Epidemiology of mine explosion and other munitions organic injuries in Ilam province from 2001-2007

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Abstract: The widespread use of explosive weapons such as mine is cause of various injuries in the victims. That is very important about the health and life of the people and military personnel as special forces in charge of country security. Epidemiological studies in these events are one of the most effective ways to manage and reduce the damage caused by the explosions in the border areas contaminated by mines and other explosive materials. Therefore, the present study aims at evaluation of types of injuries related to mine and munitions explosion and their related factors in Ilam province. This survey is a cross-sectional (descriptive - analytical study) study. Data for this study were collected from census of all case records of injuries caused by the explosion of mines and other munitions from 2001 to 2007 that were registered in the forensic office of Ilam. In this study descriptive statistics like Chi-square, Fisher exact, one-way variance analysis ANOVA and Tukey tests were used from the total of 106 injuries during the study period 95.3% were male and the rest female, in age group 20-40 years old that had the highest number of injuries(47.2 %). Also among the injures, impairments with 4%(CI95%:0.29-0.57), skin lesions 16% (CI95%:0.01-0.33), nephropathy 15.1%(CI95%:0.01-0.32), upper extremity bone defects3.8%(CI95%:-0.14-0.22), lower limb bone defects 18.9% (CI95%:0.02-0.36)and skull bone injuries 2.8% (CI95%:-0.15-0.21) were common respectively. Also, a meaningful relationship between type of injury, age, gender, occupational status and type of explosives in injured individuals was found. The degree of impairment caused by the explosion of mines and other ammunitions in this study is higher than other similar studies. In fact, these events can leave irreparable damage to the physical or mental health of the affected people. Also, ignoring the affected areas can damage residents' mental health such as farmers, ranchers, and military personnel stationed on border areas.
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1. Introduction

Mine and other war weapons are among the most ancient military strategies utilized for prohibiting the enemy's progress. these weapons are extensively being used by the military forces all around the world that due to their long time presence cause death, destruction and financial and life loses among military individuals and the civil [1]. In Iran, in spite of enormous attempts for clearing the explosive materials, many west and southwest border areas are filled with mine and explosive material that threaten local villagers, farmers and military personnel in these regions [2].

In contaminated regions, usually, the land mine contamination is higher than other explosive materials. Moreover, the main problem with mine is that they are hidden under ground exploded by the victim. This factor causes an increase in number of munitions victims compared to other explosive materials [3]. In fact, explosive materials are utilized in different forms , i.e., antipersonnel mine, bounding mine and etc. the annual records show that about 15 to 20 thousands victims are killed or get injured in the world because of mine explosion or other weapons [2]. Also, mine explosion is considered as the most fundamental factor in visual and hearing loss in comparison to other explosive materials and war weapons [4].

Therefore, epidemiologic recognition of such tragedies and that what type of injury and damage they leave behind among victims, can contribute in future planning and monitoring as well as general understanding of such accidents [3]. After explosion, the explosive materials play a critical role in the result and intensity of damage. In some studies, type of explosive materials, destruction power and location of these materials in lands are taken into consideration [5]. When Iraq-Iran war finished in 1988, approximately 16 million mines were left in border areas of 5 neighborhood provinces to Iraqi borders like West Azerbaijan, Ilam, Kurdestan, Kermanshah, and Khouzestan that killed 3 victims each day. Unfortunately, in addition to military personnel, lots of farmers are living around these

contaminated areas that risk of explosion threats them every day. Of the injuries made by mine explosion, top and bottom body organs injuries are extremely deadly that occur after the explosion [1,6].

In Persian Gulf war, 2002, about 75 per cent of injuries were due to explosion. From this, 53 per cent were penetrating injuries to the soft tissues injuries and 23 per cent bone fracture. Among them, 82 per cent of open fracture, 50 per cent upper extremities fracture and 50 per cent lower extremities fracture. Also, in a similar study in Croatia, it was found out that the most common injuries resulted by explosive materials are penetrating injuries in lower organs [7,8]. One of effective methods in management and reduction of injuries caused by explosion among victims in contaminated borders areas to mine and other explosive materials is epidemiologic realization of these tragedies from different aspects. Accordingly, some necessary actions can be taken in order to clear the contaminated regions and consequently drop off life and financial losses of explosions [9].

Ilam province, which has the longest shared border with Iraq , has experienced the highest rate of contamination to mine and other explosive materials and have left behind many victims and destructions. The present research, thus, examines the frequency of body injuries like the skull and upper and lower extremities injuries in victims of mine explosion in Ilam within years 2001 through 2007.

