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MEDICAL EDUCATION AND TRAINING FOR DISASTER MANAGEMENT: AN URGENT NEED

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Disaster is a Greek word which means "bad star". It is a natural or man-made event that negatively affects life, property, livelihood or industry. It has often resulted in permanent changes to human societies, ecosystems and environment. Disasters manifest hazards that exacerbate vulnerable conditions for individuals and communities to threaten their survival and thrive.

Most commonly occurring natural disasters include earthquakes, floods, windstorms, typhoons, drought, extremes of temperature and epidemic outbreaks. During past 20 years, natural disasters have claimed more than 3 million lives worldwide. These have affected at least 800 million people and resulted in damage to property exceeding US $50 billion [1].

Pakistan is vulnerable to a number of natural hazards, of which floods, earthquakes, cyclones, windstorms, avalanches, drought and heat waves are the most significant. Floods, droughts and landslides in Pakistan tend to be frequent, seasonal, and localized. The snow melts at high mountains coinciding with the monsoon season and leads to very large discharges of the Indus River and its tributaries that results in annual floods. In February and March 2005, large areas of Pakistan were battered by rain, snowfall and flooding. The worst affected areas were NWFP, Northern Areas and Balochistan. Water supply, sanitation systems, electricity, communication and road links were severely affected. In Balochistan, nearly half a million people were affected, with more than 4,000 families left homeless. In NWFP more than 80,000 houses were destroyed and over 108,000 were damaged. A number of dams collapsed due to excessive flooding, causing severe destruction of crops and livestock [2].

The earthquake hazard in Pakistan is high because of its vulnerable position on the eastern margin of the collision of the Indian plate with the Eurasian plate. These results in potential for major earthquakes in the north, where Indian plate thrusts under the Himalayas, and along the western edge of the country, where Indian plate transformation is relative to the Iranian and Afghan micro-plates and is expressed with the Chaman fault. The 1935 Quetta earthquake (60,000 killed) occurred on the Chaman fault. The Arabian plate subducts beneath the Iranian plate along Makran coast, where in 1945, earthquake of 7.9 magnitude resulted in a tsunami with 12 meter high waves. Karachi, east of the Makran coast, has significant seismic risk due to several nearby faults, including Allah Bund fault (1819 earthquake), and Pubb fault. The geological and seismic survey of Pakistan places the entire Sindh coastline (including Karachi) in a zone of “noticeable seismic danger” [2]. However the Oct. 8, 2005 earthquake has made it “mandatory” to update existing National Seismic Hazard Map of Pakistan.

Pakistan is also exposed to extreme degree of hot weather during summer (May and June) which leads to melting of glaciers in North and extensive flooding of water in plains of Punjab and Sindh. This is followed by the monsoon season during July and August, that results in overflowing of rivers. Due to lack of adequate water reservoirs, there occurs extensive flooding of water in plains and mud slides in the North. Since 1935 the region where Pakistan is located has repeatedly experienced various natural disasters of which earthquakes and floods have been more dreadful. This has resulted in

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loss of life of thousands of people and affecting millions [3].

Initial Assessment:

In emergency medical care, response time is critical. Studies of earthquakes in Turkey and China indicate that two to six hours after entrapment, less than 50 percent of buried persons under collapsed earthen buildings are still alive [4,5]. Safar, studied the 1980 earthquake in southern Italy, concluded that 25 to 50 percent injured died slowly which could have been saved if first aid measures were rendered immediately [6].

How to Face Disasters?

There is a dire need to develop guidelines to standardize curriculum for education and training in multi-disciplinary health response to major events that threaten health status of the community. Evidence-based standards and guidelines for education and training must be developed for all members of the healthcare system. Rather than describing isolated performance indicators, priority must be given to lay emphasis on general approach, presenting the conceptual framework, clarifying important principles, and describing educational needs and training requirements for situations posing major threat to the health status of a community.

Health Training:

Health professionals and medical students may be taught, how to use available resources for dealing disasters and emergencies, when called for [7].

