

Communicable diseases management in disasters: an analysis in the Islamic Republic of Iran

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Abstract

Background: Due to the importance of managing communicable diseases (CD) in disaster situations, the Center for Communicable Diseases Management (CCDM) within the Ministry of Health and Medical Education, Islamic Republic of Iran, has taken measures to improve routine communicable diseases management systems in normal and emergency situation.

Aims: This study aims to explore the improvement measures since 2005.

Methods: A qualitative document analysis method was used for analyzing all existing documents related to communicable diseases management from March 2003 to the end of 2014 in the CCDM and official websites of related organizations.

Results: Seventy-two documents that addressed communicable diseases management in disasters were included in the final analysis. The study findings were summarized in four phases of the disaster management cycle according to five core and support functions of the surveillance system.

Conclusions: The reviewed documents highlighted improvements in communicable diseases management in disasters, including inter-organization collaboration, information flow and use of new technologies such as web-based or mobile phone-based systems.

Keywords: Disaster, infectious disease, outbreaks, epidemic, Iran

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Introduction

Generally, any kind of man-made or natural disasters result in humanitarian emergencies (1). The consequences of such disasters, including displacement of a large number of people, basic infrastructure and lifelines disturbance, overcrowding, incremented exposure vectors of diseases, food insecurity, shortage of safe water, sanitation and basic health services, facilitate communicable diseases epidemics with particularly high morbidity and mortality (2). Death rates have been reported to increase by a factor of 10 among displaced populations compared to baseline rates, with communicable diseases being responsible for the majority of deaths (3). The Islamic Republic of Iran is affected by different man-made and natural disasters, placing it among the areas with a high prevalence of disasters (4) and the probability of communicable diseases epidemic.

The International Health Regulations (2005) and the subsequent guidelines and scientific documents have endorsed the importance of communicable diseases control (5). In addition, the new approach has declared the importance of surveillance core and support functions in all four phases of the disaster management cycle. This approach has emphasized case detection, reporting, investigation/confirmation, analysis/interpretation, and actions (control/response, policy, and feedback) as core functions and setting of standards, training and supervision, setting up laboratory support, setting up communications, and resource management as support functions (6).

Communicable diseases control programs in the Islamic Republic of Iran started more than 70 years ago and, concordant with international developments, has had many revisions. Before the release of the International Health Regulations (2005), the Bam earthquake (2003) was the focal point of the new approach of the country's communicable diseases management (CDM) in disasters. On 27 December 2003, the ancient city of Bam experienced one of the worst natural disasters since the last century (7). The first communicable diseases control program in disasters was thus launched in the earthquake-stricken areas with emphasis on communicable diseases control, yet routine surveillance had short-comings (8). It should be noted that a pre-disaster surveillance system as a health network system existed in the Islamic Republic of Iran, but it was not properly prepared for disaster situations. In fact, current health systems in disaster affected areas make the pre-existing surveillance system quite inefficient (9). Therefore, communicable diseases surveillance contingency plans for disasters are inevitable (10).

The Center for Communicable Diseases Management (CCDM) in the Ministry of Health and Medical Education (MoHME) is the ultimate decision-making and planning authority in the area, and issued many guidelines and regulations, with the assistance and cooperation of other

health authorities in MOHME, to improve and empower the existing surveillance system for disasters. The present study aims to explore how the country's CDM has improved.

Methods

The qualitative document analysis method (11) was used for analyzing the existing documents in the CCDM of the Islamic Republic of Iran. All types of hard or electronic documents, including books, guidelines, reports (conference paper, training, exercise, operational reports), interviews, correspondences, government documents, legal laws or regulations, newspaper articles, and films or broadcasts, in Farsi or English in the CCDM that were related to communicable diseases control and management in disasters were reviewed from March 2003 to the end of 2014. Additionally, the official websites of the Iranian Islamic Parliament, Ministry of Health, Treatment, and Medical Education, and the Iranian Red Crescent Society were searched for relevant documents from the Internet. The key terms for searching in websites were "Communicable disease" or "Infection" and "Surveillance" or "Control" and "Emergencies" or "Disaster". Many of the documents were not directly retrievable from websites, Therefore, the researchers referred to the secretariat and the archive centers of the related organizations or ministries for obtaining the required documents. The inclusion criteria were being produced in English or Farsi from March 2003 to end of 2014, relevancy to communicable diseases control, management or surveillance and disaster.

