

# Implementation of surveillance systems to determine the burden of communicable diseases in a facility in Qatar

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## Abstract

**Background:** Hospital-based surveillance has proved useful in determining the incidence of infectious diseases.

**Aims:** This study aimed to describe the epidemiological characteristics of reported cases and specific performance indicators of the surveillance system.

**Methods:** A descriptive study of reported communicable diseases was carried out in The Cuban Hospital (Qatar) during January 2012 to December 2013. A multidimensional communicable diseases surveillance approach was used. Information of epidemiological variables, laboratory confirmation and notification date were collected. We calculated the proportion of cases with laboratory confirmation and time between the report by the physician and notification to the Supreme Council of Health.

**Results:** A total of 1065 patients were reported; 802 (75.3%) male with a mean age of 33.2 (standard deviation 15.4) years. There was a predominance of cases from Southeast Asia (41.5%) and Eastern Mediterranean Region (16.7%). There were 539 cases of influenza-like illness, 186 of skin infectious diseases, 66 of scabies, 48 with multidrug-resistant organisms, and 39 cases of diarrhoea of presumed infectious etiology. A steady increase in laboratory confirmation was observed (mean 59.3%). Timing for notification to the Supreme Council of Health was 1.88 (2.9) days.

**Conclusion:** The implemented hospital-based surveillance system was feasible and delivered important insights into the epidemiological characteristic of communicable diseases in a western community in Qatar.

Keywords: surveillance system, communicable disease, hospital-based surveillance, Cuban Hospital, Qatar

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## Introduction

The implementation of a surveillance system for community-acquired infections, in compliance with national regulations, has the main purpose of achieving timely and complete reporting of patients with infectious diseases (suspected or confirmed). This should contribute to knowledge of the incidence of communicable diseases in the population and early identification of outbreaks or epidemics, to facilitate timely prevention and control measures (1–3). Hospital-based surveillance systems have proved useful in determining the incidence of infectious and noninfectious diseases (4–7), and have been used as sentinel surveillance for selected health problems such as influenza and acute respiratory infections (8–13). Studies that have focused on rotavirus gastroenteritis have shown high disease burden in Romania (14), Pakistan (15) and Ethiopia (16), and have emphasized the need for national immunization programmes. Biggs et al. (7) used a hospital-based sentinel surveillance system to identify a high incidence of leptospirosis in Tanzania.

The Cuban Hospital in Qatar was opened during mid-2011. It is a 75-bed facility and member of the Hamad Medical Corporation, which provides health care to a

population of 80 000 inhabitants of an industrial area in Western Qatar. All the medical staff (physician, nurses and ancillaries) are Cuban nationals. The surveillance of communicable diseases in The Cuban Hospital began in January 2012, following procedures defined by the Department of Public Health of the Supreme Council of Health (17). The objective of this study was to describe the results of implementation of the surveillance system and the burden of communicable diseases in a community in Western Qatar, which will provide useful information for leaders (e.g. departmental heads, medical directors and senior consultants) and clinicians.

## Methods

### Study design

This was a descriptive study of communicable diseases reported at The Cuban Hospital during January 2012 to December 2013.

### Implementation of the surveillance system

The hospital-based surveillance system, which focuses on community-acquired infections, is conducted by the Department of Infection Control, and includes a hospital epidemiologist, infection control nurse, and support

from the Department of Microbiology at The Cuban Hospital.

The surveillance system includes the followings components.

1. Training of medical staff about the national surveillance system and the incidence of communicable diseases in Qatar and neighbouring countries.
2. Laboratory component consisting of:
  - (i) laboratory-based alert system by means of immediate notification (by telephone) of relevant cases to the infection control staff; and
  - (ii) weekly review of laboratory data to identify laboratory-confirmed or nonreported cases.
3. Notification to the Supreme Council of Health.

