ORIGINAL ARTICLE

Surveillance of Zoonotic Diseases in Marvdasht city, Fars Province

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Abstract

Background: Complete and fast diagnosis, registry and treatment programs are the main effective strategies for controlling infectious diseases. In addition, an organized and extended infectious disease surveillance system is crucial in designing and monitoring communicable diseases control programs. The quality of the surveillance system can be evaluated by several indices such as timeliness, completeness and sensitivity. This is an evaluation study to measure the mentioned indices for 3 zoonotic diseases (leishmaniasis, brucellosis and rabies) surveillance system.

Methods: The indexes such as completeness, timeliness and sensitivity of surveillance system were measured using the data obtained from population based (door to door) interviews and recorded data obtained at each level of health and medical sectors or administrative centers within the diseases reporting system. Interviews were conducted for 5969 participants and the required information was obtained.

Results: The total completeness, timeliness and sensitivity of case reporting for leishmaniasis were 26.9%, 103.2 days and 11.1%, respectively. These indexes forbrucellosiswere14.3 %, 58 days, 12.1% and those for suspected rabieswere100%, 83.4 days and 48.2%, respectively.

Conclusion: It seems that so called immediate communicable diseases reporting system is not providing reliable, complete and timely information to the health authorities. Program monitoring and personnel training, especially physicians, are recommended to improve the quality of the surveillance system and the related indexes.

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Introduction

Complete and fast diagnosis, registry and treatment programs are the main effective strategies for controlling infectious diseases. In addition, an organized and extended infectious disease surveillance system is crucial in designing and monitoring communicable diseases control programs.[1] Surveillance is defined as ongoing systematic collection, analysis, and interpretation of an outcome. With regards to health issues, it includes collection and analysis of specific data to be used in understanding community health issues and to plan, implement and evaluate public health programs and interventions.[2]

Communicable disease surveillance system contains two particularly important strategies as follows: early warning (early detection of infectious diseases occurrence such as SARS and Ebola) and monitoring the effectiveness of control programs (such as eradication or elimination of measles or polio

diseases).[2] The quality of the surveillance system can be evaluated by several indices such as timeliness, completeness and sensitivity.[2] Completeness of case reporting is generally defined as the ratio of reported cases to the detected ones in a defined time and population. Sensitivity is the ratio of both detected and reported cases to the total cases in population and finally the elapsing time between different stages of surveillance procedures is defined as timeliness.[2,3]

Several studies have measured such indexes to evaluate national communicable diseases surveillance systems in several countries. With regard to the type of communicable diseases, the results of these studies suggested significant differences between countries and their surveillance strategies.[4-7]

Countries, based on their institutions, priorities and financial straits, select different strategies for disease surveillance and monitoring control programs.[8] In Iran, communicable and non-communicable diseases surveillance systems are nested in the Iranian primary health care system (PHC).[9] The Iranian surveillance system categorizes the reportable communicable diseases into two major groups. Those require immediate reporting to the highest level within 24 hours and those diseases which require periodic reporting within a week or month to the highest levels.[10] Public and private health care providers collect and report the required information by telephone or specially designed forms to the district and then to the provincial health centers. Provincial health centers finally merge and send the data to the ministerial office of the Center for Communicable Diseases Control (Figure 1).[10] As to other health programs, evaluation studies based on the indices mentioned above are essential for monitoring and evaluating the national communicable diseases surveillance programs.[3] Unfortunately, due to the hardness of conducting independent evaluation studies on the quality of national surveillance systems, these types of studies on the Iranian surveillance programs on communicable and non-communicable diseases are extremely limited.[11]

This study was conducted in a large city located at the southern part of the country to evaluate the quality of Iranian communicable diseases surveillance system.

Methods

This is an evaluation study conducted to measure 3 main indices of surveillance system for three important Zoonotic diseases in Iran including cutaneous leishmaniasis, brucellosis and rabies. To calculate these indices, basic information about the incidence of confirmed cases of leishmaniasis and brucellosis and suspected cases of rabies in both urban and rural areas was gathered via an interview. The indexes such as completeness, timeliness and sensitivity of surveillance system were measured using the data obtained from population based (door to door) interviews and recorded data obtained at each level of health and medical sectors or administrative centers within the diseases reporting system (Figure 1).

