

PREPAREDNESS TOWARDS BIOTERRORISM: A SURVEY AMONG POST GRADUATE STUDENTS AND FACULTY MEMBERS OF DENTAL COLLEGES OF DAVANGERE CITY, KARNATAKA

ABSTRACT

Background: Bioterrorism agents include bacteria, viruses, fungi and other microorganisms, as well as biotoxins produced by microorganisms, plants and animals that can kill or incapacitate. Agents have the unique potential to make an environment more dangerous over time. If used for hostile purposes, any disease-causing microorganism could be considered a weapon. The dental profession could potentially play a significant role in the emergency response to a major bioterrorism attack.

Methodology: A cross-sectional questionnaire-based study was conducted among 363 dental post-graduate students and teaching faculty members of 2 dental colleges in Davangere city, Karnataka to assess their preparedness towards bioterrorism. A pre-fabricated, validated questionnaire consisting of 15 questions was used in assessing the objective of the study. The responses were tabulated as percentage of responses and inferential analysis was done using Chi-Square test.

Results: Of the 363 subjects who participated in the study, 45.2% were males and 54.2% were females. About 68% comprised of post-graduate students and the rest 32% were faculty members. 75.2% of the respondents had come across the term 'bioterrorism' during their practice period. Only 25.3% among the respondents were aware of the diseases that have a potential to spread from person to person. 65.8% were aware that inhalational form of anthrax is the most deadliest form of anthrax and only 25.3% could differentiate an upper respiratory tract infection from inhalational anthrax. 98% had not undertaken any training for dealing with bioterrorism event and 88.6% were interested to participate in training programs. 92.8% opined that dentists should be prepared for handling any such bioterrorism.

Conclusion: The results of the present study revealed that the dental post-graduate students and the dental faculty members have deficiencies with respect to their knowledge, perceived ability to recognize and preparedness towards a bioterrorism event. This deficiency was more frequently observed among the faculty members than the post-graduate students.

Key Words: Bioterrorism, dentist, knowledge, preparedness.

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INTRODUCTION

Throughout history, warriors have sought to devise more effective means of mass destruction. Biological weapons have been of interest for centuries and have been utilized in numerous battles. State-sponsored programs have intensively researched optimal organisms and techniques for their dissemination. Recent advances in molecular biology have allowed successful manipulation of bacteria and viruses to provide resistance to conventional treatments. Large stockpiles of such altered bio-weapons now exist and are available for terrorist use.¹

As defined by the Centers for Disease Control (CDC), bioterrorism is the "intentional or threatened use of bacteria, fungi, or toxins from living organisms to produce death or disease in humans, animals and plants," and involves "intimidation of nations or people to accomplish political or social ends."¹

Bioterrorism agents include bacteria, viruses, fungi and other microorganisms, as well as biotoxins produced by microorganisms, plants and animals that can kill or incapacitate. Because they can reproduce, biological agents have the unique potential to make an environment more dangerous over time. If used for hostile purposes, any disease-causing microorganism could be considered a weapon. These agents typically are found in nature, but it is possible that they could be changed to increase their ability to cause disease, to be resistant to current medicines or to be spread into the environment. Biological agents can be spread through the air, through water or in food. Terrorists may use biological agents because they can be extremely difficult to detect and do not cause illness for several hours to several days. Some bioterrorism agents, such as the smallpox virus, can be spread from person to person, while others, such as anthrax, cannot.²

Public health systems are designed to deal with a regular stream of crises that span a wide range. Health professionals are part of these systems and include, for instance, communicable disease specialists and emergency response personnel, who must be ready to respond to natural and man-made

disasters. The public health system has an integral and critical role in responding to threats to public well being, and thus requires a well-prepared workforce.³

The dental profession could potentially play a significant role in the emergency response to a major bioterrorism attack. If a major attack were to occur, little time will be available to develop a response. In preparation for fulfilling such a role if called upon, it is vital to identify the specific areas in which the dental profession can provide emergency assistance and to prepare dentists adequately. Dentists, as health professionals should be aware of the medical sequelae of bioterrorism including the diseases it spreads, systemic and oral manifestations it produces and most importantly the management of such patients who have encountered biological agents and developed health problems.⁴

Dentists play an important role as they are well prepared at the time of catastrophic events and are experts in barrier techniques and infection control. They are trained and skilled in administering drugs by injection, can place sutures and control bleeding. Also, they are able to participate in interdisciplinary professional groups; and well adapted at managing uncomfortable patients. They can be employed in prescription of medications, immunization, and distribution of medical supplies as well as manages victim triage.⁵ Dental identifications using forensic odontology helps in victim identification during natural and manmade disaster situations and in particular mass casualties normally associated with aviation disasters.^{6,7}

It is the recommendation of the American Dental Association (ADA) that the dental professionals can be a resource and with targeted education and training can effectively respond and assist during natural and other catastrophic disasters⁸ To carry out these roles effectively, a thorough knowledge and adequate training in bioterrorism preparedness and management, as well as the willingness to provide them are essential.⁹

Thus, this survey was conducted to assess the base of objective knowledge about bioterrorism, the perceived readiness to respond to a bioterrorism associated event and

the willingness to respond to such an event among the faculty members and postgraduate students of the dental colleges of Davangere city, Karnataka.

