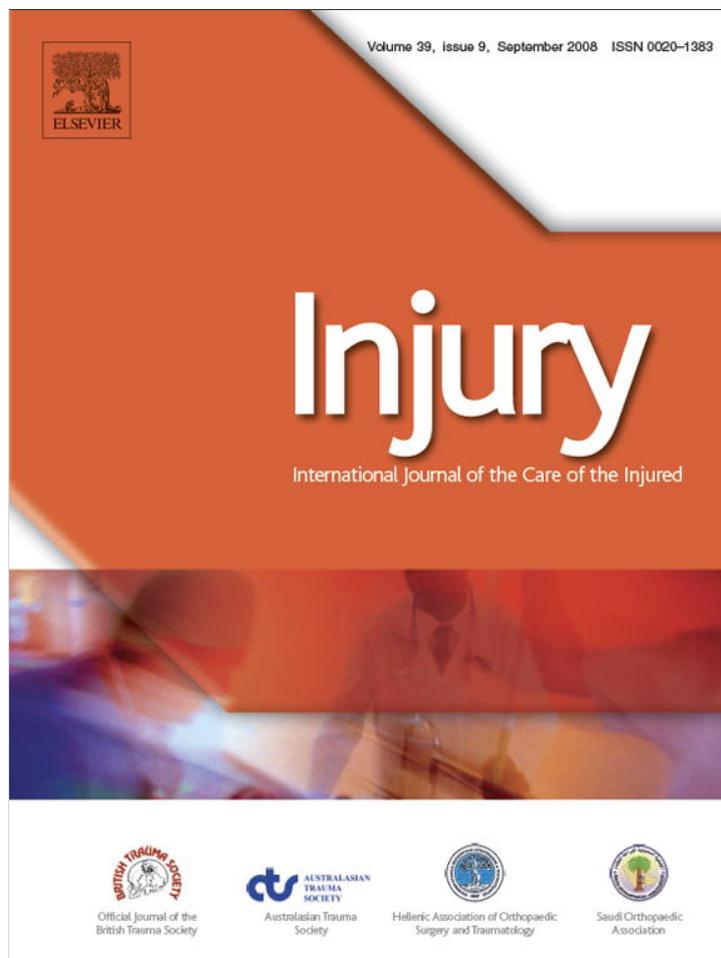


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Injury and pre-hospital trauma care in Hanoi, Vietnam

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Pre-hospital care

Summary

Background: In Vietnam, injury is the leading cause of death in children under 18, and road traffic accidents are the fifth leading cause of death. Information systems for pre-hospital trauma care are insufficient.

Objectives: The objective of this study was to assess injury morbidity and mortality, and the existing level of pre-hospital trauma care in Hanoi city.

Research design and subjects: A cross-sectional study was conducted in seven districts in Hanoi in 2006. We studied 2800 households (11,334 members), 9 hospitals and an emergency service centre.

Results: The injury morbidity rate was 1134/100,000 (year⁻¹), and the injury mortality rate was 23.7/100,000 (year⁻¹). There was no significant difference in age or sex between injury severity levels ($p > 0.05$). Road traffic accidents were the leading cause of injury. Causes of injury mortality differed among different age groups. Only 4% of injured cases were transported to hospital by ambulance. Fifty-two percent of victims did not receive first aid at the site. Pre-hospital trauma care was separately

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provided by the emergency service centre and hospitals. There was no communication network between the emergency service centre and hospitals, ambulances and hospitals, or between different hospitals.

Conclusions: The results reveal that injury is a major health problem in Hanoi and that the pre-hospital care system lacks both coordination and many vital components. Study results may assist decision-makers in identifying interventions to improve health and safety for the population of Hanoi.