Multi-disciplinary Programmes:

The operational context of "Disaster Medicine" is based on multi-disciplinary education programmes in the field of disaster management and reflects operational reality.

Vocational Focus:

Education and training programmes for all levels of "Disaster Medicine" practitioners are based on a vocational focus with the requirement of underpinning knowledge, understanding, skills and attitudes integrated together in the program. However, education programs should be designed on the basis of local standards of learning and vocational understanding so as to achieve international standard which may be activated by international consultative process.

Case or Scenario-based Framework:

"Disaster Medicine" education lends itself naturally to explore this methodology as a keystone component of a conceptual framework. In an education program, the educational objectives for disaster management should be specified, and teaching methods be related to these objectives. A common teaching method recommended for health professional education is that of "case or scenario-based education". In scenario-based models, the selected cases or scenarios would:

- Integrate the biomedical sciences, health social sciences, clinical sciences, public health sciences, and emergency management standards
- Integrate the required knowledge, skills, and attitudes in a holistic approach
- Facilitate the development of cognitive and management skills amongst students
- Facilitate development of ability to change in setting the modern, dynamic, and integrated community based emergency response system
- Facilitate the research or evidence-based approach to practice and establish the foundation for learning from evaluations of major events
- Lend themselves to be student-centered and suitable for flexible delivery strategies.

Themed Approach:

In such programme, the content would be arranged in themes which integrate specific disciplines and attempt to introduce the student to an integrated real-life curriculum.

Core and Electives:

The 'core knowledge' of disaster management is based on essential educational needs for health workers, and 'elective' in-depth knowledge and learning skills, according to the professional background, personal interest and national needs. For this purpose, medical students from first to final year of training can be taught different aspects of disaster medicine (table-1)

Modular Approach:

The above framework appropriately facilitates a modular approach by offering international standards and guidelines in a modular way. It will make it possible to choose different core units and a number of elective units, depending on existing risks and hazards, the size and possibilities of universities, and individual requirements or preferences.

Supervised Practical Experience:

The very nature of "Disaster Medicine" requires a hands-on approach. There is a need to demonstrate immediacy of skills in major events that may be a threat to the health of a community. "Disaster Medicine" courses, at more senior level, should include a compulsory period of supervised practical experience over a defined period before receiving course awards. This core requirement would be in addition to the didactic phase of the course.

Competency-based Approach:

The competency in education and training has achieved greater recognition in last 10 years and has been linked strongly with developing training in the industrial sector and has been linked to improving productivity of a country in the international arena.

Competency within a Conceptual Framework:

The competency required for persons involved in the 'management of events or potential events threatening health' can be situated at the intersection of three main 'disciplines' which include clinical care, public health, and emergency management. The clinical field here is not reduced to skills and competencies belonging to emergency medicine, but includes e.g., psychosocial aspects and contributions from the other health disciplines.

Adoption of Coordinated Framework for Disaster Health Education:

During undergraduate training, medical students along with paramedical staff should be trained in advance life support through short courses. These courses can be the part of summer electives. In these courses mock emergencies can be created and medical students as well as paramedics can learn how to deal disaster emergencies? Students can be divided into groups with a group leader who would have to take immediate decisions and to get them implemented with the help of his team. They should also be trained as to how one can interact with various government departments and NGO's in such times? Online programmes can be arranged by Allama Iqbal Open University and Virtual University in consultation with trained medical consultants to facilitate learning of disaster medicine (table-2). The students of these programmes can be examined for certification at certain referral centers in various cities.

Devastations of Earthquake:

Total damage estimated during the 2005 earthquake in the eight most affected districts was US$2.3 billion, and the loss in income (indirect loss) was estimated as US$576 million. The direct damage caused by the earthquake was estimated approximately Rs. 135.1 billion (US$2.3 billion). The damage to private houses were calculated as Rs. 61.2 billion (US$1.03 billion), suffered the most extensive damage. The earthquake destroyed 203,579 units of housing, damaged another 196,574 and left an estimated 2.8 million people in need of shelter. Of the total housing stock, 84 percent was damaged or destroyed in AJK and 36 percent was damaged or destroyed in NWFP [8].