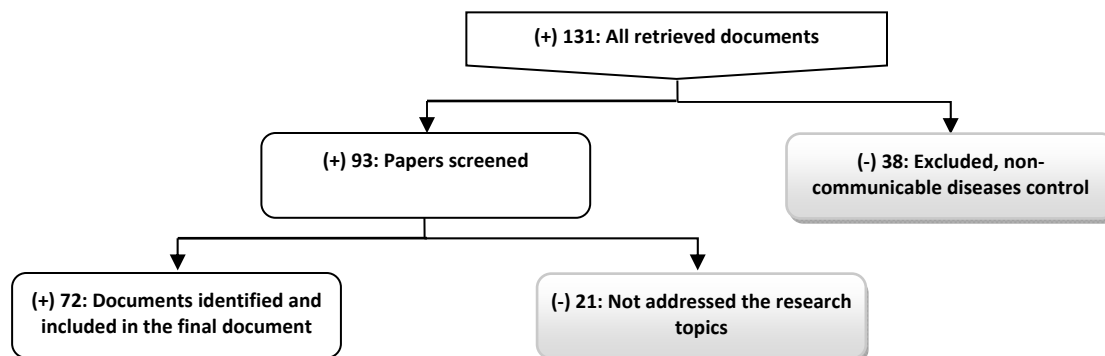
All extracted data from the included documents were put into analysis sheets (Annex 1), which were evaluated and confirmed by the research team epidemiologist using content validity assessment method (12). The analysis sheet consisted of 11 items using data compiled from the included documents. We recorded the frequency of each item with relation to years and place of document in the disaster management cycle (DCM) across all content.

Documents were analyzed regarding the inclusion of surveillance definition and communicable diseases control in the four phases of disaster management. Subsequently, the information in the document analysis sheets was grouped using content analysis method in Maxqda ver12 and analyzed using statistical package SPSS version 14. Enhancing transparency in reporting the synthesis of qualitative research (ENTREQ) was used for presenting strategy guideline (13).

Results

In total, 2256 pages of 131 documents were reviewed. Initially, 93 documents were included. However, 21 documents had not addressed the research topic and were excluded (Figure 1).

Figure 1. Document analysis process



All the 72 remaining documents had addressed, either directly or indirectly, the surveillance and CDM during the four phases of disaster management cycle (DMC). The study findings were summarized in four phases of DMC (Mitigation-Prevention, Preparedness, Response and Recovery) according to five core (case detection, reporting, investigation and confirmation, analysis and interpretation, and action) and support functions (setting of standards, training and supervision, setting up laboratory support, setting up communications, and resource management) of the surveillance system (Table 1).

Table 1. Results of document analysis

No.(D)	Author, title, institution	Subject	Year	Audience	Place in DMC
1	CCDM with cooperation of Kermanshah University of Medical Sciences and Health Services.	Guide to diseases surveillance system in disaster	2003	Universities and relevant ministerial departments and responsible partner organizations	All phases of DMC
2	Secretariat Task Force on health in disaster with collaboration of Kermanshah University of Medical Sciences and Health Services.	General health threats in disaster	2005	Universities and relevant ministerial departments and responsible partner organizations	All phases of DMC
3	MA Connolly. Farsi Translation: MM Gouya, M Soroush, A Omidvarinia, M Hemmati, et al. Center for Communicable Disease Management, Ministry of Health and Medical education.	Communicable diseases control in emergencies: A field manual	2005	Universities and relevant ministerial departments and responsible partner organizations	All phases of DMC

4	Islamic Parliament Research Center, Parliament of Islamic Republic of Iran.	Disaster Management Act.	2007	All country and regional role playing organizations	All phases of DMC
5	SH Emami Razavi, Deputy of Health, Ministry of Health and Medical Education.	Mandatory Reporting to Emergency Operation Center of Ministry of Health and Medical Education	2008	Universities and relevant ministerial departments and responsible partner organizations	All phases of DMC
6	SM Alavian, Health deputy of Iran ministry of health and medical education	Lessons learned from Cyclone Gonu	2008	All country and regional directors	All phases of DMC
7	GR Haghghi. Deputy of Health, Zahedan University of Medical Sciences	performance report on Bampour flood disaster	2008	Iran CCDM	Response
8	GR Haghghi, Deputy of Health, Zahedan University of Medical Sciences	Report measures taken in the wake of heavy rainfall and flooding in Sistan and Baluchestan.	2008	Iran CCDM	Response
9	GR Haghghi, Deputy of Health, Zahedan University of Medical Sciences	Health Measures Instructions During Floods.	2008	Administrator of all health networks, Sistan and Baluchestan Province	Response
10	Iran CCDM	Report the latest flood situation in Sistan and Baluchestan with Summarizing Report of Province EOC	2008	Deputy of Health, Ministry of health and medical education	Response
11	F Bidarpour, Deputy of Health, Kurdistan University of Medical Sciences	The Report of First Health Exercise.	2008	Deputy of Health, Ministry of health and medical education	All phases of DMC
12	H Jafarzadeh, Deputy of Health, Ardabil University of Medical Sciences.	Reporting zero case in the Khalkhal Hashtjin earthquake area.	2008	Deputy of Health, Ministry of health and medical education	Response
13	SH Emami Razavi, Deputy of Health, Ministry of Health and Medical Education.	Mandatory Reporting to Emergency Operation Center of Ministry of Health and Medical	2008	Iran CCDM	All phases of DMC