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Introduction

There have been changes in disease patterns in Vietnam with the rapid reduction of communicable diseases and the significant increase in non-communicable diseases and injuries. The rate of deaths due to injury was three times as high as that of deaths due to infectious diseases.¹² Injury is the leading cause of death in children under 18, and road traffic injuries are the fifth leading cause of death in Vietnam. The Asian Development Bank estimated the annual economic loss from road accidents alone to be \$US 885 million, which accounts for 2.45% of the nation's annual gross domestic product.¹

In many low-income and middle-income countries, the burden of traffic-related injuries represents between 30 and 86% of all trauma admissions.²⁷ Worldwide, traumatic brain injury is the main cause of death and permanent disabilities if proper pre-hospital trauma care is not provided. Many studies in the United States and in Europe have clearly shown that early and effective resuscitation and rapid transportation from the scene of an accident to an appropriate hospital can provide timely and effective care as well as reduced mortality and morbidity.^{4,5} The way in which a trauma care system is organised may influence the number of deaths after injury, suggesting that the pre-hospital phase should be viewed as the start of a continuum of care that forms a "trauma chain".¹⁸

Pre-hospital trauma care includes pre-hospital trauma care providers, trauma information systems, transport and communication systems.³⁵ Pre-hospital trauma care providers include: (a) bystanders or villagers (first providers); (b) basic trauma life support providers (second-tier care providers); and (c) advanced trauma life supporters (third-tier care providers).³⁵

Communication is required for informing a centralised facility of an incident and calling for help or assistance; describing the nature and extent of an injury from the ambulance to a hospital for preparedness, and between hospitals for specific referral and intervention. To facilitate timely communication, a universal access telephone number should be established in order to reach the Centralised Ambu-

lance Dispatch System of the area concerned, as well as to direct the ambulances to the injury site.

Unfortunately, capacity to provide such a basic level of pre-hospital care does not exist in many parts of the world including Vietnam.³⁰ Emergency medicine in Vietnam is not recognised as a distinct medical specialty.²⁹ Only a few major cities have emergency service centres. The emergency service centre is responsible for providing first aid at the accident site and conveying patients from the site to health care facilities. Patients or attendants could access the emergency service centre through an emergency telephone number, "1-1-5", which could be accessed toll-free from a public telephone. However, those centres can respond to only 10% of the calls. The results of an injury survey in Tu Liem district of Hanoi (the capital city) in 2005 showed that only 31% of cases received first aid at the accident site, and 71% of cases died before reaching hospitals.²³ Information systems for pre-hospital trauma care in Vietnam are insufficient and, in many instances, complete pre-hospital mortality records are scarce and to date, there is no reliable data upon which one can plan the requirements for an emergency service. In order to plan a comprehensive emergency service in Hanoi, information of the magnitude of injuries and the current pre-hospital care is needed.

Therefore, this study aimed to assess (1) the injury morbidity and mortality in Hanoi City and (2) the existing level of pre-hospital trauma care in Hanoi.

Materials and methods

Study overview

Hanoi City is the major metropolitan area of Northern Vietnam (Red River Delta region) and the country's political centre. It has a population of 3,145,300 (as of 2005) and is comprised of 14 districts (eight inner and six outer) with 232 communes^{9,10}; with districts comprising a population of approximately 200,000 and a commune approximately 6000–30,000.

Table 1 Baseline characteristics of the population and injury cases

Age (years)	Male		Female		Missing no.	Total	
	No.	%	No.	%		No.	%
0–9	737	13	719	12	4	1,460	13
10–19	782	14	735	13	7	1,524	13
20–29	909	16	1075	19	5	1,989	18
30–39	911	17	935	16	1	1,847	16
40–49	828	15	812	14	4	1,644	15
50–59	595	11	667	12	4	1,266	11
60–69	400	7	436	8	5	841	7
70 and above	348	6	395	7	6	749	7
Missing	5	0	2	0	7	14	0
Total	5515	100	5776	100	43	11,334	

Four inner and three outer districts of Hanoi, each that have a hospital or health centre providing emergency services were selected for the study. Fourteen communes (two from each district) were then randomly selected with a total population of 231,260.

Data were obtained in two ways: (1) by a household survey to enumerate both the injury morbidity, mortality, and actual practice of pre-hospital care at the accident site and (2) by hospital survey to assess the existing pre-hospital care system in Hanoi. The Scientific Review Boards of the Vietnam Ministry of Health and the Research Committee of the Atlantic Philanthropies approved the study and procedures. Data were analysed using the Statistical Package for the Social Sciences for Windows, software Version 14.0.

