Original Article

Work-related Injury Sustained by Foreign Workers in Singapore

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Abstract

Introduction: Singapore has a resident population of 3.26 million and 0.53 million foreign workers. The objective of the study was to compare the injuries sustained by foreign and local workers presenting to an emergency department (ED). Materials and Methods: Adult victims of work-related injury who presented to an urban public hospital ED from 1 December 1998 to 31 May 1999 were interviewed. Chart reviews were done for those hospitalised. Data collected were those of demographic, nature of injury, ambulance care, ED and hospital care, outcome and final diagnoses. Results: There were 1244 local workers and 1936 foreign workers, giving a ratio of 1 local:1.6 foreign workers. The mean age of foreign workers was 29.6 years [standard deviation (SD) 6.2], which was younger (P <0.0001) than the mean age 37.8 years (SD 14) of local workers. Fridays and Saturdays were the common days for injuries among foreign workers as opposed to Wednesdays and Mondays for local workers. Falls from height ≥2m occurred among 9.1% of foreign workers, more (P <0.0001) common than 4.3% of local workers, resulting in 2 out of 3 foreign workers death. Though the pattern of injuries was similar between foreign and local workers, foreign workers needed longer (P = 0.03) sick leave and more (P = 0.01) foreign workers were hospitalised, giving a ratio of 2 foreign workers for every 1 local worker hospitalised. Conclusion: Foreign workers had no difficulty accessing ED and hospital care for work-related injuries. The pattern and severity of injuries were similar between foreign and local workers but more foreign workers were hospitalised.

Ann Acad Med Singapore 2004;33:209-13

Key words: Local workers, Trauma

Introduction

Singapore has a resident population of 3.26 million and 0.53 million foreign workers.[1] Of these half a million foreigners, 450,000 are work permit holders,[1] typically working in lower skill industries and blue-collar sectors, e.g. construction industry. Even though injuries is the fifth leading cause of death in Singapore, accidents and violence as a group is the leading cause of hospitalisation in Singapore.[2] An earlier study[3] by the authors found that 43.4% of foreign workers visited the ED for trauma-related complaints, with work-related trauma being the major cause of injury. This study was therefore conducted to compare the patterns of work-related injuries sustained by foreign workers and local workers.

Materials and Methods

The study was conducted in a 1000-bedded acute urban public hospital in which the annual census of the ED for 1999 was more than 110,000. From 1 December 1998 to 31 May 1999, all consecutive patients above 15 years old with work-related injury who presented to the ED were enrolled in the study. Interviews with the patients or suitable surrogates were conducted in the ED using a closed-ended questionnaire. All the ED doctors were briefed on the use of the questionnaire. The doctor who provided care for the patient also administered the interview. Due to the logistic problems posed by the large number of patients involved, we did not attempt to have a second observer counter-check the data captured during the interviews. The computerised 24-hour ED attendance log was checked to ensure enrolment of all eligible patients. A trained research nurse extracted data of those patients who were not interviewed during their episode of ED care. A foreign worker was defined as a non-Singapore citizen, non-permanent resident working in Singapore.[3] Foreigners studying in Singapore and tourists were excluded.

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For patients who were admitted to the hospital, chart reviews were also done by the second (KYT) and third (ES) authors. Again, due to the large number of patients involved, we did not attempt to have a second observer counter-check the data collected during the chart review. The following data were collected: (1) demographics, (2) ambulance timings, (3) cause and nature of injury, (4) assessment of physiologic parameters in ED, (5) ED care and in-hospital care, (6) definitive anatomic injury diagnoses upon discharge or death obtained from charts, radiology reports or autopsies and (7) outcomes i.e. survival or death at discharge from the hospital.

The Revised Trauma Score (RTS)[4] and the Abbreviated Injury Scale 1990 version (AIS-90)[5] were used to characterise injury severity. These scoring systems provide an objective basis for comparing injury severity in patients with different mechanisms of injury. The RTS is a physiologic score and is calculated using the patient's Glasgow coma scale, systolic blood pressure and respiratory rate, giving values from 0 to 7.84 whereby lower values indicate more severe injuries. The AIS-90 is an anatomic score requiring definitive diagnoses of injuries, and is a tool for retrospective characterisation of injury severity. The AIS-90 divides the body into 6 regions: (1) head and neck, (2) face, (3) thorax, (4) abdominal and pelvic contents, (5) extremities and pelvic girdle and (6) external structures, i.e. skin. Each injury in each AIS-90 region is then rated on a scale from 1 (minor injury e.g. abrasion) to 6 (fatal injury).