		Education			
14	N Nikparast, Deputy of Health, Mashad University of Medical Sciences	Report of measures taken in city flood of Bojnoord	2008	Iran CCDM	Response
15	A Hasani, Head of Center for Disaster Management and Medical Emergencies, Ministry of Health and Medical Education.	The third session report of the workshop on national project guidelines for service package for disaster preparedness.	2008	Deputies and managers of the Ministry of health and medical education.	All phases of DMC
16	M Soroush, Head Surveillance Bureau, Iran CCDM, Ministry of Health and Medical Education.	Health rapid response teams configuration and tasks in heterogeneous wars and disaster.	2008	Participants in health in heterogeneous wars and disaster conference.	Response
17	SH Emami Razavi. Deputy of Health, Ministry of Health and Medical Education.	The Activities of the Center for Disease Control in Four Response Levels of National, Pole, Provincial and County.	2009	Iran CCDM	All phases of DMC
18	M Soroush, Head Surveillance Bureau, Iran CCDM, Ministry of Health and Medical Education.	Duties of the Ministry of Interior in communicable diseases control.	2009	Presentations session in Ministry of Interior	All phases of DMC
19	MM Gouya, Director of Center for Communicable Diseases Management, Ministry of Health and Medical Education.	Pakistan flood risks.	2010	Deputy of Health, Ministry of Health and Medical Education	Preparedness and mitigation
20	Deputy of Health, Kerman University of Medical Sciences	Necessary measures in earthquake stricken areas.	2010	Head of health network, Reagan city	Preparedness and mitigation, Response
21	MM Gouya, M Soroush, A Omidvarinia, M Zahraei, A Raeisi, A Sedaghat. Center for Communicable Disease Management, Ministry of Health and Medical Education.	National Communicable Diseases Operation Plan in Disaster and Emergencies.	2011	Universities and relevant ministerial departments and responsible partner organizations	All phases of DMC
22	MM Gouya, Director of Center for Communicable Diseases Management, Ministry of Health and Medical Education.	Report of visit the earthquake region of Mamasani city in Fars province	2011	Deputy of Health, Ministry of Health and Medical Education	Response and Recovery

23	M Aghazadeh, M Mafi, Center for Communicable Disease Management, Emergency Headquartered of Enviroment and Labor Health Center, Ministry of Health and Medical Education.	Report from the Flood affected areas of Kelardasht in Mazandaran Province.	2011	Deputy of Health, Ministry of Health and Medical Education	Response
24	A Ardalan, MJ Moradian, MM Gouya, K Naddafi, ME Motlagh, Z Abdollahi, et al. Disaster Management and Risk Reduction Unit, Department for Public Health, Disaster Public Health Committee, Task force of Health in Disaster and Emergencies, Ministry of Health and Medical education.	National Public Health Disaster & Emergency Operation Plan.	2011	Universities and relevant ministerial departments and responsible partner organizations	All phases of DMC
25	A Reisi, M Zahraei, M Soroush, M Shirzadi, A Sedaghat, H Masoumi Asl, et al. CCDM, Ministry of Health and Medical Education.	A Comprehensive Guide for communicable diseases surveillence system for family physicians.	2012	Universities and relevant ministerial departments and responsible partner organizations	All phases of DMC
26	S Eayar, Deputy of Health, Ilam University of Medical Sciences.	Report on Measures in Earthquake affected areas in Abdanan.	2012	Iran CCDM	Response
27	MM Gouya, Director of Center for Communicable Diseases Management, Ministry of Health and Medical Education.	Syndromic surveillance system of national and international needed in the implementation of the International Health Regulations	2012	Universities and relevant ministerial departments and responsible partner organizations representatives in meeting	All phases of DMC
28	AR Mesdaghinia, Deputy of Health, Ministry of Health and Medical Education.	The necessary measures in Eastern Azerbaijan earthquake.	2012	A Ardalan, Health Deputy Counselor and Head of Disaster Risk Management Unit.	Response
29	M Soroush, Head Surveillance Bureau, Iran CCDM, Ministry of Health and Medical Education.	Analysis of earthquake affected situation in east Azarbaijan. Quoted from Young Journalist club reported by Asriran News Agency	2012	MM Gouya, Director of Center for Communicable Diseases Management, Ministry of Health and Medical Education.	Response

30	Javad Nouaallahi, Deputy of Health, Ilam University of Medical Sciences.	Environmental health emergency vigilance performance report	2012	Deputy of Health, Ministry of Health and Medical Education	Preparedness
31	A Hasani, Head of Center for Disaster Management and Medical Emergencies, Ministry of Health and Medical Education.	Announce some issues related to emergency and passive defense	2012	Public awareness through ISNA news agency	preparedness
32	SM Dastour, Head of Veterinary Organization.	Report on veterinary services and activities in the Eastern Azerbaijan earthquake.	2012	Minister of Agriculture	Response
33	SM Dastour, Head of Veterinary Organization.	The report of subsequent measures taken in East Azerbaijan earthquake	2012	Minister of Agriculture	Response
34	M Mirzaei, Deputy of Health, Mazandaran University of Medical Sciences.	Briefings the measures taken following flood of Noshahr & Chaloos	2012	Center for Communicable Disease Management, and Environment and Labor Health Center, Ministry of Health and Medical Education.	Response
35	National Disaster management Organization. In: National Disaster management Organization, Ministry of Interior 2012.	Tasks of health sector specialized working group in unexpected events and disaster.	2012	Ministry of Health and other member organizations in health disaster working group	All phases of DMC
36	M Soroush, Head of Surveillance Bureau, Iran CCDM, Ministry of Health and Medical Education.	Report on earthquake-stricken areas of Eastern Azerbaijan.	2012	Iran CCDM	Response
37	A Reisi, M Zahraei, M Soroush, M Shirzadi, A Sedaghat, H Masoumi Asl, et al. CCDM, Ministry of Health and Medical Education.	A Comprehensive Guide for communicable diseases surveillance system for family physicians. 1 ed	2012	All general practitioners	All phases of DMC
38	K Mehdizadeh, Deputy of Health, Birjand University of Medical Sciences.	Field visit report of flood-hit areas covered by the Sarbishe health network	2013	Iran CCDM	Response