Household survey

A household survey was conducted between May and June 2006. The sample size was calculating using the World Health Organisation formula for community surveys on injuries and violence.³¹ The total number of households that would need to be surveyed was 2799. Fourteen communes were selected for the study. Therefore, 200 households of each commune were included. To select study households, entire lists of households from each commune were first obtained from the District Centre of Population, Family and Children. The sampling interval was then calculated by dividing the total households of the commune by number of households needed to select. A random number between 1 and the sampling interval in the list was chosen. The sampling interval was added to the random number and then the second unit was selected based on the sum. The sampling interval was added to the sum from the previous step and the next units were chosen. The actual number of households enrolled was 2800.

Households unwilling to participate were excluded. The total number of household members included in the study was 11,334. Characteristics of the studied population grouped by age and sex are shown in Table 1. A household was defined as a group of people who live together, share a common kitchen, and have slept in the house regularly for 3 months or more during the previous 12 months.

The interview was conducted with the head of the household or, if that person was unavailable, another adult. The head of the household was defined as the person who manages the affairs of the house comprising the dependents and relatives living along with him/her. The interview included questions about injuries sustained by members of the family during the preceding 7-month period (1 October 2005 to 30 April 2006), characteristics of the injury, mode of treatment at the accident site, injury-to-hospital arrival time, referral vehicles, etc. The 7-month period began just 1 month after Vietnam National Independence Day (2 September) and included the New Year period (February) so respondents might better remember any injury incurred during that time. Injuries were categorised as “minor” if they required medical care without hospitalisation or no more than 1 day off work or school, “moderate” if they required hospitalisation of 9 days or less, “major” if they required hospitalisation of 10 days or more, and “severe” if they resulted in permanent disability.

Death statistics were obtained from the death registration book of each commune. Such information includes a person's name, age, sex, address, and date–place–cause of death during the preceding 28-month period (from 1 January 2004 to 30 April 2006). The population of 14 communes in 2005 was used for calculating the injury mortality rate.

Hospital survey

The emergency service centre and nine hospitals (six general and three specialised hospitals) in Hanoi were selected based on the availability of an emergency service and their willingness to participate in the study. All hospitals and emergency service centres were asked to complete a comprehensive questionnaire designed to elicit information about the emergency service system in the hospital/centre, mobile pre-hospital teams and their activities, and the communication network capacity both within the hospital/centre and with other organisations.

Results

Injury morbidity and mortality

The household survey showed that the injury morbidity rate was 1,134/100,000 (year⁻¹) (male: 1212/100,000 (year⁻¹); female: 1068/100,000 (year⁻¹)). Injury morbidity rates by age group, severity and cause are listed in Table 2. In general, the 60–69 group had the highest rate of injury (2038/100,000 (year⁻¹)), followed by the 50–59 group (1354/

100,000 (year⁻¹)) and the 10–19-year-old group (1350/100,000 (year⁻¹)). Among males, the highest injury morbidity rate was in the 10–19 group. Among females, those 60–69 had the highest rate.

Minor injuries showed the highest overall rate (787/100,000 (year⁻¹)). Rates of major and severe injuries were highest among the 20–29 group (517/100,000 (year⁻¹)), followed by the 10–19 group (337/100,000 (year⁻¹)), and then by the 50–59 group (271/100,000 (year⁻¹)). The major and severe injury morbidity rate among males was three times as high as that among females. However, using Poisson Regression Analysis, we found no significant difference in age and sex among injury severity levels (minor, moderate, major and severe) (*p* values >0.05). Road traffic injuries showed the highest rate in both sex groups (514/100,000 (year⁻¹)), followed by falling on a level surface (227/100,000 (year⁻¹)), and burns (106/100,000 (year⁻¹)).

The total number of deaths due to injuries was 128, yielding an injury mortality rate of 23.7/100,000 (year⁻¹). Fig. 1 shows injury mortality trends by age groups and sex. Overall, injury mortality increased from infancy, reached a peak in the 20–29 age group, then diminished steadily until age

Table 2 Injury morbidity rate by age group, severity and causes (per 100,000 (year⁻¹))

