ORIGINAL ARTICLE

Evaluation of Occupational Traumatic Injuries in Rural Sectors of Turkey

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ABSTRACT

Aim: Traumatic injuries related to agricultural production can lead to serious disability and even mortality. Inappropriate use of farm machinery increases the risk for accidents. The objective of this study was to describe the characteristics of "pat-pat-machine"-related work injuries cases treated at the emergency department and to assess injury severity and hospital admissions in the West Black Sea Region of Turkey. **Methods:** All cases related to injuries caused by work with a "pat pat machine" between June 2003 and June 2010 were included. Information was collected concerning the demographic features of patients, and injury sites, injury types, initial injury severity scores at admission, and clinical features were evaluated. **Results:** Thirty-nine (73.6%) of the cases were male and 14 (26.4%) were female. The ages of the cases were 5–76 years with a mean age of 38.8 ± 18.3 years. Approximately 19% of the cases were considered slight injuries, 30.2% moderate, and 50.9% severe. In terms of age, a plurality of injuries 24 (45.3 %) occurred among those aged 19-45. The Glasgow Outcome Scale score for 37 patients was five; it was four for 14 patients, and it was three for two patients. **Conclusions:** Our findings suggest that the "pat-pat machine" is one of the most dangerous agricultural machines, particularly for adults. In rural areas of Turkey, agricultural machines cause serious injuries that require hospitalization.

Keywords: Agricultural machine, Injury, Pat-pat machine

INTRODUCTION

The agricultural sector employs an estimated 1.3 billion workers worldwide, half of the world's labor force. Agriculture is one of the three most hazardous sectors in terms of fatalities, injuries, and work-related health problems (along with construction and mining). The International Labor Organization estimates that at least 170,000 agricultural workers die each year. This means that workers in agriculture run twice the risk of dying on the job compared with workers in other sectors.[1] Traumatic injuries related to agricultural production can lead to serious morbidity, disability, and even mortality.[2] In particular, the hazards of farm tractors have been widely recognized since tractors replaced horses as the primary power source for farming.[3] Tractors account for a large proportion of nonfatal injuries and the majority of fatal farm injuries.[4] A pat-pat farm vehicle looks like an all-terrain vehicle in terms of its structure; however, it is functionally similar to a farm tractor. The name of the pat-pat machine was derived from the sound it makes.[5] This vehicle has two separate structures: its main part is an engine and its other part is a trailer. It weighs an average of 300-350 kg, has a steering wheel or handlebars, and can carry loads of >1 ton or 10-15 people. The recommended maximum speed on flat roads is 40 km/hr.[6]

Pat-pats can be used for expulsion of fields, planting, spraying activities, removing water from soil, carrying additional loads, and even for transportation. This vehicle is practical and useful and increases work efficiency due to its low price, low fuel consumption, ease of use, all-weather capability, and ability to climb even the steepest slopes. However, it is not safe to use because of balance problems and the lack of safety features such as seatbelts and protective structures for roll-overs.[5]

This study underscores the importance of injuries related to the pat-pat machine and outlines preventive measures based on types of lesions, injury severity, and injury site as well on the age, sex, and mortality and hospitalization rates of victims.

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METHODS

This was a descriptive and retrospective study. The clinical and demographic features of 53 patients diagnosed with pat-pat injuries at the emergency department (ED) of Bulent Ecevit University Training and Research Hospital between June 2003 and June 2010 were evaluated. The cases were assessed based on sex, age, time of admission, monthly and seasonal cumulative distributions, rate of discharge, hospital stay, Glasgow Outcome Scale score, and mortality during the early period.

Injury site, injury type, and clinical examination data were recorded. Initial injury severity scores (ISS) of all cases were determined during admission. The ISS was categorized into three groups: ≤3, slight; 4 ≤ ISS ≤ 8, moderate; ≥9, severe.[7,8]

The study design was approved by the Bülent Ecevit University Faculty of Medicine Ethics Committee.

