Analysis of Non Enemy Action Deaths in Counter Insurgency Operations through Mortuary Services

Col MM Arora*, Lt Col JK Bhatia[†], Brig KVS Rana[#]

Abstract

Background: Regional Trauma Centre in the northern India receives the mortal remains of all fallen soldiers for embalming. Non enemy action deaths during counter insurgency operations (CI Ops) were analysed for planning preventive measures.

Methods: Mortal remains received for embalming from Jan 1999 to Dec 2006 were analysed with respect to mode of injury, causation, body parts involved, fatality, seasonal variation and changing trends.

Result: Accidents accounted for 3.02 deaths per thousand troops and environmental factors were responsible for 1.14 deaths per thousand troops deployed. Accidental deaths peaked in 2000, declined in 2001 and then remained more or less static. Of the accidental deaths, 88% were brought in dead and 12% died after reaching hospital. Road traffic accidents were the major killers accounting for 48.2%, followed by accidental discharge of weapon 35.5%. The latter is showing a rising trend from 8% of total accidents in 2001 to 65% in 2005 and 51% in 2006 ($p < .01$). Most (49.7%) of the deaths were below 25 years of age. Proportion of persons below 25 years was more in fatalities due to accidental gunshot wound. Amongst the road traffic accidents, 40% died of head injury and 51.2% due to multiple injuries. When deaths occurred due to accidental discharge of own weapon, 36.4% had brain injury and 22% heart injury. Of the environmental fatalities all but one were brought in dead. Majority were due to avalanches and landslides (51.2%), followed by earthquake (22.4%), lightning (12.8%), high altitude pulmonary oedema (10.4%) and hypothermia (3.2%). Most of the deaths due to avalanches occurred in February while all deaths due to earthquake were in October 2005. Of the deaths due to lightning, 75% occurred in April and May.

Conclusion: Prevention of death caused by road traffic accidents, accidental discharge of weapon, avalanches and lightning will conserve manpower and add to operational preparedness.

MJAFI 2008; 64 : 104-107

Key Words : Non enemy action deaths; Counter insurgency operations; Accidental discharge of weapon; Road traffic accidents

Introduction

Non-enemy action injuries are a significant cause of mortality and morbidity in the armed forces which are responsible for 28.08 admissions per year per 1000 troops [1]. Analysis of mechanism and type of injury permits more focused planning of medical cover and trauma prevention. Peculiarities of terrain, training, equipment and environment, make it mandatory for armed forces to evolve terrain and operation specific data. The army is deployed during operations in varied geographical and climatic conditions. This study was designed to evolve combat medical statistics to assess the quantum and nature of non-enemy action fatalities in counter insurgency operations.

Material and Methods

This study was done at a regional trauma centre of Indian Army. The study subjects were the combat personnel who lost their life in non enemy action injury while being deployed in counter insurgency operations, and whose mortal remains

were received for embalming between 01 Jan 1999 to 31 Dec 2006. Fatalities of Kargil war (1999) were not included, that being more like a conventional war. Fatalities of paramilitary personnel were also not included as most of their mortal remains do not reach us. Deaths due to enemy action, illness, and those with incomplete information were excluded.

Injuries sustained by the deceased were studied with respect to cause, body parts involved, fatal injury, seasonal variations and changing trends over the years. Injury was considered fatal, if it involved vital organs or major blood vessels. If more than one vital organ were involved, cause of death given by the medical officer on the death certificate was referred to. Multiple injuries were considered the cause of death if more than one non-adjacent vital organ were injured. In case an autopsy was performed, fatal injury was deduced after the autopsy. Data was analysed using Microsoft excel software and chi square test for difference in proportions.

Results

During the study period 13.06 mortal remains per thousand troops deployed, were received for embalming. Out of these,

*Professor & Head, Dept of Biochemistry, AFMC, Pune 411040. [#]Graded Specialist Pathology, Military Hospital, Mathura (UP); [†]Deputy Director of Medical Services, HQ Delhi Area, PIN 900106, C/o 56 APO.

accidental deaths accounted for 3.02 per thousand (23.1%) and environmental deaths for 1.14 per thousand (8.7%) as compared to 8.16 deaths per thousand (62.5%) due to terrorist induced injuries and 0.63 per thousand (4.8%) due to injuries induced by enemy across the line of control. All but one of the environmental fatalities and 89% of the accidental fatalities (Fig. 1) were brought-in-dead. Accidental deaths peaked in 2000, declined in 2001 and remained static thereafter (Fig. 2). Environmental deaths peaked in 2005 due to the earthquake on 08 October 2005. Another peak in 2003 was due to avalanches. Changes in proportions of the various modes of injury over the years were significant at a 'p' value < 0.001.

