The Consequence of Land Mines on Public Health

Faiz Kakar, PhD,[1,2] Fabrizio Bassani, MD,[1,3] C.J. Romer, MD,[1,4] S.W.A. Gunn, MD[1,5]

1. Division of Emergency and Humanitarian Action, World Health Organization (WHO), Geneva, Switzerland
2. Chancellor, Islamic University of Afghanistan, temporarily in Peshawar, Pakistan
3. Director, Division of Emergency and Humanitarian Action, WHO, Geneva, Switzerland
4. Chief, Safety Promotion and Injury Control Unit, Division of Emergency and Humanitarian Action, WHO, Geneva, Switzerland
5. President, World Association for Disaster and Emergency Medicine, Geneva, Switzerland

Correspondence: Professor William Gunn, MD, FRCSC, La Panetiere, 1279 Bogis-Bossey, Switzerland

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Abbreviations:
EMD = eye movement desensitization
HIV = human immunodeficiency virus
ICRC = International Committee of the Red Cross
NGO = nongovernmental organization
PHC = primary health care
PTSD = post-traumatic stress disorder
UN = United Nations
WFP = World Food Program of the UN
WHO = World Health Organization

Abstract

An estimated 110 million land mines scattered in 64 countries continue to terrorize people and destroy human lives long after wars and fighting have ceased. Despite efforts to clear these devices, their numbers continue to increase and their presence constitutes a substantial threat to public health in the affected countries. Direct consequences include both the physical and emotional injuries from the impact, flying debris, and structural collapse associated with their detonation. Indirect consequences include increases in the incidence of waterborne diseases, diarrhea, malnutrition, infectious diseases, and spread of the human immunodeficiency virus associated with the increased use of blood. Those at highest risk of these latter consequences are mostly the disadvantaged poor, especially children. Psychiatric disorders, such as post-traumatic stress disorder, occur in those not directly injured as well as those physically wounded by the explosion.

Besides efforts to ban production, stockpiling and export of land mines, a comprehensive and integrated health program aimed at the prevention, treatment, and rehabilitation of those injured directly or indirectly by land mines is needed urgently. Strategies should include mine-awareness programs, enhanced transport of those directly injured, training the villagers in first aid, augmenting the capacity and quality of treatment facilities, improving the psychological support and treatment capabilities, development of rehabilitation programs, and the institution and enhancement of public-health programs directed at the indirect consequences associated with the presence of land mines.

Land mines constitute a major public-health problem in the world that must be addressed. **Prehospital and Disaster Medicine 1996;11(1):2–10.**

Introduction

An estimated 110 million land mines scattered in 64 countries around the globe continue to terrorize people and destroy human lives long after wars and fighting have ceased.[1] Most land mines are anti-personnel mines, laid specifically to injure or kill persons, civilian and military personnel. Little research has been done to determine how long land mines actually remain active, but we know that they continue to explode decades after being planted. For example, land mines planted in North Africa in 1942 killed four persons in 1990.[2] The secretary-general of the United Nations has stated that "land mines may be the most widespread, lethal, and long-lasting form of pollution we have yet encountered."[1]

Mine detection and clearance technologies are at least 20 years behind mine design,[3] and new mines continue to be laid. At the present rate of mine clearance, it is estimated that it will take 1,100 years to clear the 110 million land mines existing, assuming that no more are laid. But in 1993, while 100,000 land mines were cleared worldwide, two million more were planted.[1] The number of active land mines around the world, their constant augmentation, and their devastating consequences comprise an urgent public-health matter that needs to be addressed.

Worldwide, nearly 10,000 people, many of them innocent civilians, lose their lives every year because of land mines, and 20,000 or more are maimed and/or blinded.[4] Furthermore, land mine explosions cause psychological stress, which, in about 30% to 40% of those physically injured, can evolve into a chronic mental illness known as *post-traumatic stress disorder* (PTSD).[5]

In addition to the direct consequences of land mines, these man-made, indiscriminately used weapons have significant indirect effects. The presence of minefields can prevent a population's access to safe drinking water, in turn,