OBJECTIVES

1. To assess the knowledge, perceived readiness to respond to associated events and the willingness to respond to bioterrorism events among the faculty members and post graduate students of dental colleges of Davangere city, Karnataka.
2. To compare the knowledge, perceived readiness to respond to associated events and the willingness to respond to bioterrorism events between the faculty members and post graduate students of dental colleges of Davangere city, Karnataka.

METHODOLOGY

Study Design: A cross sectional descriptive questionnaire based survey was conducted among the faculty members and post graduate students in two dental colleges of Davangere city.

Study population:

The survey was conducted in two dental colleges of Davangere city, Karnataka. Questionnaires were distributed to the subjects who were present at the time of data collection. The subjects who were not willing to participate in the study and who did not return the questionnaire even after repeated intimation were excluded from the survey. A total of 363 samples that included 247 PG's and 116 faculty members participated in the survey. Prior to the survey, the permission was obtained from the Principals of the respective colleges and the programme was scheduled accordingly.

Questionnaire:

A structured, pretested questionnaire which consisted of 15 questions was employed to

assess the knowledge, attitude and preparedness regarding bioterrorism among post graduate students and faculty members of the dental colleges in Davangere city, Karnataka. The questions used were mainly close-ended. In the beginning of the questionnaire, the personal information regarding the respondents was obtained like age, sex, designation and teaching experience.

Ethical considerations:

Ethical approval was obtained from the ethical committee of College of Dental Sciences, Davangere. Informed consent was obtained from all the participants.

Statistical Analysis:

All returned questionnaires were coded and analyzed. Results were expressed as a number and percentage of respondents for each question and were analyzed using the SPSS Version 21 software. Chi-square test was performed to analyze the significant difference in the response if any between the faculty members and post graduate students. The level of significance was set at $p=0.05$.

RESULTS

Of the 363 subjects who participated in the study, 45.2% ($n=164$) were males and 54.2% ($n=199$) were females. About 68% ($n=247$) of the samples comprised of post graduate students and the rest 32% ($n=116$) were faculty members. (Table I)

TABLE I: Profile of respondents

VARIABLE	N	%
GENDER		
MALE	164	45.2%
FEMALES	199	54.8%
QUALIFICATION		
POST GRADUATE STUDENT	247	68%
FACULTY	116	32%

Table II shows response in percentage to the questions. Majority of the respondents (75.2%) had come across the term 'bioterrorism' during their practice period. Only 25.3% (n=92) among the respondents were aware of the diseases that have a potential to spread from person to person in any such event. The response differed significantly among post graduate students in comparison to faculty members ($p < 0.001$). When asked about the various diseases which can be used as biological terrorism threats in case of any bioterrorism events, very few (31.1%) of the respondents said that botulism, anthrax, smallpox and plague are the diseases, the correct response being significantly greater among post graduate students ($p = 0.008$).

Most of the respondents (65.8%) were aware that inhalational form of anthrax is the most deadliest form of anthrax and only few of the respondents (25.3%) could differentiate an upper respiratory tract infection from inhalational anthrax. The difference in giving a correct response was significantly different among postgraduate students and faculty members ($p = 0.001$) for both the questions.

Over half the number of respondents, 55.4% (n=201) were aware of the infection control measures which are recommended in case of a suspected or confirmed case of smallpox (Table III). Only 37.7% (n=137) of the respondents were aware of the critical measures to be used in

case of preventing any contact transmission of vaccinia virus (Table IV). There was a significant difference in the awareness between staff and faculty members ($p < 0.001$) in both the cases.

About 43% of the respondents were able to identify the most common early presenting symptoms associated with the majority of the high risk bioterrorism associated diseases. When asked about their ability to identify and recognize a bioterrorism event, only 47.7% of the respondents said they had fair knowledge.

About ninety eight percent (n=352) of the respondents had not undertaken any training for dealing with bioterrorism event and majority (88.6%) of the respondents were interested to participate in any such training programs regarding bioterrorism.