39	A Khajeh Nian, Deputy of health, Bushehr University of Medical Sciences.	Report on activities carried out in Bushehr earthquake.	2013	Deputy of Health, Ministry of Health and Medical Education	Response
40	Specialized group of disease response and prevention, Deputy of Health, Qazvin University of Medical Sciences.	Report of rapid response teams' exercise.	2013	Iran CCDM	Preparedness
41	Manager of Disaster and Medical Emergencies of Bam city, Bam University of Medical Sciences.	Report of damage after the flood in Tilek-Asfykan of Bam city.	2013	EOC of Tehran Emergency Center	Response
42	Seyedi. Manager of Disaster and medical emergencies, Jiroft University of Medical Sciences.	Report of the flood and waterlogging in city of Jiroft	2013	Iran Center for Disaster Management and Medical Emergencies	Response
43	Manager of Center for Disaster Management and Medical Emergencies, Kerman University of Medical Sciences.	A report of recent floods and rainfall in Kerman province	2013	Iran Center for Disaster Management and Medical Emergencies	Response
44	MM Gouya, Director of Center for Communicable Diseases Management, Ministry of Health and Medical Education.	Bam and Jiroft flooding	2013	Deputy of Health, Bam and Jiroft University of Medical Sciences.	Response
45	F Rakhshani, Health deputy, Zahedan University of Medical Sciences.	Flooding in Sistan and Balouchestan province	2013	Governor of Sistan and Balouchestan province	Prevention, response
46	SM Tabatabaei, Deputy of Health, Zahedan University of Medical Sciences.	A report of primary measures to control flood disaster	2013	Center for Communicable Disease Management, and Environment and Labor Health Center, Ministry of Health and Medical Education. Iran National Disaster Management Organization	Response
47	SM Tabatabaei, Deputy of Health, Zahedan University of Medical Sciences.	A report of subsequent measures to control flood disaster	2013	Center for Communicable Disease Management, and Environment and Labor Health Center, Ministry of Health and Medical Education. Iran National Disaster Management Organization	Response
48	SM Tabatabaei, Deputy of Health, Zahedan University of Medical Sciences.	A report of measures to control flood disaster	2013	Center for Communicable Disease Management, and	Response

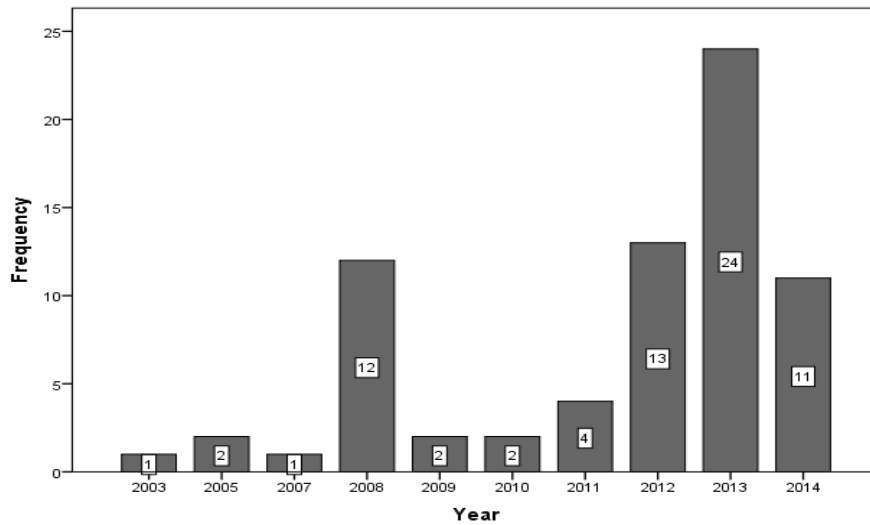
		consequences		Environment and Labor Health Center, Ministry of Health and Medical Education. Iran National Disaster Management Organization organization	
49	SM Tabatabaei, Deputy of Health, Zahedan University of Medical Sciences.	A report of measures taken in flood disaster	2013	Center for Communicable Disease Management, and Environment and Labor Health Center, Ministry of Health and Medical Education. Iran National Disaster Management Organization	Response
50	F Rakhshani, Deputy of Health, Ministry of Health and Medical Education.	The implementation of disaster risk assessment program in health networks	2013	Health deputy of all medical universities in Islamic Republic of Iran	Mitigation and prevention
51	MT Talebian, Head of Disaster Management and Medical Emergencies Center, Ministry of Health and Medical Education.	Report of problems caused by the outbreak of water-borne and food-borne diseases in Yazd province.	2013	Preparedness and response deputy, Iran National Disaster Management Organization	Response
52	K Naddafi, Head of Environment and Labor Health Center, Ministry of Health and Medical Education.	A report of the assessment team dispatched from the ministry of Health to Yazd.	2013	Deputy of Health, Yazd University of Medical Sciences.	Response
53	K Naddafi, Head of Environment and Labor Health Center, Ministry of Health and Medical Education.	Proceedings of outbreak investigation in Yazd province.	2013	Director and Chairman of the Board of Water and Wastewater Engineering Company	Response
54	AR Moraveji, Deputy of Health, Kashan University of Medical Sciences.	Report on water and food-borne outbreaks in Abu Zeid Abad of Aran and Bidgol county	2013	Center for Communicable Disease Management, Ministry of Health and Medical Education.	Response
55	MM Gouya, Director of Center for Communicable Diseases Management, Ministry of Health and Medical Education.	Eltor Report	2013	Deputy of Health, Ministry of Health and Medical Education.	Response
56	Deputy of Health, Zahedan University	A report of cholera	2013	Center for	Response

