RESEARCH ARTICLE

Evaluation of the timeliness and completeness of communicable disease reporting: Surveillance in The Cuban Hospital, Qatar

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ABSTRACT

Public health surveillance systems should be evaluated periodically, and should involve an assessment of system attributes.

Objective: Evaluate hospital-based surveillance of communicable diseases using the elements of timeliness and data quality.

Method: Descriptive study was conducted of communicable diseases reported at The Cuban Hospital, Qatar during January 2012 to December 2013. The completeness of notifications were assessed for contact number, address, place of work, and date of symptom onset. Time between the symptoms onset and physician notification, time between physician and Supreme Council of Health notification and time between physician notification and lab confirmation were calculated for each case.

Analysis: Percentage of cases with documented essential information and 95% confidence interval (CI) were determined. Mean and standard deviation (SD) of time were calculated. Results: 1065 patients were reported, 75% were male, 80% non-qataries and 91.5% were group 1 (high priority) diseases. Symptom onset date was documented in 91.5% (95% CI, 89.8; 93.2) of cases; contact number in 84.7% (82.5;86.8), with lower frequencies for address (68.1%, 65.3;70.9) and place of work (60.5%, 57.5;63.4). Diagnostic time for tuberculosis was 61.7 days (SD 93.0), acute hepatitis 18.5 days (SD 17.6), typhoid fever 17.0 days (SD 11.6 days), other diseases of sexual transmission 300.2 days, chronic hepatitis 165 days and AIDS 154.5 days. The time of notification to the Supreme Council of Health for group 1 diseases was 1.2 days (SD 1.4).

Conclusion: Our results show that the quality of essential data and timeliness is not sufficient to meet

the needs of the health system. Additional studies should focus on the evaluation of time delay for diagnosis of high priority diseases.

Keywords: hospital-based surveillance, evaluation, communicable diseases, Qatar

INTRODUCTION

Recent research has shown that one third of morbidity and mortality in the Eastern Mediterranean Region (EMR) is attributed to communicable diseases. Although such diseases are not the main health problem of people of these countries, it is thought that the high number of migrant workers influxing from Southeast Asia (SEA) contributes to this.[1–3] Similarly, Qatar has a large migrant worker population of more than 1 million of inhabitants and therefore shares this problem. Regional cooperation is therefore a cornerstone in the prevention and control of communicable diseases in the Middle East.

The surveillance of communicable diseases is a key component in programs for its prevention and control, including the commitment of clinicians, who ensure timely notification of suspected or confirmed cases. Appropriate laboratory support is also essential in identifying etiological agents.[4] The purpose of evaluating public health surveillance systems is to ensure that problems of public health importance are being monitored efficiently and effectively. Public health surveillance systems should be evaluated periodically, and the evaluation should include recommendations for improving quality, efficiency, and usefulness.[5]

This evaluation of public health surveillance systems should involve an assessment of system attributes, including simplicity, flexibility, completeness, acceptability, sensitivity, positive predictive value, representativeness, timeliness, and stability. The attributes of timeliness and completeness are the most frequently considered factors for evaluation of surveillance systems in different settings and for specific diseases.[6–14]

The Cuban Hospital, located in Dukhan around 80 km from Doha, the capital city of Qatar, is situated in an industrial area centred around the oil and gas industry, and has a population consisting mainly of expatriates, many of whom are from SEA countries.

Surveillance of communicable diseases at this hospital began in January 2012 through the implementation of national recommendations defined by the State of Qatar, Supreme Council of Health (SCH). In this study, the surveillance system is evaluated using the elements of timeliness and data quality (completeness) of reported cases during a two year period.

METHOD

A descriptive study was carried out of cases reported by the surveillance system of The Cuban Hospital (TCH) in Qatar during the period of January 2012 to December 2013. TCH is a 75 bed community hospital that serves a population of 80,000 inhabitants, and constitutes a focal point in the national surveillance system with systematic contact with the Department of Public Health, Supreme Council of Health (DPH/ SCH), Qatar.