		Reference
Incidence of injured who survive	20,000 per year	4
Incidence of deaths due to direct injury	10,000 per year	1
Proportion of mine-injured dying in hospital	3.7%	7
Proportion of mine victims losing one or both legs	28%	7
Proportion of survivors injured by directly stepping on a mine	29%	7
Proportion of survivors injured by ejected mine fragments	48%	7
Proportion of all mine victims requiring blood transfusion	37%	7
Proportion of amputees requiring blood transfusion	75%	7
Average number of days spent in hospital (first admission)	22 days	7
Estimated lifetime prevalence of PTSD among mine victims	30–40%	5,8

Note: Reference No. 7, on which most of the statistics of Table 1 are based, is an analysis by the International Committee of the Red Cross of data collected on 23,767 surviving victims of land-mine explosions.

Table 1—Worldwide epidemiological data on land mine injuries and post-traumatic stress disorder (PSTD)

causing waterborne diseases, especially diarrhea.[6] Also, by preventing the cultivation of farmland, land mines precipitate or worsen food scarcity and, hence, malnutrition. Malnutrition and diarrhea interact in a vicious cycle, resulting in debilitating health consequences, especially among infants and the elderly. Public-health programs, including vaccination campaigns, that depend on mobile teams, also may be hampered in mine-infested areas.

The treatment of land mine victims requires multiple blood transfusions for the initial lifesaving measures and for subsequent surgery. Increased blood transfusion frequency also can increase the incidence of blood-transmitted diseases.

Land mine casualties place an enormous burden on war-stricken countries. The injuries resulting from these devices require skilled surgeons, large quantities of blood, antibiotics, other drugs, prosthetic devices, and intensive physical therapy.[7] A study of patterns of hospital utilization shows that even if only 4% of a hospital's admissions are victims of land mines, they utilize 25% of all surgical services and resources.[2] In countries with a paucity of health resources, caring for land mine victims draws resources from other essential health services and, therefore, tends to worsen the overall health status of the population.

The obvious economic, social, and politically destabilizing effects of mines are not discussed here, though they also have damaging consequences on health and health services.

The land mines in more than 60 countries constitute an "epidemic" and pose a major public-health problem. Even if the manufacturing and military use of land mines were banned internationally today, the existing mine-infested areas around the world would continue to affect the health and well-being of countless innocent victims for decades, and perhaps for generations to come. Thus, besides efforts to ban production, stockpiling, and export of land mines, a comprehensive and integrated health program is needed urgently. Such a program should be aimed at prevention, treatment, and rehabilitation of land mine injuries, including treating the psychosocial consequences.

Land mines

Types of Mines

The estimated 110 million land mines currently infesting 64 countries vary in size and destructive capacity. The vast majority of land mines are *anti-personnel* mines designed to explode when people walk on them or, in some cases, near them. Larger devices designed to explode when vehicles drive over them are known as *anti-tank* mines. Other mines called *improvised explosive devices* or *booby traps* are designed to explode when a person opens a door or picks up a particular object. Because most land mines are anti-personnel mines, hereafter, the terms are used interchangeably.

Land mines often are laid to protect military installations from enemy approach. In some countries, these mines also are used to dissuade enemy soldiers from inactivating or removing the anti-tank mines from strategic anti-tank minefields. Anti-personnel mines are especially effective militarily because they can put out of action not only the mine victim, but also the two or more other soldiers required to carry the victim behind the lines of combat. In actual practice, however, armies do not target only military personnel; they also utilize anti-personnel mines to demoralize the civilian population by mining roads and paths to prevent access to safe drinking water, firewood, grazing and agricultural land, etc. Use in this way contravenes the Geneva Conventions.[7]

Direct and Indirect Consequences of Land Mines

Land mine victims suffer direct and indirect health consequences.[8] *Direct consequences* include both physical and emotional injuries caused by the impact of the blast itself, mine fragments or other flying objects accelerated by the mine blast, or the collapse or fall of a wall, ceiling, tree, or the like. A summary of statistics regarding

