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RESEARCH ARTICLE

THE ROLE OF DENTIST IN DISASTER MANAGEMENT :INDIAN PERSPECTIVE

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Abstract

Emergencies and disasters not only affect the health and well-being of people; frequently, a large number of people are dead, injured, or subjected to greater risk of epidemics. The fundamental aspects of Disaster Management include Disaster Response, Disaster preparedness, and disaster mitigation. Dentists are one of the important constituents of the health team, yet their role or utility has not been emphasized till date. The various activities carried out by Dentists for the purpose of Disaster Management include providing support to First responders, Disease surveillanceand Forensic assistance.

Introduction:-

A Disaster is an occurrence that disturbs the normal living conditions and causing a level of suffering that exceeds the capacity of adjustment of the affected community[1]. The roles of traditional first responders shift in case of severe disaster events, particularly when the number of victims overflows the hospitals and clinics. In such situations, dentists and dental auxiliaries play a vital role in response to disaster by a wide range of skill sets based on personal experience, training and enthusiasm [1]. Disasters may be man- made or natural which include, earthquakes, cyclones, floods, tidal waves, land- slides, volcanic eruptions, tornadoes, fires, hurricanes, snow storms, severe air pollution smog, heat waves, famines, epidemics, building collapse, toxicologic accidents (e.g., release of hazardous substances), nuclear accidents, and warfare[2]. Disasters are as old as human history, but the dramatic increase and the damage caused by them in the recent past have become a cause of national and international concern; almost all of them resulting in high incidence of morbidity and mortality. Mass disasters are highly unexpected events that cause alarming loss of lives. A "disaster" can be defined as "any occurrence that causes damage, ecological disruption, loss of human life or deterioration of health and health services on a massive scale sufficient to warrant an extra ordinary response from outside the affected community or area [2]. Like all comparative disciplines odontology is grounded in two principles: firstly, that humans are unique, i.e., nature does not repeat itself, and secondly, that macroscopic and microscopic variation occurs to allow individualization . The degree of variation may decrease with genetic closeness but even so-called identical twins can be differentiated dentally. The rationale for use of dental comparison techniques to establish identity is based on the recognition that teeth and dental restorations are resistant to destruction, illustrated in, they exhibit differences facilitating highly

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variable patterns and that most people have, during their lives, visited a dentist and/or had facial photographs taken to provide ante-mortem data.[3] In case of severe disaster events, particularly when the number of victims overflows the hospitals and clinics. In such situations, dentists and dental auxiliaries play a vital role in response to disaster by wide range of skill sets based on personal experience, training and enthusiasm.[13] The implementation of thorough identification procedures ensures that human remains are given back a name and an identity. It also contributes towards the respecting of medico-legal, ethical, socio-cultural, psycho-social, religious principles and humanitarian values[14].

Role of a Dentist in identification of human remains:

The important role of dentists the identification process is reflected from the event where high percentage of victims were identified via dental examination (61%) in the Tsunami disaster of 26th of December in 2004, north of Sumatra Island.

Types of Disaster Management:

Disasters are classified into two types, namely:

Natural disasters are physical peculiarities caused either by quick or slow beginning occasions that promptly affect human wellbeing and auxiliary effects bringing on additional demise and languishing. Natural disasters are further classified into 5 types.

- **Geophysical natural disasters:** Naturally occurring disasters like a volcanic eruption, tsunamis, earthquakes, and landslides are some of the major forms of geophysical natural disasters.
- **Hydrological natural disasters:** Naturally occurring disasters like avalanches and floods are the major forms of hydrological natural disasters.
- **Climatological natural disasters:** Naturally occurring disasters like extreme temperatures, forest fires, and global warming are some of the major forms of climatological disasters.
- **Meteorological natural disasters:** Naturally occurring disasters like cyclones and storms are the major forms of meteorological disasters.
- **Biological natural disasters:** Naturally occurring disasters like disease epidemics and plagues are the major forms of biological disasters.