According to the latest Iranian ministry of health guidelines for report of communicable diseases, confirmed cases of leishmaniasis and brucellosis and

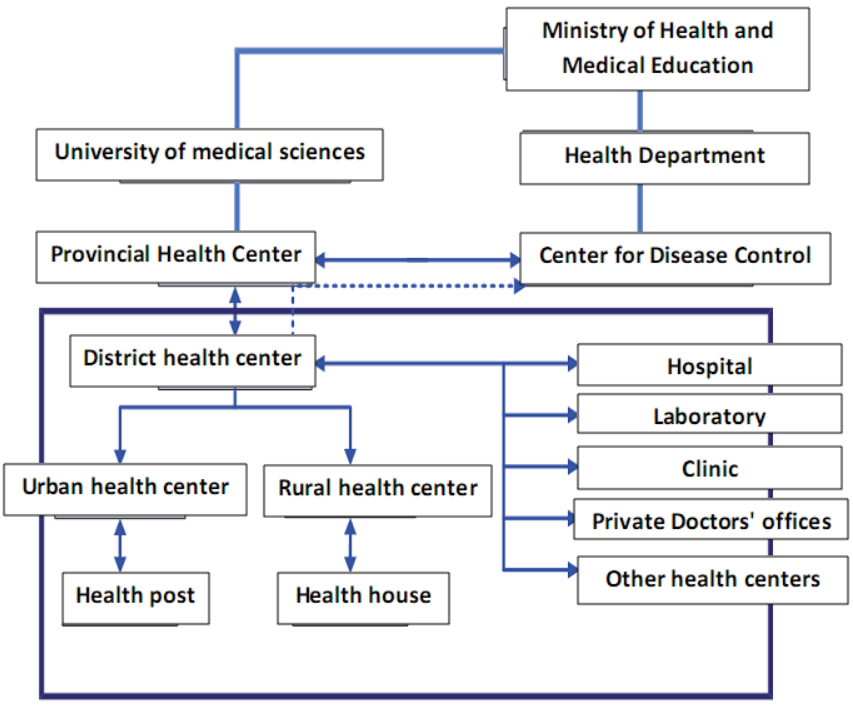

Figure 1: Flow diagram of Iranian communicable diseases surveillance program

suspected cases of rabies are defined as:

Leishmaniasis: Aperson having papules or cutaneous ulcers with positive smear. These cases are reported monthly to the provincial center for diseases control (CDC) office.[10]

Brucellosis: Aperson having clinical sign which is confirmed by laboratory finding. These cases are reported monthly to the provincial CDC office.[10]

Rabies: A person having animal bite or any contact with animal saliva. These suspected cases are reported monthly to the CDC and take preventive treatment, i.e. vaccination.[10]

Settings: Population of Marvdasht, a large cityin the southern part of the country was selected as the study population. Marvdasht health network covers one city with more than 170000 urban population and 226 villages with over 160000 rural population. Sampling was done using multi-stage cluster sampling in urban and rural areas separately. Households were determined as the sample units of the study and each cluster contained 15 households. The sample size was determined using cluster sampling formula and 110 clusters (55 from rural and 55 from urban areas), each of which consisted of 15 houses was calculated. By using family file information that was available in rural health houses and urban health posts, we randomly determined the cluster heads and then each cluster was defined as 15 households on the right. The mother or other adult women in the house at the time of door to door interview were interviewed using a questionnaire by a trained health nurse with the same sex. Interviewers were selected from experienced and interested health staff. They were trained about the study objectives, questionnaires and interview method. Quality control of data collection and reliability was evaluated by a pilot study and test-retest method.

The population based data collection: The data on the incidence of the defined symptoms of the study diseases (leishmaniasis, brucellosis and rabies) was collected during October 2013 to October 2014 (the past 12 months to the date of interview). In case any household member suffered from or noticed any defined sign or symptom of the study diseases, the second interview was conducted with the affected member of the family. The information about patients and their health status (name and address of health care centers that they presented themselves and exact date of their presentation) was obtained through both medical records and patient's self-report. Interview was done by 10 groups of nurses, each consisting of 2 members. The aims of the study and the confidentiality of the patient's information were expressed before each interview and verbal informed consent was obtained from women and any family member with the history of predefined symptoms just before the interview.

The health system based information: Data on registered cases of the study diseases was obtained from rural or urban as well as cities' health centers. In order to measure the diseases surveillance indexes (completeness, timeliness and sensitivity), required information was obtained from health records of those cases registered and reported to the health centers during the study period.

Finally, the questionnaires were checked and incomplete and inadequate data were rectified by returning to clusters and health centers. Descriptive results were calculated by SPSS software. In addition, according to the standard definitions indexes were calculated as following: the completeness of case reporting was calculated as the ratio of the reported cases to the higher level to those presented to the health care providers (Figure 1).