Statistical Methods

The Statistical Package for the Social Sciences 18.0 for Windows (Chicago, IL, USA) was used to evaluate the data and perform the frequency analysis. Data regarding age, sex, time of admission, injury site and type, hospitalization rate, and duration of stay are reported as means ± standard deviations. Quantitative data are shown as percentages.

RESULTS

Fifty-three cases presented to the ED during the study period due to an injury related to the pat-pat machine. Thirty nine (73.6%) of the cases were male. The ages of the patients were 5–76 years, and the mean age was 38.8 ± 18.3 years; 45.3% of the patients were 19-45 years of age, and approximately 85% of the patients were >18 years. The demographic characteristics of the study population are presented in Table 1. Patients most frequently presented to the ED between 1 and 6 pm (n = 29, 54.7%), and a few cases (n = 2, 3.8%) were admitted between 1 and 6 am. Most injuries (58.6%) occurred in April, June, and November. No injuries occurred in January (Table 2). Twenty-three (43.4%) of the cases were received by our ED from other hospitals.

The most common injury sites were the extremities (32, 60.4%). Twenty-eight cases had only extremity injuries, and four cases had extremity injuries with other multiple injury sites. Lower extremity injury was the most frequent (75% of all cases) of all extremity injuries (Table 3). Eight (15.1%) cases demonstrated multiple injury sites. About 34% of the injuries were lacerations, 24.5% were fractures, 17% were strains-sprains, and 3.8% were internal injuries related to the chest-abdomen-pelvis (Table 4).

The mean ISS for all cases was 12.32 ± 10.36. Ten (18.9%) of the cases had slight injuries (ISS≤3), 16 (30.2%) had moderate injuries (4 ≤ ISS ≤ 8), and 27 (50.9%) had severe injuries

Table 1: Patient demographic characteristics

Characteristics	*n*	%
Age (years)		
0-18	8	15.1
18-45	24	45.3
46-65	17	32.1
≥66	4	7.5
Sex		
Male	39	73.6
Female	14	26.4
Total	53	100.0

Table 2: Distribution of patients according to time of admission and month

	n	%
Time of admission		
12:00 am-05:59 am	2	3.8
06:00 am-11:59 am	6	11.3
12:00 pm-05:59 pm	29	54.7
06:00 pm-11:59 pm	16	30.2
Total	53	100.0
Month of admission		
February	1	1.9
March	2	3.8
April	11	20.8
May	6	11.3
June	10	18.9
July	3	5.7
August	2	3.8
September	4	7.5
October	4	7.5
November	10	18.9
Total	53	100.0

Table 3: Distribution of injury sites and extremity injuries

	n	%
Injury site		
Head and neck	9	17.0
Face	3	5.7
Chest	2	3.8
Abdomen	2	3.8
Extremity	28	52.8
External	1	1.9
Multiple sites	8	15.1
Total	53	100.0
Extremity		
Lower	24	75
Upper	8	25
Total	53	100.0

(ISS ≥9). Approximately 62% of the males 19–45 years of age had severe injuries. Despite a high mean ISS score of 12.32 (indicating severe injuries), no mortality occurred in this study. The relationship among injury severity, age, and sex is shown in Table 5.

Whereas 32.1% of cases were discharged following treatment in the ED, 67.9% were hospitalized. Approximately 72% of patients admitted to the hospital stayed in the hospital <10 days. Whereas 78.6% of the subjects with extremity injuries were hospitalized, 77.8% of those with head-neck injuries were discharged from the ED. The Glasgow Outcome Scale score was five in 37 (69.8%) cases, four in 14 (26.4%) cases, and three in two (3.8%) cases.