Manmade Disasters

Manmade Disasters are the events that are brought about by human beings which happen in or near human settlements frequently caused as a consequence of Environmental or Technological Emergencies. Manmade disasters are further classified into three types.

- **Gas leakages:** Gas spills are quite possibly the riskiest man-made disaster on the planet. They can straightforwardly carry unfortunate results to human well-being and the climate. Gas breaks can likewise spread rapidly without notice. It might cause a huge blast and claim human lives.
- **Oil spillages:** Oil spills adversely affect marine creatures. Since the majority of the oil floats in water, the daylight engrossing limit of the water diminishes. Oil spills are serious natural contamination. A ton of poisons are flushed into the air and soil.
- **Nuclear explosions:** Nuclear explosions cause serious damage to the atmosphere and soil and also have a long-lasting impact on the health of the inhabitants.

Disaster Management Organizations

- **National executive committee (NEC):** NEC readies the National Plan for Disaster Management according to the National Policy on Disaster Management.
- **State Disaster Management Authority (SDMA):** It is the state disaster management organization that deals with wit-disaster planning. The chief minister of the state is the head of the state disaster management authority.
- **District Disaster Management Authority (DDMA):** It is the district disaster management organization that deals with disaster planning. The Collector or deputy commissioner of the district is the head of the state disaster management authority.

(a) Levels of Disaster:
Major Disasters in India:

- 1984 Bhopal Gas Tragedy
- 2001 Gujarat earthquake
- 2004 Indian Ocean tsunami
- 2008 Mumbai attacks
- Uttrakhand floods2013
- Jammu Kashmir floods2014
- 2016 Uttarakhand forest fires.
- 2018 Indian dust storms.
- 2019-20 Corona virus pandemic

Objective of Disaster Management :

- Reduce (avoid, if possible) the potential loss from hazards.
- Assure prompt and appropriate assistance to victims when necessary.
- Achieve rapid and durable recovery. [1]

Dental Professional and Response:

(a). Triage Services: Triage is derived from French word 'trier', which means to sort-out. During a mass casualty event when there may be deficiency of personnel, facilities, and medical supplies, it may not be possible to give immediate treatment for all casualties. In such situations, triage must be done to prioritize treatment plan. Dentists hence can provide assistance in these treatment procedures without further training. This provides additional help to physicians providing definitive care for patients most urgently in need rather than screening casualties. Dental offices could serve as triage centers if needed, Red color indicating high priority treatment or transfer. Yellow color for medium priority. Green color for ambulatory patients. Black color is for dead or moribund patients.[1]

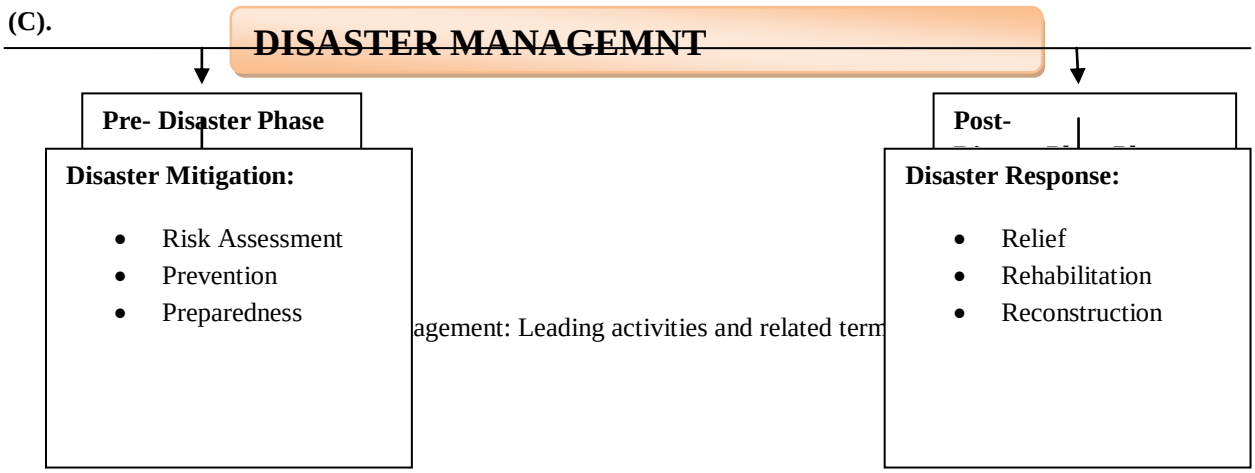
(b). Forensic Assistance: This is one area which makes the dental professionals unique in disastrous events. Identification of human remains to mass disaster management, including the assessment of bite marks and patterned skin injuries a long with the use of dental materials in the examination of evidence. Dental identifications play a key role in victim identification during natural and manmade disaster events. The legislation compels dental professionals to produce and maintain adequate patient records. Dental records can also find their use in forensic cases, teaching and research, as well as in legal matters. Comprehensive and accurate records are a vital part of dental practice.[1]