	of Medical Sciences.	control activities		Communicable Disease Management, Ministry of Health and Medical Education.	
57	MM Gouya, Director of Center for Communicable Diseases Management, Ministry of Health and Medical Education.	Report of Cholera control team activities in the Sistan and Baluchestan.	2013	Deputy of Health, Ministry of Health and Medical Education.	Response
58	A Ardalan, Deputy of Health Counselor and Head of Disaster Risk Management Unit, Ministry of Health and Medical Education.	A report of natural Hazards occurrence in Iran	2013	Deputy of Health, Ministry of Health and Medical Education.	preparedness
59	AA Rezaei, General Directorate of Animal Health and Disease Management, Ministry of Agriculture.	Necessary measures in the earthquake affected areas of Borazjan.	2013	General Director of Veterinary Medicine of Bushehr Province	Response
60	AM Khajeheian, Deputy of Health, Bousehr University of Medical Sciences.	Description of the current situation, the initial assessment and health measures in the affected area of Dashtestan.	2013	Deputy of Health, Ministry of Health and Medical Education.	Response
61	K Naddafi, Head of Enviroment and Labor Health Center, Ministry of Health and Medical Education.	A brief report of of the review mission respiratory disease in Ahvaz.	2013	Deputy of Health, Ministry of Health and Medical Education.	Response
62	MM Gouya, Director of Center for Communicable Diseases Management, Ministry of Health and Medical Education.	Rapid assessment of the earthquake affected area in the county of Bastak.	2014	Deputy of Health, Ministry of Health and Medical Education.	Response
63	Aliasghar Vahidi, Deputy of Health, Kerman University of Medical Sciences.	Instructions of response to flood.	2014	Administrator of all health networks in Kerman province.	Response
64	SH Hashemi, Mininster of Health and Medical Education.	Warning About Eltor.	2014	Minister of Interior	Preparedness and response
65	M Araabi, Deputy of Health, Mazandaran University of Medical Sciences.	Request of equipments and funding for responding to cold wave disaster.	2014	Center for Communicable Disease Management, Ministry of Health and Medical Education.	Response
66	AA Sayyari, Deputy of Health, Ministry of Health and Medical Education.	Recalling things to apply in cold wave disaster management	2014	Health deputy of Mazandaran and Gilan universities of medical sciences.	Praparedness and response

67	K Naddafi, Head of Environment and Labor Health Center, Ministry of Health and Medical Education.	Intensify supervision on water facilities and food storage and distribution centres	2014	Deputy of Health of all universities of medical sciences in Islamic republic of Iran	Prevention
68	M Araabi, Deputy of Health, Mazandaran University of Medical Sciences.	A report of measures taken in cold wave disaster	2014	Deputy of Health, Ministry of Health and Medical Education. Chancellor of Mazandran University of Medical Sciences.	Response
69	A Ardalan, Deputy of Health Counselor and Head of Disaster Risk Management Unit, Ministry of Health and Medical Education.	General recommendations related to the snowfall disaster.	2014	Deputy of Health of all universities of medical sciences in Islamic Republic of Iran	Preparedness and Response
70	K Mehdizadeh, Health deputy, Birjand University of Medical Sciences.	A report of most important actions taken in Tabasyn flood, Nehbandan county.	2014	Center for Communicable Disease Management, Ministry of Health and Medical Education.	Response
71	K Mehdizadeh, Deputy of Health, Birjand University of Medical Sciences.	Daily report of the number of patients affected by the disaster in the Tabasyn flooded area, Nehbandan county.	2014	Center for Communicable Disease Management, Ministry of Health and Medical Education.	Response
72	MM Gouya, Director of Center for Communicable Diseases Management, Ministry of Health and Medical Education.	The initial assessment of the disaster affected area of Musian.	2014	Head of Environment and Labor Health Center, Ministry of Health and Medical Education.	Response