Land mine primary influence point	Conditions or behaviors altered	Diseases especially increased
Agricultural land and irrigation canals mined	Decreased farming activities causing food scarcity	Malnutrition-related diseases
Access to drinking water and firewood mined	Consumption of contaminated water	Waterborne diseases such as hepatitis, dysentery, etc.
Roads and access to public places mined	Disruption of transport of health and basic supplies; Areawide reduction of activities requiring mobile health teams including vaccination campaigns and other PHC activities	Preventable childhood diseases; Communicable diseases; Aggravation of existing diseases
Increased amputations and injuries requiring blood transfusion and surgery	Increased frequency of blood transfusion; Increase in nursing care	Increase in infections; Increase in blood-transmitted diseases such as HIV, hepatitis, and malaria

Table 2—The most important and probable indirect public health consequences of land mines (HIV = human immunodeficiency virus; PHC = primary health care)

the occurrence of land mine injuries and some of the mental health consequences is provided in Table 1.

Indirect consequences caused by land mines include waterborne diseases, occurring when minefields block access to safe drinking water; malnutrition, where minefields prevent land cultivation; increase in infectious diseases, where vaccination teams have difficulty or reluctance to vaccinate near mined areas; the spread of human immunodeficiency virus (HIV) and other blood-borne diseases due to the increase in frequency of blood transfusions caused by mine injuries, etc. A summary of the indirect consequences of land mines which, it should be noted, often involve a larger number of victims and, therefore, may have a greater impact on public health, is provided in Table 2.

Characteristics of Persons at Highest Risk

Persons at highest risk of mine injury are rural, poor peasants foraging for firewood and food, herding cattle, or tilling their fields. Refugees or internally displaced persons returning home also are at high risk of being killed or maimed from land mines, especially those returning spontaneously without the benefit of information provided to organized groups returning to an area.[9] The risk of returning refugees or displaced persons is high because they return to areas that recently have been involved in fierce fighting and still may be heavily mined. They also are at high risk because they are less familiar with their "changed" former environment. In some countries, children and teen-agers are returning who actually were born in refugee camps and never before have seen their parents' land.

Age and gender distribution studies on land mine victims indicate that the majority were young adult males. In a 1992 study in Cambodia, 87% of surviving land mine victims were males older than 15 years of age, with a mean age of 28 years.[10] However, as land mines remain after military conflict ceases, an increasing proportion of victims are women, children, and the elderly. The 1995 International Committee of the Red Cross (ICRC) data indicate that 31.3% of surviving mine victims are within these "noncombatant" groups.[7]

Data on the age and gender distribution of mine victims who did not survive are sparse. However, it is known that the ratio of death to injury is considerably greater in children because their vital organs are closer to the blast and comparatively less protected, and they are less able to withstand blood loss than are adults.[3]

Those at highest risk of the *indirect health consequences* of land mines again are mostly the disadvantaged poor, especially children. Some of the conditions exacerbated by land mines, such as malnutrition and low tetanus vaccine coverage of mothers, also will affect the prenatal care of the unborn.

Public Health Impact of Land Mines

Land Mines and the Risk of Waterborne Diseases

As mentioned earlier, the mining of roads and pathways leading to sources of fresh drinking water, firewood, and grazing and agricultural land has indirect and long-term consequences on public health, particularly of rural populations. When a population perceives that the paths to the fresh water may be mined, they likely will seek water from a "safe" area away from the minefields, which often is a nearby river. While boiling river water, in general, can make it safe to drink, boiling requires fuel. The fact that often the roads and pathways leading to forest areas where firewood is found also are mined, further discourages the villagers from "bothering" to boil their drinking water. Waterborne diseases, such as hepatitis, dysentery, and polio, may result.

Land Mines and Malnutrition

It is difficult to quantify the risk of malnutrition attributable to minefields, because land mines are part of many other disruptive and destructive activities of war, such as aerial bombings that may destroy other vital agricultural resources, such as water dams and irrigation canals. But land mines, because of their long-lasting presence and the fear they generate, greatly discourage farming activities. It does not matter if there is one land mine or many in a field—unless they are found and cleared, the farmer will be fearful and will stay away. The limited farming activities in mined areas, along with mined roads and the difficulties of getting food to such areas, may create a man-made food scarcity and famine situation, especially among children.