	Male		Female		Total	
	No.	Rate	No.	Rate	No.	Rate
Age group						
0–9	4	930	5	1192	9	1057
10–19	8	1754	4	933	12	1350
20–29	9	1697	2	319	11	948
30–39	7	1317	2	367	9	835
40–49	3	621	6	1267	9	938
50–59	3	864	7	1799	10	1354
60–69	4	1714	6	2359	10	2038
Injury severity						
70 and above	1	630	4	1736	5	1144
Minor	25	777	27	801	52	787
Moderate	2	62	5	148	7	106
Major	5	155	3	89	8	121
Severe	7	218	1	30	8	121
Causes of injury						
Road traffic accident	20	622	14	416	34	514
Intentional injury	1	31	2	59	3	45
Fall on level surface	6	187	9	267	15	227
Fall from height	1	31	3	89	4	61
Falling objects	2	62	1	30	3	45
Sharp objects	3	93	0	0	3	45
Animal bites	2	62	0	0	2	30
Burns	3	93	4	119	7	106
Electrical shock	0	0	1	30	1	15
Other	1	31	2	59	3	45

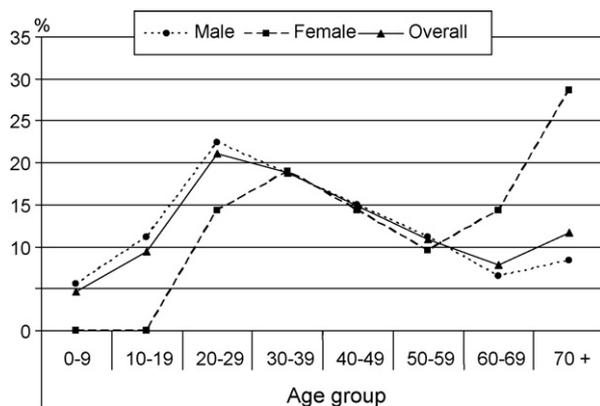


Figure 1 Injury mortality by age and sex groups.

60–69, rising only again among those 70 and more. However, among females, injury mortality increased from age 10–19 until age 30–39, then declined steadily until age 50–59 before rapidly increasing once again to reach a peak at age 70 and more. Fig. 2 shows injury mortality among different age groups. Overall, road traffic injuries resulted in the highest injury mortality proportion (52%), followed by drowning (14%), heroin overdose (13%) and falls (6%). However, drowning accounted for the highest injury mortality among those under 20. Road traffic injuries were the leading cause of death among those 20 aged and over. Heroin overdose was more common among the 20–49 group. Falling accounted for the highest proportion of injury mortality in the 70 and more age group.

Pre-hospital care practice

Injury-to-hospital arrival time intervals were estimated by household members. The mean value for the time from injury to hospital admission was 6.3 h (Table 3). Injured cases transported to the hospital

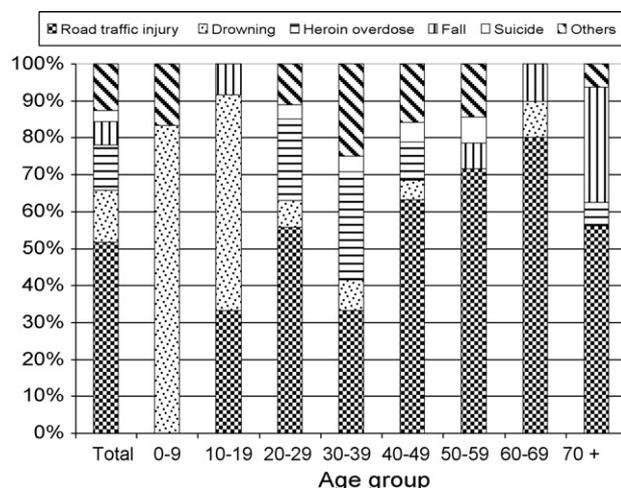


Figure 2 Injury mortality causes by age group.

after crashes within the first 6 h accounted for the highest proportion (68%). In 60% of the cases, pre-hospital emergency services were not called. Various types of vehicles were used for transporting the injured to the hospital. Motorbikes were most often used (50.7%), followed by cars (10.7%). Only 4% of injured cases were transported to the hospital by ambulances. Fifty-two percent of injured cases did not receive first aid at the site of the accident. The remaining cases received first aid from family members (33.3%), accompanying people (19.4%), passers-by (19.4%), and commune health workers (13.9%).