The rank structure of accidental fatalities was officers 5.7%, junior commissioned officers (JCOs) 4.5%, and other ranks 89.8%. Among the environmental fatalities there were 2.4% officers, 6.4% JCOs and 91.2% other ranks. Most (49.7%) of the persons who died were below 25 years of age. Proportion of persons below 25 years was more in fatalities due to accidental gunshot wound (Table 1).

In the accident group, road traffic accidents (RTA) were the major killers accounting for 48.2% deaths. Accidental discharge of weapon was responsible for 35.5% fatalities, while accidental fall and falling objects for 6.3% and 2.7% respectively (Table 2). Road traffic accidents are showing a declining trend from 82% of total accidents in 2001 to 12% in 2005. Accidental discharge of weapon is showing a rising trend from 8% of total accidents in 2001 to 65% in 2005 and 51% in 2006 ($p < .01$) (Fig. 3). Of the accidental gunshot deaths, 22.7% were suicidal and 17.3% were fired from own weapon. Out of the self inflicted deaths, 58% were under 25 year of age and 26% between 25 to 30 years. Of the environmental fatalities majority were due to avalanches and landslides (51.2%), followed by earthquake (22.4%), lightning (12.8%), high altitude pulmonary oedema (10.4%) and hypothermia (3.2%).

In the accident group, maximum road traffic accident deaths occurred in the month of June followed by October. There was no specific trend regarding accidental gunshot wound. In the environmental group most of the deaths due to avalanches occurred in February while the second peak was due to earthquake in October 2005 (Fig.4). Majority (75%) deaths due to lightning occurred in April and May.

In environmental fatalities, whole body was involved in majority except in cases of high altitude pulmonary oedema. Body region wise distribution of fatal accidents (Table 3) reveals that 37.4% of all deaths were due to head injury, 5.1%

Fig. 1 : Accidental deaths

due to neck and maxillofacial injury, 8.1% due to heart injury and 5.7% due to injury to lungs. Multiple body parts were injured in 33.2%. Most frequent targets of accidental gunshot was brain (39.1%) and heart (23.6%) (Table 3) (Fig.5). Out of the road traffic accidents, 40% died of head injury and 51.3% due to multiple injuries.

Discussion

Majority of combat deaths in war occur before evacuation. For every death in a medical treatment facility, as many as nine have already died [2]. Despite differences in the mechanism of injury, we found nearly the same proportion in accidental deaths. In environmental fatalities, most victims were brought-in-dead reflecting instant death or delayed evacuation.

Non-enemy action injuries are responsible for 28.08 admissions per year per 1000 troops in Indian Army [1]. In this study also accidental and environmental injuries accounted for 23.1% and 8.7% of casualties. Half of

Table 1
Age distribution of fatalities (%)

Type of fatalities	< 25 years	25-30 years	30-35 years	>35 years
Accidental gunshot	57.3	21.8	6.4	14.5
Other accidents	47.7	23.8	14.9	13.5
Environmental	46.4	22.4	16	15.2
Total	49.7	23	13.1	14.2

'p' value accidental gunshot vs environmental < 0.05

Table 2
Causes of injury

Accidental deaths	%	Environmental deaths	%
Road traffic accidents	48.2	Avalanche	43.2
GSW/Mine/IED	35.6	Earthquake	22.4
Fall	9.0	Lightning	12.8
Aircraft accidents	2.4	High altitude pulmonary oedema	10.4
Electrocution	1.8	Landslide	8.0
Hanging	1.8	Hypothermia	3.2
Drowning	0.9		
Burns	0.3		
Total	100		100

Fig. 2 : Accidental and environmental deaths

Fig.3 : Road traffic accident and gun shot wound (%)

Fig. 4 : Seasonal trends

the accidental deaths were because of road traffic accidents (RTA) (Table 2). This could be due to increased movement of troops and fatigue of the drivers. Seasonal trends (Fig.4) substantiate this fact as most of the accidents occurred between June to December when vehicular movement is more. Annual trends reveal that number of road traffic accidents is going down (Fig.3). Probably emphasis on training of the weak drivers and mechanised transport discipline is paying dividends. Similar decline was observed in United States (US) army when their fatality rate due to motor vehicle accidents dropped from 40.8 per lac in 1980 to 20.6 in 1997 consequent to military policies and law enforcement regarding drunken driving and seat belts [3]. Nearly 40% died of head injury and 51.2% of multiple injuries in RTA (Table 3). A similar pattern of injury was reported in motor vehicle deaths in Hong Kong [4].