The Injury Severity Score (ISS)[6] is calculated based on the AIS-90 by summarising multiple injuries in a single patient. The highest values from 3 different AIS-90 regions are each squared and then summed to derive the ISS, which yields scores ranging from 1 (minor injury) to 75 (fatal injury). An ISS $\geq$16 indicates major trauma. The RTS and ISS are the 2 commonest scoring systems in trauma-related studies.

Ordinal data were analysed by chi-square test and continuous data by Student's *t*-test. Where appropriate, a *P* value equal to or less than 0.05 is considered significant. Statistical calculations were performed with the Statistical Package for Social Sciences (SPSS). This study was approved by the hospital ethics committee.

Results

The total ED attendance for the 6 months of the study period was 52,680 of which 11,313 (21.5%) were for trauma-related complaints. There were 3180 (28.1%) patients among these 11,313 who sustained work-related injuries, forming the largest group of trauma patients. There were 1244 local workers of which 196 (15.8%) were women, a significantly higher proportion (P <0.0001) compared to 75 (3.9%) women among the 1936 foreign workers. Foreign workers were significantly younger (P <0.0001) than local workers by a mean of 8.2 years. Given the countries that are major contributors to the pool of foreign workers in Singapore, i.e. India, Bangladesh, China and Thailand, the ethnic distribution was understandably different from that among local workers. Table 1 summarises the demographic characteristics of local and foreign workers. Figure 1 outlines the outcome of all patients with work-related injuries. There was no difference between local and foreign workers as far as the time of day when injury occurred. More than two-thirds of both groups of workers sustained injury between 1300 hours and 1759 hours. Figure 2 illustrates the day of the week when injury occurred which showed a significantly different (P = 0.04) trend between local and foreign workers. Wednesdays and Mondays were the 2 most common days when local workers sustained injury, while Fridays and Saturdays were the 2 most common days for foreign workers.

Falls made up 27.5% of injuries with significantly more (P <0.0001) foreign workers (9.1%) falling from height $\geq$2 m compared to 4.3% of local workers. There was 1 foreign worker death in the ED and this patient died of multiple injuries after a fall from height $\geq$2 m. The number with upper limb digit amputation was not different between the 2 groups. A total of 2604 (81.9%) patients were

Table 1. Demographic Characteristics of Local and Foreign Workers

Characteristic	Local workers n = 1244	Foreign workers n = 1936	*P* value
Mean age (SD) (y)	37.8 (14)	29.6 (6.2)	<0.0001
Median age (y)	36.2	28.6	-
No. of men (%)	1048 (84.2%)	1861 (96.1%)	<0.0001
Ethnic distribution (%)			<0.0001
Chinese	852 (68.5%)	404 (20.9%)	
Indian	188 (15.1%)	655 (33.8%)	
Malay	125 (10%)	25 (1.3%)	
Others (e.g. Bangladeshi, Thai)	79 (6.4%)	852 (44%)	
Type of injury			0.57
Blunt trauma	1015 (81.6%)	1531 (79.1%)	
Penetrating trauma	189 (15.2%)	329 (17%)	
Others (e.g. burns)	40 (3.2%)	76 (3.9%)	
Number brought in by emergency ambulance service (%)	81 (6.5%)	100 (5.2%)	0.07
Disposition from ED			0.01
Discharged from ED	1049 (84.3%)	1555 (80.3%)	
Admitted to hospital	195 (15.7%)	380 (19.6%)	
Died in ED	0	1 (0.1%)	

SD: standard deviation; ED: emergency department

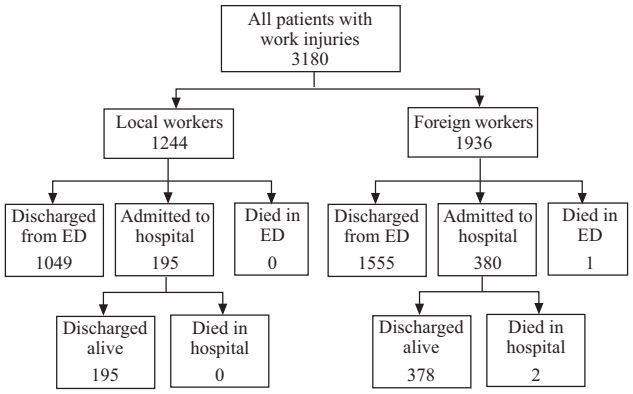

Fig. 1. Outcome of all patients with work-related injuries.