Timeliness was calculated as the summation of the elapsing time between the onset of symptoms and presentation of the patients to the health care providers and also from presentation of the patients (if any) to the date when the case was reported to the provincial health center.

Sensitivity was calculated as the ratio of detected and reported cases to the total number of incident cases in the population. In this study, sensitivity index was calculated through the ratio of the reported cases to the CDC to the expected ones obtained by multiplying the incidence rate obtained from the population based door to door phase of the study to the size of the related population.

Results

In the first stage, interviews with 5969 participants were conducted and the required information was obtained. Out of 5969 participants, 2908 (48.7%) were from urban areas. Totally, the frequency of confirmed cases of leishmaniasis and brucellosis and suspected cases of rabies (those with the defined symptoms) was155,7 and31, respectively (Table 1).

In this study, the incidence rate of Leishmaniasis among the inhabitants of rural areas was about 1.5 times higher compared to those living in urban areas. The sex ratio and average age of leishmaniasis cases was 1.1and 34.7 years, respectively. The incidence rate of brucellosis cases in rural areas compared to the urban areas was more than 2 times higher. The average age and sex ratio of the cases were 38.9 and 2.5years old, respectively. The incidence rate of the suspected cases of rabies in urban areas compared with the rural areas was about 1.1 times higher. The average age and male/female sex ratio of the cases

Table 1: Baseline characteristics of the participants and detected cases

Disease	Area	Number of participants	n	Sex Ratio	Age			Incidence Rate (Per100000)
					$\bar{X}$	SD	Median	
Leishmaniasis	Urban	2908	60	1.2	34.8	18.9	36	2063.3
	Rural	3061	95	1	34.7	17.6	33	3103.6
	Total	5969	155	1.1	34.7	18	34	2596.7
Brucellosis	Urban	2908	2	2	37	8.5	37	68.8
	Rural	3061	5	1.5	39.6	9.4	39	163.3
	Total	5969	7	2.5	38.9	8.6	39	117.3
Suspected cases of rabies	Urban	2908	16	3	28	14	26.5	550.2
	Rural	3061	15	2.75	29.3	19.8	28	490.0
	Total	5969	31	2.9	28.7	16.8	33	519.3

were 28.7 and 2.9 years, respectively.

Completeness of Case Reporting for Iranian National Surveillance System

Leishmaniasis: Out of 155confirmed cases of leishmaniasis,104 (67.1%) presented to a health care provider to receive diagnosis and treatment services. Most patients went to the Health Centers and Health houses (37.6%). Out of 104casesreferred to at least a health or medical center, only 28wereregistered and reported to the CDC. Accordingly, the total completeness of case reporting for Leishmaniasis was 26.9% (Table 2).

Brucellosis: Out of 7confirmed cases of Brucellosis, 7 (100%) presented to a health care provider to receive diagnosis and treatment services. Most patients went to the laboratory (43.7%). Out of 7 cases referred to at least a health or medical center, only 1 was registered and reported to the CDC. Accordingly, the total completeness of case reporting for brucellosis was 14.3% (Table 3).

Rabies: Out of 31suspected cases of Rabies, 16 (51.6%) presented to a health care provider to receive diagnosis and treatment services. Most patients went to the Health centers and Health houses (88.9%). Out of 16 cases referred to at least a health or medical center, only 16were registered and reported to the CDC. Accordingly, the total completeness of case reporting for suspected cases of Rabies was 100% (Table 4).

Timeliness of Iranian National Surveillance System

Leishmaniasis: The average period of elapsed time between the onset of symptoms and the first patients' presentation to a medical care center was 33.2 days. The average period of elapsing time between the time patients presented to the medical care centers and the time duration the cases were reported to the Ministry was 70 days. Accordingly, the average total elapsing time between the onset of symptoms and reporting of the cases to the Ministry lasted 103.2 days (Table 5).

Brucellosis: The average period of elapsed time between the onset of symptoms and the first patients' presentation to a medical care center was 20 days. The average period of elapsing time between the time the patients presented to the medical care centers and reporting the cases to the Ministry lasted 38 days. Accordingly, the average total elapsing time between the onset of symptoms and reporting the cases to the Ministry lasted 58 days (Table 5).

Rabies: The average period of elapsed time between the animal bite and the first patients' presentation to a medical care center and treatment with the vaccine was 5.1 hour. The average period of elapsing time between the time patients presented to the medical care centers and the period of reporting the cases to the Ministry lasted 83.4 days. (Table 5).