The national surveillance system classifies diseases into those that require immediate notification (within 24 hrs) by telephone or fax (Group 1) and those that may be notified as soon as possible but not immediately (72 hrs) (Group 2). Group 1 and 2 diseases are classified according to their priority for reporting defined by the national surveillance system and with the need to implement prompt control measures. Standard definitions for case reporting are used according to the Centers for Disease Control and Prevention case definitions. Some case definitions within the study were for groups of conditions such as "other sexually transmitted infections" which included condylomata acuminate, genital warts and genital herpes. The "others" group included cases with infectious disease that did not fit the definitions of the other diseases which mainly included respiratory diseases, non classified influenza-like illnesses (ILI) or severe acute respiratiory infections (SARI). Multi-drug resistant organisms included a broad specturm of germs resistant to antimicrobials, mainly extended spectrum beta-lactamase (ESBL) producing enterobacteriaceae or MDR pseudomona sp., Methi-cillin Resistant staphylococus aureus (MRSA).

The source of data were patient notification forms available in the hospital epidemiology department, lab reports of the case studies and fax reports. On every notification form, a sticker was affixed with patient information, such as patient name, date of birth, nationality, file number and Qatar ID number. The completeness of the form was assessed, i.e, if all essential data was documented in the notification, including the following: 1) contact number, including mobile or landline numbers 2) address of residence,

3) place of work/employer details (if the patient was employed), and 4) date of onset of symptoms.

The following time intervals were calculated for each case: diagnostic delay time (time between the symptoms onset and physician notification), notification time (time between physician and SCH notification) and confirmation time (time between physician notification and lab confirmation).

ANALYSIS

Data was analyzed using the statistical package, JMP 10.0 to calculate the completeness of data, the percentage of cases with essential information documented and confidence interval (CI) of 95%. For timeliness, the mean and standard deviation (SD) for diagnostic delay time, notification and confirmation time were calculated. Both indicators were calculated for the reported illnesses during the study period, making comparisons between Groups 1 and 2 using the Student's t-test. A p-value of less than 0.05 was considered a statistically significant difference.

RESULTS

During the study period, 1065 patients (cases) were reported, 75% were male, 80% non-Qatari and 91.5% were Group 1 diseases. Of all the cases notified in the two year period, 65.7% (700 patients) were in 2013 and laboratory confirmation of the disease occurred in 59.3% of patients.

Regarding the quality of essential data, it was noted that the time of onset of symptoms was documented in 91.5% of cases (95% CI 89.8, 93.2); contact number in 84.7% of cases (95% CI 82.5, 86.8), with lower frequencies for address (68.1%, 95% CI 65.3; 70.9) and place of work (60.5%, 95% CI 57.5; 63.4). No statistically significant differences were identified between these indicators for Group 1 and 2 diseases (Table 1).

The Group 1 diseases included infectious diarrhea (39 patients), tuberculosis (22 patients), food poisoning (12 patients) and lower frequencies for viral meningitis (5 patients), typhoid fever (4 patients) and two reported cases, respectively, with acute viral hepatitis, dengue fever and measles. For Group 1 diseases, the date of onset of symptoms were recorded in 95.6% (95% CI 91.4, 99.8), contact number in 90.0% (95% CI 83.8, 96.2), with lower figures for address (66.7 %) and place of work (57.8 %). Of note was the fact that in 90.9% of

patients with tuberculosis and 75% with typhoid fever, the contact number was documented, with figures less than 75% for the address or place of work documented for both diseases.

Among the Group 2 diseases, influenza like illnesses (ILI) were the most frequent (539 patients), followed by skin infectious diseases (186 patients), scabies (66 patients) and lower frequencies for the other diseases described in Table 1.

When considering the elements of essential data (excluding date of onset of symptoms), it was found that 25.6% of patients with Group 1 diseases had more than one type of data missing on the notification form, and 28.6% for Group 2 diseases.

