INTERNATIONAL CBRNe MASTER COURSES SERIES

COLLANA DI SICUREZZA CHIMICA, BIOLOGICA, RADIOLOGICA E NUCLEARE

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Peace cannot be kept by force; it can only be achieved by understanding.

Albert Einstein

The CBRNe Book Series was born as an initiative of the Directive Board and of the Scientific Committee of "International Master Courses in Protection Against CBRNe events" (www.mastercbrn.com) at the University of Rome Tor Vergata. The evolution and increase in Security and Safety threats at an international level place remarkable focus on the improvement of the emergency systems to deal with crisis, including those connected to ordinary and non–conventional events (Chemical, Biological, Radiological, Nuclear, and explosives). In every industrial Country there are multiple entities with specialized teams in very specific fields, but the complexity of the events requires professionals that not only have specific know-how, but also expertise in the entire relevant areas. Given the global interest in these issues, the Department of Industrial Engineering and the Faculty of Medicine and Surgery of the Tor Vergata University organize the international Master Courses in "Protection against CBRNe events": I Level Master Course in "Protection against CBRNe events" (120 ECTS) and II Level Master Course in "Protection against CBRNe events" (60 ECTS). These courses aim at providing attendees with comprehensive competences in the field of CBRNe Safety and Security, through teaching and training specifically focused on real needs. Both Master Courses are designed according to the spirit of the Bologna Process for Higher Education, the Italian law and educational system. The Master Courses are organized also in cooperation with the following Italian Public Entities:

— Presidenza del Consiglio dei Ministri (Prime Minister's Office);
— Ministero della Difesa (Ministry of Defence);
— Ministero dell'Interno (Ministry of The Interior);
— Istituto Superiore di Sanità (National Health Institute);
— Istituto Nazionale di Geofisica e Vulcanologia (National Institute for Geophysics and Vulcanology);
— ENEA (Italian National Agency for New Technology, Energy and Sustainable Economic Development);

— University Consortia CRATI, MARIS and SCIRE;
— Comitato Parlamentare per l'Innovazione Tecnologica (Parliamentary Committee for Technological Innovation).

And together with the following International Entities:

— OPCW (Organization for the Prohibition of Chemical Weapons)
— NATO Joint Centre Of Excellence (Czech Republic);
— NATO SCHOOL of Oberammergau (Germany);
— HotZone Solutions Group (The Netherlands);
— VVU–026 Sternberk (Czech Republic);
— Seibersdorf Laboratories GmbH (Austria);
— Chernobyl Centre (Ukraine).

All the above–mentioned organizations have signed official cooperation agreements with the University of Rome Tor Vergata in the aim of Master course activities. The Master have also cooperation with OSCE, IAEA, ECDC, KEMEA in the aim of the didactical activities and we are working to formalize this collaboration with a formal cooperation agreement.

Both Master Courses have been officially granted the "NATO selected" status and have been included in the NATO Education and Training Opportunities Catalogue (ETOC) and also they are supported by OPCW.

The purpose of the CBRNe book series is to give a new perspective of the safety and security risks from both a civil and military point of view, touching all the aspects of the risks from the technological to the medical ones, talking about agents and effects, protection, decontamination, training, emergency management, didactic, investigation, communication and policy.

The authors will be experts of the sector coming from civil, military, academic/research and private realities. A special thanks for the realization of this series goes to Prof. Carlo Bellecci for his initial encouragement, continuous support and help.

Nel mese di Agosto 2016 il Ministero dell'Istruzione, dell'Università e della Ricerca (MIUR) ha inserito la collana nella lista di quelle ufficialmente riconosciute con i seguenti riferimenti:

— codice di classificazione: E237557;
— titolo: CBRNe BOOK SERIES.

During the month of August, 2016, the Italian Minister for Instruction, University and Research (MIUR) has officially added this book series in the list of the official publications recognized by the Minister itself with the following references:

— classification code: E237557;
— title: CBRNe BOOK SERIES.

