Abstract

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

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

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

Results: Seventy-two documents addressing communicable diseases management in disasters were included in the final analysis. The findings were summarized in 4 phases of the disaster management cycle corresponding to 5 core and support functions of the surveillance system.

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

Keywords: disasters, communicable disease management, surveillance, outbreaks, 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; disruption of basic infrastructure and lifelines; overcrowding; increased exposure to disease vectors; food insecurity; and shortages of safe water, sanitation and basic health services facilitate communicable disease epidemics with particularly high morbidity and mortality (2). Death rates have been reported to increase by a factor of 10 among displaced populations compared with baseline rates, with communicable diseases being responsible for the majority of deaths (3). The Islamic Republic of Iran is affected by a number of man-made and natural disasters, placing it among the areas with a high prevalence of disasters (4) and the probability of epidemic communicable diseases.

The International Health Regulations (2005) and the subsequent guidelines and scientific documents have emphasized the importance of communicable disease control (5). In addition, the new approach has affirmed the importance of surveillance core and support functions in all 4 phases of the disaster management cycle. This approach has highlighted case detection, reporting, investigation/confirmation, analysis/interpretation and actions (control/response,
Communicable diseases control programmes started more than 70 years ago in the Islamic Republic of Iran and, in accord with international developments, have gone through many revisions. Before the release of the International Health Regulations (2005) (5), the Bam earthquake of 2003 was the focal point of the new approach for the country’s communicable diseases management in disasters. On 27 December 2003, the ancient city of Bam experienced one of the worst natural disasters since the previous century (7). The first communicable diseases control programme in disasters was launched in the earthquake-stricken areas with the emphasis on communicable diseases control, yet routine surveillance had some shortcomings (8). It should be noted that a pre-disaster surveillance system already existed in the country but it was not properly prepared for disaster situations. In fact, current health systems in disaster-affected areas show that the pre-existing surveillance system was quite inefficient (9). Therefore, communicable diseases surveillance contingency plans for disasters are a necessity (10).

The Centre for Communicable Diseases Management (CCDM) in the Ministry of Health and Medical Education is the ultimate decision-making and planning authority in the area, and has issued many guidelines and regulations with the assistance and cooperation of other health authorities to improve and empower the existing disaster surveillance system. The present study aims to explore how the country’s communicable diseases management has improved since its inception.

**Methods**

The qualitative document analysis method (11) was used for analysing the existing documents in the CCDM. All types of hard copy or electronic documents, including books, guidelines, reports (conference papers, training, exercises, operational reports), interviews, correspondence, government documents, laws or regulations, newspaper articles and films or broadcasts in Farsi or English that were related to communicable diseases control and management in disasters from March 2003 to the end of 2014 were reviewed. Additionally, the official websites of the Iranian Islamic Parliament, the Ministry of Health and Medical Education and the Iranian Red Crescent Society were searched for relevant documents. The key terms for searching websites were “communicable disease” or “infection” and “surveillance” or “control” and “emergencies” or “disaster”. For those documents that were not directly retrievable from websites the researchers referred to the secretariat and the archive centres of the related organizations or ministries to obtain the required materials. The inclusion criteria were: produced in English or Farsi from March 2003 to the end of 2014, relevance to communicable diseases control, management or surveillance and disaster.
All data extracted from the included documents were put into analysis sheets (Table 1), which were then evaluated and confirmed by the research team epidemiologist using the content validity assessment method (12). The analysis sheet consisted of 11 items using data compiled from the documents. We recorded the frequency of each item in relation to year and place of document in the disaster management cycle across all content.

Documents were analysed regarding the inclusion of surveillance definition and communicable diseases control in the 4 phases of disaster management. Subsequently, the information in the document analysis sheets was grouped using the content analysis method in Maxqda, version 12, and analysed using SPSS, version 14. “Enhancing transparency in reporting the synthesis of qualitative research” (ENTREQ) was used for presenting strategy guidelines (13).