(0). Role of dentists during an emergency

The role of dentists in national emergencies has its origin since the inception of forensic field. During World War II, dentists in conjunction with medical fraternity participated in the emergency care of the injured. The assignment of a specific role to an individual dentist depends on the state of organization of the Emergency Health Services at the community level. However, it is considered that the immediate needs in terms of professional personnel will be more critical in relation to primary treatment services, irrespective of the fields they are concerned with. Apart from the routine duties, additional functions for dentists under mass casualty conditions would comprise of:

(a) First- Aid , including artificial respiration, emergency treatment of open chest wounds, relief of pain, treatment of shock and the mobilization of casualties towards the disastrous events
(b) Control of hemorrhage
(c) Attainment and maintenance of patent airway, and intra- tracheal intubation including tracheotomy
(d) Proper and adequate cleansing, debridement, and treatment of wounds
(e) Bandaging and splinting
(f) Triage of facial and oral injury cases
(g) Administration of anesthetics under medical supervision
(h) Assisting in surgical procedures apart from oral procedures
(i) Insertion of naso- gastric tubes for lavage, as instructed
(j) Administration of whole blood and intravenous solutions, as directed
(k) Administration of parenteral medication
(l) Urethral catheterizations
(m) Administration of immunizing agents to avoid future complications as directed [2].

(C).



agement: Leading activities and related term

(0). Dental Surveillance:
Dentists can be a part of effective surveillance network by getting updated on the information on unusual syndromes in the community as well as unusual clinical presentations. Dentists can also notify the public health authorities about the presence of patients with intra-oral or coetaneous lesions or both, thus helping the early detection of a bioterrorism attack. Early detection of an infectious agent in a population can lead to reduction in mass casualties by prompt prevention and therapeutic methods[1].

(d). Dental Offices Acting as Medical Sites:
Dental offices are well equipped and supplies to serve as decentralized auxiliary hospitals in case the need arises. Availability of air and suction lines, X-ray equipment and sterilizing techniques in dental offices can be used as self-contained alternate medical sites if hospitals are under attack or are unsafe because of widespread infection associated with biological weapons. No other health professional has such well-equipped clinic to provide as alternative medical site for use during an event of catastrophic disaster [1].

(e). Distribution of Medication:
Dentists can prescribe and dispense the required medications, after the outbreak of the disease; this can be guided by public health officials. Patients can be monitored by dentists for adverse reactions and side effects, and if necessary, they can be referred to physicians for further treatment. Dentists can also be a source of information about the medication and its use, side effects and the need for compliance for the patient [1].

(f). Immunization:
The number of physicians and nurses available may not be able to implement immunization programs in limited time. In urgent programs, trained dentists can participate in mass immunization programs. Dental clinics can also be considered as immunization sites to minimize the concentration of potentially infected patients[1].

(g). Infection Control:
They are well versed and well-practiced for asepsis and can bring their expertise to mass casualty situations. Dentists can help to prevent decontamination casualties from certain bioterrorism attacks in which contact with patients‘ clothing or skin surfaces may also lead to the spread of infection to caregivers. Dentists already familiarized with the disaster mortuary activities can be useful in managing the remains of victims whose death is a result of infectious events[1].