Sami Abdullah Alsaadi

Education and Training CBRNe Awareness and Preparedness

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Contents

Abstract

European CBRNe Centre that initiates and coordinates research and training within the fields of safety and security while dealing with Chemical, Biological, Radiological, Nuclear and Explosive substances realizes that majority of the citizens in the USA and European nations always lack information on CBRNe and how to handle such substances especially in terrorist attack scenes. The aim of this study was to investigate CBRNe Awareness and Preparedness among the public. The objectives of the study were: to investigate the public knowledge about CBRNe substances; to investigate the ability of the general public and emergency responders attend to CBRNe incidents and,to investigate what governments ability to address CBRNe threats.

The study involved both qualitative and quantitative design in the collection of data where in the former the respondents responded to open ended question and the later involved closed ended questions both of which were included in the questionnaire presented to the respondents. The target population included students, corporate body employees and health care employees. There were a total of 119 respondents: 38 students, 36 corporate employees (Non–health care employees) and 45 health care employees.

The study revealed that overall there was relatively low level of CBRNe preparedness in the respondents even though the health care employees appeared to show higher preparedness. The investigation of biological agents involved 7 items with the correct response ranging between 50% and 58%. The Not sure response had scores of between 21% to 32%. The cross tabulation revealed that health care employees were knowledgeable on biological agent issues. The χ^2 results proved that there was a significant relationship between the variables; $\chi^2(4) = 9.77$ ($p < 0.05$).

It was concluded that the level of preparedness was relatively low and that there is need for effort to be made to improve the situation. Recommendation to policy makers included the need to provide emer-

gency preparedness training at workplace to ensure that the public is conscious of their environment and are equipped with knowledge and skills necessary that can be helpful in facing CBRNe emergency; and appropriately packaged information should be given at all community gathering such as churches, sports events etc. Further studies were recommended specifically on healthcare facilities preparedness on CBRNe emergencies and another about measures taken by security agencies in preventing and handling CBRNe related attacks.

Acknowledgement

During the entire period of my study and writing of this thesis, many people were of great help and I wish to express my gratitude to them. First and foremost, I wish to thank my wife for inspiring me and encouraging me to enroll for this course. I wish to thank her for the moral and financial support throughout the study period. I am most indebted to my supervisors, both of University for their dedication, enthusiasm and patience in working with me from its inception to the end. I am also indebted to Eng. Riccardo Quaranta for his constructive criticism, suggestions and advice on this work.My heartfelt gratitude goes to Dr. Daniele Di Giovanni for his invaluable input in the research seminars. I am also grateful to Major. Mohammed Ibrahim Alali encouraging words and prayers throughout this course.My heartfelt appreciation goes Dr. Andrea Malizia to for his editorial input and also I am indebted to the heads of institutions and the students who participated in this study.Lastly, to God the Almighty for endless provision, sustenance and ever sufficient grace.

Introduction

Background Information

Have you ever seen casualties of a terror attack? Terrorism has appeared to be one of the most challenging crimes of this century. It poses as unwinnable war both to the super powers and to the developing nations. It metamorphoses with technological advancement in a manner that they are practically inseparable (Nelms, 2011).

CBRNe is an acronym of Chemical Biological, Radiological/Nuclear, and Explosives. In essence, these are agents that are hazardous to the environment but more so are grave to the lives of both human and animals. Suppose you are in a bus station or any transport, terminus and you visualize people spewing out of a cafeteria gasping for air due to rancidity? What will you do? It has been realized that in most occasions terrorist attacks are carried out in more of a scientific process involving CBRNe agents' (Markenson, DiMaggio, Redlener, 2005). Surprisingly, victims and the rescuers are often injured. Injuries are witnessed either at the scene or out of the scene.

According to the data provided by the CBRNe, the immediate impacts of the chemical, biological, radiological and nuclear substances may be felt in areas much further from the scenes and in the scenes. The fire may be witnessed at the scenes and contained. The contaminated survivors of the accidents and the emergency responders may leave to their residential areas or to health facilities to seek medical attention, thereby creating an adverse situation in those areas. This sends an alarm on awareness and preparedness of the general public and the experts on the CBRNe (Jasper *et al.*, 2013). This thesis proposal aims at finding out the level of awareness on the CBRNe substances and the preparedness of the public on the same. Are the members of public able to tell what these substances are? Has the public witnessed CBRNe attack? How does the emergency team respond to CBRNe attacks? It should be noted that the public comprises of fire fighters,

flying doctors, emergency responders and anyone since the victim is limitless.