Results
Documents

In total, 2256 pages of 131 documents were reviewed. Initially, 93 documents were included. However, 21 documents did not address the research topic and were excluded (Figure 1). All the 72 remaining documents addressed, either directly or indirectly, the surveillance and communicable diseases management during the 4 phases of the disaster management cycle. The study findings were summarized in the 4 phases (mitigation–prevention, preparedness, response and recovery) according to 5 core (case detection, reporting, investigation and confirmation, analysis and interpretation, and action) and support (setting of standards, training and supervision, setting up laboratory support, setting up communications and resource management) functions of the surveillance system (Table 2).

The number of documents generated relating to the management of communicable diseases in the years under study has grown more or less progressively from 1 in 2003 and 2007 to a maximum of 24 in 2013.

Although content such as guidelines for all phases of the disaster management cycle in primary years and field reports from the response phase in subsequent years were more prominent, there were documents covering all phases of the cycle.
There were both weaknesses and strengths in communicable diseases management in disasters; these are detailed in Table 3. The situation was partly resolved by establishing a national disaster risk reduction plan as well as by developing regulations and related guidelines and planning for the provision of resources.

The changes and improvements in communicable diseases management over the 10 years of the study, based on the 4 phases of the disaster management cycle are detailed below.

**Mitigation–prevention, preparedness**

**Case definition**

The main diseases with the potential to produce epidemics include cholera, measles, meningococcal meningitis, shigellosis, cutaneous and visceral leishmaniasis, viral haemorrhagic fever, plague, influenza, typhus, relapsing fever (Borrelia recurrentis), hepatitis A and E, typhoid and yellow fever and were therefore included in routine surveillance systems. In accordance with the limitation of case-specific definition and detection, especially in disasters and emergencies, a syndromic surveillance system with definitions for 14 syndromes was confirmed. Definitions for: severe acute respiratory illness, chronic cough syndrome, fever with bleeding syndrome, fever with skin rash syndrome, acute watery diarrhoea syndrome, bloody diarrhoea 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 distributed for rapid detection, early notification and early intervention. These definitions were integrated into primary health care services and family physician reference materials. Zero reporting is also mandatory.

**Setting of standards**

Standard definitions; training and exercise protocols; standard educational materials; documentation for laboratory, supplies and necessary equipment standards; organized reporting with mandatory zero reporting; standard communication devices; and evaluation standards were prepared and released as the emergency response plan, i.e. the National Public Health Emergency Operation Plan (also known as the Emergency Operation Plan), in the middle of the study period. Risk assessment and a risk map of health facilities were produced as reference maps in all universities.

**Training, exercise and drills**

In line with the Emergency Operation Plan, training sessions, exercises and drills were performed in universities and at national level to improve the coordination and skills of team members and to identify and address weak and strong points. Exercises were performed with the participation of all members of the health work group to improve inter-agency coordination.
Policy-making

In accordance with the International Health Regulations (2005) and the World Health Organization, legislation and regulations were adopted in the health sector at national, provincial and university levels. The National Disaster Management Organization also published regulations to improve coordination in action by governmental and nongovernmental organizations. For this purpose, the Emergency Operation Centre was set up in universities and the Ministry of Health and Medical Education as local and national authorities of the health sector.

Response

Investigation and confirmation

Outbreak investigations or rapid health assessments were carried out within 2–3 days of a disaster by a standard team comprising 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 in accordance with the Emergency Operation Plan. The communicable diseases surveillance system was designed to detect and monitor diseases/syndromes in the affected areas.