Vast majority (92.8%) of the respondents were of the opinion that dentists should be prepared for handling any such bioterrorism events and 93.6% (n=338) were of the opinion that the subject of bioterrorism should be included in the curriculum of dental students

Only 53.2% (n=192) of the respondents agreed that they could recognize the oral manifestations of the bioterrorism agents used in any bioterrorism event. Vast majority (95%) of the respondents were willing to provide assistance to the state in response to any such bioterrorism event.

TABLE II: Response to the questions

Sl.No.	QUESTION	OPTIONS	RESPONSE
1	Have you come across the term 'bioterrorism'?	Yes	75.2%
		No	24.8%
2	Which of the following diseases have potential for person to person spread?	Anthrax and plague	57.85%
		Plaque and botulism	5.50%
		Botulism and brucellosis	4.95%
		Small pox and plague	25.34%
		Small pox, plague & anthrax	6.33%
3	Which of the following is the deadliest form of anthrax?	Cutaneous	14.32%
		Gastrointestinal	12.94%
		Inhalational	65.84%
		Bubonic	6.88%

4. Which of the following symptoms is/are not commonly found in inhalation anthrax and if present could help differentiate an upper respiratory tract infection from anthrax?	Rhinorrhoea& sore throat	27.54%
	Dyspnoea	13.49%
	Meningeal signs	41.87%
	Vomiting	17.07%
5. The most common early presenting syndrome associated with the majority of high risk ("Category A") bioterrorism-associated diseases (i.e., anthrax, botulism, plague, smallpox, tularemia, and viral hemorrhagic fevers) is:	Acute bloody diarrhea	15.97%
	Influenza like illness	42.97%
	Acute hepatitis	7.71%
	Fever and rash	33.33%
6. How do you perceive your ability to identify and recognize a BT (bioterrorism) event in	Very good	4.40%
	Good	17.63%
	Fair	47.65%
	Poor	30.30%
7. Have you undertaken any training for dealing with BT (bioterrorism) event?	Yes	2%
	No	98%
8. Are you interested in participating in the training procedures?	Yes	86.6%
	No	13.4%
9. Do you feel it is important for dentists to be prepared for any such bioterrorism event?	Yes	92.8%
	No	7.2%
10. Is it worth to include the knowledge of bioterrorism in the curriculum of dental schools?	Yes	93.6%
	No	6.4%
11. Perceived ability to recognize oral manifestations of bioterrorism agents.	Yes	53.2%
	No	46.8%
12. Are you willing to provide assistance to the state in response to a bioterrorism event?	Yes	95%
	No	5%

TABLE IV:
Response when asked about the critical measures used to prevent the contact transmission of vaccinia virus.

Option	Response (%)
Isolation of the person in a negative air pressure room.	7.7
Protective clothing for healthcare workers in contact with patients.	6.6
Vaccination of persons involved with direct medical care of suspected cases.	26.5
Monitoring contacts of suspected smallpox cases for febrile illness.	3.8
All of the above	55.4

TABLE III:
Response when asked about the infection control measures recommended for a suspected or confirmed person with smallpox.

Option	Response (%)
Thorough hand washing after contact with vaccination site.	37.7
Isolation of vaccinated person.	20.6
Use of a porous bandage to cover vaccination site.	9.9
Antibacterial ointment applied to the vaccination site.	5.2
Application of the vaccine at an anatomical site normally covered by clothing.	25.6

DISCUSSION

Bioterrorism has become a significant threat to the world and a challenge to public health if not diagnosed early. Exposure of civilians to bioterrorism agents may result in severe health problems if not treated within sufficient time, and the effects may last longer or can be transferred to the next generation.¹⁰

In June 2002, the American Dental Association (ADA) convened a national workshop to determine the potential role for dentistry in the event of a bioterrorism attack. A consensus statement arose from the workshop recognizing the valuable assets that dentists could contribute in response to a bioterrorism event.¹¹

Dentists in the armed forces have been trained in handling various emergency situations. Galligan has reported that dentists were a part of Disaster Mortuary Operational Response Teams and contributed to disaster management¹². Dental professionals'

involvement in identifying victims and human remains, and in dealing with mass suicides, mass graves, homicides, and terrorist attacks also have been reported^{7,13}.

The present study included 247 post graduate students and 116 faculty members of the two dental colleges of Davangere city, Karnataka.

Majority of the respondents (75.2%) had come across the term 'bioterrorism' during their practice which reflects that the respondents have some knowledge of such an event. When asked about the diseases that have the potential to spread from person to person, only 25.3% (n=92) were aware that smallpox and plague are the diseases. These results were in accordance with the study conducted by Menon I. et al on dental faculty members in Uttar Pradesh, India in the year 2010⁴ and the results are in contrast with the study conducted by Katz AR et al among Hawaii dentists in the year 2006¹¹ wherein majority (87.2%) of the dentists responded correctly.