Sensitivity Index of Iranian National Surveillance System

Leishmaniasis: Totally, 955confirmed cases of leishmaniasis were reported to the Center for Communicable Diseases Control. The sensitivity rate was estimated at about 11.1%, according to both the number of expected cases in population and reported cases (Table 6).

Brucellosis: Totally, 47confirmed cases of Brucellosis were reported to the Center for Communicable Diseases Control. The sensitivity rate was estimated at about 12.1%, according to both the number of expected cases in population and reported cases (Table 6).

Rabies: Totally, 826suspected cases of Rabies were reported to the Center for Communicable Diseases Control. The sensitivity rate was estimated according to both the number of expected cases in population and reported cases at about 48.2% (Table 6).

Discussion

According to the results, more than half of leishmaniasis patients presented to the health care centers to receive diagnosis and treatment services and most patients referred to governmental sectors

Table 2: Completeness of cases reported according to different levels of health care system for Leishmaniasis

Area	Total cases found	Number of cases visited health service provider A	Completeness of case reporting of national Iranian surveillance system								
			Number of visits	Service provider	Number of visits B	Reported cases to county health center C	Com-pleteness % C/B*100	Total Reported cases to county health center D	Reported cases to the CDC by county health center E	Completeness of case reporting by county health center E/D*100	Total Com-pleteness of case reporting E/A*100
Urban	60	47 78.3%	75	Urban health center	24 32%	5	20.8	5	5	%100	%10.6
				General practitioner in private sector	15 20%	0	0				
				Specialist practitioner in private sector	11 14.7%	0	0				
				Hospital	0	-	-				
				laboratory	25 33.3%	0	0				
Rural	95	57 60%	82	Rural health center/Health houses	35 42.7%	23	65.7	23	23	%100	%40.4
				General practitioner in private sector	10 12.2%	0	0				
				Specialist practitioner in private sector	13 15.8%	0	0				
				Hospital	3 3.7%	0	0				
				laboratory	21 25.6%	0	0				
Total	155	104 67.1%	157	Health center/ Health house	59 37.6%	28	47.5	28	28	%100	%26.9
				General practitioner in private sector	25 15.9%	0	0				
				Specialist practitioner in private sector	24 15.3%	0	0				
				Hospital	3 1.9%	0	0				
				laboratory	46 29.3%	0	0				

(health centers or health houses). In addition, none of the patients in other centers reported the cases to the Ministry. In general, a small fraction of patients who referred to the health and medical service providers were registered and reported to the highest level of surveillance system. This study showed that a few expected leishmaniasis cases in population were detected and reported to the highest level of surveillance system (sensitivity index). According to the results and high incidence rate of leishmaniasis in the study population, it seems that the low sensitivity and the delay in reporting the cases can be the main causes of inability for early detection and implementation of effective and timely control programs.

All the brucellosis patients referred to the health care centers to receive diagnosis and treatment services. All patients referred to the laboratories for diagnostic tests, but the completeness of case reporting was 0% for laboratories. This study has shown that the completeness and sensitivity of brucellosis surveillance system is low. Accordingly, it seems that the low index of completeness and sensitivity can be the main factors in the failure of preventive programs.

In general, half of the suspected cases of rabies referred to the health care centers to receive diagnosis and treatment services. Based on the results, all of the suspected cases who referred to at least a health or medical center were reported to the Ministry. It might be due to the importance of rabies (with 100% fatality in cases) and emphasis on reporting the rabies cases by all health and medical service providers. Also, with

Table 3: Completeness of cases reported according to different levels of health care system for Brucellosis

Area	Total suspected cases found	Number of cases visited health service provider A	Completeness of case reporting of national Iranian surveillance system								
			Number of visits	Service provider	Number of visits B	Reported cases to county health center C	Completeness % C/B*100	Total Reported cases to county health center D	Reported cases to the highest level by county health center E	Completeness of case reporting by county health center E/D*100	Total Completeness of case reporting E/A*100
Urban	2	2	5	Urban health center	0	-	-	0	-	-	0
				General practitioner in private sector	2 40%	0	0				
				Specialist practitioner in private sector	1 20%	0	0				
				Hospital	0	-	-				
				laboratory	2 40%	0	0				
Rural	5	5	11	Rural health center/Health houses	2 18.2%	1	50	1	1	100%	20.0%
				General practitioner in private sector	0	-	-				
				Specialist practitioner in private sector	4 36.4%	0	0				
				Hospital	0	-	-				
				laboratory	5 45.5%	0	0				
Total	7	7	16	Health center/ Health house	2 12.5%	1	50	1	1	100%	14.3%
				General practitioner in private sector	2 12.5%	0	0				
				Specialist practitioner in private sector	5 31.3%	0	0				
				Hospital	0	0	0				
				laboratory	7 43.8%	0	0				

regard to the expected cases of suspected rabies in population and reported cases to the highest level, only half of the suspected cases were detected and reported to the authorities.