All cases are notified by fax, while those cases that require immediate notification (e.g., measles and dengue fever) are notified by telephone. The national surveillance system classifies diseases into those that require immediate notification (within 24 hours) by telephone or fax, and those that may be notified as soon as possible but not immediately (by fax). Diseases are classified according to their priority for reporting defined by the national surveillance system and the need to implement prompt control measures. The Centers for Disease Control and Prevention standard definitions are used for reporting (18). Review of the surveillance definitions and drafting a compendium of definitions for internal reference and use for the medical staff was developed. This is an internal document of the Cuban Hospital and can be requested by e-mail.

4. Data analysis and dissemination
  - (i) Data analysis is conducted by descriptive analysis of cases reported, and presented in tables and graphs, including descriptions of cases over time. For influenza-like illness, the seasonal distribution of cases and etiology are described.
  - (ii) Feedback to medical staff through a monthly epidemiological bulletin.
  - (iii) Distribution of epidemiological alerts issued by the Department of Public Health of the Supreme Council of Health or the Cuban Hospital Department of Infection Control according the national or regional public health events/alerts.

### Data collection

The following information was recorded: age, sex, nationality, reported illness, laboratory confirmation and date of notification to the Supreme Council of Health. The World Health Organization (WHO) classification system according to geographical areas (Americas, Africa, Europe, Southeast Asia, Eastern Mediterranean and Western Pacific regions) was used to classify cases according to their nationality. Qatari nationals were analysed as a single group, and

not included in cases reported in Eastern Mediterranean Region countries.

### Statistical analysis

All information was analysed using JMP version 10.0 (<http://www.jmp.com>) using descriptive statistical techniques. The proportion of laboratory-confirmed cases was calculated per 100 reported cases.

### Results

We reported 1065 patients with communicable diseases during the study period: 802 (75.3%) male; mean age 33.2 (standard deviation 15.4) years (Table 1). Qatari patients represented 20.3% of reported cases. There were 442 (41.5%) cases from Southeast Asia and 178 (16.7%) from other Eastern Mediterranean Region countries, with other regions showing lower frequencies. The sex distribution highlights the predominance of male patients, which was 93.9% in Southeast Asia; mainly from India and Nepal.

There were 539 (50.6%) patients reported with influenza-like illness, 186 with skin infectious diseases, 66 with scabies, 48 with multidrug-resistant infections, and 39 with diarrhoea of probable infectious etiology (39 cases). Additionally, 22 patients were reported with tuberculosis, 23 with malaria, 12 with sexually transmitted diseases (AIDS, gonorrhoea, syphilis and genital herpes simplex) and 2 with dengue fever, measles and rotavirus infection, respectively. "Others" included mainly severe respiratory tract infection or community-acquired pneumonia (not reported as influenza-like illness). No cases of acute flaccid paralysis, poliomyelitis, rubella, viral haemorrhagic fevers, anthrax, tetanus, diphtheria, mumps, pertussis, rabies, cholera or other epidemiologically important communicable diseases were reported.

Vaccine-preventable diseases (influenza and chickenpox) were the most frequent in patients from

**Table 1 Baseline characteristic of notified cases at The Cuban Hospital 2012–2013**

Variables	Sex		
	Total	Female n = 263	Male n = 802
Age, mean (SD), yr	33.1 (16.2)	32.9 (18.8)	33.3 (14.1)
<b>Nationality, n (%)</b>			
Qatari	217	80 (36.9)	137 (63.1)
Other Eastern Mediterranean	178	40 (22.5)	138 (77.5)
Southeast Asian	442	27 (6.1)	415 (93.9)
Western Pacific	52	21(40.4)	31 (59.6)
European	31	12 (38.7)	19 (61.3)
African	43	14 (32.6)	29 (67.4)
American	102	69 (67.6)	33 (32.4)

SD = standard deviation.