We observed that those sitting in front compartment facing the road sustained less fatal injuries than those seated in the rear of the vehicle. The cargo area in the rear of a truck does not meet occupant safety standards, yet it is too often used for transporting soldiers. In California, passengers in cargo area of pickup trucks were three times more prone to death in automobile

Fig. 5 : Target of fatal accidental gunshot (%)

accident than front seat occupants [5]. In United States, there is legal prohibition on carrying passengers in cargo space [6]. A larger study to confirm these observations and vehicles redesign may be required.

Accidental discharge of weapon was responsible for nearly 35% of fatal accidents and is showing a rising trend after 2001 (Fig.3). Battle stress and deliberate self harm may be partly responsible for these accidents as a sizable portion of these were self inflicted. The possible motives for deliberate self harm could be: to die; to escape from unbearable anguish; to change the behaviour of others; to escape from a situation; to show desperation to others; to get back at others and make them feel guilty; to gain relief of tension and to seek help [7]. It was observed that proportion of persons under 25 years of age in accidental gunshot deaths was more than in other accidents or environmental deaths (Table 1) and out of self inflicted deaths 58% were under 25 years of age. In US, suicide is the third leading cause of death in 15- 24 years age group [8]. Similar observations were made in US army soldiers in 2005; when 54% of all suicide victims were under 25 years [9]. A chart review of 425 deployed soldiers in Operation Iraqi Freedom II revealed that 127 (30%) had considered killing themselves and 67 (16%) killing others [10]. Access to a gun increases the vulnerability to suicide by five times [11] and a household member is 22 times more likely to be shot than an intruder is [12]. Thorensen et al [13], observed an overlap of certain risk factors such as depression, substance abuse and negative life events. Present emphasis on rejuvenation and relaxation techniques in the troops deployed in CI Ops appears to be a step in right direction [14].

Table 3

Body parts involved in accidental deaths (%)

Accident	Head	Face/Neck	Heart	Lungs	Abdomen	Limbs	Hanging	Multiple	Whole body
Gunshot	39.1	8	23.6	11	5.5	2		10.8	
Road traffic accident	40	2	0.6	2.5	1.9	1.9		51.1	
All accidents	37.4	5.1	8.1	5.7	3.6	1.8	1.5	33.2	3.6

'p' value Gunshot vs Road traffic accident < 0.001

Although blunt trauma may kill up to one third of avalanche victims, early asphyxiation is the predominant mechanism of death, and hypothermia is rare [15, 16]. Studies using small artificial air pockets in snow have shown that the degree of hypoxia following avalanche burial is dependent on air pocket volume, snow density and unknown individual personal characteristics, yet long-term survival is possible with only a small air pocket [17]. In one study, survival probability in completely buried victims in open areas (n=638) plummeted from 91% at 18 minutes after burial to 34% at 35 minutes and then remained fairly constant until a second drop after 90 minutes [18]. This steep drop ("fatal kink") underlines the importance of efficient rescue procedure and survival devices. Apart from a transceiver and shovel, these devices include artificial air pocket device (AvaLung), the avalanche air bag system (ABS), and the avalanche ball [19]. The artificial air pocket provides respiration during snow burial while ABS forces the wearer to the surface of the avalanche debris by inverse segregation to help prevent burial. The Avalanche Ball is a visual locator device in the form of a spring-loaded ball attached to a tether, which is released from a fanny pack by a ripcord [19]. Motorola have tested one GPS based system that gives effective signal up to one meter depth of snow [20]. The decrease in deaths among groups that benefit from avalanche control programs supports the benefit of avalanche prevention strategies [21]. Lightning was responsible for 12.8% of environmental fatalities and its safety guidelines are available in public domain [22].

To conclude, prevention of road traffic accidents and negligent discharge of own weapon by adequate training and stress amelioration techniques is the need of the hour. Lightning-safe shelters and avalanche survival devices will reduce fatalities due to non enemy action.