(h). Supporting Other Health Professionals:
It is the responsibility of the private practitioners and local dental societies to make the local emergency response planners aware of the services rendered by the dental profession at the time of disaster. Dentists can be recruited to provide certain services that only physicians can do when there are inadequate local medical resources to cope adequately with increasing number of patients. Dentists can enhance the surge capacity of the local medical system until another team of physicians can arrive or the demand for immediate care decreases[1].

Definitive Treatment:
OMFS are appropriately trained to provide first aid, endotracheal intubation, cardiopulmonary resuscitation as well as aesthetic and surgical services to patients with different injuries. Dentists can identify the infectious disease that causes mass casualties and can recognize the sign and symptoms of that disease. Dentists regularly collect salivary samples, nasal swabs, or other specimens for laboratory processing, leading to proper diagnosis, information about progress of the treatment and the status of the infection of patient[1].

Quarantine:
During a pandemic or after a bioterrorism attack with a communicable agent, strict quarantine restrictions should be imposed primary care providers may become infected directly or through contact with patients seeking care. Dentists may not be similarly infected by patients because ill patients do not seek care from dentists and, if sufficiently ill, do not keep scheduled dental appointments. Dentists may be called on to provide some primary health care for people in the quarantined area[1].

Post Event:
Dentists are able to spot re-emergence of infection in areas previously considered under control. Dentistry should participate actively in the emergency, public health and medical community post event analysis to determine how the immediate response to mass casualty events can be improved and how dentistry role can be enhanced [1].

Providing Forensic assistance:
Dental identifications have always played a key role in victim identification during natural and manmade disaster situations and in particular mass casualties normally associated with aviation disasters. At the onset of disaster, various teams of dentists can be established to start collecting antemortem data based on the list of missing persons. Once these records have been compiled, forensic odontologists can begin comparisons between remains and antemortem records[5].

Online Consulting and Prescribing:
The demand for medical care has increased due to the corona virus pandemic, but it was not convenient for patients to go to the hospital for medical treatment. Dental professionals conducted medical consultations through online consultation platforms, including answering patients' questions, relieving patients anxiety, and prescribing required medications. In this way, they helped reduce the admission of mild cases to the hospital, and reduced the risk of cross infection[7].

Collecting and Distributing Medical Supplies:
Dental professionals participated in the collection of medical protective equipment such as masks, goggles, and disposable protective clothing. They also assisted hospital logistics personnel with counting and handing out protective equipment and medicines.

Medical Evacuation and Transfer:
Dental professionals participated in the medical evacuation and transfer of suspected and confirmed cases of COVID-19 with negative pressure ambulances, paying special attention to the airway management and vital signs of patients during transit. Moreover, the dentists comforted the patients with good communication skills and disinfected the vehicles after transit.[7]In this dental mission, active information exchange with medical staff was necessary. the public health nursing team provided oral hygiene instruments to public health nurses forhouse calls, and other medical staff provided us with clinical information[11].

Community Volunteering:
Dentists were well-versed in community infection control. They helped quarantine suspected cases, monitored temperature by infrared thermometer, registered personal information, provided COVID-19 prevention knowledge, assessed the management of community personnel and vehicles, recycled used masks, and disinfected the community environment [7].

Psychological Comfort:
The outbreak of COVID-19 had the potential to cause panic and trigger overblown anxiety in the population. Dental professionals participated in sharing knowledge about COVID-19, comforting people over the phone or online,

relieving their stress and anxiety, and enhancing their confidence in successful resolution of the COVID-19 pandemic[7].

Providing Wards for the Injured:
The department of oral and maxillofacial surgery could provide vacant wards and beds to the injured, and dentists could assist surgeons with taking in and managing postoperative patients[7].