Table-1: Teaching programme for medical students.

1st and 2nd year MBBS	Should have general awareness of: • A disaster, its sequel and should be able to identify measures of protection • Blood grouping and cross matching • Storage of donated blood	Should be trained to assist the doctors / paramedic staff in the following: • Documentation of patients and maintenance of treatment records • Recording vital signs of patients • Maintenance of i/v line and giving injections • First aid support to the injured • Provide emotional support to patients • Bedding change of patients	Special classes with emphasis on: • Physiology of Shock (especially hypovolemic shock) and principle of its treatment – in Physiology • Bone injuries including fractures and spinal injuries – in Anatomy • Providing health care as health worker to masses – in Community Medicine
3rd and 4th year MBBS	Should be able to: • Apply dressing on wounds • Do cleaning and stitching of uncomplicated wounds • Maintain i/v line	Should be trained to assist / carry out on their own: • Vaccinations of children and adults against outbreak of epidemics • Vaccination against tetanus	Special classes with emphasis on: • Emergency care of patient – in Trauma centre of Hospital • Psychological aspect of trauma – in Psychiatry
FINAL year MBBS	Should be able to identify: • Spinal injuries • Head injuries • Fractures • Obstetric cases • Tetanus cases	Should be trained to: • assist senior consultants for management of serious patients • perform minor surgical procedures under guidance • apply splints / POP in cases of fractures • manage spinal injuries and guide students of 1st and 2nd year about mode of mobilizing these patients	• Special module of Trauma management to be included in training • Students to be rotated for at least 1 month in Trauma centre / Emergency room
Postgraduate Students	• A module of Trauma and disaster management may be incorporated in their training • Trainees of Medicine and Surgery may be offered special module of training in trauma management		

In natural disaster, health professionals or their families may themselves become victims in wake of a natural disaster. Such scenario training needs to be imparted to medical workers. In the recent earthquake of 2005 in Pakistan, more than 90% health facilities including tertiary care hospitals were destroyed with considerable loss to the families of health workers. The damage to public health infrastructure was widespread, with 574 health facilities partially or fully damaged. Almost 75% of the first level care facilities were either fully damaged or had suffered partial damage. The five District Headquarters Hospitals were completely destroyed, which tertiary health care facilities suffered structural damage in the region. In addition, the smaller health units including Sub-Health Centers and First Aid Posts serving remote small mountainous hamlets were destroyed. Information on Lady Health Workers (LHWs) and health houses is not yet available, but the number of health houses destroyed were likely to be proportional to the number of houses destroyed in the affected area. Besides infrastructure, the majority of medical and office equipment, furniture, drugs and laboratories had been destroyed. Complete information on ambulances and supervisory vehicles is also

Table-2: Proposed plan for medical education and training for disaster management.

Level	Category of Health Professionals	Details	Course / Skills	Mode of Action / Competency level	Assessment	Certification
1	First responders: Advanced or specific disciplines or specialty areas	Primary health care providers, including Red Crescent of Pakistan, Local NGO's, Boy Scouts, Girl Guides	Common course for all, according to the local needs	Short, didactic, competency-based, case-related, manageable	Yes	Advanced certificate (time limited)
2	Professional - Masters degree	Formal education courses at professional level, e.g., Bachelor or Masters for recognition as Professional". Course curriculum to meet local, national, and international standards. Consider external accreditation by international body	Core of CC, EM, and PH, plus electives related to discipline and Regional needs	As determined by specific academic or professional organizations	Yes	Bachelor or Masters Degree. Issued by specific academic or professional organization e.g., HEC, AIOU, VU
3	Specialist/Consultant – Masters plus practical experience	For holders of formal education course award at Masters level to add formal, supervised, mentored professional experience in real time "Disaster Medicine" situations. Course curriculum to meet local, national, and international standards. Consider external accreditation by international body	Core of CC, EM, and PH, plus electives related to discipline and Regional needs	"In the field" specification of supervised, mentored professional experience in real time "Disaster Medicine" situations	Yes	Formal course award, e.g., Fellowship or specialist endorsement as determined by specific academic or professional organization e.g., CPSP, Medical or Health Sciences University

(AIOU = Allama Iqbal Open University; CC = Critical Care; CPSP = College of Physicians & Surgeons of Pakistan; EM = Emergency Management; HEC = Higher Education Commission; PH = Public Health; Lahore; VU = Virtual University)

not yet available [9]. This experience emphasises the need to impart training to undergraduate students for setting up a field hospital or a clinic so as to provide health facilities to general population with meager resources and available equipment.