Regarding the diagnostic delay time, the longest period of physician notification was recorded for tuberculosis with 61.7 days (SD 93.0), with lower figures for pulmonary tuberculosis (47.8 days (SD 77.2)) compared with non-pulmonary (89.5 days (SD 122.0)). For acute hepatitis, the time was 18.5 days (SD 17.6) and lower for hepatitis A (6 days) than hepatitis C (31 days). For patients with typhoid fever, the diagnostic delay time was 17.0 days (SD 11.6 days). All other Group 1 diseases had lower mean times of ten days (Table 2). For Group 2 diseases, the other diseases of sexual transmission had a diagnostic delay time of 300.2 days (SD 162.1), chronic hepatitis 165 days (SD 164.8) and AIDS with the longest time of 154.5 days (SD 176.1).

In relation to the time of notification of the SCH for Group 1 diseases, it was recorded as 1.2 days (SD 1.4), which is significantly ($p < 0.001$) lower than for Group 2 diseases (mean 1.9 days, SD 2.7) (Table 2). For Group 1 diseases, the longest time for notification was for dengue fever (2 days) and infectious diarrhea (1.8 days). The time for laboratory confirmation was 2 days (SD 3.9) for diseases in Group 1 and 1.4 days (SD) for Group 2 (Table 2).

DISCUSSION

The results presented here constitute the first report on the evaluation of a surveillance system of communicable diseases in a healthcare facility in Qatar, which can serve as a valuable reference point for researchers when conducting similar studies in future. It must however be taken into consideration that The Cuban Hospital is a recently opened facility (January 2012), which under the guidance of the Supreme Council of Health and the participation of a hospital

Table 1. Completeness of essential information in communicable diseases. The Cuban Hospital, 2012 – 2013.

Variables*	Total	Information included in the notification form			
		Contact number**	Address	Place of Work	Date onset of clinical symptoms
Disease of immediate notification					
Acute hepatitis	2	2 (100)	2 (100)	1 (50.0)	2 (100)
Dengue	2	2 (100)	1 (50.0)	1 (50.0)	1 (50.0)
Tuberculosis	22	20 (90.9)	14 (63.6)	16 (72.7)	20 (90.9)
Measles	2	2 (100)	1 (50.0)	1 (50.0)	2 (100)
Meningitis	5	5 (100)	3 (60.0)	2 (40.0)	5 (100)
Infectious diarrheal dis.	39	38 (97.4))	25 (64.1)	23 (59.0)	38 (97.4)
Typhoid fever	4	3 (75.0)	2 (50.0)	3 (75.0)	4 (100)
Food poisoning	12	12 (100)	12 (100)	5 (41.7)	12 (100)
Total	90	81 (90.0)	60 (66.7)	52 (57.8)	86 (95.6)
Disease of non immediate notification					
Chronic hepatitis	13	11 (84.6)	7 (53.8)	10 (76.9)	11 (84.6)
Chickenpox	25	20 (80.0)	21 (84.0)	19 (76.0)	24 (96.0)
Syphilis	2	2 (100)	2 (100)	2 (100)	2 (100)
Gonorrhea	4	4 (100)	4 (100)	3 (75.0)	4 (100)
AIDS	2	1 (50.0)	0	0	2 (100)
Other sexually transmitted infections	4	4 (100)	3 (75.0)	4 (100)	4 (100)
Influenza like illness	539	447 (82.9)	376 (69.8)	353 (65.5)	492 (91.3)
Severe acute resp. infections	8	5 (62.5)	4 (50.0)	3 (37.5)	7 (87.5)
Malaria	23	19 (82.6)	18 (78.3)	17 (73.9)	23 (100)
Multi-drug resistant organisms***	27	23 (85.2)	3 (11.1)	5 (18.5)	24 (88.9)
Methicillin Resistant Staphylococcus aureus	21	18 (85.7)	2 (9.5)	2 (9.5)	21 (100)
Parasitic dis.	11	8 (72.7)	7 (63.6)	5 (45.5)	10 (90.9)
Brucellosis	2	1 (50.0)	2 (100)	1 (50.0)	2 (100)
Rotavirus	2	2 (100)	1 (50.0)	0	2 (100)
Salmonellosis	1	1 (100)	1 (100)	1 (100)	1 (100)
Scabies	66	57 (86.4)	47 (71.2)	40 (60.6)	62 (9.9)
Scarlet fever	4	2 (50.0)	1 (25.0)	1 (25.0)	4 (100)
Skin infectious dis.	186	168 (90.3)	150 (80.6)	113 (60.8)	166 (89.2)
others	37	29 (78.4)	16 (43.2)	13 (35.1)	30 (81.1)
Total	975	821 (84.2)	665 (68.2)	592 (60.7)	889 (91.2)
Total	1065	902 (84.7)	725 (68.1)	644 (60.5)	975 (91.5)