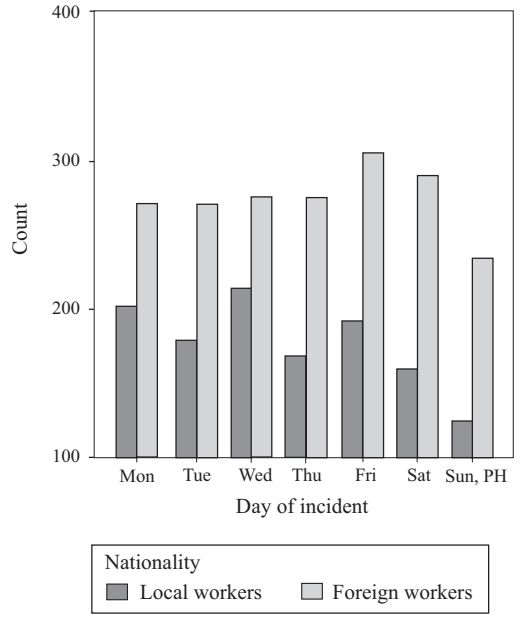

Fig. 2. Day of the week when injury occurred.

discharged from the ED. Among those discharged from the ED, 16.7% of the workers did not need sick leave or declined to go on sick leave, 35.8% needed 1 to 3 days of sick leave, 36.9% needed 4 to 7 days and the rest needed between 8 to 21 days of sick leave. Table 2 summarises the injuries sustained and follow-up plans for those discharged from the ED. There was no difference between the principal injuries sustained by the local and foreign workers.

Among the admitted patients, foreign workers were significantly younger (P <0.0001) than local workers by almost 11 years. More than 60% of the admitted patients needed orthopaedic operations while other surgical operations were very few. Two foreign workers died of multiple injuries during their hospital stay, 1 was a fall from height ≥2 m and the other was hit by heavy machinery. The ISS and RTS for local and foreign workers were comparable.

Table 2. Injuries Sustained and Follow-Up Plans for Local and Foreign Workers Discharged from Emergency Department

	Local workers n = 1049	Foreign workers n = 1555	*P* value
Injuries			0.81
Minor wounds to limbs	527 (50.2%)	795 (51.1%)	
Minor wounds to head and trunk	265 (25.3%)	379 (24.4%)	
Fractures of upper limb	108 (10.3%)	143 (9.2%)	
Fractures of lower limb	58 (5.5%)	87 (5.6%)	
Abrasions	45 (4.3%)	81 (5.2%)	
Other injury (e.g. minor head injury)	46 (4.3%)	70 (4.5%)	
Follow-up plans			0.002
No follow-up needed	494 (47.1%)	661 (42.5%)	
Referred to primary care provider	238 (22.7%)	464 (29.9%)	
Referred to orthopaedic clinic	255 (24.4%)	341 (21.9%)	
Referred to other clinic	61 (5.8%)	88 (5.7%)	
Mean duration of sick leave (SD) [days]	4.7 (3.4)	5.1 (3.4)	0.03

SD: standard deviation

Table 3. Characteristics of Local and Foreign Workers Admitted from Emergency Department

	Local workers n = 195	Foreign workers n = 380	*P* value
Mean age (SD) (y)	41 (13.8)	30.1 (6.3)	<0.0001
Median age (y)	40.2	29.1	-
No. of men (%)	173 (88.7%)	370 (97.4%)	<0.0001
Mean no. of surgical procedures (SD)	1.07 (0.31)	1.09 (0.52)	0.62
Surgical procedure (%)			0.2
Orthopaedic procedure	123 (63.2%)	237 (62.4%)	
No surgery needed	68 (34.9%)	124 (32.6%)	
Other procedure (e.g. craniotomy)	4 (2%)	19 (5%)	
Final outcome			0.28
Discharged home	195 (100%)	375 (98.6%)	
Discharged to rehabilitation facility	0	3 (0.8%)	
Died in hospital	0	2 (0.5%)	
Mean ISS (SD)	4.6 (4.5)	4.3 (5.5)	0.47
Mean RTS (SD)	7.8 (0.2)	7.8 (0.2)	0.21

ISS: Injury Severity Score; RTS: Revised Trauma Score; SD: standard deviation

However, for the group of 95 patients who fell from height ≥2 m, their ISS of 8.3 was significantly higher (P <0.0001) than the ISS of 3.6 among other patients. Table 3 summarises the characteristics of workers who were admitted.