Conflicts of Interest

None identified

Intellectual Contribution of Authors

Study Concept : Col MM Arora, Brig KVS Rana

Drafting & Manuscript Revision : Col MM Arora, Lt Col JK Bhatia, Brig KVS Rana

Statistical Analysis : Col MM Arora, Lt Col JK Bhatia, Brig KVS Rana

Technical Support : Col MM Arora, Lt Col JK Bhatia

Study Supervision : Col MM Arora

References

1. Chaturvedi A, Jayaram J, Saiprasad GS, Singh Z, Dutta Gupta KK, Singh M, eds. Manual of Health for the Armed Forces. New Delhi: Govt of India; 2002: 773-4.
2. Bellamy FR. The causes of death in conventional land warfare: Implications for combat casualty care research. *Milit Med* 1984; 149: 55-62.
3. Krull AR, Dellinger AM, Yore MM, Amoroso PJ. Motor vehicle fatalities among men in US Army from 1980 to 1997. *Milit Med* 2004; 169: 926-31.
4. Cameron PA, Rainer TH, Mak P. Motor vehicle deaths in Hong Kong: Opportunities for improvement. *J Trauma* 2004; 56: 890.
5. Anderson CL, Agran PF, Winn DG, Greenland S. Fatalities to occupants of cargo areas of pickup trucks. *Accid Anal Prev* 2000; 32: 533-40.
6. Williams A, Goins S. Fatal falls and jumps from motor vehicles. *American Journal Public Health*. 1981; 71: 275-9.
7. Hawton K, James A. Suicide and deliberate self harm in young people. *BMJ* 2005; 330: 891-3.
8. Moscicki EK. Identification of suicide risk factors using epidemiologic studies. *Psychiatr Clin North Am* 1997; 20: 499-517.
9. Allen JP, Cross G, Swanner J. Suicide in the Army: A review of current information. *Milit Med* 2005; 170: 580-4.
10. Hill JV, Johnson RC, Barton RA. Suicidal and homicidal soldiers in deployment environment. *Milit Med* 2006; 171: 228-32.
11. Kellermann AL, Somer G, Rivara FP, et al. Suicides in the homes in relation to gun ownership. *NEJM* 1992; 327: 467-72.
12. Kellermann AL, Somer G, Rivara FP, et al. Injuries and deaths due to firearm in the home. *J Trauma* 1998; 45: 263-7.
13. Thorensen S, Mehlum R. Risk factors for fatal accidents and suicides in peacekeepers: Is there an overlap. *Milit Med* 2004; 169: 988-93.
14. Dimsdale JE, Irwin M, Keefe FJ, Stein MB. Stress and Psychiatry. In: Sadock BJ, Sadock VA, eds. *Kaplan & Sadocks Comprehensive Textbook of Psychiatry*, 8th ed. Philadelphia: Lippincott Williams & Wilkins, 2005; 2180-95.
15. Locher T, Walpoth BH. Differential diagnosis of circulatory failure in hypothermic avalanche victims: Retrospective analysis of 32 avalanche accidents. *Schweiz Rundsch Med Prax*. 1996; 85: 1275-82. [Article in German]
16. Rostrup M, Gilbert M. [Avalanche accidents]. *Tidsskr Nor Laegeforen*. 1993; 113: 1100-2. [Article in Norwegian]
17. Brugger H, Sumann G, Meister R, Adler-Kastner L, Mair P, Gunga HC, et al. Hypoxia and hypercapnia during respiration into an artificial air pocket in snow: Implications for avalanche survival. *Resuscitation*. 2003; 58: 81-8.
18. Brugger H, Durrer B, Adler-Kastner L, Falk M, Tschirky F. Field management of avalanche victims. *Resuscitation* 2001; 51: 7-15.
19. Radwin MI, Grissom CK. Technological advances in avalanche survival. *Wilderness Environ Med*. 2003; 14: 69-70.
20. Stepanek J, Claypool DW. GPS signal reception under snow cover: A pilot study establishing the potential usefulness of GPS in avalanche search and rescue operations. *Wilderness Environ Med*. 1997; 8: 101-4.
21. Page CE, Atkins D, Shockley LW, Yaron M. Avalanche deaths in the United States: A 45-year analysis. *Wilderness Environ Med* 1999; 10: 146-51.
22. Holle RL, López RE, Zimmermann C. Updated Recommendations for Lightning Safety-1998. *Bull Amer Meteor Soc* 1999; 80: 2035-41.