*Data presented as No (%); **Includes mobile or landline numbers; ***Methicillin-resistant staphylococcus aureus not included.

epidemiologist, has implemented the surveillance system. It is in fact the only national institution that has a medical epidemiologist devoted to hospital epidemiology and an infection control program, which has been identified as a strength in healthcare facilities. Sickbert-Bennett et al.[11] assessed reporting completeness of surveillance systems in North Carolina and found that healthcare systems with the highest reporting proportion had hospital-based public health

epidemiologists or infection preventionists responsible for disease reporting.

The finding that the majority of cases (65.7%) were reported during 2013 is related to the lower volume of patients seen during 2012, during which time the institution was gradually increasing the number of its available services.

The quality of data of reported cases is essential for the timely identification of patients with communicable

Table 2. Timeliness of reporting according diagnosis and type of notification (days). The Cuban Hospital, 2012 – 2013.

Variables*	Diagnostic time	Notification time	Confirmation time
Disease of immediate notification			
Acute hepatitis	18.5 (17.6)	0.5 (0.7)	1 (1,41)
Dengue	4.0	2 (2.8)	2.5 (3.53)
Tuberculosis	61.7 (93.0)	1 (1.3)	2.3 (6.0)
Measles	8.0 (5.7)	0	0
Meningitis	3.8 (2.2)	0	1.3 (1.0)
Infectious diarrheal dis.	2.8 (3.6)	1.8 (1.4)	2.6 (2.1)
Typhoid fever	17.0 (11.6)	0.8 (0.9)	1.3 (1.9)
Food poisoning	9.5 (11.1)	0.5 (0.6)	6.7 (0.6)
Total	21.3 (56.2)	1.2 (1.4)	2.0 (3.9)**
Disease of non immediate notification			
Chronic hepatitis	165.0 (164.8)	1.3 (1.6)	0.83 (1.85)
Chickenpox	8.5 (34.2)	1.5 (1.4)	3
Syphilis	365.0	2.5 (3.5)	0
Gonorrhea	0.5 (1.0)	2.8 (1.5)	0
AIDS	154.5 (176.1)	0	0
Other sexually transmitted infections	300.2 (162.1)	2.5 (2.1)	0
Influenza like illness	3.4 (3.0)	1.4 (2.1)	1.8 (2.3)
Severe Acute Respiratory Infections	3.3 (3.0)	0.5 (0.7)	1.3 (1.6)
Malaria	18.9 (41.7)	1.3 (1.1)	0.5 (0.7)
Multi-drug resistant organisms	36.0 (103.0)	1.1 (1.2)	0.03 (0.2)
Methicillin resistant staphylococcus aureus***	14.3 (46.2)	1.3 (1.5)	0.1 (0.2)
Parasitic dis.	29.3 (48.2)	1.7 (1.3)	2.9 (6.7)
Brucellosis	8.5 (5.0)	1	0
Rotavirus	8.0 (4.2)	0.5 (0.7)	0
Salmonellosis	3.0	1	0
Scarlet fever	4.0 (3.3)	4 (4.1)	3
Scabies	18.0 (40.6)	3 (3.2)	
Skin infectious dis.	78.1 (122.6)	3.5 (4.5)	2.1 (2.0)
Others	18.1 (75.1)	0.7 (0.9)	0.5 (1.2)
Total	23.3 (71.4)	1.9 (2.7)	1.4 (2.3)