**Table 2** Reported cases of communicable diseases in WHO Regions and Qatar (The Cuban Hospital) 2012–2013

Diseases	No.	Qatar	Other Eastern Mediterranean	Southeast Asia	Americas	Africa	Europe	Western Pacific
Influenza-like illness	539	120 (22.3)	74 (13.7)	252 (46.8)	26 (4.8)	21 (3.9)	13 (2.4)	33 (6.1)
Chickenpox	25	1 (4.0)	1 (4.0)	23 (92.0)	0	0	0	0
Tuberculosis	22	0	0	18 (81.8)	0	3 (13.6)	0	1 (4.5)
Measles	2	0	1 (50.0)	0	0	1 (50.0)	0	0
Meningitis	5	1 (20.0)	1 (20.0)	2 (40.0)	0	0	1 (20.0)	0
Severe acute respiratory infections	8	0	1 (12.5)	4 (50.0)	0	1 (12.5)	0	2 (25.0)
Scarlet fever	4	1 (25.0)	1 (25.0)	1 (25.0)	0	1 (25.0)	0	0
Skin infectious diseases	189	35 (18.5)	32 (16.9)	42 (22.2)	56 (29.6)	7 (3.7)	9 (4.8)	8 (4.2)
Scabies	66	12 (18.2)	17 (25.8)	27 (40.9)	3 (4.5)	0	2 (3.0)	5 (7.6)
Multidrug-resistant infections	48	10 (20.8)	18 (37.5)	7 (14.6)	5 (10.4)	1 (2.1)	1 (2.1)	6 (12.5)
Viral hepatitis (acute/chronic)	15	2 (13.3)	5 (33.3)	2 (13.3)	3 (20.0)	0	2 (13.3)	1 (6.7)
Sexually transmitted diseases	12	2 (16.7)	3 (25.0)	1 (8.3)	3 (25.0)	1 (8.3)	0	2 (16.7)
Brucellosis	2	2 (100)	0	0	0	0	0	0
Infectious diarrhoea	39	9 (23.1)	3 (7.7)	20 (51.3)	1 (2.6)	2 (5.1)	0	4 (10.3)
Food poisoning	12	7 (58.3)	4 (33.3)	1 (8.3)	0	0	0	0
Parasitic diseases	11	1 (9.1)	2 (18.2)	5 (45.5)	0	0	1 (9.1)	2 (18.2)
Rotavirus infection	2	0	0	0	1 (50.0)	1 (50.0)	0	0
Salmonellosis	1	0	0	1 (100)	0	0	0	0
Typhoid fever	4	0	1 (25.0)	2 (50.0)	1 (25.0)	0	0	0
Dengue	2	1 (50.0)	0	1 (50.0)	0	0	0	0
Malaria	23	0	10 (43.5)	10 (43.5)	0	3 (13.0)	0	0
Others	34	13 (38.2)	4 (11.8)	9 (26.5)	3 (8.8)	1 (2.9)	2 (5.9)	2 (5.9)

Data presented as n (%).

Southeast Asia (Table 2). Cases of viral hepatitis were primarily from other Eastern Mediterranean Region countries including Qatar; 2 of the patients from other Eastern Mediterranean Region countries had hepatitis B (from Oman and Morocco), and 3 had hepatitis C. The skin infectious diseases were predominantly fungal (46.0%) and viral (42.0%), and were mainly from Americas, Southeast Asia, Qatar and other Eastern Mediterranean Region countries. Scabies was primarily diagnosed in patients from Southeast Asia.

Southeast Asia accounted for 18 of 22 (81.8%) tuberculosis patients; 16 from India and Nepal (Table 2). The other 4 patients were from African and the Western Pacific regions. Gastrointestinal infections (diarrhoea of infectious origin, parasitic diseases, salmonellosis and typhoid fever) were more frequently reported in Southeast Asia. Brucellosis (mainly related to exposure to camel's milk) and food poisoning were mainly reported in Qatar and other Eastern Mediterranean Region countries. Twenty-eight of 48 (58.3%) cases of multidrug-resistant infections were from the Eastern Mediterranean Region countries (10 from Qatar, 8 from Pakistan, 5 each from Egypt and other countries).