Triage:

The triage of mass casualties after a catastrophic earthquake differs from traditional triage. After earthquakes, victims are distributed over a wide area when medical resources are limited; the length of time before a patient can receive standard care is unpredictable; and early evacuation is not possible. Cardiopulmonary resuscitation is generally not performed in mass-casualty situations unless sufficient resources are available to sustain resuscitation effort without jeopardizing lives of other victims. Given these assumptions, a method of dynamic triage has been developed to maximize patient survival and the efficient use of equipment (fig. 1) [1]. Students should be trained to immediately categorize the patients in guidelines of a simple triage and rapid treatment plan (fig. 2) [1]. By making the students aware of this pattern, it would facilitate the job of consultants working in the field hospital.

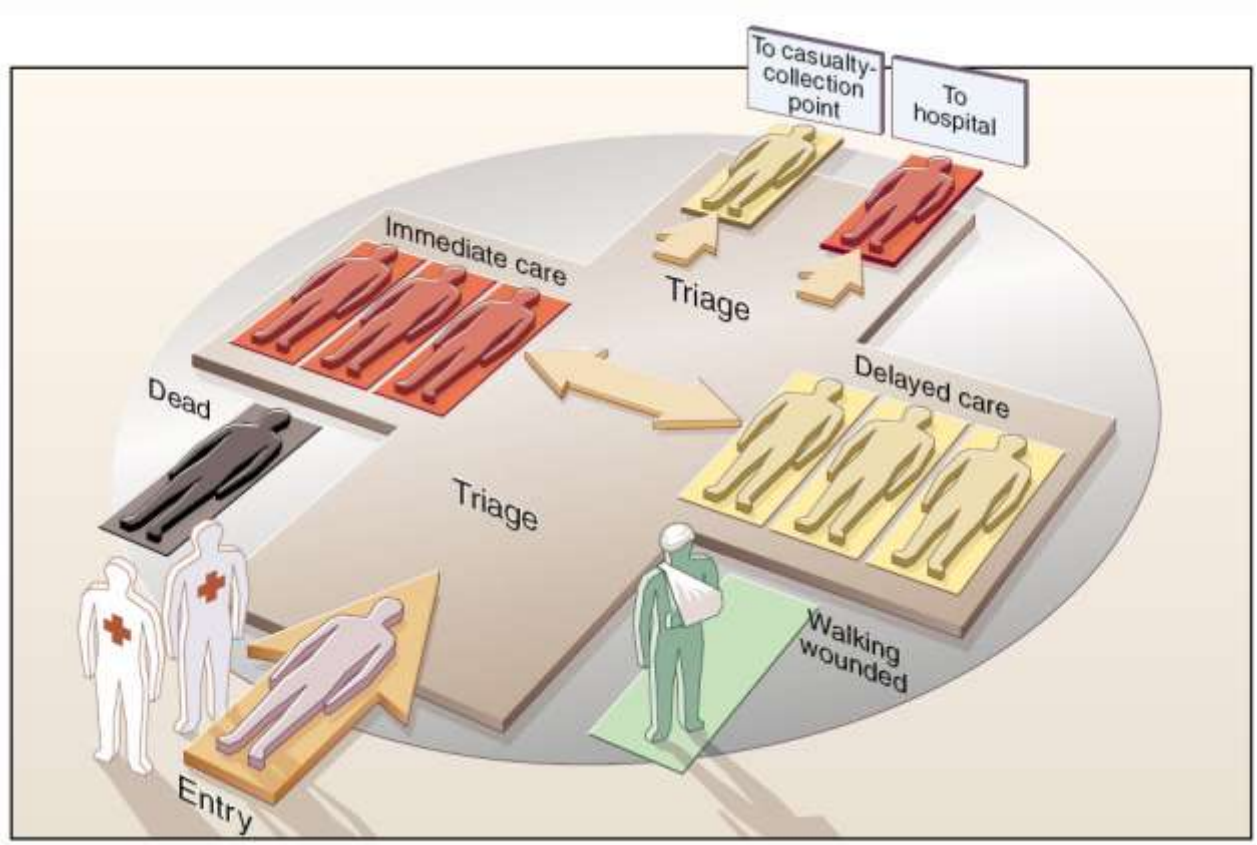

Fig. 1: Operation of a disaster-medical-aid centre.

In wake of a natural disaster, there is every possibility that local resources of the area may become non-functional. This would result in delayed provision of health facility to the affected population, leading to contamination of wounds and delayed wound healing. During the earthquake of 2005 over 102,600 patients were treated and or airlifted to 70 hospitals in the earthquake neighboring areas. Over 27,700 operations were performed on the referred patients with 784 reported deaths. About 211 amputations in Rawalpindi and Islamabad and another 500 plus in AJK and NWFP were performed. Out of 23 reported cases of tetanus, only two survived. The exact number of people who had been disabled due to amputations or had spinal injury is not known, however, the rough estimate is that the number of people with amputations may range between 1200 and 2500. In addition, large number of cases of spinal injury needed rehabilitative services and accessibility to supporting aids (crutches/wheel chairs) [9].

Postgraduate students, of all specialties in general and surgery, in particular, medicine and emergency and critical care can be of special importance in case of natural disasters. The student's team may include at least one trained doctor who can provide useful guidance to medical students for simple life saving procedures like tracheostomy, cardiopulmonary resuscitation, care of head injuries, fractures and shock etc.

Taking Care of Healthcare Workers:

Undergraduate medical students are usually in the age group between 18 – 23 years when they are emotional but not accustomed to miseries and grief's of people. As medical students, their job is usually to observe and assist senior doctors in patient management in their respective wards and emergency rooms. As such they are entirely unprepared for the task of treating casualties of a natural disaster – as they have not had any disaster management training or exposure to real-time emergency care

