%

		cases, where 2815 cases (suspected, probable and confirmed) were detected.	
	3.	PVP (%) =1601/2815×100= 56.8%	
Representat iveness (Poor)	1.	TB program available only 12 health care facilities. (0/2)	2/6 (33%)
	2.	Limited integration with private health facilities, laboratory and physician (0/2)	
	3.	System collect information regarding clinical course of disease with outcome & describe the population in term of time, place, and person (2/2)	
Timeliness (Poor)	1.	Information reached after 3 month from the sentinel sites to district TB coordinator office and then provincial TB office (quarterly reporting system)	
Stability (Fair)	1.	Stability in term of its reliability: the system has ability to collect data regarding the cases of TB, manage properly without failure. (2/2)	4/6 (66.6%)
	2.	Stability in term of its availability: the system is available for necessary public health action after reporting of cases. (2/2)	
	3.	Variation of funding effect on performance (0/2)	

6. CONCLUSION

The current evaluation showed that the system was overall effective in estimating morbidity and mortality, monitoring the trend of disease but had limited usefulness in early detection of outbreak. The system covers a small population of district which may miss a large number of cases. TB surveillance system was satisfactory in all attributes except representativeness, sensitivity, timeliness and stability, other weaknesses were absence of regular feedback mechanism with in surveillance system and limited involvement of private stakeholder. The following recommendations can lead to improvements with the aforementioned weaknesses.

1. Develop policy for replacement of quarterly reporting to daily reporting.
2. Sensitivity will be increases by establishment of new sentinel sides for uncovered population and involvement of private stakeholders in reporting system.
3. Broadness of diseases case definition will enhance PVP.
4. Increase budget allocation to the NTCP will improve the stability of the surveillance system.
5. Develop a regular feedback mechanism with in surveillance system and among the stakeholders.
6. Policy maker develop a mechanisms for monitoring errors during data entering.

ETHICAL CONSIDERATIONS

Before conducting the evaluation, permissions were taken from the Directorate General Health Services Sindh, District Health Officer, Hyderabad and respective program manager. All stakeholders were approached and an interview was conducted after obtaining verbal informed consent. All patient information was anonymized and de-identified prior to analysis by using codes. Prior to the evaluation, it was also decided the strengths and weakness would be discussed with higher health authorities to facilitate further improvements in surveillance system.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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