

Chemical release at the airport and lessons learned from the medical perspective

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Received 16 May 2006; received in revised form 15 October 2006; accepted 19 October 2006

Available online 25 October 2006

Abstract

The risk of massive exposure to toxic chemical substances including chemical weapons or industrial chemicals has increased especially during the last century due to the development in industry and chemistry science. This paper aims to describe a real chemical release event and further exposures to personnel working at the Esenboğa Airport, Ankara, Turkey, and to give lessons learned. This chemical release was noticed firstly by airport staff giving symptoms including nausea, vomiting, irritation of eyes, itching and rinorrhea. First responders from civil defense unit and a group of health staff including NBC First-aid and Rescue Team gave response to the incident. The increasing number of exposed or suspected cases transferred to hospital were isolated in Emergency Department (ED) following the decontamination at the airport. Due to the characteristic odour and the growing number of the victims, the releasing agent was considered to be likely cyanide or sulfur mustard. Because of the panic amongst the workers, the number of the exposed (real or suspected) people increased up to about 40 and were kept under observation in ED of the hospital. The chromatographic analysis revealed that the agent contained diallyl disulfide, an organo-sulfur compound present at very high concentrations in pure garlic oil. Blood results showed no cyanide and the isolation were terminated. Along with the lessons learned, incident showed that the health facilities should be prepared against such deliberate or accidental mass casualties.

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Keywords: Chemical spill; Medical management; Chemical casualty; Decontamination

1. Introduction

Chemical weapons are still threatening the peace in the world by means of terrorist events and military respect. From these agents, phosgene (carbonyl chloride) and cyanide are still widely used and manufactured in industrial processes. Similarly, thousands of tonnes of organophosphorus and carbamate insecticides are manufactured and used annually in Turkey having a high agricultural potential [1,2]. In other aspect, Turkey has been one of the target countries frequently suffering from terrorist attacks and gave hundreds of deaths and injuries in recent years [3,4].

The intentional or unintentional release of a chemical terrorism agent in a civilian community could give rise to hundreds or thousands of casualties, so furtherly overwhelm the local

medical facilities. An incident of chemical and biological (CB) terrorism would be a high-consequence event that might potentially generate hundreds or thousands of casualties requiring prompt medical attention with the increased need of clean water and food supplies. So, health agencies are the main organizations that need to effectively cope with CB releases.

The response to such an incident was a complex task requiring closely integrated efforts by local and governmental organizations. The public health system, hospitals, and emergency medical services must be prepared to respond to all terrorist attacks or such incidents giving rise to massive injuries and victims [5].

The purpose of this article is to describe the accidental (or suspected deliberately at the beginning) release event of a chemical substance, and to explain the prehospital and hospital medical response, the problems encountered in such a scene management, and the lessons learned in improving the level of preparedness for future events.

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2. Case description

The event occurred on 11th of February 2005 at 11.40 a.m., when a suspicious-smelling package caused panic at Ankara Esenboga Airport in Turkey. Five workers and an employee from the Airlines Company who were unloading plane's cargo hold suddenly coughed, vomited and felt burning in their throats after they carried a leaky package. As the leaky package caused six workers to fall ill, the authorities thought that it might contain a chemical weapon because of the bad-bitter smell. This situation was notified by the Security Forces feeling the garlic-like odor suspecting sulfur mustard or cyanide in the first scene. Upon this notification, local first responders including civil defense team and local health care givers arrive on the scene at 12.15 to bear the immediate burden of treating casualties since the incident was the result of a release of a suspected chemical agent. The teams were equipped with full-body protective suits and self-contained breathing apparatus and other equipment listed in Table 1.

The teams belonging to Civil Defense Directorate of Ankara province, which were trained and equipped to detect, identify and handle chemical warfare agent and toxic industrial chemicals established the hot, warm and cold zones based on the previous training they had received [6]. At the time they arrived, decontamination area was set up in an isolated and a decontamination truck (KARCHER) was used by civil defense team members for this purpose. Firstly, workers who were supposed to be contaminated were decontaminated following the removal of their clothings, and then the cargo department was cleaned. They assessed the incident, collected and preserved the evidences and transferred collected samples to Hygiene Center Poison Research Department (HCPRD) belonging to Turkish Ministry of Health (MOH) for confirmatory analysis. In the first declaration, they found no agent by using on-field detectors like chemical agent monitor and radiacmeter. However, the route of entry to the warm zone was considered contaminated until it was cleaned.

On site medical management was provided by Ministry of Health team comprised of medical personnel including physicians, nurses, paramedics who are responsible for first-aid, casualty clearing, medical staging and field surgical intervention. The group of experts had sufficient scientific information available as to the effects of chemical weapon and on its behaviour in the human body. The group also had sufficient information on pathways to man and the potential consequences.