Analysis, interpretation, report and feedback

Having information about the prevalence of diseases over the same period in previous months or years is very helpful in determining epidemic thresholds (the number of cases that can produce an outbreak) in a 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 information on previous seasonal epidemics are available in the CCDM. Communications and reports were 2-sided, meaning that the data were collected from field health teams and interpreted and analysed in the regional health centres and then sent to the Emergency Operations Centre and the health centre of the provincial university. Finally, information was sent to the end point for information collection, the CCDM in the Ministry of Health and Medical Education. Feedback is provided at each stage during this process, and continues to be given on a daily basis. The Emergency Operation Plan forms were used to record data and distribute information.

Control

It may not always be possible to determine the exact cause in the early stages of an outbreak in the aftermath of natural disasters. In such a situation using syndromic surveillance, general control measures based on the probable cause of the outbreak were carried out for primary control. In later stages, when the causative agents become clear, specific measures may be carried out. Four main actions can be performed: preventing exposure (by eliminating the
possible source of the disease), preventing infection (protecting sensitive groups, including immunization and primary hygiene services), preventing disease (chemoprophylaxis early treatment) and preventing death.

Setting up laboratory support

Confirmation of probable case/syndrome to define the disease agent needs laboratory services. According to the Emergency Operation Plan, essential laboratory services are deployed on-site with the support of advance laboratory services at the provincial and national level. Rapid diagnostic kits have been used in recent years for outbreak investigation.

Setting up communications

Stable and appropriate communications are an important component of a communicable diseases surveillance system in disasters. With the mobile networks distributed in recent years, information is transferred in a timely manner, but back-up communication is essential.

Coordination

In keeping with laws and regulations announced by the National Disaster Management Organization to improve coordination in action, coordination among the organizations involved has improved but is still not satisfactory.

Resource management

Since communicable diseases management is an ongoing and enduring process, providing sustainable resources is one of the main concerns. Collaboration and sharing of resources among all responsible organizations is critical to a sustainable supply chain. The issue has been the subject of laws and regulations promulgated by the National Disaster Management Organization to relevant authorities, and by the Ministry of Health and Medical Education to universities and local and national health organizations.

Recovery

In accordance with the Emergency Operation Plan, the final point of response and the instigation of recovery is shifting from emergency surveillance systems to routine surveillance systems, reconstruction of health facilities and re-implementation of routine health services.
Discussion

The aim of this study was to review the Islamic Republic of Iran’s communicable diseases management specification and improvement in disaster management from documents published during 2003–2014. The main issues included the identification of partners; policy planning for health management in disasters; early warning of hazards; training and simulation; cooperation with the 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. These were addressed in primary documents from 2003, and indicated a need for improved communicable diseases management.

In line with changes enacted internationally, and using existing guidance from the World Health Organization, measures have also been made towards improving communicable diseases management in the Islamic Republic of Iran. One of the most important points of the system development was the change in case definition to syndrome. Simple learning of the syndromic surveillance for health staff, rapid implementation with minimum facilities and there being no need for extra cost are advantages of the establishment of syndromic surveillance. Another advantage is its adaptation to the routine surveillance system in the country, and familiarity with syndromic surveillance helped inspire health staff to act more skillfully and efficiently. Nevertheless, there were weaknesses in syndromic surveillance, for example a non-estimated denominator, lack of participation of the private sector and general hospitals, nonparticipation of staff, poor intersectoral 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 the communicable diseases surveillance system in disaster-affected areas (14).

Another major problem of implementing the surveillance system was lack of agreement on case definitions for monitoring diseases among physicians, especially in the private sector. Although there are some problems in the establishment of syndromic surveillance, its success and effectiveness is confirmed in many disaster-affected areas within different contexts (14,15,16). Routine surveillance systems that are supposed to be involved in patient care at the start of syndromic surveillance in disaster-stricken areas should have the use of advanced technology but these are extremely vulnerable to the effects of disasters. Considering this problem, the introduction of simple disease surveillance, such as syndromic surveillance, following a disaster can be useful. After a disaster has occurred, syndromic surveillance should be initiated and tailored to the local setting (17).
Another problem in the current situation was documentation and registration systems. Data were collected, registered and reported manually, which could introduce human error (18). Although advanced technology such as web-based registration has some advantages, e.g. increased coverage, accuracy and timeliness of data collection and instant feedback, the disruption of telecommunications infrastructure and failing computers creates too high a risk (19). According to advanced mobile networks in the Islamic Republic of Iran, mobile-based surveillance systems for sending data and monitoring communicable diseases, which has seen success in other countries (20,21,22) using a geographical information system to identify disease distribution, could be useful (23).