Since malnutrition and diarrhea can be indirect consequences of the presence of land mines, it is necessary that the biochemical interaction between malnutrition and diarrhea be discussed. Malnutrition, as caused by a nutrient-deficient diet, is known to predispose to diarrhea, and diarrhea, in turn, causes further depletion of the body's nutrients. Malnutrition and diarrhea, therefore, interact with each other in a vicious cycle, causing high mortality and morbidity in a vulnerable population. Because of their interaction, the effect on public health of diarrhea and malnutrition is considerable.

Land Mine Injuries and Spread of HIV Infection

Land mine injuries, especially limb injuries, often cause the loss of a great deal of blood which needs to be replaced immediately.[7,11] According to the 1995 ICRC study, 28.5% of mine-blast survivors lose one or both legs, and 75% of the amputees receive blood transfusions—each patient requiring, on average, 3.2 units of blood and four surgical operations.[7] In many countries affected by land mines, the medical infrastructure, including blood-bank capacity and related services, has been destroyed or greatly reduced during the military conflict. Furthermore, many land mine victims originate from rural areas where blood-bank facilities may be very limited or nonexistent.

The increased demand for blood transfusions to victims may force health workers to compromise on the rigorous blood safety rules needed to prevent the spread of HIV and other blood-transmitted infections. In some African countries in which contaminated blood transfusions already account for 10% of the HIV transmission, land mine injuries put added pressure on blood transfusion services and increase the risk of HIV infection among land mine victims and their families. Similarly, in many countries, the transmission of hepatitis, trypanosomiasis, and malaria through contaminated blood transfusions also is a greater risk in mined areas.[2]

Effect of Land Mines on Public-Health Campaigns

In areas where roads and access to public health clinics and public meeting places are mined, a public-health campaign, such as mass immunization, is difficult to carry out. Mass immunization requires mobile vaccination teams. In such a setting, where mobile teams are not familiar with their surroundings, their lives can be put in danger. Therefore, villages or towns near minefields may be left out of public-health campaigns. A similar difficulty is faced by public-health workers and humanitarian agencies when there is an epidemic outbreak close to a mined area. The presence of land mines in and around a community interferes with access to and delivery of health care, including disease surveillance.

Land mines, by preventing health-service activities and discouraging humanitarian assistance, can increase the risk of the affected population of contracting infectious diseases. Low or absent vaccination coverage in a village will give rise to preventable childhood diseases, resulting in increased rates of child morbidity and mortality.

Land Mine Injuries and the Risk of Psychiatric Disorders

Suffering the intense pain, trauma, and shock of having one's limbs, eyes, or other body parts blown away by a land mine explosion is a severe psychological trauma. Psychiatric problems following traumatic injury may arise and can be divided into acute, subacute, and long-term reactions.[12]

Acute phase—During this phase, which occurs from the moment of impact (if the patient is conscious), the victim demonstrates emotional shock and denial. At the mine explosion site or in the emergency room, the victim shows bewilderment, apathy, or even, if capable, aimless running away, causing difficulty in administering appropriate lifesaving measures. This is important to understand in the case of mine victims, because the aimless running may further endanger the victim in the minefield. About 10% to 20% of accident victims develop deep anxiety with vivid fantasies of having sustained severe injuries and a concomitant increased activation of the sympathetic nervous system along with increased blood pressure and pulse rate. In some cases, the psychological impact of the event may overwhelm cognitive processes, and the victim will present varying degrees of amnesia.[12]

Subacute phase—This phase starts within hours or days (less frequently) and lasts from several days to weeks. In this phase, the patients most commonly show signs of anxiety. Their symptoms may include worrying compulsive thoughts about the injury, startle reactions, and concentration difficulties. The subacute phase also is characterized by depressed moods that often are due to guilt, shame, or grief over losses experienced (e.g., the loss of one or more of the extremities, eyes, or genitalia). Treatment of the patient in the subacute phase and restoration of psychological health is crucial to prevention of chronic mental illness.[12]

Long-term reaction—The long-term reaction, also called PTSD, arises as a *delayed* response to a stressful event or situation of an exceptionally threatening or catastrophic nature. The onset of PTSD follows the trauma within a period of a few weeks or months, but rarely after six months. Within a few weeks of the mine explosion, the traumatized person may exhibit symptoms of intrusive recollection in the form of nightmares, daytime fantasies, and psychotic re-enactments. Victims also suffer from insomnia and demonstrate behavioral patterns