Table 4: Injury type

Injury type	*n*	%
Fracture	13	24.5
Amputation	2	3.8
Crushing	2	3.8
Laceration	18	34.0
Multiple trauma	6	11.3
Sprain-strain	9	17.0
Avulsion	1	1.9
Internal injuries related to chest-abdomen-pelvis	1	1.9
Intracranial lesions	1	1.9
Total	53	100.0

Table 5: Injury severity scores according to age and sex

Age	<3	3-8	>9	Total
Injury severity score				
0–18				
n	2	4	2	8
%	25.0	50.0	25.0	100.0
19–45				
n	6	3	15	24
%	25.0	12.5	62.5	100.0
46–65				
n	2	5	10	17
%	11.8	29.4	58.8	100.0
≥66				
n	0	4	0	4
%	0	100.0	0	100.0
Total				
n	10	16	27	53
%	18.9	30.2	50.9	100.0
Injury severity score				
Sex				
Male				
n	5	13	21	39
%	12.8	33.3	53.8	100.0
Female				
n	5	3	6	14
%	35.7	21.4	42.9	100.0
Total				
n	10	16	27	53
%	18.9	30.2	50.9	100.0

DISCUSSION

There are approximately 5,276,000 registered agricultural machines and implements in Turkey according to 2011 data from the Turkish Statistical Institute.[9] Thirty percent of the overall population works in agricultural activities.[10] Although published statistical data are available concerning farm tractor accident-related fatalities in Turkey, few studies have considered pat-pat-machine accident-related injuries or fatalities. There is increased risk for roll-over in a pat-pat machine compared with in a tractor because the former has an unbalanced center of gravity and less technological sophistication. Our results indicate that pat-pat machines cause serious injuries to rural workers in the Western Black Sea Region of Turkey.

Males predominated among those who suffered farm-related injuries. The highest ratios of male-to-female injuries are for fatalities and hospitalizations due to accidents with agricultural machinery, particularly among men >60 years.[11, 12] Overall, we found ratios of males to females of 7:3 and 5:1 with respect to pat-pat-machine-related admissions to the emergency room and hospitalizations, respectively. The extent of these sex differences in the number of farm injuries has been corroborated in other surveys.[3,5, 7,13-15] The disparity between the sexes in the mechanisms of injury involving farm machinery most likely reflects differences in exposure. For example, a 1992 Canadian community survey showed that 92% of men drove agricultural machinery in comparison with 35% of women.[16]

Karapolat et al. reported that the mean age of cases was 36.0 ± 16.6 years for men and 32.2 ± 18.6 for women,[5] and Akdur et al. found a mean age of 35.8 ± 17.0 for both men and women.[7] In this study, the mean age was 38 ± 18.3 years for all cases, and 30.2% of all cases were men 19–45 years of age. It is possible that younger farmers perform heavier or more hazardous work, lack experience, or tend to be risk-takers. Furthermore, younger farmers suffer from more non-fatal injuries than do older farmers, whereas older farmers experience more fatal accidents.[7,13] Furthermore, 15.1% of all cases were children. Small children are not able to appropriately identify and respond to hazardous work environments. Children must be monitored by adults to prevent agricultural injuries, and they should be kept away from hazardous agriculture environments if possible.[17]

Carlson et al. determined that most tractor-related injuries (82%) occur between 6:00 am and 5:59 pm. However, other

studies have reported that most agricultural injuries occur in the afternoon and evening hours.[5,13] Consistent with the literature addressing accidents in Turkey, we found that most accidents occur between 12:00 pm and 11:59 pm. The reason that most accidents occur during evening hours is that the collected produce is transported for storage and the workers are exposed to increased highway traffic during this time period. Nevertheless, Karapolat et al. found that the most frequent admissions following injury were during the months of July, August, and September[5] and Brandenburg et al. found the most frequent admissions to be in July and August. In this study, the majority of pat-pat events (58.6%) occurred in April, June, and November, which was similar to the pattern for tractor accidents that occurred during planting, garden-field preparation processes, and harvesting. We believe that the use of a pat-pat machine to transfer people and materials increases during these periods.