Table 1

The team deployed to the airport to give first response to the chemical agent release used the following equipment

1. Decontamination truck
2. Protective suit level A (for first-responders in the hot zone)
3. Protective suit level C (for decon staff and first-aid purposes)
4. Protective masks and appropriate filters
5. Decon materials
6. Chemical and biological sampling kit
7. Chemical agent monitor (CAM)
8. Radiation measuring instrument

Casualties were transferred to a hospital belonging to the government, which was the closest hospital to the airport and reported the package to the police department. The airport remained open, but firefighters and security personnel were called in as a precaution before the package was identified. After the members of the deployed team detected the suspicious package, they conveyed it to HCPRD at 03.00 p.m. The team checked the exposed surfaces and plane's cargo hold for the presence of chemical agent contamination.

Cargo department and unit workers were quarantined. As the time advanced, the number of affected people was augmented, so, these 43 employees were also taken to the same hospital, most probably suffering from the fumes and giving the similar symptoms like nausea, vomiting, eye irritation, itching, rhinorrhea, throat irritation. Emergency Room of mentioned hospital was evacuated for casualties and routine emergency patients complaining for other reasons were transferred or evacuated to hospitals in close distance. In the afternoon, all personnel of emergency service were also quarantined besides casualties.

Poison Research Department of Turkish Ministry of Health and Department of Medical NBC Defense of Gulhane Military Medical Academy were consulted about possible side effects and management of exposure to this still unidentified chemical material. Ministry of Health provided information to press and addressed that suspected package was delivered to HCPRD. They opened the package and found some CD-ROMs in it. They took samples from the package due to bitter odour spreading although there was no visible contamination on the surface and then these samples were analyzed by microbiological and chemical methods.

Some measurements for toxic scanning of the sample was performed in Poison Research Department belonging to HCPRD. By using the GC-MS (gas chromatography-mass spectrometry) method, a considerable amount of "diallyl disulfide" in pure garlic oil was detected in the contaminated sample taken from the package. This substance is known as a typical volatile component, which was generally found in garlic oil [7]. Also, by using a spectrophotometric method, they examined cholinesterase levels of blood samples, which were taken from contaminated employees to eliminate the exposure of any type of nerve agent or an organophosphorus insecticide. Results were in normal levels. Microbiological results were also normal and no pathological microorganism was detected.

Some members of NBC First-aid and Rescue Team of Gulhane Military Medical Academy (GMMA) deployed to the same Hospital as soon as they were notified. From these affected people, four staff from the Air Force who were on duty in the airport Cargo also admitted to Emergency Service of GMMA showing the symptoms of rhinorrhea, lacrimation, eye irritation and throat irritation. Depending on the previous information and characteristic signs, the patients were kept under observation including oxygen supply and blood analysis for routine tests, whole blood counts and cyanide.

Deployed members of NBC Team of GMMA gave assistance to Emergency staff of local Hospital and took blood samples of victims to eliminate any even minor cyanide exposure although the symptoms did not strongly suggest that this toxic chemical

was involved. The results of cyanide test were negative. Following all these reports and initiation of recovery observed in victims resulted to finalize the quarantine after about 6 h from the beginning of the event.

The above incident was the result of a chemical release, a garlic oil substance, which was very effective in upper respiratory system giving signs and symptoms similar to those in exposure to sulfur mustard, a vesicant warfare gas, and hydrogen cyanide, a classical terrorist and warfare agent. This substance, diallyl disulfide, is commonly used in some food and drug manufacture [8]. So, it was then declared by Governor Aide of Istanbul who was responsible for the Airport, that an Indian company had sent six plastic barrels of garlic oil to a Food Company by Qatar Airways, and Ground Handling Cargo Department had received plastic barrels and sent these packages to Ankara. He mentioned that one of them might have leaked accidentally because of faulty packaging and garlic oil contaminated some packages since then. Reports said that the package leaking garlic-like smell led the airport and cargo staff to be affected and to suspect the first-responders that the packages contained chemical weapon.

This event was noted as an accidental chemical incident that exceeded response capabilities of local and state health agencies belonging to civilian and military health organizations to manage the consequences of the incident, decontaminate and evacuate the casualties.

3. Discussion and lessons learned

In this case analysis, an almost occasional industrial disaster that is happened in an airport cargo is described. Beyond this explanation, the management regarding the medical and administrative improvement of this event is of great interest in terms of mitigation of such incidents that may be due to terrorist attacks. In response to the growing threat of terrorism with such industrial toxic substances or CB weapons, it is absolutely agreed that a multidisciplinary approach for operations between emergency medical services response is a requirement.