Programs/activities	Objectives	Expected results
Mine awareness	Improve mine-avoidance behavior	Reduce incidence of land mine injury
Train selected villagers in first-aid techniques	Improve skills and timely response to injury	Improve survival chances
Transport the land mine victim rapidly	Timely replacement of lost blood	Improve survival chances
Improve national capacity and health facilities in treating land mine injury, including PTSD	Improve treatment and rehabilitation	Improve survival; Reduce surgical complications, blood transfusion problems and infection; Prevent PTSD; Improve rehabilitation
Strengthen PHC and CHWs Train mobile health workers/teams and send them to villages near mined areas	Improve vaccination coverage; Distribute concentrated food packages, etc.	Prevent childhood diseases; Prevent malnutrition; Improve rehabilitation in mined areas
Establish decentralized prosthesis facilities	Provide and maintain prostheses locally	Improve the quality of life of land mine victims
Provide solar energy, low-tech cookers and/or fuel; give priority to determining safety of areas leading to drinking water sources, etc.	Reduce deforestation and avoid minefields;	Reduce incidence of injury; waterborne diseases
Provide safe access to grazing land	Reduce food shortages	Prevent malnutrition; Prevent zoonoses
National and international advocacy of abolition of land mines	Interdiction of production, sale, and use of mines; Clearance of minefields	Fewer land mine victims; Better treatment of victims; Respect for life; Peace

Table 3—Proposed programs to help prevent, treat, and rehabilitate victims of land mine injuries (CHW = community health worker; PHC = primary health care; PTSD = post-traumatic stress disorder)

aimed at avoiding any perceived risk that may resemble what led up to the experienced trauma.[13] The prevalence of PTSD among land mine victims is estimated to be between 30% and 40%.[5,8]

Furthermore, psychiatric disorders make it very difficult to treat physical diseases of the victim, especially those conditions that require patient cooperation and compliance, such as tuberculosis or diabetes. Patients with psychiatric co-morbidity who undergo surgery stay in the hospital significantly longer than do other patients with similar surgery but no psychiatric conditions.[12]

Health Programs for Prevention, Treatment, and Rehabilitation of Land Mine Injuries

Before discussing specific programs, the important roles of surveillance and intersectoral issues related to land mines warrant particular emphasis. Surveillance of land mine injuries, including their direct and indirect consequences on public health, as well as collection of demographic data relevant to populations at risk, is very important for planning and implementing effective health programs. To accomplish this, countries need to strengthen the collaboration among national agencies as well as with nongovernmental organizations (NGOs) and United Nations agencies concerned.

To mobilize national and international efforts for land mine-affected countries, it is recommended that each affected country organize a national intersectoral committee for land mines, which may include representatives from the ministries of health, transport, defense, agriculture, urban planning and development, education, public welfare, etc., to undertake the following: 1) strengthen or initiate surveillance of land mine injuries; 2) determine the prevalence and incidence of

land mine injuries; 3) formulate a national policy on how to deal with the land mine problem; 4) identify training needs and develop training programs; and 5) create an environment conducive to collaboration with local, community, regional, and international organizations concerned with the land mine problem.

Surveillance data gathered in each country could be funneled to a data processing center agreed on by the proposed national intersectoral committee for land mines. Availability of such data would help the intersectoral committee, the WHO, the ICRC, and other agencies working on land mine issues.

Mine-Awareness Programs

Mine-awareness programs are vital public-health measures that can decrease the incidence of mine injuries and also can improve patient survival by giving the public information on what to do and where to go in case of such injury. Obviously, a program targeting those at highest risk—the rural, illiterate, and poor—should not depend entirely on printed matter about how to avoid mines. The mobilization methods developed for mass immunization and acquired immune deficiency syndrome awareness campaigns among less literate populations also could be used for mine awareness campaigns. Depending on the social traditions in each country affected, the potential for using delivery methods such as radio and pictographs, as communication channels to the rural populations should be explored and developed. As displaced persons and returning refugees are at high risk of mine injury, mine-education classes also should be directed to them.

