

Civilian Landmine Injuries in Sri Lanka

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Objectives: The purpose of this study was to describe the injuries sustained by displaced people returning home after a military conflict when landmines were not removed.

Method: This study describes the landmine injuries to patients at the Jaffna Teaching Hospital in northern Sri Lanka over a 20-month period, from May 1, 1996, to December 31, 1997.

Results: There were definite and identifiable landmine injury patterns. Patients were most often wounded in the lower extremities, had multiple wounds, and were injured together in groups.

Victims were most often male, but there were unusually high numbers of women, children, and elderly injured. Mortality rates and amputation rates were high. Deaths occurred early after injury. Higher incidences of mine injuries could be associated with two important activities: returning home and agriculture.

Conclusions: Civilians returning home after armed conflicts are at risk of injury when landmines are not removed. No one is spared. This problem is preventable.

Key Words: landmine, war, wounds, injuries.

Despite all of the media attention devoted to landmines, the majority of medical papers on this subject are editorials instead of studies based on data from the field. Most of the studies include military data; very few study the effects of landmines on civilians specifically. Such information is difficult to obtain. Much of the previous civilian data come from either questionnaires¹ or from the field hospitals run by the International Committee of the Red Cross.²⁻⁶ The data in this study come from Jaffna Teaching Hospital, in Sri Lanka, a war zone hospital whose catchment area includes the city and its surrounding farms and villages. It is the third largest reported landmine study with civilian data.

A chronic and complex civil war has been raging in Sri Lanka and on Jaffna's northern peninsula since 1983. In late 1995, intense open warfare broke out in Jaffna between the Sri Lankan government forces and a militant Tamil group named the "Liberation Tigers for Tamil Eelam" (LTTE). The city of Jaffna and its surrounding villages were evacuated as the armies fought. By early 1996, when the Sri Lankan government forces took control of the peninsula, Jaffna's people were invited to return to their homes and farms. Unfortunately, no efforts were made to remove the landmines left behind by both sides. This study identifies the patterns of these civilian landmine injuries.

CLINICAL SERIES AND METHODS

We reviewed the patients and the medical records of the Jaffna Teaching Hospital during the 20-month period between May 1, 1996, and December 31, 1997. This time was the initial period when civilians were allowed to return home

by the Sri Lankan Army. The data in this study come from the senior author's 3-month assignment in Jaffna with the international organization "Doctors Without Borders," which has been involved with providing medical care on the Jaffna peninsula since 1987.

Jaffna Teaching Hospital is a 1,000 bed hospital serving as the referral and residency training center for the northern peninsula of Sri Lanka. The hospital structure was damaged during the war and was in a constant state of being rebuilt. Antibiotics were available, but shortages of medical supplies were common. The operating rooms were functional, with good nurses, surgeons, and anesthesiologists. The blood bank had a limited capacity. There was a single ambulance.

This study of civilians included demographic and specific injury data. All data were collected prospectively, directly from patients on the wards or in the operating theater, except for the first 17 months, when retrospective data were collected from the medical records, the War Injury Registry, and the logbooks kept in the Casualty Ward and in the Outpatient Department. A total of 587 civilians were admitted with war-related injuries: 349 landmine injuries, 223 gunshot wounds, and 15 grenade injuries. Of the total of 349 civilians injured by mines, only 21 charts could not be located.

RESULTS

The population of the Jaffna peninsula at the close of the study was approximately 485,000;⁷ thus, the incidence of landmine injuries was approximately 72 per 100,000.

Anatomic Location

The lower extremities were injured in 56% of victims, with over 27% of injuries being below the knees (Table 1; Fig. 1). A total of 60% of patients had multiple injuries. Patients with multiple injuries showed a slightly higher admission rate (98%) and amputation rate (20%) compared with patients with single injuries (88% and 13%, respectively).

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TABLE 1. Anatomic location of mine blast injuries

Location	No. of Wounds (n = 587)	% Total Wounds
Head/neck/eyes	101	16
Trunk	104	18
Upper extremity ^a		
Right arm	71	12
Left arm	63	11
Upper extremity total	134	23
Lower extremity ^a		
Right leg total	132	23
Left leg total	116	20
Lower extremity total	248	43

^a All four extremities injured in nine patients.