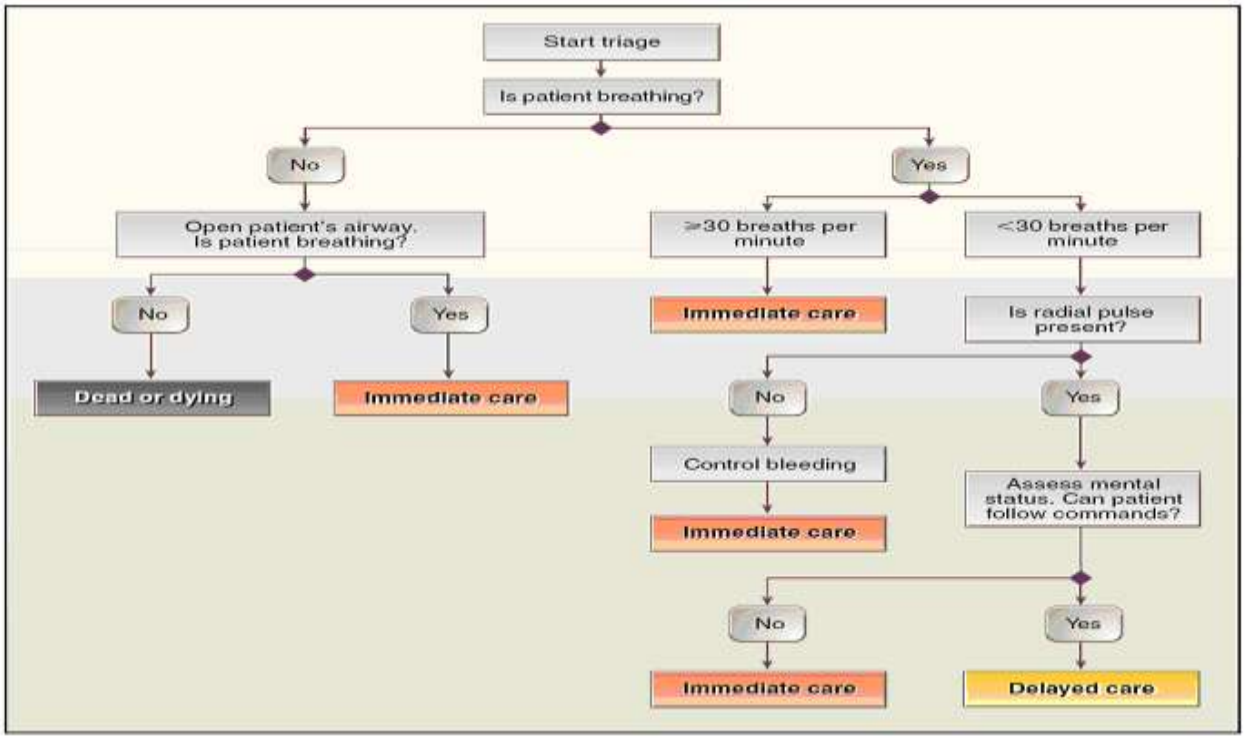

Fig. 2: Modified simple triage and rapid treatment system.

situations. Only physically strong and willing medical students should be sent in small teams along with senior doctors in areas of disaster. It can be a real challenge for young people to keep their emotions checked in a traumatic situation of a disaster where loss to human life is great.

The availability of trained paramedical staff is not much in our set up. In wake of a disaster, the medical students, especially of first two years can provide basic auxiliary support to doctors. They can be trained to do documentation and handling of the patients and referring them to proper consultant available in the field hospital.

In disasters the whole population has to be shifted to make shift homes or camps. Especially in cases of floods there is every possibility that an outbreak of cholera, diarrhea or some other epidemic may spread in the population. Students of first three years can be trained to provide immunization to the population.

Children are the most affected in any community hit by a natural calamity. They are the most vulnerable group exposed not only to the physical trauma of the injury and extreme of weather but also suffer from emotional turmoil at seeing their family members and the local population in general being injured or dead. Pediatric injuries need to be dealt with special care and affection for they are the future of the nation. Fourth and final year students should be taught about pediatric emergencies and child psychology in their ward round on rotation.

Disaster management is an essential component of medical training, but unfortunately this component is largely missing from medical and nursing curricula. A lack of training in disaster management can have unfortunate consequences for both patients and health-care students. We believe that in countries facing the risk of natural disasters, can have enhanced risk due to global warming [10]. Therefore, training of health professionals should be designed with an emphasis on regional disaster management.

Prevention and Preparedness:

The primary objective of prevention is to take measures for reducing earthquake casualties [11]. Priority may be given to

consider seismic safety in planning land-use and design building [12]. A well-planned medical response, although important, is just one component of a successful strategy for reducing mortality during earthquake.

In the preparedness phase the emergency managers must work out strategy and develop plans of action in case of disaster strikes. Common preparedness measures include; proper maintenance and training of emergency services, development and exercise of emergency population along with warning methods combined with emergency shelters and evacuation plans including stockpiling of supplies and equipment supported by the development and practice of multi-agency coordination etc.

In conclusion, the remedial measures to mitigate grief of the disaster may be made as part of the curriculum at varying levels of education from primary schooling to higher learning. Thematic symposia, seminars, workshops, short courses, conferences and talk-discussions may be conducted. The practical sessions to have hands-on-experience may be organized to learn psychomotor domain of disaster management. New vistas of specialized disciplines be opened up in colleges and universities like ecology, geography, soil structure, mining, geo-ecology, geological information system, environmental engineering, geology, material engineering, time management, emergency management, structural engineering, metrology, seismic system, traumatology, rehabilitation and reconstructive surgery, psycho sociology, advance trauma life support (ATLS) and so forth.

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