It is very important to promote mine awareness, not only among the population at risk, but also among community leaders, educators, and physicians regarding the devastating effects of land mines on human health. Mosques, churches, civic authorities, and primary health-care (PHC) centers are excellent networks for reaching the poor, and will be effective, especially if the mine-awareness educators can persuade the community leaders to include mine-awareness information in their sermons, broadcasts, and programs. Special efforts should be directed toward raising the consciousness of community leaders, informing them of their responsibilities and roles in catalyzing change in health behavior and initiating community involvement.

Transport of the Injured

The proportion of land mine casualties that will die before reaching a medical facility depends on how soon medical treatment is obtained. Experience from around the world indicates that as many as 50% to 80% may die before reaching a hospital or health facility; the majority of these die due to blood loss.[2,3] The first six hours are critical for a land mine victim, but the worldwide averages of time taken by mine victims to reach a health facility vary from six to 36 hours.[2] Shortening the arrival time will improve survival and lessen morbidity.

In the ICRC's experience in Afghanistan, survival rates improved dramatically when taxi fees or bonuses were paid to drivers who delivered land mine victims directly to hospitals or the nearest health facilities.[3] For rural areas that do not have taxis or even a sufficient number of other vehicles available at any time to transport a victim, Nixon proposed that an NGO small business credit program consider the feasibility of loaning money to village entrepreneurs in far-flung settlements for the purchase of rural truck or Jeep taxis.[3] These could be used not only to transport mine victims to hospitals, but also could transport amputees to rehabilitation centers and serve other important community health needs, and entrepreneurs could be paid by the receiving facilities for delivering patients. To do this, one could identify all those villages that have land mine problems, but lack PHC facilities.

Training of Villagers in First Aid

At the community or village level, the availability of persons with some basic health and first-aid skills could save limbs and improve survival rates. A person who knows how to stop bleeding, whether to apply a tourniquet, how to perform mouth-to-mouth resuscitation, and how to bandage a fracture would be an asset to the community. Public health-care clinics or hospitals in the area periodically could provide training courses for such individuals from villages near minefields. The persons selected for such a course must be those who reside in the community or village, preferably pharmacists, shopkeepers, and especially community health workers. Paying participants a small stipend or honorarium during their training would be an appropriate incentive. In the event that area clinics or hospitals do not have people who are qualified to provide such training, the WHO, other United Nations agencies, NGOs, or the ICRC could provide the technical training needed through consultants, experts, or master trainers who would travel from place to place to train the relevant clinical or hospital staff as trainers. *Per diem* as well as some essential drugs provided to the facility would provide adequate incentive. This not only would help to improve survival and care of mine victims, but also would improve the health of other injured and sick people.

Improving Capacity and Quality of Mine-Injury Treatment Facilities

Countries affected by war or civil strife also suffer from destruction of health infrastructure. Mine injuries are complicated emergencies requiring skilled surgeons and adequate health-care services. As a first step, a quick survey and analysis of the availability and capacity of such facilities are required to improve or expand existing capacity. The need for trained staff to handle land mine injuries often is the greatest because war frequently causes a "brain drain" of trained staff. In assessing training needs, both shortage of trained personnel and the ongoing occurrence of land mine injuries need to be considered. Land mine injuries are likely to continue to occur for many years during the post-war period.

National disaster-management planners, thus, should link emergency and post-emergency plans as a develop-

ment continuum plan. This type of linkage is important, especially in the case of training personnel. Many NGOs are involved in helping countries affected by war, and the number and funding levels tend to decrease as the "emergency" state ends. An adequate number of trained nationals must remain when the expatriates leave.

Therefore, it is recommended that the WHO should continue to help the ministries of health in affected member states during the emergency preparedness and early relief phases of an emergency. The resources of NGOs can be utilized in training national staff that can handle mine injuries during a prolonged war and in the post-war period. Implementing such a plan would allow better allocation of limited human and financial resources from the international and national communities. The goal of the WHO, in this context, is to strengthen the national capacity in emergency preparedness and disaster relief within the overall framework of health development.