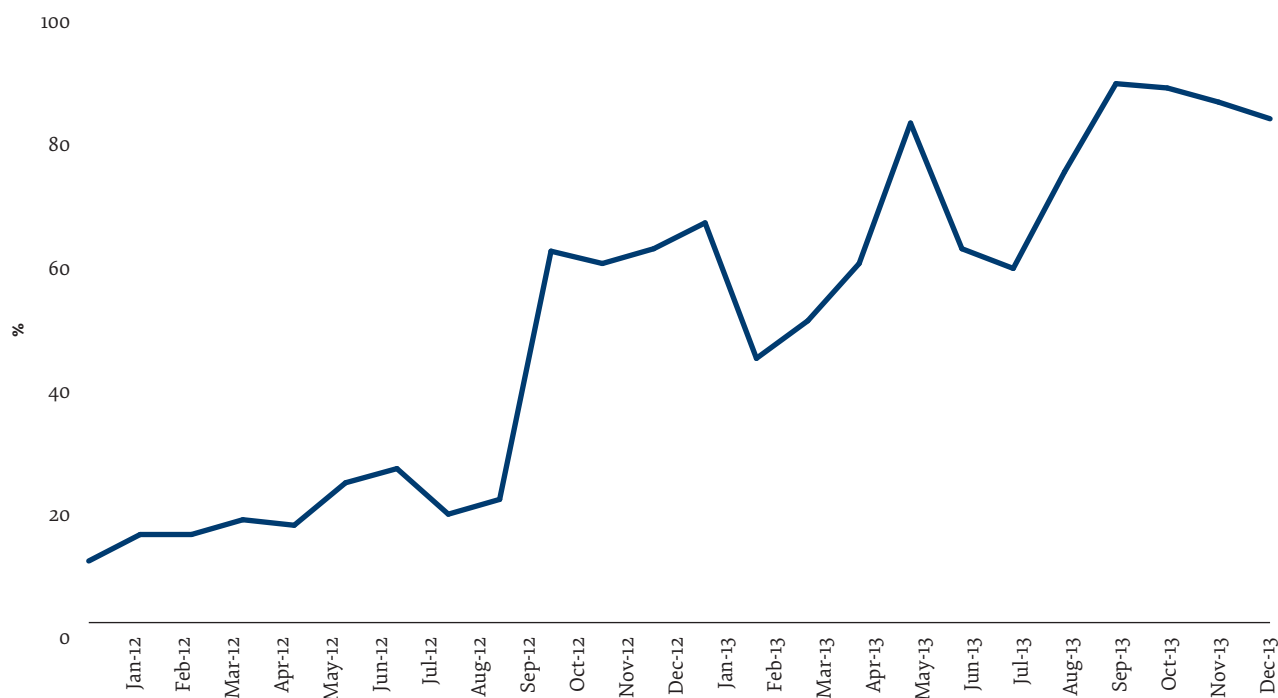
Primary mode of transmission was respiratory (62.2%), direct and indirect contact (29.2%), fecal–oral (6.2%) and vector borne (e.g., dengue and malaria) (2.4%).

Probable etiology of the reported communicable diseases was viral (67.7%), bacterial (13.8%), parasitic (mainly scabies) (9.0%), fungal (mostly skin infections) (8.2%) and unknown (1.2%). The basic etiology of malaria was *Plasmodium vivax* (20 patients), with 1 patient infected with *Plasmodium falciparum* and 2 with mixed *P. vivax/falciparum*.

During the study period, a steady increase was observed in the laboratory confirmation of reported cases with a mean figure of 59.3% of confirmed cases, and a maximum figure during September 2013 of (87.5% of cases) (Figure 1).

## Discussion

The study provides a general picture of communicable diseases reported in a newly opened facility in Qatar. The incidence of infectious diseases is a reflection of the population characteristics (e.g., demographics and ethnicity) (19,20) and related health systems issues (e.g. incidence of communicable diseases), especially the effectiveness of infection prevention and control programmes. The population from which our results came were predominantly workers in the oil industry, mostly from Southeast Asian countries, which have significant differences in the structure and function of their

**Figure 1 Percentages of reported cases with laboratory confirmation, 2012–2013**

national health systems and incidence of infectious diseases when compared to Qatar (21).