2. Materials and methods

The current research is a type of cross-sectional (descriptive-analytical) one. The population consists of all victims of mine and other weapons explosion during years 2001 through 2007. By referring to the forensics center of Ilam as a reference for examination of injuries resulted by explosion for determination of injuries and impairment with total size 106 victims. After receiving permissions, by referring to records of the Examination unit of the forensics center in Ilam , names and file numbers of all victims were taken . Then, the required data were collected through a previously prepared checklist which was performed by some professionals. After, the data were analyzed by SPSS software version 18 . Statistical tests, Chi-square, Fisher Exact, One –way variance analysis ANOVA and Tukey test were applied to test the data.

3. Findings

Examining the victims' medical files, 101 subjects were male and 5 subjects were female. Also, average age of victims was 31+ 1/1. The highest rate of injuries happened in winter 2003. Moreover, impairment was the most significant type of injuries. In addition, most of the victims were farmer, and military personnel. The findings showed that the principle explosive material in creating injuries was antipersonnel mine. Table1 presents the victims characteristics based on different measures.

The common distribution of different impairments based on the studies years and the job in Fig. 1 and 2.

Considering the relation between type of injuries and some registered quality variables in the victims' medical files, the results are provided in Table 2.

To test the relation between type of injury with the victims' age, one o-way variance analysis (ANOVA) test was applied ($P \leq 0.02$). Also, Tukey test was used in order to see the mean age in what group of victims is meaningful. Table 3 shows the results.

The Tukey test results indicated that mean age of the victims has a meaningful relation with bone defects of upper and lower organs ($P \leq 0.01$). Furthermore, the mean age in victims with impairment and nephropathy was meaningful ($P \leq 0.01$).

4. Discussion

In the current research, most of mines and other munitions explosion victims were male (95.3%) , which shows men are more in danger than women. This result is in accordance with a study performed in Thailand in 2002 and the studies of the trauma center of Sina at Medical Sciences university of Tehran in 2005. The reason for higher risk of men could be due to men's job that is more frequently in contact with contaminated areas [3,10,11]. Moreover, most of victims were farmer that augments the number of explosion injures. However, in another study in Afghanistan in 2007, victims were mostly students, worker and employed peoples who have been injured by munitions explosions [11].

Since in Iran farmers travel and work in the contaminated areas, it would be expected the number of victim farmers increases. In other study, most of victims were reported to be military personnel [12]. This, also, could be because the military personnel patrol in the border areas of Ilam are continuously threaten by explosion compared to other groups. In the present research, the group age was increasing in risk of injuries were young adults and adults 20 through 40 years old. This group age is the most productive labor force; therefore they have higher work enthusiasm and as a result are more encountered with explosion risks. This finding correlates with researches were done at Sina trauma center [11] and epidemiologic study of disasters caused by war weapons [13]. On the other hand, in Radonic and colleagues' study, victims were mostly little boys had no awareness about not traveling to mine regions and prohibiting any disaster [14].

Also, most of accidents in this research had been occurred in winter. It seems that thanks to good climate in tropical areas of southern and western Iran, farmers more frequently move to these regions in winter. Examination of the victims' medical documents indicated that the most common injury is impairment (43.4%). This backs to direct and severe injuries of these weapons. The obtained result accords with other previously preformed studies. [15-17]. Furthermore, only 2.8% of victims suffered from skull bone injuries that could be because of in-land explosion and consequently the lower body organs were more at risk of injury. A Norwegian military unit of UN reached the same result in 2007[18].

Considering the nephropathy, 15.1% were such. In a study in Thailand, 40 % of victims suffered from nephropathy because of higher vulnerability of eyes against explosion [19]. More prevalence of nephropathy in Thailand study may be because of difference in type and quality of explosive materials. Besides, no correlation found between injury and disorders such as loss of consciousness, neurological and vascular lesions of lower extremities, which is to some extent in accordance with other research results. In these studies, the lowest number of victims were in these groups [19,20].

The relation between age and type of injury was meaningful (P 0P≤ 0.002). That is, since victims were mostly in age group 20 through 40 years old, more training programs and planning for this age group must be hold. This result, also, is in accordance with previous researches in this field [19]. Regarding the relation between sex and type of injury, a meaningful correlation exists. In fact, in the present study number of injured men exceeded number of injured women, so this relation is explained by. Additionally, higher contact of men with risky explosive materials represents a meaningful relation with type of impairments in the former studies [19,1].

The current research found a meaningful relation between type of injury and employment (P ≤ 0.04). Since farmers were the greatest injured population, it can be concluded that farmers in the border areas are more at risk of mine and other munitions explosions and the greater rate of subsequent injuries compared to other work groups[9]. Hence, farmers and military personnel face with different types of injuries for their job. However, no meaningful relation was discovered between type of injury and seasons.

