Knowledge Regarding Biological Terrorism among Medical Physicians in Goa

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Introduction: The danger of using biological warfare for mass destruction is a serious threat to this country. Thus, it is necessary that our health care services are prepared to efficiently manage any such unfortunate events that we may have to face in future. Physicians in the public and private sector of health services are the first point of contact between public and health services. Thus, the present study examines the awareness of medical physicians in Goa about biological terrorism to evaluate the need for further education in this field.

Methods: The present cross-sectional study was conducted among the medical physicians in Goa using purposive sampling method. The self-administered questionnaire collected information regarding the qualification, work setting of the study participants and knowledge regarding biological terrorism. Data was entered and analysed using SPSS version 22. Descriptive statistics was utilized to study frequencies and proportion of various study variables.

Results: Of the 200 study participants, 128 (64%) were Specialist doctors, 65 (32.5%) were General physicians, while 7 (3.5%) were Super-specialist doctors. Of the 200 study participants, 174 (87%) reported that they were aware of the use of biological agent for mass destruction of human lives. As much as 34 (17%) study participants could not list any agent of bioterrorism.

Conclusion: The knowledge of medical physician in Goa regarding bioterrorism is low, which is a matter of concern as these medical professionals are the first point of contact for the patients affected by an attack of bioterrorism.

Keywords: Bioterrorism, Knowledge, Physicians

Introduction
As early as 1320 BC, infectious diseases were reportedly used as weapons during wars for mass destruction of property and human lives. India has seen several terrorist attacks right from 1993 Bombay bomb blasts to 2018 Sukma attacks that have not only caused mass destruction but also created major fear among the people of India. Terrorist attacks in India is a real and constant problem of National security. Biological terrorism is the intentional release of a biological agent (s) or toxin (s) to incapacitate or kill humans, animals, or plants. The danger of using biological warfare for mass destruction is a serious threat to this country. Thus, it is necessary that our health care services are prepared to efficiently manage any such unfortunate events that we may have to face in future. Physicians in the public and private sector are the first point of contact between public and health services. Thus, medical community plays an important role in secondary prevention by participating

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How to cite this article: Cacodcar J, Bicholkar A, Kumar P et al. Knowledge Regarding Biological Terrorism among Medical Physicians in Goa. Epidem Int 2018; 3(4): 10-13.

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in disease surveillance and reporting the first indication of biological weapons use. It is necessary that these medical physicians are adequately trained and informed about the diagnosis, treatment and reporting of such events at the earliest to initiate the much needed control measures to reduce further damage to life and property.

One of the biggest threats from terrorists involves the deliberate harmful use of biological agents. These are attractive instruments of terror because they are relatively easy to produce, capable of causing mass casualties, difficult to detect and likely to generate widespread panic and civil disruption. The dissemination of Bacillus anthracis through the U.S. postal system in 2001 demonstrated the vulnerability of United States and the world to the unleashing of a host of dangerous microbes. Any such unforeseen catastrophe in India is likely to cause much more panic and casualties owing to its overcrowded cities and towns, poor planning and disaster preparedness and inadequate primary health care services.

This study therefore, attempts to assess the awareness of medical physicians of Goa about biological terrorism and to evaluate the need for further education in this field.

Materials and Methods
The present cross-sectional study was conducted among the medical physicians in Goa using purposive sampling method. The self-administered questionnaire was administered to the study population prior to local meetings of IMA, Goa as well as wards and OPDs of Goa Medical College and Hospital. All the physicians present for the IMA meeting and willing to participate in the study were included. Also, resident doctors from various speciality departments like Medicine, Surgery, Orthopaedics, Community Medicine etc. were approached as per convenience and included in the study. Those who did not give consent were excluded from the study. The questionnaire included brief information about the study and necessary instructions needed to participate in the study.

The questionnaire collected information regarding the qualification, work setting of the study participants and awareness regarding biological terrorism. It covered the basic knowledge regarding bioterrorism and aspects of outbreak response.

Ethics clearance was taken from the Institutional Ethics Committee of Goa Medical College. Prior to starting the survey, the participants were informed that answering the questionnaire implies they give their full consent to use their responses for the study and for research publication without revealing their identity in any form. The study participants were free to refuse consent to participate. Confidentiality was assured and maintained.