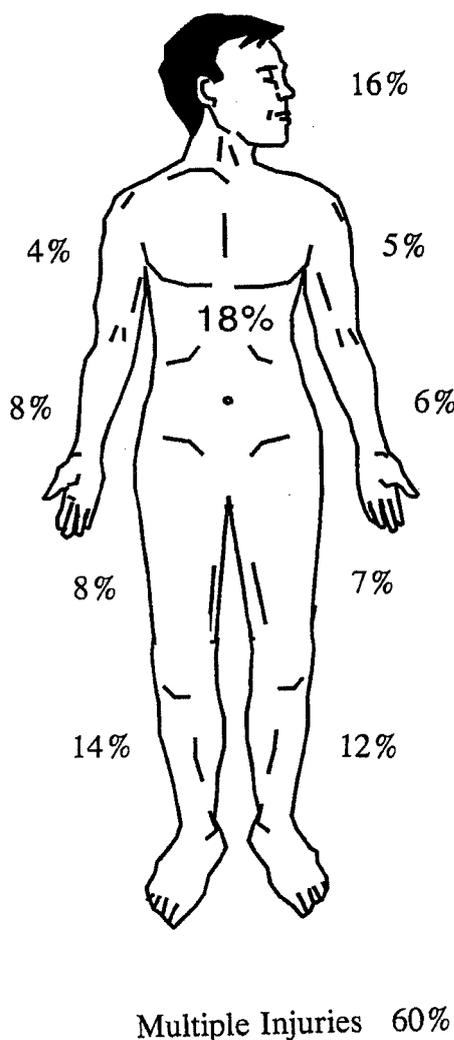


FIG 1. Percentage of landmine wounds per anatomic area.

TABLE 2. Comparisons of age and mine injuries

Study	Mean Age (yr)	Age Range (yr)	% Children <15 yr	% Men 16-50 yr	% Men >50 yr	% Women >16 yr
Thailand ¹³	23.8	17-35	—	—	—	—
Angola ¹²	27	7-61	—	—	—	—
Jaffna	32.2	6 mo. -88	20	50	11	20
Afghanistan ³	—	—	25	66	3	6

Amputations

The amputation rate was 23% (64 patients), 84% were below-the-knee (54 patients), and an equal number on each side (27 left and 27 right). Two patients had bilateral below-the-knee amputations, two had above-the-knee amputations, and two had forefoot amputations. One patient lost both hands, one patient lost his right hand, and one patient lost three fingers.

Mortality

A total of 56 patients died. The mortality rate during the last 12 months of the study was 29%. Forty-five victims were dead-on-arrival (80%). Of the 11 patients who died in the hospital, 5 died within hours of arrival after emergency operative intervention (4 after amputations, 1 after laparotomy) and 2 patients died early from head injuries. Three others died after 2 weeks because of septic shock.

Group Injuries

Nearly half of the victims (49%; 172 patients) were in groups when they were injured. Five of the incidents involved 46 patients (13%). Eleven patients were injured when a civilian bus rode over a mine.

Gender and Age

More men (76%) than women (24%) were injured. The mean age was 32.2 years (range, 6 months to 88 years). Children (<15 years old) composed 20% of all mine victims (Table 2).

Operative Procedures

A total of 54% of the patients went to the operating room. Half of those patients (54%) had one procedure and 88% had three or less operative procedures. The most common procedures were surgical debridement and amputation. Other procedures included laparotomies, enucleations of the eye, removal of foreign bodies, and split-thickness skin grafts.

Length of Hospitalization

Sixty-five percent of patients were in the hospital for less than a week (range, 1-88 days). The mean length of hospitalization was 10.25 days, but it was three times higher if the patient had an amputation (31.0 days). Hospital stays were shorter than previously reported studies, including Thailand (153 days),⁸ Afghanistan (120.4 days),⁹ Mozambique (67 days),⁹ and Bosnia (55 days).⁹

Time of Year and Number of Injuries

The occurrence of mine injuries was greatest during three periods: repatriation and the two planting seasons (Fig. 2). Twenty-six percent of the total injuries took place during the