Qatar has high vaccination coverage for major vaccine-preventable diseases, reaching between 93 and 98% (22), which is similar to other Eastern Mediterranean Region countries, except Pakistan, which has < 90% coverage, and the presence of endemic poliomyelitis is a clear failure in their immunization programme. A similar problem arises in Southeast Asia, with frequent reports of measles and other vaccine-preventable diseases (23). Referring to hepatitis C, it is well known that Eastern Mediterranean Region countries have high population rates of chronic infection, mainly in Egypt (15%) and Pakistan (4.8%), due to exposure to injections with contaminated needles (24).

Data from Qatar relating to influenza (since 2011) can be found on the WHO website, which is based on the national laboratory surveillance system (25). The significant prevalence of reported cases of influenza-like illness is mainly due to the circulation of respiratory viruses in the community, and the contribution of climatic factors, especially the presence of dust from the desert. Influenza immunization coverage is probably low in Qatar, although there are no data about this issue.

The number of patients diagnosed with tuberculosis was small in our study, even though > 500 cases are reported annually, mainly from Southeast Asian countries, which have a high incidence of the disease (22). Similarly, gastrointestinal infections, especially typhoid fever and parasitic infections, are imported from these countries. Salmonellosis (non-typhoid) and food poisoning are related to specific risks in the food chain, especially in public markets.

The incidence of sexually transmitted diseases in Qatar is low, similar to other Eastern Mediterranean Region countries and the countries of origin of the patients who attended the facility, which explained our findings. The significant prevalence of multidrug-resistant infections in the Eastern Mediterranean Region (including Qatar), even when there are no national reports about these, may be related to national and regional policies and practices of antimicrobial use in humans and animals, which is a topic that requires further study.

The frequent reporting in our study of infectious skin diseases, which include a wide variety of diseases of predominantly viral or fungal etiology, is related to surveillance strategies at the national level. We made special mention of scabies, which is more strongly related to personal hygiene and living conditions, and depends on the cultural, educational and socioeconomic factors of patients, who are generally unskilled workers.

The proportion of laboratory-confirmed cases constitute an indicator of system operation, which showed steady improvement during the study period as a result of the progressive increase in availability of laboratory resources and monitoring of systems operation.

The implementation of a surveillance system in a newly created facility is a challenge, and even greater when medical staff come entirely from a country with significant differences in surveillance methods and procedures. Furthermore, it is vital to educate the staff about the surveillance procedures and use of information about the incidence of infectious diseases at local or regional level, for clinical decision-making (2,26).

The diseases under surveillance in the Cuban Hospital follow the recommendations of the Department

of Public Health of the Supreme Council of Health, Qatar. However, monthly data analysis and feedback to the staff were performed at The Cuban Hospital, which is not usual practice in public healthcare facilities in Qatar.

There were some limitations to the present study. First was the limited possibility to compare the results with similar hospital-based studies conducted at national or regional levels. Second, there were small numbers of cases reported for some communicable diseases.

We believe that for the Qatari National Health System, the characteristics of the population are a challenge for epidemiological surveillance, which requires continuous

analysis of surveillance strategies and methods for prevention and control of infectious diseases. The hospital-based surveillance system implemented was feasible and delivered important insights into the burden of communicable diseases in Western Qatar, which can be used for clinicians and leaders (e.g., departmental heads, medical directors and senior consultants) for improvement of public health.

**Funding:** None.

**Competing interests:** None declared.

## Mise en œuvre d'un système de surveillance pour déterminer la charge des maladies transmissibles dans un établissement de santé au Qatar

### Résumé

**Contexte :** La surveillance en milieu hospitalier s'est révélée utile afin de déterminer l'incidence des maladies infectieuses.

**Objectif :** Décrire les caractéristiques épidémiologiques de cas rapportés et les indicateurs d'exécution spécifiques du système de surveillance.