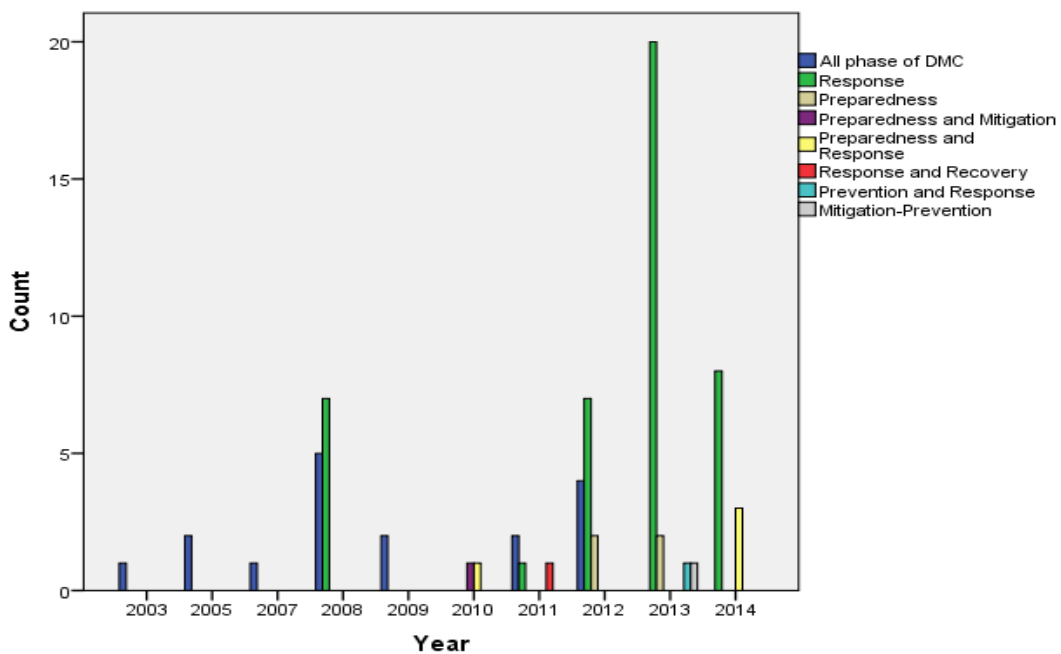
Generated documents relating to the management of communicable diseases in the years under study have grown increasingly (Figure 2).

Figure 2. Documents generation by year



Although contents such as guidelines for all phases of DMC, in primary years and field reports from response phase in subsequent years were more prominent, there were documents in any phases of DMC (Figure 3).

Figure 3. Documents generation by place in DMC and years



There were many weaknesses and strengths in CDM in disasters (Table 2). Part of the problems was solved by establishing a national disaster risk reduction plan, as well as developing regulations and related guidelines and planning for provision of resources.

Table 2. Weakness and strengths of CDM in disasters

Weakness / problem	Strength
<ul style="list-style-type: none"> • Safety and security of staff and health facilities • Health facility vulnerability • Basic requirements and tools scarce • Interacting with the media • Access to affected areas • Span of control in operation area • Reporting weakness (communication) • Information Management and Documentation • correct indicators (lack of denominator) • Inter organizational coordination • Evaluation and performance assessment • Equipment and diagnostic facilities • Job description or transparency in duties (inter-organization) • Non-participation of staff 	<ul style="list-style-type: none"> • Operation plan • Training and exercise • Monitoring and vertical supervision • Logistic • Active and continuous surveillance system • Vector control program • Contingency planning • Information management system • Intra organizational coordination

The changes and improvements in CDM over 10 years of study, based on the four phases of the disaster management cycle were as follows:

• **Mitigation–prevention, preparedness:**

- Case definition: The main diseases having the potential to become epidemics include cholera, measles, meningococcal meningitis, shigellosis, skin or visceral leishmaniosis, viral hemorrhagic fever, plague, influenza, malaria, typhus, Borrelia recurrentis, hepatitis A and E, typhoid and yellow fever, and therefore were included in routine surveillance systems. According to limitation of case specific definition and detection, especially in disasters and emergencies, syndromic surveillance system with definition of 14 syndromes confirmed. Severe acute respiratory illness, chronic cough syndrome,

fever with bleeding syndrome, fever with skin rash syndrome, acute watery diarrhea syndrome, bloody diarrhea syndrome, fever with meningeal symptoms, undifferentiated fever, food intoxication, acute flaccid paralysis, shock syndrome, Icter syndrome, influenza-like syndrome, and sudden or unexpected death were established and released to rapid detection, early notification and early intervention. In this case, these definitions integrated in primary health care services and family physician reference materials. Zero reporting is mandatory, as well.