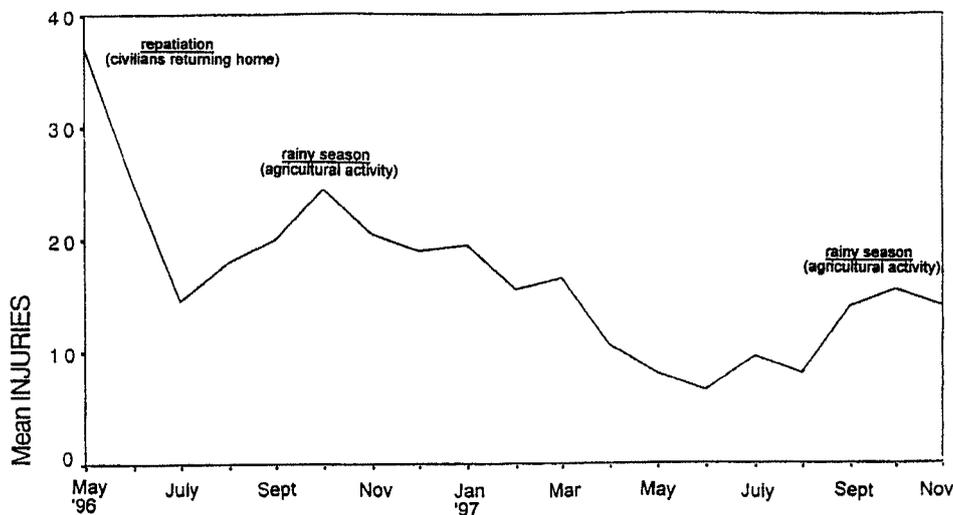


FIG 2. Landmine injuries over time.

first 3 months of the study period, from May to July of 1996 (92 patients), corresponding with initial civilian repatriation. Both the second and third peaks each came during the latter parts of 1996 and 1997, during the planting seasons. During the second peak, 72 patients (18%) were injured, and during the third peak, 51 patients (15%) were injured.

DISCUSSION

The incidence of landmine injuries of 72 per 100,000 was similar to data previously collected in Mozambique¹ for which the incidences of 50 and 120 per 100,000 were reported. The lower extremities were injured nearly twice as often as other areas (56% of all victims). Injuries to other anatomic areas (head, trunk, upper extremities) were fairly uniform (Fig. 1; Table 1). Previous studies confirm these same patterns,^{2,8} although Jaffna's multiple injury rate was higher. Multiple wounds did not necessarily correlate with more serious injury in terms of admission and amputation rates.

The amputation rate (23%) was lower than most other previously published studies (Table 3). There were two possible reasons for this. First, there was a higher use of mines with lower explosive power. According to the United Nations Development Program, the greater proportion of mines on the Jaffna peninsula were of the antipersonnel type and they can be found virtually anywhere, from marked minefields to agricultural lands, homes, and gardens.¹⁰ The most commonly encountered mine was the homemade "shoebox" or "Jony mine."¹⁰ These are small wooden boxes with 300 to 400 grams of TNT or C4 that explode with pressure. The lips of the mine are lined with tin foil, which, on contact, complete a battery-powered circuit and detonates the mine (Fig. 3). Second, this study was large and did not include military casualties. Larger studies with higher numbers of civilian casualties tend to have lower amputation rates^{2,11} than the other studies examining predominantly military casualties^{4,5,12-14} (Table 3). This finding may suggest that larger studies are more reflective of true rates of amputation than smaller ones. Goonetilleke,¹⁴ also reporting from Sri Lanka, showed an amputation rate of three times higher in male military casualties.

Paradoxically, the mortality rate for landmine injuries on the Jaffna peninsula was one of the two highest ever reported^{1,2,12,13} (Table 3). One possible reason for this had less to do with the mines and more to do with the effect of geography on transport time. We surmise that in larger and more mountainous countries such as Afghanistan² and Angola,¹² where other landmine studies have been done, seriously injured patients would have to be transported for several days on poor roads over difficult terrain. Many probably died before they could reach medical facilities and, thus, were not counted, causing mortality rates to appear lower than they really were. The Jaffna peninsula is smaller and the terrain is more flat; transport was probably easier and, thus, faster, so more critically injured patients (and more dead-on-arrivals) could make it to the hospital and be counted.

Death from landmine injuries occurs rapidly. Eighty percent of the landmine deaths were dead-on-arrival, with an additional 9% dying within hours of arrival after emergency operations from exsanguination.