Information about the body regions affected by injury is crucial to the identification and evaluation of preventive actions. Our findings have important clinical implications concerning prehospital and ED care. Karapolat et al. reported that the head-neck and spine were the most frequent sites of pat-pat accident injuries.[5] Akdur et al. reported that the most commonly encountered injury sites were the upper extremities (56.7%), followed by the head-neck region (21.6%).[7] Shults et al. found that the arm/hand and leg/foot were more common injury sites.[18] Similar to other studies, we found that the most common injury types were fractures, lacerations, and amputations of extremities due to an overturning pat-pat.[7,5] A head, thoracic, abdominal, or spinal cord injury with a pat-pat or tractor commonly results in death.[19,15] Indeed, because pat-pat machines have an unbalanced center of gravity and have no seatbelts or structures to protect during roll-overs, manufacturers should consider lower-extremity protection equipment.

A variety of ISS have been used in the context of trauma care for various purposes. Emergency medical personnel in the field or emergency room must assess injury severity and make a triage decision. Scoring systems are critical for triage and resource utilization. Some studies emphasize that data about injury severity and sites play key roles in identifying preventive measures.[7] Akdur et al. found that 16 (43.2%) cases had moderate injuries ($4 \leq ISS \geq 8$), and 14 (37.9%) had severe (ISS ≥9) injuries, and Brandenburg et al. reported that 23 (40%) had minor to moderate injuries (ISS <9), 12 (21%) had severe injuries (ISS 10–15), and 23 (40%) had critical injuries (ISS >15).[7,15] We found that 16 (30.2%) cases had moderate injuries and 27 (50.9%) had severe injuries. Carlson[20] reported that the hospitalization rate for tractor-related injuries is 3%, and Nogalski et al. reported a 7.3% hospitalization rate for tractor-related injuries.[13] Karapolat et al.[5] found that the hospitalization rate for pat-pat related injuries was 26.7%, whereas 67.9% of patients were hospitalized in this study. Palmer[8] demonstrated a relationship between hospitalization and ISS of 7–9 and death and ISS of 20–25. In our study, high ISS (mean ISS 12.32 ± 10.36) was strongly correlated with hospitalization. Despite the determined high ISS, we did not observe any fatalities, largely because most injuries were to the extremities. Although such injuries were frequent, patients with high ISS for other injuries should not be forgotten, and the routine Advanced Trauma Life Support protocol should apply.

Several limitations of this study should be mentioned. Although we were able to study a proportion of all pat-pat accidents occurring in the Western Black Sea region, we did not use a random sample, which may have led to some selection bias. Additionally, some of the injured people may have been treated at other medical centers without ever visiting our hospital. Given that our hospital provides specialist trauma care for serious injuries, we suggest that the real number of injuries associated with pat-pat machines in our region is considerably higher. We may also have "missed" riders who died before coming to our hospital. As a result, the dropout rate, due to injury or fatality, could not be calculated from our data. Information about the rider's position on the pat-pat (e.g., driver, passenger) was not available, and no information was available on the size of the pat-pat or the rider's frequency of pat-pat use or level of experience. Another limitation was the small sample size. Finally, we did not have sufficient information on the accident location (e.g., highway or agricultural area) and accident type.

CONCLUSION

The importance of this study lies in the fact that it provides data on the characteristics and injury scores related to use of an inappropriate machine (pat-pat) for agricultural purposes. Our findings suggest that the "pat-pat machine" is very dangerous, particularly for adults. Although injury severity and hospitalization rates were high, the mortality rate was low. Extremity-protection devices will decrease hospitalization rates. Appropriate legal regulations; additional engineering studies of the mechanics, design, and safety of the vehicles; as well as licensing requirements for the vehicles could prevent these types of accidents.

REFERENCES

1. International Labour Organization. Agriculture: A Hazardous Work. Accessed September 8, 2012. Available from: http://www.ilo.org/safework/areasofwork/hazardous-work/WCMS_110188/lang--en/index.htm.