- Setting of standards: Standard definition, training and exercise protocols, standard educational materials, Laboratory, supplies and necessary equipment standards, documentation, organized reporting with mandatory Zero reporting, communication standard devices, and evaluation standards were prepared and released as emergency response plan (ERP) with the name of Iran's National Public Health Emergency Operation Plan (PHEOP) or Emergency Operation Plan (EOP) in midst study period. Risk assessment and risk map of health facilities were produced as reference maps in all universities.
 - Training, exercise and drill: According to EOP, many training, exercise and drills were performed in universities and national level to improve coordination and skills of team members and addressing weak and strong points. Exercises with participation of all members of the Health Work Group were performed to improve inter agency coordination.
 - Policy-making: According to IHR and WHO, legislation and acts in national, province and university levels in health sector were adopted. National Disaster Management Organization (NDMO) also released many acts to improve coordination in action by governmental and non-governmental organizations. For this purpose, Emergency Operation Center (EOC) set up in universities and MoHME as local and national authorities of health sector.
- **Response:**
- Investigation and confirmation: Outbreak investigation or rapid health assessment after two to three days of any disasters done by a standard team consisting of specialists in the related sectors (general physicians, obstetricians/nurses, environmental health and disease control technicians/specialists) with rapid laboratory kits, primary equipment, and sample collection tools according to EOP. The surveillance system of communicable diseases was designed for detecting and monitoring diseases/syndromes in the affected areas.

- Analysis, interpretation, report and feedback: Having information about prevalence of diseases in the same periods in previous months or years are very helpful to declare epidemic thresholds (the number of cases that can produce an outbreak) in disaster affected population. The first step in interpretation and confirmation of an outbreak of unknown origin is assessment of the available clinical and epidemiological information. Endemic disease status and seasonal epidemics information in the past are available from the deputy of health at the university and in CCDM. Communications and reports were two-sided, meaning that the data were collected from field health teams, and interpreted and analyzed in the health regional centres and then was sent to the EOC and health centre of the provincial university. Finally, information was sent to the end point of information collection, EOC and CCDM of MOHME. Feedback was met from each layer during this process and continues repeatedly on a daily interval. EOP forms were used to record data and pass information.

- Control: According to impossibility of exact cause of outbreak determination in the early stages of an outbreak in the aftermath of natural disasters, and with use of syndromic surveillance, general control measures based on the probable cause of outbreak were done for primary controlling. When certain agents become clear, specific measures may be done. Four main actions could be done, such as preventing exposure (by eliminating the possible source of the disease), preventing infection (protect sensitive groups, including immunization and primary hygiene services), preventing diseases (chemoprophylaxis early treatment) and preventing death.

- Setting up laboratory support: Confirmation of probable case/syndrome to define disease agent needs laboratory services. According to EOP, essential laboratory services deployed in site with the support of advance laboratory services at the provincial and national level. Rapid diagnostic kits used in recent years for outbreak investigation.

- Setting up communications: Stable and appropriate communications are an important component of communicable diseases surveillance system in disasters. According to distributed mobile networks in recent years, information is transferred in timely manner, but backup communication is essential.

- Coordination: According to released acts and regulations by NDMO to improve coordination in action, coordination among involved organizations has improved but is still not satisfactory.

- Resource management: Since CDM is an ongoing and longstanding process, providing sustainable resources is one of the main concerns. Collaboration and sharing of resources in all responsible organizations is critical for having sustainable supply chain. The issue has been the subject of the laws and regulations that were communicated by NDMO to relevant authorities and by MoHME to universities, local and national health organizations.

- **Recovery:**

According to EOP, final point of response and beginning of recovery is turning from emergency surveillance systems to routine surveillance systems, reconstruction of health facilities and re-implementation of routine health services.

Discussion

This study's aim was to review the Islamic Republic of Iran's CDM specification and improvement in disasters from existing documents since 2003. The main issues included: identification of partners, policy planning for health management in disasters, early warning of hazards, training and simulation, cooperation with media, safety and security of health facilities and staff, transparency in describing tasks, search and evacuation capacity, safe water and sanitation, rescue and relief, health preparedness, health response planning, policy support, efficiency and sustainability of the supply chain, risk assessment and vulnerability analysis, defects in cooperation and coordination, outbreak management, resource mobilization, information management and documentation, and disaster commanding. These were addressed in primary documents from 2003 and indicated a need to improved CDM. These issues are also mentioned in other studies in different contexts (14,15).

According to changes occurring internationally, and using existing guidance from the World Health Organization (WHO), measures have also been made to improving CDM in the Islamic Republic of Iran. One of the most important points of the system's development was the change in case definition to syndrome. Simple learning of the syndromic surveillance (SS) for health staff, rapid implementation with minimum facilities and no need for extra cost are advantages of SS establishment. Another advantage is its adaptation with the routine surveillance system in the country, and familiarity with SS helped involve health staff to act more skillfully and efficiently. Nevertheless, there were weaknesses in SS, such as non-estimated denominator, lack of participation of the private sector and general hospitals, non-participation of staff, poor inter-sectorial collaboration, and inconsistency of data collection tools. These findings were similar to another study of the East Azerbaijan earthquake to examine strengths and weaknesses of communicable diseases surveillance system in disaster affected areas (16).