Civilians were usually wounded together in groups (52%). This finding reflects the practice of planting multiple mines in small areas, rather than singly.⁶ In addition, mines were often placed along roads and highways, where people walked to-

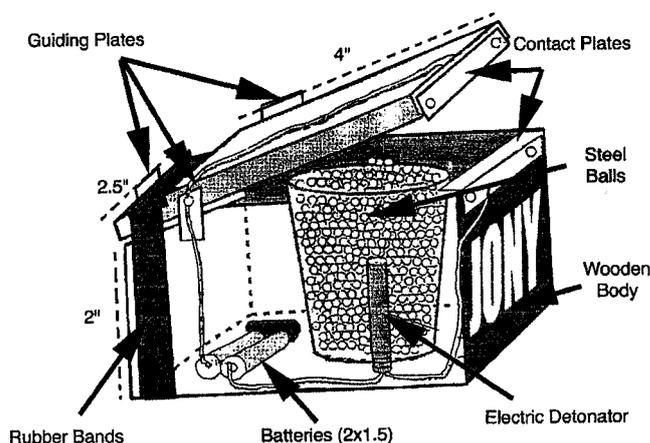


FIG 3. Jony mine.

TABLE 3. Comparisons with other studies

War Zone/Country	Year	Study Size	% Amputation	% Mortality	Multiple Injuries	Population (%)
Kurdistan ¹¹	1991	1,652	24	—	—	Mixed
Afghanistan ²	1991	757	39	0.8	1816/757 ^a	Mixed
Jaffna	1996–97	328	23	29	60%	Civilian
Sri Lanka ¹⁴	1990–92	191	75	—	—	Military (74.9)
Thailand ⁸	1981	120	93	—	47%	Military (82.5)
Angola ¹²	1995	94	56	2	—	Civilian
Thailand ¹³	1981	40	100	0.0	—	Military (81)
Afghanistan ⁴	1985	20	60	—	—	Mixed
Afghanistan ⁵	1985–87	11	73	—	—	Military
Mozambique ^{b1}	1994	—	—	48	73	Civilian

^a Wounds/patients.

^b Questionnaire data.

gether. This is consistent with the 73% multiple victim rate reported in Mozambique.⁹

There were more mine injuries to adult women in Jaffna than in other published studies.³ Injuries to children were high (20%).³ Victims were of all ages (Table 2; Fig. 4). The reason for all of these sex and age differences was because the victims were civilians and not soldiers.

There was a drop in the numbers of mine injuries to civilians between the ages of 26 and 35 years (Fig. 4). One explanation for this finding could be lower numbers of civilian men resulting from years of chronic war. Many men in this age group were probably in the military, missing, or dead.

Because Jaffna’s climate is relatively dry, its planting season comes only once a year, during the rainy season, from late October through January. Because there were greater numbers of mine injuries during the rainy season, it can be concluded that the reason was that more farmers were being injured while attempting to farm. In addition, heavy rains and flooding can also cause shallowly buried mines to be washed down into formerly safe paths, trails, or fields causing additional injuries (“floating mines”).

What kinds of landmines are being used in Sri Lanka? This is a difficult question. After a mine has exploded and the damage has been done, it is very difficult to say with any certainty exactly what kind of ordinance caused the injury (Figs. 5 and 6). Furthermore, the question becomes even more complex when one considers that the civil war has been going on for a very long time (since 1983), and thousands of landmines from numerous sources have been laid over the years by both sides of the conflict.

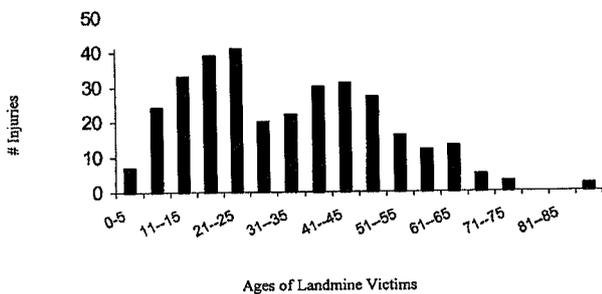


FIG 4. Number of injuries and ages of victims.

According to the United Nations Development Program, the Sri Lankan government is not thought to be a producer of antipersonnel mines, but has received mines from China (Chinese Type 72A) and from Pakistan (Pakistani P4).¹⁰ The LTTE is thought to have received mines from Bulgaria and Romania and has manufactured its own explosive devices as well, including “Jony” mines and directional fragmentation Claymore-type mines.¹⁰

CONCLUSIONS

Civilians returning home to mined areas face a substantial risk of serious injury. Over half of our landmine victims either died or had amputations. Deaths were rapid.

