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).

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).

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

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).

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.
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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