In the event of likely incidents, agencies or hospitals belonging to Ministry of Health should be primarily responsible for patient care, the delivery of medical equipment and supplies, health surveillance in the affected area and managing the health consequences of environmental contamination. Emergency medical response personnel should consider medical issues regarding prehospital management of a chemical attack (Table 2).

According to the reaction shown by the first-responders, the awareness of the team members that the agent might be a chemical weapon due to some physical characteristics noticed was found so appreciable. That occasion led the level of awareness to rise in any similar event.

Some of these points must be taken into consideration as pre-attack measures performed by medical units. Of these, priority should be given to incident site isolation and zone establishment together with triage and transportation. That is, the evacuation is a priority since survival depends on the rate with which the casualty receives definitive care.

Table 2

Medical issues concerned in the prehospital management against a chemical attack

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1. Event recognition
 2. Incident medical command and control
 3. Safety and personal protection
 4. Decontamination
 5. Isolation of the incident area
 6. Sampling and detection
 7. Psychological management
 8. Communication and coordination
 9. Triage
 10. Treatment
 11. Transportation
 12. Recovery activities
 13. Fatality management
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Zone establishment by the deployable team at the incident site was also a positive consideration. Especially, the Hot Zone, which is close to the warm zone referred to as the contamination reduction zone is accepted as the area of highest level of contamination. Thus, the first-responders would not be expected to function in this zone without any Level-A Personal Protective Equipment. Here, the victims should be evacuated rapidly to lessen the exposure time to the dangerous material.

Although a program for enhancing the health and medical services response to CB terrorism was practiced, several important deficiencies need to be addressed here.

Decontamination, which is a special aspect in the response of a chemical incident, is a neutralization and/or removal process performed by application of a decontaminating compound an/or thorough flushing with water, depending on the agent type [9,10]. Decontaminating the victims correctly at incident scene is of great importance and would prevent health staff becoming contaminated. Assuming patients are generally poorly decontaminated at the incident site, hospitals must be prepared with decontamination facilities.

Some of the police officers and security workers entered the incident scene without protective gear and they would have become poisoned themselves in an actual intensive incident. Had the incident been real and had a chemical agent been used, ambulances and hospital emergency departments would have rapidly become contaminated, resulting in secondary exposure of hospital workers and patients.

The main teams acting in this event were Civil Defense Team, Medical Team of Ministry of Health, and NBC First-aid and Rescue Team of GMMA. NBC medical rescue team of GMMA had been established specially to carry out medical first-aid and medical procedures including detection, sampling, decontamination and triage following a suspected event involving weapons of mass destruction (WMD) [11]. This event could be considered as a good opportunity for these teams to remark the requirements and learn some practical issues regarding coping with chemical disasters. The teams were too limited in size and capabilities to treat hundreds or thousands of prompt casualties from a major chemical attack or to handle multiple terrorist CB incidents. Such medical teams aiming to give

treatment, diagnosis and other required health services should be furtherly set up throughout the country.

Such an incident would be a high-consequence event that might potentially generate hundreds or thousands of casualties requiring prompt medical attention with the increased need of clean water and food supplies. So, this incident tells us that we need to develop and implement a domestic preparedness program to improve the ability of local and state organizations to cope with these threats and to conduct exercises and preparedness tests with a considerable amount of finance. This program should be based on local police, firefighters, medical personnel and other first responders like civil defense workers together with an integrated exercise program.

A capability for the analysis of such toxic materials associated with CB terrorist incidents should be furtherly improved and institutionalized. In this item, every terrorist incident involving an explosive device should be investigated via routine analysis for CB contaminants.

A more practically detailed coordination plan should be elaborated. Improved coordination is also required between first responders and other teams. Appropriate detection equipment and personal protective equipment for first responders should be developed and distributed (relatively simple, inexpensive, portable and user-friendly systems for detecting and identifying CB agents). MOH should establish stockpiles of necessary medical equipment, nerve agent antidotes, decontamination solutions, antidotes for cyanide poisoning to ensure the prompt treatment of casualties. In addition to that and for practical purposes, procedures should be developed so that urgent life saving operations can be proceeded by first responders.

4. Conclusion

This chemical spill gave us a good opportunity to practice a specific medical response system. Beyond its being a real threat

or an incident, it became a training for the preparedness for massive injuries. Many lessons were learned about different items of pre-hospital and hospital management. The observations we had and experiences gained can then surely be applied to rescue and save lives in real attacks involving WMD.

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