Statistical Analysis
Data was entered and analysed using SPSS version 22. Descriptive statistics was utilized to study frequencies and proportion of various study variables.

Results
Of the 200 study participants, 128 (64%) were specialist doctors, 65 (32.5%) were general physicians, while 7 (3.5%) were super-speciality doctors. A majority of the study participants i.e. 128 (64%) were working in government sector while 72 (36%) were working in private sector. On inquiry about their principal work field, it was reported that a majority i.e. 85 (42.5%) of the study participants worked in an inpatient setting, while 46 (23%) were primarily involved in providing primary care to the patients. Only 4 (2%) study participants were primarily involved with administrative duties Table 1.

Table 1. Occupational characteristics of the study population

| Field of work          | Frequency | Percentage |
|------------------------|-----------|------------|
| In-patient care        | 85        | 42.5       |
| Primary care           | 46        | 23         |
| Public health          | 21        | 10.5       |
| Emergency services     | 18        | 9          |
| Medical college faculty| 14        | 7          |
| Laboratory             | 12        | 6          |
| Administration         | 4         | 2          |
| Total                  | 200       | 100        |

Of the 200 study participants, majority i.e. 174 (87%) reported that they were aware of the use of biological agent for mass destruction of human lives. As much as 34 (17%) study participants could not list any agent of bioterrorism. Anthrax was reported as agent of bioterrorism by 101 (50.5%), Botulinum by 49 (24.5%), Smallpox by 45 (22.5%) and Ebola was reported by 26 (13%) of the study participants. Malaria and E. coli was reported as agent of bioterrorism by 1 (0.5%) of the study participants each Table 2.

The assessment of awareness of the study participants about agents of bioterrorism with person-to-person transmission revealed that 76 (38%) were not aware of any such biological agent. Only 37 (18.5%) were aware
Table 2. Biological agents considered as agents of bioterrorism by the study population

| Infectious agent | Frequency | Percentage |
|------------------|-----------|------------|
| None             | 34        | 17         |
| Anthrax          | 101       | 50.5       |
| Botulinum        | 49        | 24.5       |
| Small Pox        | 45        | 22.5       |
| Ebola            | 26        | 13         |
| HIV              | 18        | 9          |
| Plague           | 16        | 8          |
| Tularaemia       | 11        | 5.5        |
| Cholera          | 11        | 5.5        |
| Brucella         | 8         | 4          |
| SARS             | 7         | 3.5        |
| Influenza        | 5         | 2.5        |
| TB               | 3         | 1.5        |
| Chicken Pox      | 2         | 1          |
| Diphtheria       | 2         | 1          |
| Typhoid          | 2         | 1          |
| Dengue           | 2         | 1          |
| Hepatitis        | 2         | 1          |
| Malaria          | 1         | 0.5        |
| *E.coli*         | 1         | 0.5        |

Table 3. Agents of bioterrorism with potential of person-to-person transmission as reported by the study participants

| Agent            | Frequency | Percentage |
|------------------|-----------|------------|
| None             | 76        | 38         |
| Anthrax          | 37        | 18.5       |
| Ebola            | 16        | 8          |
| Small Pox        | 14        | 7          |
| Plague           | 12        | 6          |
| HIV              | 10        | 5          |
| Influenza        | 4         | 2          |
| Cholera          | 3         | 1.5        |
| Tularaemia       | 2         | 1          |
| Hepatitis        | 1         | 1          |

Table 4. Knowledge of the study participants regarding bioterrorism

| Knowledge                                      | Frequency | Percentage |
|------------------------------------------------|-----------|------------|
| Attributes of agent of bioterrorism            | 64        | 32         |
| Public health response to an outbreak          | 98        | 49         |
| Requirements for public health response preparedness | 82        | 41         |
| Personnel who can report a suspected bioterrorism attack | 130       | 65         |
| Personnel responsible for bioterrorism attack preparedness | 68        | 34         |
| Key components of national preparedness plan   | 99        | 49.5       |

of anthrax, 16 (8%) were aware of Ebola while Smallpox and Plague was reported by 14 (7%) and 12 (6%) study participants respectively Table 3.