What type of training is necessary, and for how long and where, are specific issues that need to be addressed following the initial survey and needs assessment for each affected country. As a general rule, however, a country infested with mines needs nurses trained to provide emergency care at health facilities. It also must be able to treat trauma victims with subacute psychiatric reactions. Treating the psychiatric problems of the patient during this phase is important in preventing PTSD.

As many land mine victims need surgery (28% need amputation), a referral system for victims must be worked out carefully. Again, at the referral-level facility, skilled surgeons are necessary to handle the complicated surgery needed. Training of orthopedic and general surgeons to handle land mine injuries may be beyond the capacity of the developing countries affected. The cooperation of the WHO and other agencies will be needed to train surgeons at the national level. While these surgeons are being trained, expatriates will need to be brought in to cope with the emergency situation.

For countries with land mine problems, a long-term training plan is necessary. Given the slow pace of mine clearance activity, land mine injuries sustain the emergency state of war. However, since fewer NGOs may be operating during the post-war period, continuous publicity and advocacy by international agencies is necessary to persuade donor countries and agencies to provide the necessary funds and expertise to help implement the above proposed recommendations.

A high incidence of land mine injuries creates a great demand for supplies of surgical implements, antibiotics, anesthesia, X-ray films, and blood transfusion supplies. Land mine surgery cases, when compared with other surgery cases, use a much greater proportion of available hospital resources,[2] exacerbating an already limited surgical-supply situation. For the sake of land mine victims, and also to prevent land mine casualties from "monopolizing" or diverting supplies from other surgeries, it is necessary that sufficient medical and surgical supplies be provided to countries struggling to take care of land mine injuries. To this end, cooperation is essential between United Nations agencies, the ICRC, and other NGOs.

Blood transfusion is a particularly important issue because of the risk involved in the spread of HIV and other blood contaminants, such as the agents causing hepatitis, trypanosomiasis, and malaria. In areas in which there is an HIV epidemic, the provision of facilities that will test blood for contaminants, especially HIV, is very critical to prevent further spread of the deadly virus. The specifics on how such a disaster can be avoided need to be worked out for each country.

Psychiatric Programs

There are land mine-related psychiatric patients with chronic conditions, such as PTSD, and there are those who are being added to the pool of disabled who may be in the acute or subacute phases of reaction to the trauma. This latter group constitutes the population at high risk for developing PTSD. It has been shown that intervention at the subacute phase reduces the chances of a victim developing PTSD, and may reduce the intensity and duration of PTSD if they develop it.[12] For this reason, treatment strategy specifically should include treatment of patients with subacute reactions, as well as treatment of those with chronic conditions.

Treatment in the first few days or weeks (subacute phase)—Psychiatric treatment is needed not only by patients with severe injuries, but also by those who experienced severe shock, but had lesser or no injuries. Traumatized individuals feel unsafe and terrified. The trauma can cause guilt, shame, low self-esteem, distrust, and self-blame. The recovery of traumatized patients, therefore, requires the restoration of a sense of safety, the validation of the patient's feelings, the provision of opportunity for the patient to express anger, and the restoration of the patient's self-acceptance.[13]

Treatment of PTSD—Several treatment modalities currently are being evaluated for the treatment of PTSD. Eye movement desensitization (EMD) is one method that has shown promising results. First described by Shapiro in 1989, the EMD technique is simply and rapidly performed.[14] The therapist elicits rhythmic eye movement, while the PTSD patient visualizes an image of an "intrusive" memory and attends to the negative self-statement associated with the image.[15] Given the large number of patients around the world who are waiting to be helped, it is recommended that further studies on the effectiveness of EMD be concluded, and feasibility studies and preparation for training the relevant staff from countries infested with mines be expedited.

Rehabilitation Programs

Disability as defined by the WHO is "any restriction or lack of ability to perform an activity in the manner, or in the range, considered normal."[16] Land mine-related disabilities include the directly disabled (physical and/or mental) and the indirectly disabled (e.g., those with poliomyelitis, and iodine-deficiency disease).