Provision of Oral Health Services:
Oral health is also difficult to maintain for rescuers and earthquake victims in temporary shelters. The poor oral health due to harsh living conditions and psychological stress can easily cause gingivitis, pulpitis, periodontitis, ulcers, and lichen planus. The normal medical infrastructure and dental facilities were seriously damaged in the earthquake. Dentists could deal with the oral disease with portable dental equipment, relieving the suffering of the patients[7].

Donation of Dental Care Products and Provision of Oral Health Education:
Prevention is very important. A lack of medicines and dental care products such as toothpastes, toothbrushes, floss, and mouthwashes may lead to poor oral health, and oral diseases might occur easily as a result. In these natural disasters, dentists could procure and donate medicines and dental care products to rescuers and victims, helping to reduce oral diseases. Dentists could also provide guidance to maintain the oral health of individuals with pre existing conditions, through educational materials, lectures, posters, and dental counseling [7].
Regular Training Plan: Public health emergency training could also be made a necessary skill for dental students in universities, and incorporated into curriculum assessments. Targeted training could also be carried out on regional emergency responses like major epidemics or disasters. Medical Doctor Association, could provide free and regular public health emergency courses and training at different levels, serving as a national continuing medical education project for in service dental professionals. In addition to professional training in oral first aid and oral health, emergency management training such as Core Disaster Life Support (CDLS), Basic Disaster Life Support (BDLS), Advanced Disaster Life Support (ADLS), infection control, triage, and so on, should also be added[7].

Organizing Emergency Drills:
Regional just-in-time (JIT) emergency drills could be carried out from time to time to help dentists apply the knowledge and skills they have learned in practice. Team communication and cooperation among dentists, physicians, surgeons, and logistical personnel could be strengthened by the emergency drills[7].

(5). Disaster Victim Identification:
Following mass disaster, identification of individual victims by dental evidence is one of the most reliable methods of identification in such situations. Individuals with loss of all teeth can also be potentially identified based on the anatomy of the jaw bone or dentures with different shapes, sizes, manufacturers and compositions Moreover, dental data can also be used to determine individual‘s personal data such as age, race and gender. Dental anomalies like missing teeth, supernumerary teeth and presence of extra cusp can also form important basis of identification of an individual. A quick, valid and reliable method of age estimation during the times of disasters can also be offered by dental tissues [7].

(a). Dental identification:
The dental identification (DI) highlights the role of teeth and is based on certain pathological conditions including prior dental treatment, malocclusion or disturbance in tooth eruption [9]. Tooth is the hardest structure of the body, which can withstand heavy forces and temperature. Therefore, the role of teeth or the dentition or dental treatments is preferable over other methods in the identification of the victims. As stated earlier, the dental tissue is resistant to trauma, mutilation, incineration and decomposition, thus making it an excellent reservoir of DNA material[8].

(b). DNA in Dental identification:
The failure of conventional dental identification methods increases the importance of biological material such as DNA to provide the necessary link to establish identity. The revolution in DNA technology has established the forensic DNA profiling as a gold standard for identification of unknown remains . The objective of DNA profiling for disaster victim identification is to extract as much genetic information as possible from highly compromised samples [8].

(c). Sources for Ante-mortem Data:
Ante-mortem data obtained by investigative agency are dental radiographs, written records, etc. However, additional characteristics recognized by the forensic odontologists (e.g. prior orthodontic treatment) could be helpful in establishing a putative ID[8].

Role in Forensic Odontology:
Forensic Odontology continues to be a crucial element in nearly all mass disasters whether natural, accidental or intentional. Dentists collect ante mortem data on the onset of the disaster based on the list of missing persons, and then compare between remains and ante mortem data. Traditionally, overlays have been used in many disaster situations even before 1980 [4].

(6).Role of Forensic Odontologists:
The important role of dentists in the identification process is reflected from the event where high percentage of victims were identified via dental examination (61%) in the Tsunami disaster of 26th of December in 2004, north of Sumatra Island. Forensic dentists usually have a leading role in the forensic team when dental structures are the only source of information for the identification of human remains. The resistance of teeth and their supporting tissues, even to fire and decomposition, makes them extremely useful for identification purposes [8].