*Data presented as mean (standard deviation); **Included only cases with lab confirmation; ***Methicillin-resistant staphylococcus aureus not included & $p < 0.001$.

diseases and epidemiological evaluation in order to search for the source and mode of transmission of infections and the timely implementation of control measures.[14] Although contact numbers were documented for most patients (902/1065 patients), the frequency of recording of address and place of work was significantly lower (68.1% and 60.5% respectively). It is important to consider that the majority of the population are expatriates. Where an address has not been documented, having additional information such as contact number or place of work is necessary to conduct effective infection control. Because of the importance of this data, we consider the number of cases without an address or place of work to be high. The low levels of more than two essential types of data being documented may be associated to the lack of perceived value of this information and language barriers existing in communicating with patients who often do not communicate in English or Arabic (the most commonly spoken languages of medical staff). The problem of communicating with patients was previously reported in a study of measles surveillance in Qatar where a majority of the reported cases (60%) were among non-Arabic and non-English speakers.[6] Nevertheless, for epidemiological diseases of high priority for national or regional programs (e.g. tuberculosis, vaccine preventable

diseases), it should be set as a standard to obtain 100 percent of key information. Although not included in our study, selected cases required additional information such as vaccination history and reference of recent travel. The latter is of relevance if we consider that most diseases are diagnosed in non-Qatari citizens, and are imported from the patients' native country, especially tuberculosis, vector-borne or vaccine-preventable diseases which are absent or of very low incidence in the Qatari population.[3,15,16]

Regarding the time between the onset of symptoms and physician notification, we consider this generally adequate for most diseases studied as the time recorded did not exceed the incubation period of the disease.[17] The importance of time to physician notification for pulmonary tuberculosis (47.8 days) and syphilis (latent or chronic forms) (365 days) however, given their significant risk to the population needs to be emphasized. According to a study by Gundersen et al.[18] the time between the presentation of symptoms to diagnosis for tuberculosis was 21 to 136 days in different countries, depending on factors related to patients and the healthcare system, an issue not clarified in our study.

The notification time for diseases that required immediate notification were not found to meet the standards of the SCH 24 hours notice however, were fulfilled for the diseases that required notification within 72 hours after diagnosis. During the study period, the improvement in notification time depended on the training of staff on the procedures and new technological facilities such as a readily available fax machine for notification in 24 hours, which significantly reduced reporting times from figures over 2.5 days during 2012 to 1.5 days in 2013.

The time taken for laboratory confirmation of suspected cases in our facility was considered appropriate when taking into account the epidemiological relevance for infection control of each disease. Virological studies however were performed in a central laboratory of Hamad Medical Corporation resulting in occasional delays in transporation of samples. By opening a laboratory for viral and serological studies at the hospital could contribute to a reduction in the confirmation time of cases and more of an opportunity to take necessary infection control action.

A limitation to consider is the lack of similar studies to compare our results with as the majority of studies conducted have been for specific diseases at regional or national level, which prevents valid inferences being made.

Studies that have highlighted deficient communicable disease surveillance systems in some developed and developing countries point to the need for the implementation of new tools for surveillance e.g., electronic surveillance systems and response tailored to local settings which are essential for improvement in the prevention and control of diseases at local and regional level.[19,20] Our results show that the quality of essential data gathered on patient presentation is not sufficient to meet the needs of the health system, and although reporting timeliness has shown marked improvement during the study period, national standards need to be met. Improvement can be achieved through staff education and monitoring the quality of notifications through an annual evaluation of specific performance indicators. Additional studies should focus on the evaluation of time delay for diagnosis of high priority diseases.

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