There are hundreds of thousands of mine-disabled people. At least 8,000 are added annually. Many of the

disabled have serious difficulties locating and affording appropriate rehabilitation programs. A few examples are:

1) The amputated disabled need prostheses, which are hard to find. When they are located, several fittings generally are needed during the first year. Once the fittings are accomplished, the prostheses require maintenance; some last only a few years;
2) A growing, disabled child may need a new prosthesis every six months.[2] A 10-year-old child may need at least 25 prostheses during his or her lifetime;
3) The majority of the disabled live in rural areas with no or few transportation facilities. They have difficulty reaching a rehabilitation center, and many may just give up treatment, increasing the burden on the family.

To mitigate some of these consequences, it is proposed that decentralized prosthesis workshops or factories with "outreach capacity" be established in affected countries. For the purpose of sustainability, it is important that the affected countries develop their own prosthesis facilities, including production and maintenance capacities. It also is recommended that the prosthesis facilities have a recruitment policy of giving preference in hiring to amputees and other disabled who still can use their hands in producing prostheses. This would provide jobs and, thus, economic benefit for the disabled, and help the disabled to cope better psychologically with their disability by working alongside others who are similarly disabled.

Public-Health Programs

Greater awareness among health professionals, health services, and relevant ministries regarding the public-health impact of land mines, such as malnutrition, waterborne diseases, and childhood preventable diseases is expected and hoped to stimulate specific programs at national level.

Some suggestions are offered to help control the indirect consequences of land mines:

1) Reduce the demand for firewood to decrease the chances of land mine injury among those who venture out to gather it in or near mined areas. Fuel-efficient, low-technology, solar cookers provided to the villagers will reduce, to a great degree, the need for firewood and, thus, save lives and reduce deforestation;
2) Finding ways to provide safe drinking water to communities where water sources have been mined will help reduce waterborne diseases. Mine-clearing organizations may clear a path of land leading to the water source and fence the rest of the area with clear warning signs. Alternatively, water may be transported to the affected village until the mines are cleared;
3) To reduce the risk of shepherds, farmers, and animals suffering land mine injuries, and to reduce the problem of overgrazing, it would be useful to conduct "military minefield breaching."[3] This would require working with the mine-clearing organizations to locate mine-free detours to pasture land. Finding safe grazing land for the affected villagers would help with food shortages, as well as reduce risk of mine injury; and
4) Provide PHC, especially vaccination coverage, in each province within an affected country to strengthen its community health workers and develop special mobile teams trained in dealing with land mine injuries. These teams would need the cooperation of land mine-clearing organizations and other relevant authorities to find safe routes to the affected villages. These teams also could distribute concentrated food items, such as those provided by the United Nations International Children's Fund, the United Nations High Commission for Refugees, and the WFP.

Conclusions

It will be inferred from these data and recommendations that the cooperation of the people and of the concerned agencies is essential. For example, the NGOs involved in health, education, and relief programs could cooperate by "piggy-backing" the mine-awareness message onto their projects,[3] or by coordinating their activities with mine-clearing organizations to provide safe drinking water to land mine-affected areas. Such coordination at the national level could be carried out by the proposed national intersectoral committee for land mines, which could help strengthen national capacity in the struggle against the land mine epidemic.

However, being born of a military conflict and political nature, this epidemic transcends the functions and capacities of the health authorities and of citizens' organizations; it directly concerns the moral responsibility of nations, their governments' military commands, and the intergovernmental organizations—the UN, North Atlantic Treaty Organization, European Union, and others—at the highest level. For the UN, the position is clear: there must be a worldwide ban on the manufacture, use, and sale of mines.[1] For the WHO also, the issue is fundamental. The organization maintains that "peace is the most significant factor for the attainment of health for all,"[17] while land mines and such devices impede this goal. The ICRC continually calls the attention of belligerents and mine-producing countries to their humanitarian obligation ratified through the Geneva Conventions.[9]

At the national level, the end of the Cold War has introduced serious reassessment, especially among the superpowers, of the size and function of their armies. At present, many armed forces are "recycling" a major part of their personnel for civilian tasks; this opens new challenges for humanitarian, noncombat roles for the military,[18] and it would be a most salutary reversal of functions if such highly experienced personnel, previously trained for war and mine-laying, were to be deployed for peace and mine clearing. This is being done already on some dangerous minefields; given the magnitude of the problem, more nations and governments should have the political will and social determination to eliminate this disastrous man-made epidemic.

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