**Méthodes :** Une étude descriptive des maladies transmissibles notifiées a été réalisée au sein du Cuban Hospital (Qatar) de janvier 2012 à décembre 2013. Une approche pluridimensionnelle de la surveillance des maladies transmissibles a été utilisée. Des informations ont été collectées sur les variables épidémiologiques, la confirmation en laboratoire et la date de notification. Nous avons calculé la proportion de cas avec confirmation en laboratoire, ainsi que les délais entre le rapport du médecin et la notification au Conseil Supérieur de la santé (CSS).

**Résultats :** 1065 patients au total ont été signalés ; dont 802 (75,3 %) hommes d'une moyenne d'âge de 33,2 ans (écart type 15,4). Une prédominance de cas provenait d'Asie du Sud-Est (41,5 %) et de la Région de la Méditerranée orientale (16,7 %). Cinq cent trente-neuf (539) cas de syndrome de type grippal, 186 cas de maladies infectieuses de la peau, 66 cas de gale, 48 cas impliquant des micro-organismes multirésistants et 39 cas de diarrhées d'origine présumée infectieuse ont été enregistrés. Une augmentation régulière des confirmations en laboratoire a été observée (moyenne de 59,3 %). Le délai de notification au CSS était de 1,88 (2,9) jours.

**Conclusion :** Le système de surveillance mis en œuvre en milieu hospitalier était réalisable et fournissait des indications importantes sur les caractéristiques épidémiologiques des maladies transmissibles au sein d'une communauté occidentale du Qatar.

### تطبيق نظام الترصد وعبء الأمراض السارية في أحد المرافق في قطر

هومبرتو جارسيل، تانيا هيرنانديز، المبشر بكر، أريادنا أرياس

#### الخلاصة

الخلفية: لقد ثبت أن الترصد القائم على المستشفيات مفيد في تحديد معدل الإصابة بالأمراض المعدية.

الأهداف: وصف الخصائص الوبائية للحالات المبلغ عنها ومؤشرات أداء معينة لنظام الترصد.

طرق البحث: أجريت دراسة وصفية للأمراض السارية المبلغ عنها في المستشفى الكويبي (بقطر) خلال الفترة من يناير/ كانون الثاني ٢٠١٢ إلى ديسمبر/ كانون الأول ٢٠١٣. واستُخدم نهج متعدد الأبعاد لترصد الأمراض السارية. وجمعت معلومات عن المتغيرات الوبائية، والتأكيد المختبري، وتاريخ الإخطار. وحسبنا نسبة الحالات المؤكدة مختبرياً والوقت المستغرق ابتداءً من تقديم الطبيب للتقرير حتى إخطار المجلس الأعلى للصحة.

النتائج: بلغ مجموع المرضى المبلغ عنهم ١٠٦٥ مريضاً، منهم ٨٠٢ (٣, ٧٥٪) من الذكور الذين يبلغ متوسط أعمارهم ٣٣, ٢ (الانحراف المعياري ٤, ١٥) سنة. وكانت غالبية الحالات من جنوب شرق آسيا (٤١, ٥٪) وإقليم شرق المتوسط (١٦, ٧٪). وكانت هناك ٥٣٩ حالة مصابة بمرض يشبه الإنفلونزا، و١٨٦ حالة مصابة بأمراض جلدية معدية، و٦٦ حالة جرب، و٤٨ حالة مصابة

بكائنات مقاومة للأدوية المتعددة، و ٣٩ حالة إسهال من المحتمل أن يرجع إلى أسباب معدية. وقد لوحظت زيادة مطردة في التأكيد المختبري (المتوسط: ٣, ٥٩٪). وكان الوقت المستغرق لإخطار المجلس الأعلى للصحة ١٨٨, ١ (٩, ٢) يوماً. الاستنتاج: كان نظام الترصد المطبق القائم على المستشفى ذا جدوى، وقدم رؤية مهمة بشأن الخصائص الوبائية للأمراض السارية في إحدى المجتمعات الغربية في قطر.

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