The most frequent investigation performed, is the comparative examination used to establish with certainty that the remains of the deceased and the person represented by ante- mortem dental records are of the same individual. In most of the developing countries, comprehensive fingerprint data base and complete ante- mortem dental records are not maintained properly, thus making comparative dental identification sometimes critical. The second investigation is for cases without previous ante- mortem records and no clues of positive identity exist. Under these circumstances, postmortem dental profiles completed by the forensic dentists suggesting characteristics of the individual result in narrowing the search of the ante- mortem materialQuality of ante- mortem dental records was categorized as follows:
• Grade 0: No information
• Grade 1: Information without written records
• Grade 2: Written records only
• Grade 3: Record combined with unsystematic radiograph
• Grade 4: Record combined with bitewings
• Grade 5: Record combined with full mouth survey or an orthopantomograph.

Other Methods of dental Identification:
Other methods of dental identification include dental biometrics and genetic finger printing. Dental biometrics automatically analyzes dental radiographs to identify the deceased individual. Dental radiographs provide valid accurate and reliable information about the identity of an individual. The method used in dental biometrics is the matching of unlabelled postmortem radiographs against the labeled ante- mortem radiographs. If the set of teeth in a postmortem radiograph sufficiently matches the teeth in an ante- mortem radiograph, the identity of the deceased in the postmortem radiograph is obtained[8].

The present day DNA fingerprinting is based on polymerase chain reaction (PCR) that undergoes genetic amplification of Short Tandem Repeats (STR) of selective, highly polymorphic regions of DNA. This allows for comparison of DNA from teeth, jaws, and other parts of unidentified individuals with a known ante- mortem sample from clothing, stored blood, hair brush, cervical smear, or biopsy specimen. The success rate of dentalidentification will vary considerably depending on the nature of the accident, the degree of dental injury, the incidence of dental treatment and the availability of adequate dental records, which is a function of the nationality and country of residence of victims[8].

Identification Of The Deceased
The prompt recovery and identification of the deceased following a disaster is a key element in any disaster response. The correct identification of deceased persons is essential for family, legal, and societal reasons. The normal cultural and legal processes following a death cannot be concluded until a formal identification of the deceased has been completed. Delays in identification inevitably cause further emotional hardship for families, hindering and prolonging the grieving process [9].

Dental Identification Procedures:
Whenever a human body or the remains of a human body are found, the police are called for further investigation. The police in turn may make a formal request to the dental authorities to help them identify the individual. At this point in time, a tentative identification is possible by considering the geographical location where the body was found, the physical features, the available wallet or driving license or any other personal belonging of the deceased individual. This tentative identification may help in narrowing the search for ante mortem records with which a possible identification may be established with a degree of certainty. Dental identification of an individual can be made mainly by two methods namely

1. Comparative method of dental identification
2. Post mortem dental profiling[15].

Challenges in the Current Scenario:
Existing Curriculum in Dental Institutions:
Hospital-based training and education (in medicine and surgery) are important components of specialized dental professional training. Knowledge and skills of an average dental graduate may be utilized by the public healthcare system in times of crisis. However, a revised curriculum with the inclusion of handling of medical emergencies needs to be enforced in all dental teaching institutions[1] .

Periodic Upgradation:
Dental professionals trained in disaster management should periodically upgrade their knowledge and skills to play an effective role in disaster response and preparedness[12].

PolicyChanges:
Effectiveandmeaningfulintegrationofdentalhealthprofessionalsintodisastermanagementcallsforrelevant policy changes at national, regional, and local levels[12].

Conclusion:-

The role of a dentist during mass disaster is well- defined in other developed countries as compared to India. [15]The role has to be identified, delineated, and assigned along with proper training to be provided to the dentist, with effective planning, education and training; dentists can play a significant role in responding to mass disaster or other unforeseen events [2].

Dentists are acknowledged widely as leaders in preventive oral health care. Services provided by dentists potentially include education, risk communication, diagnosis, surveillance and notification, treatment, distribution of medications, decontamination, sample collection and forensic dentistry

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