More than 70% of all admitted workers sustained injuries

Table 4. Injuries Sustained by Local and Foreign Workers Admitted from Emergency Department

Region of injury by AIS-90 categorisation	Local workers n = 195	Foreign workers n = 380	*P* value
Head and neck	28 (14.4%)	39 (10.3%)	0.15
Face	0	9 (2.3%)	0.03
Thorax	3 (1.5%)	13 (3.4%)	0.19
Abdominal and pelvic contents	8 (4.1%)	22 (5.8%)	0.4
Extremities and pelvic girdle	141 (72.3%)	268 (70.5%)	0.66
External structures	33 (16.9%)	63 (16.6%)	0.92

Note: the percentages do not add up to 100% because 1 patient may have 2 or more regions of injuries.
AIS-90: Abbreviated Injury Scale 1990 version

to their limbs, as illustrated in Table 4. Among the limb injuries, the predominant injuries were upper limb digital fractures, amputations, crushed digits and cut tendons, contributing to 25.7% among hospitalised workers. Only 10 (1.7%) admitted workers sustained injuries to 3 or more regions while 84% had injury to a single region.

Discussion

The differences in demographic characteristics between local and foreign workers were expected because employment agencies from Singapore, when recruiting in other countries, would logically select younger and able-bodied men to take up physically demanding labour intensive work in Singapore, e.g. construction industry.

Contrary to popular belief that Monday was the day with the most work-related injuries, Friday and Saturday, i.e. the end of the week, were the 2 commonest days when foreign workers sustained injuries. Though this study did not inquire about the circumstances surrounding the incident leading to the injury, one possible reason for this phenomenon was that due to the long working hours and physically demanding work, fatigue built up through the week, resulting in reduced alertness and injuries at the end of the week.

Patients with work-related injuries formed the largest group of trauma victims seeking treatment in the ED; however, less than one-fifth of these injured workers required hospitalisation, reflecting that majority of the injuries were minor and managed as outpatients. This brings to mind the question of whether some of these workers with minor injuries, instead of seeking treatment at the ED, could have been treated by primary healthcare physicians. Even though the duration of sick leave was statistically different between local and foreign workers, the clinical difference between 4.7 and 5.1 days is minimal.

In this study, the ratio of local worker to foreign worker seeking treatment at the ED for work-related injury was 1 to 1.6. This ratio increased to 1 to 2 when we compared the number of local to foreign workers hospitalised for their injuries. Yet between local and foreign workers, there was no difference in the types and severity of injuries sustained by these 2 groups as evidenced by similar patterns of injuries, similar proportions requiring surgical intervention, and RTS and ISS values that are not significantly different. Hence, it was probable that the increased proportion of foreign workers requiring hospitalisation was due to other reasons, e.g. lack of home or social support. Emergency department and inpatient care in a restructured hospital in Singapore are heavily subsidised by taxpayers' money. If indeed the increased proportion of hospitalised foreign workers was due to non-clinical reasons, then the issue needed further study to assess if alternatives other than hospitalisation could be found for some of these foreign workers.

Several international researchers[7-14] have studied injuries and healthcare issues among foreign workers in different countries and the general conclusion was that they were disadvantaged in their access to healthcare due to multi-factorial and complex reasons. As far as work-related injuries were concerned, this study showed that foreign workers in Singapore had no difficulty accessing ED and hospital care, albeit this study did not try to find out how foreign workers felt about their ability to access healthcare in Singapore.

Limitations

One of the limitations of the study was that it was conducted in a single centre and the study centre had the highest number of trauma patients in the entire nation. This could lead to findings of higher proportion of victims of work-related injuries. The second limitation was that due to the large number of patients involved, we could not arrange for a second observer to obtain data, resulting in a single-observer study with all its inherent potential weaknesses. Finally, while foreign workers worked in a narrow range of jobs that were labour intensive, low-skill or unskilled, local workers worked in a wide range of jobs, making some comparisons difficult.

Conclusion

Foreign workers had no difficulty accessing ED and hospital care for work-related injuries. The pattern and severity of injuries were similar between foreign and local workers but more foreign workers were hospitalised.

Acknowledgement

The authors would like to thank Ms Anisa, A Quek, Rahimah and staff of the Emergency Department for their help with the data and Mr SP Chan for his help with statistical analyses.

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