This proposal can be used to determine the level of public awareness and preparedness on the explosives. It is, therefore, suitable for those training emergency responders. It is also relevant for community workers bestowed with the sole responsibility of creating public awareness (Markenson *et al.*, 2005). However, this paper cannot be used for the purpose of training as a resource material. Further research should be carried out to find how best to carry out public awareness. Intensive study is also required to come up with powerful resource materials for the purpose of training. This should comprise of key areas of substances that form part of CBRNe products and how to reduce them. Spontaneous methods should also be devised to quell CBRNe.

Research objectives:

a) to investigate the public knowledge about CBRNe substances;
b) to investigate the ability of the general public and emergency responders attend to CBRNe incidents;
c) to investigate governments' ability to address CBRNe threats.

Research questions
This thesis seeks to answer the following questions:

a) what level of knowledge does the public have on CBRNe substances?
b) how do the general public and emergency responders attend to scenes that are known to be victims of CBRNe?
c) what are governments' ability to address CBRNe threats.

Chapter I

Literature Review

1.1. Introduction

This chapter there is review of literature on various aspects of CBRNe. In the section CBRNe substances are identified and grouped. The section also looks at some major historical CBRNe events; unintentional CBRNe situational awareness as a threat among other things.

1.2. Introduction to CBRNe

CBRNe substances were studied objectively as distinct groups with the related effects. Chemical substances were grouped as Riot Control Agents, Toxic Industrial Chemicals, Chemical Warfare Agents and Incapacitating Agents. Common examples of chemical agents identified were cyanogen chloride, hydrogen cyanide, phosgene, chlorine and Orthochlorobenzylidene malononitrile (tear gas) (Stevens *et al.*, 2010).

Cyanogen Chloride was found to have a pungent smell and thus caused Nausea, frothy sputum, and hyperventilation. Hydrogen cyanide was found to be very volatile and produces a lethal concentration at room temperature. Phosgene as a product was found to be deadly and a quiet killer as it could never be detected by smell rather it causes pulmonary edema (Nelms, 2011).

Biological agents were realized to organisms or toxins that could kill or incapacitate humans. They were grouped based on most likely biological weapon types (bacteria, rickettsia, viruses, and toxins). These biological agents were realized to be the causes of Viral Hemorrhagic Fevers, Botulinum Toxin, Q Fever, Smallpox, Tularemia, plague, and Anthrax. These biological agents were also discovered to be aided by cuts and open wounds. Bites from insects such as ticks and

mosquitoes were also found to be their great facilitators. Moreover, it was also discovered from the study that these agents may also be inhaled or eaten from contaminated food or air (Stevens *et al.*, 2010).

Radiological, nuclear and explosives agents were realized to cause a massacre. They can also lead to a change of DNA structure in a generation. When viewed as a combined structure for all other types of agents, it was proved that nuclear explosives are capable of transmitting biological and chemical substances in attack operation (Nelms, 2011).Small explosives could be used to disperse pathogens and toxins in a locality (Pae, 2014). Moreover, explosives could also be used as a mechanism of propagating lethal chemical substances such as hydrogen cyanide.

1.3. Major Historical CBRN Events

There are several major historical events that are important in understanding CBRNe threat. These events are important in demonstration of the need of any country to have robust CBRNe response capabilities. Two successful WMD have been experienced in United States.

One of the attacks is the 1984 salmonella poisoning in Oregon. The attack was launched by a Buddhist cult where there was an attempt of infecting the local community by contaminating various food at local restaurants and supermarket with salmonella. The motive behind the attack was influencing a vote by making the would be voters sick which would eventually result to the voting booths being filled by the homeless. In this case no death was reported but 750 fell sick (Philip Elmer–DeWitt, 2001).

The other case in the United States involved anthrax attack. This case came shortly after the 9/11 bomb attack and it involved mails containing anthrax were sent to media houses and to two senators' offices. This attack resulted to the death of five Americans and 17 injuries and it was described as the worst biological attack in the country (Federal Bureau of Investigation, 2015). The investigation came to a closure in 2010 upon the only suspect in the case committing suicide upon learning he had been discovered and was facing arrest.

Other attacks happened in Japan and Philippines. In Japan there was a sarin gas attack in Tokyo. This attack involved release of sarin