Intra-organizational collaboration with the implementation of the Public Health Emergency Operation Plan showed little improvement. Despite notification of the comprehensive Rescue and Relief Act that was approved by the Iranian Council of Ministers (Article 44 of the Third Economic, Social, and Cultural Act of the Islamic Republic of Iran, approved in 2000 and regulated by the National Disaster Management Organization), interorganizational cooperation issues still remain. These communication and coordination problems between role player organizations are similar to those experienced in other countries (24,25). Perhaps a helpful action to resolve this problem would be legal penalties for noncooperating organizations. This requires the establishment of a performance assessment system to determine the failure of partner organizations as developed by Babaie et al. in recent research in CCDM (26). This is a very important step since successful control and management of communicable diseases requires the cooperation and support of all organizations involved 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 (27). Although rapid diagnostic kits have been used in recent years for outbreak investigation in the Islamic Republic of Iran for many infectious agents, access to advanced laboratory services on-site remains 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 wasting.

In the field of resource management, a speedy response 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 the National Disaster Management Organization emphasized this issue, measures taken have been inadequate. A hybrid clustering–optimization approach to the operation of emergency logistics distribution might be a solution (28).

**Conclusion**
The established communicable diseases management functioned well in controlling communicable diseases in disasters in the Islamic Republic of Iran, and could be usable for other low- and middle-income countries. Many problems have been resolved, including preparing guidelines, training materials, training courses, exercises and coordination of units in the Ministry of Health and Medical Education. However, there were some weaknesses in current communicable diseases management in intra-organizational cooperation in the Ministry of Health and Medical Education and interorganizational cooperation at the national and provincial level and this needs further 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 (29), i.e. an organization-centred approach.

Considering the Islamic Republic is among the top 10 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 the Ministry of Health and Medical Education, universities and other organization are suggested.

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Competing interests: None declared.
**Contex** : En raison de l’importance de la prise en charge des maladies transmissibles dans les situations de catastrophe, le Centre de prise en charge des maladies transmissibles du ministère de la Santé et de l’Enseignement médical de la République islamique d’Iran a pris des mesures afin d’améliorer les systèmes de prise en charge systématique des maladies transmissibles dans les situations normales et d’urgence.

**Objectifs** : La présente étude a pour objet d’analyser les mesures d’amélioration prises depuis 2005.


**Résultats** : Soixante-douze documents relatifs à la prise en charge des maladies transmissibles en situation de catastrophe ont été intégrés dans l’analyse finale. Les conclusions de l’étude ont été résumées en tenant compte des quatre phases du cycle de gestion des catastrophes et des cinq fonctions essentielles et d’appui du système de surveillance.

**Conclusions** : L’examen des documents a montré des améliorations dans la prise en charge des maladies transmissibles en situations de catastrophe, notamment en termes de collaboration interorganisations et d’utilisation des nouvelles technologies telles que les systèmes basés sur le Web et sur téléphone portable.
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Aims

The aim of this study is to assess the improvement measures taken since 2005 in communicable diseases management during disasters.

Methods

A longitudinal approach was used to assess the communicable diseases management during disasters, including the analysis of recorded outbreaks from 2003 to 2014.

Findings

Two and seven outbreaks were handled during the study period. The results were classified into four levels according to the management process.

Conclusions

The identified outbreaks were handled according to the established protocols, but there was a need for better coordination between the healthcare and information systems, and the use of new technologies like the communication network and mobile applications.

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