Table 4, shows the awareness of the study participants about various aspects of bioterrorism. On inquiry about the attributes as per the Centers for Disease Control and Prevention (CDC) that determine whether a biological agent is an agent of bioterrorism, only 64 (32%) of the study participants responded correctly. As much as 98 (49%) of the study participants were aware of the correct public health response to an outbreak. A high number of study participants i.e. 108 (54%) were not aware of the requirements for public health response preparedness in an event of an outbreak.

Table 4. Knowledge of the study participants regarding bioterrorism

| Knowledge                                      | Frequency | Percentage |
|------------------------------------------------|-----------|------------|
| Attributes of agent of bioterrorism            | 64        | 32         |
| Public health response to an outbreak          | 98        | 49         |
| Requirements for public health response preparedness | 82        | 41         |
| Personnel who can report a suspected bioterrorism attack | 130       | 65         |
| Personnel responsible for bioterrorism attack preparedness | 68        | 34         |
| Key components of national preparedness plan   | 99        | 49.5       |

On inquiry about the personnel who can report a suspected attack of bioterrorism, 130 (65%) study participants correctly responded that Epidemiologist, Primary healthcare providers, Laboratorians as well as Emergency service personnel like fire and police can report such an attack. Of the total study participants, only 68 (34%) correctly responded that not only private and public healthcare providers but also the public health officials and law enforcement personnel were responsible for bioterrorism attack preparedness. Only about half i.e. 99 (49.5%) of the study participants were aware of the key components of a National emergency preparedness plan.

Discussion

Of the 200 study participants, majority i.e. 174 (87%) reported that they were aware of the use of biological agent for mass destruction of human lives. Though, a high number of participants were aware of such a possibility, it is not enough to deal efficiently with an unfortunate event of biological warfare. The health personnel should be trained in not only detecting an attack of bioterrorism but also should be capable of managing patients affected by it. Thus, the most important step against bioterrorism is to reinforce knowledge of healthcare providers regarding agents of biological warfare to detect and respond quickly to a bioterrorism attack.

As much as 34 (17%) study participants could not list any agent of bioterrorism while Anthrax was reported as
agent of bioterrorism by 101 (50.5%), Botulinum by 49 (24.5%), Smallpox by 45 (22.5%) and Ebola was reported by 26 (13%) of the study participants. Thus, a significant number of healthcare professionals are unaware of possible agents of biological warfare which is alarming as they are the first point of medical response in management of patients affected by biological warfare. Familiarity with these infectious agents can expedite diagnosis and initial management leading to a successful public health response to such an attack.¹

Only 32% of the study participants were aware of the CDC attributes of an agent of bioterrorism. In a similar study done among medical and dental interns by Chaudhari A et al., it was reported that 43% of medical interns and 86% of dental interns were unaware of different categories of bioterrorism agents given by CDC, Atlanta.² Only 49% of the study participants were aware of the correct public health response to an outbreak. This may be because of lack of compulsory training of medical physicians with regards to outbreak response and prevention. The medical curriculum in India does not cover bioterrorism and its management in detail nor there are regular workshops and training for medical physicians to correctly diagnose and respond to a suspected attack of bioterrorism. This also explains the low proportion of study participants who were aware that not only private and public healthcare providers but also the public health officials and law enforcement personnel were responsible for bioterrorism attack preparedness.

**Conclusion**

In conclusion, the knowledge of medical physician in Goa regarding bioterrorism is low, which is a matter of concern as these medical professionals are the first point of contact for the patients affected by an attack of bioterrorism. Thus, it is necessary that basic knowledge and training regarding bioterrorism should be included in the current medical curriculum. Also, there should be regular CMEs and workshops on bioterrorism for hands-on training of the medical physicians and trainee medical doctors. Further emergency response training should be available to individuals interested in gaining additional knowledge and skills to assist in response to an attack of bioterrorism. A robust public health surveillance system is the primary vehicle through which an unusual emerging infectious disease or bioterrorism event will be detected.

**Acknowledgement**

We would like to acknowledge Dr. Manojkumar Kulkarni, Associate Professor in Biostatistics, Goa Medical College for providing the necessary guidance in analysis and interpretation of the results of this study.

**Conflicts of Interest:** None

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