2. Browning SR, Truszczynska H, Reed D, McKnight RH. Agricultural Injuries Among Older Kentucky Farmers: The Farm Family Health and Hazard Surveillance Study. Am J Ind Med. 1998; 33:341-53.
3. Dogan KH, Demirci S, Sunam GS, Deniz I, Gunaydin G. Evaluation of Farm Tractor-Related Fatalities. Am J Forensic Med Pathol 2010; 31: 64–68.
4. Lee TY, Gerberich SG, Gibson RW, Carr WP, Shutske J, Renier CM. A Population-Based Study of Tractor-Related Injuries: Regional Rural Injury Study-I (RRIS-I). J Occup Environ Med.1996;38:782-93.
5. Karapolat S, Saritas A, Kandis H, et al. The evaluation of Pat-Pat related injuries in the western black sea region of Turkey. Scand J Trauma Resusc Emerg Med. 2011;23:19–40.
6. Buldan M. Cobanlar News. 2012. Accessed September 14, 2011. Available from: http://www.cobanlarhaber.com/yazar.asp?yaziID=58.
7. Akdur O, Ozkan S, Durukan P, Avsarogullari L, Koyuncu M, Ikizceli I. Machıne-Related Farm Injurıes In Turkey. Ann Agric Environ Med 2010; 17: 59–63.
8. Palmer C. Major trauma and the injury severity score--where should we set the bar? Annu Proc Assoc Adv Automot Med. 2007; 51: 13-29.
9. Turkish Statistical Institute. Ankara: Statistics (Agriculture census). Number of agricultural machinery and equipment. Accessed October 28, 2012. Available from: http://www.turkstat.gov.tr/VeriBilgi.do?alt_id=49.
10. Turkish Statistical Institute. Ankara: Statistics (Agriculture census). General Agricultural Census Agricultural Holdings (Household) Survey Results. Accessed Octoberber 28, 2012. Available from: http://www.turkstat.gov.tr/VeriBilgi.do?alt_id=44.
11. Gunderson P, Gerberich S, Gibson R, et al. Injury surveillance in agriculture. Am J Ind Med 1990; 18: 169–78.
12. Dimich-Ward H, Guernsey JR, W Pickett, D Rennie, L Hartling, R J Brison. Gender differences in the occurrence of farm related injuries. Occup Environ Med 2004; 61:52-6.
13. Nogalski A, Lübek T, Sompor J, Karski J. Agriculture and Forestry Work-Related Injuries Among Farmers Admitted to An Emergency Department. Ann Agric Environ Med. 2007; 14: 253-258.
14. Ozkan S, Kiliç S, Durukan P, et al. Occupational injuries admitted to the Emergency Department. Ulus Travma Acil Cerrahi Derg. 2010; 3: 241-7.
15. Brandenburg MA, Brown SJ, Archer P, Brandt EN. All-Terrain Vehicle Crash Factors and Associated Injuries in Patients Presenting to a Regional Trauma Center. J Trauma. 2007;63: 994-999.
16. Smith P. Beyond 'add women and stir' in Canadian rural society. In: Hay DA, Basram GS, eds. Rural sociology in Canada. Toronto: Oxford University Press 1992:155–70.
17. Morrongiello BA, Pickett W, Berg RL, Linneman JG, Brison RJ, Marlenga B. Adult supervision and pediatric injuries in the agricultural worksite. Accid Anal Prev. 2008; 40: 1149-56.
18. Shults RA, Wiles SD, Vajani M, Helmkamp JC. All-Terrain Vehicle–Related Nonfatal Injuries Among Young Riders: United States, 2001–2003. Pediatrics. 2005; 116: e608–12.
19. Kücüker H. Analysis of deaths caused by pat-pat accidents in Turkey. Traffic Inj Prev. 2012; 13: 209–211.
20. Carlson KF, Gerberich SG, Church TR et al. Tractor-related injuries: a population-based study of a five-state region in the Midwest. Am J Ind Med. 2005; 3: 254-64.

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