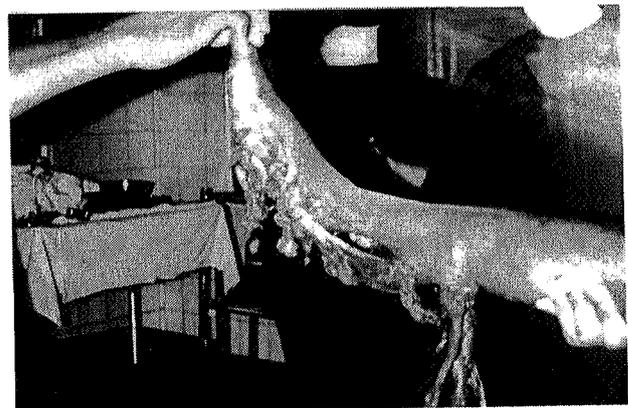


FIG 5. Landmine injury. The patient was hanging clothes on a line.

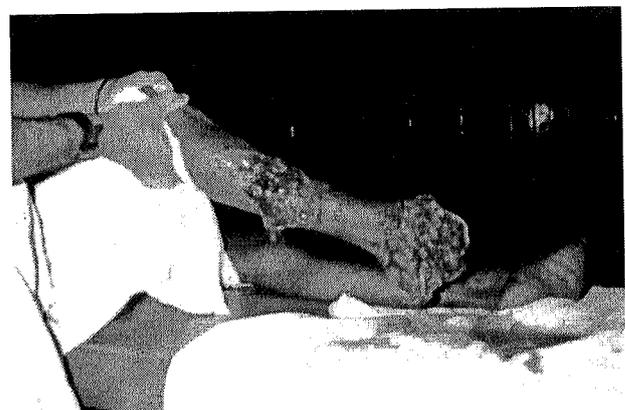


FIG 6. Landmine injury. The patient was gardening in his side yard.

People were injured in groups. More women, children, and the elderly were wounded here than in previous studies of military casualties. Wounds from landmines were scattered and multiple, with the lower extremities predominating. Peak periods of injury occurred during repatriation and during the rainy seasons. Landmine injuries are preventable.

Acknowledgment

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ADDITIONAL COMMENT ADDED IN PRESS

I remember the first person I ever saw with a land mine injury. It was toward the end of the day in an operating theater at the Jaffna Teaching Hospital in Sri Lanka. I was working as a surgeon volunteer with "Doctors Without Borders/Medecins Sans Frontieres." He was lying on a brown metal stretcher down the dark hallway, just outside the operating room, waiting for me. He was a little man, dark skinned, and with long, gray-white hair, balding in front. He was wearing only his sarong, a sheet wrapped around his waist held up with a brown piece of string. His left foot was looked fine, but his right foot was wrapped in a bandage. I could tell by the

shape and color of his bandage that his right foot was not there anymore. He was silent, but there were tears in his eyes. Someone told me that he was injured in his own home while working in his garden just after lunch.

He was a small, harmless-looking man, whose only crime was to be where he was. I wondered, "Who won today's battle? Who was today's war hero? Why?" And what could I say to that little girl I saw later that day who lost the fingers of her right hand while playing?

We just do not seem to have any solutions that work, so far. When a land mine injures a child or a farmer trying to make a living, it is an assault on people. The victim is visible, but the perpetrator is not. Survivors with amputations become beggars where the economy is based on manual labor. As physicians involved with trauma, we must stand for not only treatment but for prevention too.

But what can we do? Many seemingly insoluble problems must be faced. First, there is mine clearance. It is impractically slow and expensive. Most governments lack the resources and political will to have any effect. Second, there is the heavy manufacturing of mines. Mines are in high demand. For developing countries with limited funds, they are cheap to make and easy to deploy. For the military strategist, they protect and conserve combat power; they control terrain; deny the element of surprise; protect the flank; and inflict damage to enemy personnel and equipment. Scatterable mines can be dispensed rapidly and block the movement of opposing forces.¹⁻³ Third, there is a lack of responsibility. No one takes responsibility for the injuries caused by mines: the governments who procure them do not, the armies and the militant groups who deploy them do not, and the international companies that manufacture them do not.

What we can do is support a ban on landmine manufacture and use. We need to stop being silent and convince our military and our politicians that a weapon that has such a devastating impact on the vulnerable people who are caught in the middle of military conflicts does not accomplish our goals. We need to support research, promote responsibility, and help the international agencies leading the effort to halt their manufacture and their deployment.

These injuries are preventable; but as long as governments and militant groups continue to view mines as militarily useful, and as long as they continue to place the security of their armed forces ahead of the safety of civilians, then land mines will continue to be our own self-inflicted plague well into the next century.

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