Several studies have been conducted on the completeness of disease reporting but no study was found on the timeliness and sensitivity of surveillance system for the diseases under the study.[4-7] In comparison with the current study, completeness of case reporting for brucellosis in US studies (2008, 2011) was higher than our results and for rabies it is even lower.[4,5] Based on the results of a study in Greece (2010), the completeness of case reporting for both confirmed cases of brucellosis and leishmaniasis was several times higher than our results.[6] Also, the completeness of reporting for brucellosis cases in a Turkish study (2010) was 2 times more than the current study.[7]

In the present study, the denominator was obtained from a population based door to door case finding approach. In order to calculate the interested indexes, the required information was obtained by tracing the patients from the first presentation to the last visit to a medical/health center.

Conclusion

Based on the results of the current study, it seems that the so called immediate communicable diseases reporting system is not providing complete and timely information. Regular monitoring, periodic sensitization of physicians to the national reporting approach and training of the health personnel from governmental and private sectors about the importance, objectives and guidelines of the national diseases surveillance system seem to be effective

Table 4: Completeness of cases reported according to different levels of health care system for suspected Rabies

Area	Total suspected cases found	Suspected cases visited health service provider A	Completeness of case reporting of national Iranian surveillance system								
			Number of visits	Service provider	Number of visits B	Reported cases to county health center C	Com-pleteness % C/B*100	Total Reported cases to county health center D	Reported cases to the highest level by county health center E	Complete-ness of case reporting by county health center E/D*100	Total Com-pleteness of case reporting E/A*100
Urban	16	8 50%	8	Urban health center	7 87.5%	7	100%	8	8	100%	100%
				General practitioner in private sector	0	-	-				
				Specialist practitioner in private sector	0	-	-				
				Hospital	1 12.5%	1	100%				
Rural	15	8 53.3%	10	Rural health center/Health houses	9 90%	9	100%	8	8	100%	100%
				General practitioner in private sector	0	-	-				
				Specialist practitioner in private sector	0	-	-				
				Hospital	1 10%	1	100%				
Total	31	16 51.6%	18	Health center/ Health house	16 88.9%	16	100%	16	16	100%	100%
				General practitioner in private sector	0	-	-				
				Specialist practitioner in private sector	0	-	-				
				Hospital	2 11.1%	2	100%				

Table 5: Timeliness of reporting suspected cases for leishmaniasis, brucellosis and suspected cases of rabies

Disease	Area	Number of cases	Reported cases to the highest level	The elapsing time between the onset of symptoms and the first presentation (day)	The elapsing time between the first presentation and reporting to the highest level (day)	Total elapsing time (day)
Leishmaniasis	Urban	60	5	23	99.6	122.6
	Rural	95	23	35.9	63.6	99.5
	Total	155	28	33.2	70	103.2
Brucellosis	Urban	2	0	-	-	-
	Rural	5	1	20	38	58
	Total	7	1	20	38	58
Suspected cases of Rabies	Urban	16	8	4.4 (hour)	77.1 (day)	
	Rural	15	8	5.9 (hour)	89.6 (day)	
	Total	31	16	5.1 (hour)	83.4 (day)	

measures to improve the quality of the Iranian communicable diseases surveillance system. Since many factors can be effective on the surveillance system (such as supervision and monitoring programs, type of disease, use of trained personnel, facilities and equipment and…), it is recommended that similar studies should be conducted in different areas.

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Table 6: Sensitivity index of surveillance system for leishmaniasis, brucellosis and suspected cases of rabies

Disease	Area	Number of participants	Number of cases	Incidence Rate (Per100000)	Expected cases in population according to the incidence rate C	Reported cases to the CDC D	Sensitivity index of surveillance system D/C*100
Leishmaniasis	Urban	2908	60	2063.3	3508	349	9.9%
	Rural	3061	95	3103.6	4966	606	12.2%
	Total	5969	155	2596.7	8569	955	11.1%
Brucellosis	Urban	2908	2	68.8	117	3	2.6%
	Rural	3061	5	163.3	261	44	16.9%
	Total	5969	7	117.3	387	47	12.1%
Suspected cases of rabies	Urban	2908	16	550.2	935	383	41.0%
	Rural	3061	15	490.0	784	443	56.5%
	Total	5969	31	519.3	1714	826	48.2%

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Conflict of Interest: None declared.

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