Another major problem of implementing the surveillance system was lack of agreement on case definitions for monitoring diseases among physicians, especially in private sectors. Individuals who are trained carefully (17). Although there is some weaknesses in establishment of SS, its success and effectiveness is confirmed in many disaster affected areas within different contexts (16,18,19). Routine surveillance supposed to be involved with patients care at the start of the SS in disaster-stricken areas should be systems with use of advance technology are highly vulnerable to consequences of disaster. Considering this problem, initiation of simple disease surveillance such as SS following a disaster can therefore be useful. After a disaster has happened, SS should be initiated with tailoring to the local setting (20).

Another problem in the current situation was documentation and registration systems. Data were collected, registered and reported manually, which could allow for human error (21). Although advanced technology such as web-based registration has some advantages, including increased coverage, accuracy and timeliness of data collection and instant feedback, the disruption of telecommunication infrastructures and failing computers creates too higher a risk (22). According to advanced mobile networks in the Islamic republic of Iran, mobile-based surveillance systems for sending data and monitoring communicable diseases, which has had similar successes in other countries (17,23,24) with use of geographical information system to point out diseases distribution could be useful (25).

Intra-organization collaboration with PHEOP implementation showed little improvement. Despite notification of the comprehensive Rescue and Relief Act that was approved by Iran's Council of Ministers (by virtue of Article 44 of the Third Economic, Social, and Cultural Act of Islamic Republic of Iran that was approved in 2000 and regulated by NDMO), inter-organizational cooperation issues still remain. These communication and coordination problems between role player organizations are similar to that experienced in other countries (26,27). Perhaps a helpful action to resolve this problem would be legal penalties for non-cooperating organizations. This requires the establishment of a performance assessment system to determine the failure of partner organizations as developed by Babaie in recent research in CCDM (28). This is a very important step, since successful control and management of communicable diseases requires the cooperation and support of all involved organizations in health (safe water and food, vector control, security at the scene, lifelines, basic supplies etc.).

Laboratory support for communicable disease surveillance is usually severely limited in disasters and the existence of a mobile laboratory with proper facilities at the time of disasters in the affected area has long been a problem (29). Although rapid diagnostic kits used in recent years for outbreak investigation in the Islamic Republic of Iran for many infectious agents, yet

access to advance laboratory services in site remain an issue. Transferring samples to provincial and national referral laboratories and receiving feedback has an adverse effect on the management of communicable diseases through time wastage.

In the field of resource management, quick responses to health-related needs immediately after natural disasters through efficient emergency logistics distribution and resource management, is vital for the alleviation of disaster impact in the affected areas. Although NDMO emphasized this issue, inadequate measures have been taken. A hybrid clustering-optimization approach to the operation of emergency logistics co-distribution might be a solution (30).

Conclusion

The established CDM functioned well in controlling communicable diseases in disasters of the Islamic Republic of Iran, and could be usable for other low/middle-income countries. Many problems, including preparing guidelines, training materials, training courses, exercises and coordination of units in MoHME have been resolved. However, there were some weaknesses in current CDM in intra-organizational cooperation in MoHME and inter-organization cooperation at the national and provincial level and needs more development. Lack of coordination among external organizations, comprehensive support systems, external monitoring and evaluation, reliable communications, and timely action of all responsible organizations are the main issues. Inter-agency coordination could be improved to some extent by changing the current disaster management legislation to a service-based approach (31); i.e., an organization-centered approach.

Considering the situation of the Islamic Republic of as one of the top ten countries vulnerable to natural hazards, designing an information and communication system for recording and collecting data is essential at the time of any disaster. For better coordination and general improvement, continual retraining and exercises for intra-organizational staff in MoHME, universities and other organization are suggested.

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Annex 1:

Document Analysis Sheet	Document No.:
1- Type	
<input type="checkbox"/> Newspaper <input type="checkbox"/> Map <input type="checkbox"/> Advertisement <input type="checkbox"/> Mail <input type="checkbox"/> Telegraph <input type="checkbox"/> Seminar <input type="checkbox"/> report <input type="checkbox"/> Invent register <input type="checkbox"/> Press <input type="checkbox"/> Note <input type="checkbox"/> Report :Other	
2- The unique physical characteristics of the document	
<input type="checkbox"/> interesting Header <input type="checkbox"/> Annotation <input type="checkbox"/> handwritten <input type="checkbox"/> Received (postal) stamp <input type="checkbox"/> Typed <input type="checkbox"/> Sealed <input type="checkbox"/> Other:	
3- Date :	
4- author (originator) of document :	
5- Subject :	
6- Position (Job or academic title) :	
7- The document was written for whom :	
8- If you have access to electronic resources, write address :	
9- Document description(A-E):	
(A) key things that you think the writer has mentioned	
(B) Why do you think this document was written?	
(C) What reason guided you for aim writing of document? (Quote from the document):	
(D) Important things that matter to you at the time of writing the document:	
(E) Write comment for document's author about unanswered questions:	
10- Strength of document:	
11- Weakness of document	