Among 17 subjects with skin lesions most of them were male. Also, a meaningful relation realized by use of Chi-square test that confirms the relation between victims' sex and skin lesions (P≤ 0.03). This perhaps, is because most of victims are men rather than women. Moreover, of 16 subjects who are suffering from nephropathy 44% were student and only 4 % were military personnel. The Fisher-Exact test found a meaningful difference between skim lesions and employment measures (P≤ 0.001). this, too, could be a result of military personnel trainings about these risk factors.

Considering the research limitation, since the present research was a type of cross-sectional study and victims were included, interpretation of the analytical tests must be with care. To show a more accurate relation between these variables and munitions injuries , some other analytical studies like control case study is necessary.

Table 1: characteristics of mine and other munitions victims in Ilam province

Characteristics of mine and explosive materials victims	categorization	number	percentage	Level of confidence 95%
age	Below 20 years old	31	29.2	0.13-0.45
	20-40 years old	50	47.2	0.23-061
	40-60 years old	19	17.9	0.01-0.35
	Over 60 years old	6	5.7	-0.12-0.24
sex	Male	101	95.3	0.91-0.99
	female	5	4.7	-0.13-0.23
employment	Military Rancher-	11	10.4	-0.07-0.28
	Farmer	27	25.4	0.09-0.42
	Student	16	15.1	0.02-0.32
	Self-employed	15	14.1	0.03-0.32
	Unemployed	11	10.4	-0.07-0.8
	other	26	24.5	0.08-0.41
year	2001	19	17.9	0.01-0.35
	2002	6	5.7	-0.12-0.24
	2003	34	32.1	0.16-0.47
	2004	21	19.7	0.03-0.36
	2005	9	8.5	-0.09-0.26
	2006	4	3.8	-0.14-0.22
	2007	13	12.3	-0.05-0.30
season	Spring	18	17	0.01-0.34
	Summer	24	22.6	0.06-0.39

	Fall winter	15 49	14.2 46.2	-0.03-0.31 0.32-0.60
Type of explosive material	Antipersonnel mine Other explosive materials	74 36	70 30	0.60-0.80 0.15-0.45
Type of lesion	Skull bone Injuries Impairment skin lesions Nephropathy Upper extremity vascular and nervous lesions Upper and lower extremity bone defects	3 46 17 16 4 20	2.8 43.4 16 15.1 3.8 18.9	-0.15-0.21 0.21-0.57 0.29-0.57 0.01-0.33 0.01-0.32 -0.14-.022 0.02-0.26

Table 2: the relation of type of impairment and other variables among victims in Ilam

Independent variables	test	df	Statistic test	Level of sig. 95%	Level of confidence 95%
sex	Chi-square	4	6.25	0.03*	1.32-2.27
Employment status	Fisher-Exact	12	30.2	0.04*	1.96-2.23
Year of impairment	Fisher-Exact	16	4.2	0.08	1.31-3.12
Season	Chi-square	12	1.58	0.65	0.55-2.11
Type of explosive material	Chi-square	4	6.41	0.002*	1.45-3.87

*Sig.95%

Type of impairment						
indexes	Skull bone Injuries	Impairment	Face skin lesions	Nephropathy	Upper extremity vascular and nervous lesions	Upper and lower extremity bone defects
mean	29.2	24.6	29.6	34.1	30.1	32.3
median	28	26.1	29	31.9	31.6	30
Sd	0.3	3.9	7.6	5.8	1.2	4.2
F value	18.2					
Sig.	0.002					

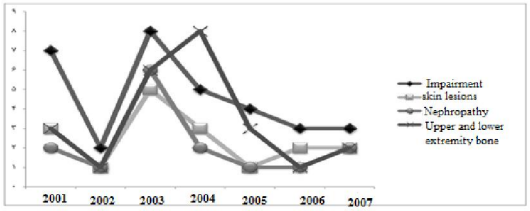

Fig. 1: distribution of main impairments among mine and other munitions injuries within years 2001-2007 in Ilam

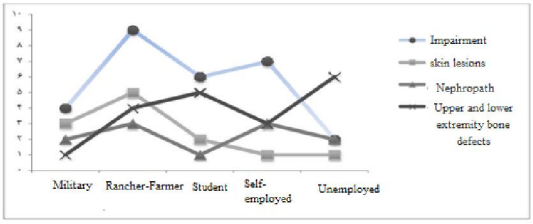

Fig.2: distribution of major impairment based on job among mine and munitions victims in years 2001 – 2007 in Ilam

5. Conclusion

The rate of impairments resulted by mine and other munitions in the research was above the world's standards. In fact, these accidents can leave irreparable damages to individual's physical health and impose many direct and indirect costs to the individual, his relatives and the society or event end to the individuals death. Therefore, with emergency and precise planning and actions for clearing the contaminated lands, as well as identification of individuals and groups at risk and giving them necessary information and trainings, the cost of such disasters will drop off consequently.

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