Only 31.1% (n=113) of the respondents were able to identify the diseases which can be good biological threats in any bioterrorism event. The results of our study were similar to the study conducted by Menon I. et al. in Uttar Pradesh, India in 2010⁴ and the results were in contrast to the study conducted by Katz AR et al in Hawaii in 2006¹¹. Most number of the respondents (65.8%) were aware that inhalational anthrax is the most deadly form of anthrax in the present study, the results of which are in accordance to the studies conducted by Menon I. et al in Uttar Pradesh, India,⁴ and by Katz AR et al in Hawaii¹¹.

About 25.3% (n=92) of the respondents could identify the symptoms that could differentiate inhalational anthrax from an upper respiratory tract infection. These results show that the respondents lack the abilities in diagnosing a case of inhalational anthrax from an upper respiratory tract infection. The results of our study are similar to the study conducted by Menon I. et al in Uttar Pradesh, India⁴ and are in contrast to the study conducted by Katz AR et al in Hawaii¹¹ which shows that the dentists of Hawaii are able to diagnose such cases of anthrax more efficiently.

Most of the respondents (55.4%) in our study were aware of the infection control measures that are recommended for a person with suspected or confirmed diagnosis of small pox. The results are in concordance with the study conducted by Katz AR et al in Hawaii¹¹. Only 37.7% (n=137) of the respondents were aware of the critical measures to be undertaken in preventing the contact transmission of vaccinia virus. This depicts the poor knowledge of the respondents regarding the various infection control measures to be undertaken in such cases. The results are in contrast with the surveys conducted by Katz AR et al in Hawaii¹¹ and by Menon I. et al in Uttar Pradesh⁴.

Around 43% (n=156) of the respondents could recognize the most common early presenting syndrome associated with the majority of the high risk bioterrorism associated diseases. The results are similar with the studies conducted by Katz AR et al in Hawaii¹¹ and by Menon I. et al in Uttar Pradesh⁴.

Forty eight percent (n=173) of the respondents said that they had fair knowledge with respect

to identifying and recognizing a bioterrorism event. Less than 3% of the respondents had received previous bioterrorism preparedness training, and this result is in accordance with studies conducted by Katz AR et al in Hawaii¹¹ and by Bhatt et al in India⁹.

It is note worthy that despite low objective knowledge test scores and the perception of being ill-prepared, more than 95% (n=343) percent of dentists expressed willingness to provide assistance to the state in response to abioterrorism event. These findings are similar to the studies conducted by Katz AR et al and Menon I. et al In Hawaii and Uttar Pradesh^{4,11} respectively.

Around 90 % of the respondents showed their willingness to participate in training procedures regarding bioterrorism and were also of the opinion that the topic regarding bioterrorism is worth to be included in the curriculum of dental students so that in the future if any such event occurs, the dentists can assist the country to fight back such an in-human act. In addition, the ADA and the American Dental Education Association recommended that a core set of competencies related to bioterrorism preparedness be incorporated into the curriculum of all dental schools, and that "all dentists should receive at least a basic level of bioterrorism training, including training that would enable them to recognize diseases."¹⁴

As Jeffcoat wrote in a Journal of American Dental Association(JADA) editorial, "All of us, dentists and physicians alike, need a crash course on the specifics of bioterror weapons. ... Learn what can be done for the victim, by you and by others. Learn how each disease is transmitted, and how to protect yourself and others from infection."¹⁵

It is this recommended that all dental students should be trained in a core set of competencies enabling them to respond to a significant bioterrorism attack, help contain the spread of the attack, and participate in surveillance activities as appropriate upon direction of proper authorities.⁷

CONCLUSION

The results of the present study revealed that

the dental post graduate students and the dental faculty members have deficiencies with respect to their knowledge, perceived ability to recognize and preparedness towards a bioterrorism event. This deficiency was more frequently observed among the faculty members than the post graduate students. The results indicate that the post graduate students and faculty members are less well prepared in managing cases of any such bioterrorism event thus highlighting the need of introducing the topic of bioterrorism in the curriculum. Additional bioterrorism preparedness training should be made available through continuing education. Even with their perceived weaknesses on the subject, the post graduate students and faculty members expressed their willingness to assist the state in its bioterrorism response activities, according to the survey in this study. Hence, it is strongly urged that a high priority be set for providing these professionals with the knowledge and training necessary to improve their ability to respond effectively in such an event.

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