Pre-hospital care system

In Hanoi, pre-hospital trauma care was provided separately by the emergency service centres and hospitals. The emergency service centre had only 4 stations (1 headquarter and 3 branches) with 14 ambulances, 9 emergency service teams but no sickbeds, though it had to serve all of Hanoi’s 14 districts. There were 29 medical doctors, 2 assistant doctors, 30 nurses and 32 drivers in the centre. Only 35.8% of the staff, or 34 out of a total of 95 staff was trained in emergency care.

All hospitals studied had mobile hospital teams providing pre-hospital trauma care. The number of teams at each hospital ranged from 1 to 7, and the number of staff of each team ranged from 5 to 13. All teams included medical doctors and nurses. The number of staff trained in emergency care was 15.1%, or 429 out of a total of 2837 staff. Among the nine hospitals studied, five had emergency referral services. When there was an emergency call, the teams would go to the site of the accident, provide first aid and transport patients to a hospital. However, there was no coordination or communication network between the emergency service centre and hospitals, ambulances and hospitals, or between different hospitals.

All hospitals studied and the emergency service centre had telephones, computers and fax machines. Telephones for emergency services accounted for 24% and were available in all hospitals, in addition to telephone hotlines with a maximum of four lines each. The hotline calls were answered by hospital senior staff (in all hospitals) and staff on duty (in 50% of hospitals). The hotlines were used to respond not only to patient and community’ complaints, but also to emergency cases. Such responses included: (1) guidelines on first aid at the site (100% of hospitals); (2) guidelines on means of emergency referral (100% of hospitals); (3) provision of emergency equipment (40% of hospitals); (4) dispatching the health staff to do first aid

Table 3 Pre-hospital trauma care practice

Variables	Categories	Total	
		No. of injured cases	%
Arrival time (h)	Mean: 6.3 h		
	0–6	51	68.0
	>6–24	6	8.0
	>24	2	2.7
	Unknown	16	21.3
Calling pre-hospital emergency services	Yes	14	19.0
	No	45	60.0
	Unknown	16	21.0
Referral vehicles	Ambulance	3	4.0
	Car	8	10.7
	Motorbike	38	50.7
	Bicycle	3	4.0
	Unknown	23	30.7
Received first aid at site	Yes	36	48.0
	No	39	52.0
First aid providers at site	Family member	12	33.3
	Accompanied persons	7	19.4
	Passers-by	7	19.4
	Commune health workers	5	13.9
	One who caused accident	1	2.8
	Other	4	11.1

at home (40% of hospitals); and other (10% of hospitals).

Discussion

To the best of our knowledge, this is one of the largest studies on injuries and the first study on pre-hospital trauma care systems in Hanoi. The result showed that over 1% of the population in Hanoi is subjected to non-fatal injuries each year. Since most of the direct medical, other economic and social costs are associated with non-fatal injuries, they represent the major public health issue of the Hanoi population.

Road traffic injuries were found to be the leading cause of both injury morbidity and mortality in our study. That may well be due to the increasing motorisation of travel in Vietnam, especially in the major cities.²² This finding corresponds with those of many other studies in Vietnam.^{8,16,17,21,22,33} Some studies show that road traffic injuries result in approximately 72% of traumatic brain injuries, which resulted in a high proportion of mortality and permanent disabilities if early treatment or surgery were not provided.^{9,24}

The pre-hospital care system in Hanoi city is very rudimentary, and lacking in many of the components, which are routinely available in developed

countries.^{3,6,7,13,15,19,25,26,28,32,34} We found that pre-hospital care was for the most part, left to the discretion of bystanders as evidenced by the fact that more than half of the injured cases did not receive first aid at the site and were transported to hospitals by motorbikes. There are some reasons for this. First, two thirds of the injured cases in the study did not seek pre-hospital emergency services perhaps because many Hanoi residents were unaware of the existing pre-hospital trauma care system. Pre-hospital emergency services should be more widely publicised among the Hanoi population. Second, the study showed that there was a lack of second-tier care providers in the existing system, which confirmed the reports of the Hanoi Health Service that the emergency service centre and hospitals in Hanoi could meet only 3.9% of emergency needs.¹¹ This situation is similar to that in other Southeast Asian countries. Records from Thailand government hospitals showed that 81.3–99.7% of patients transported themselves to hospitals.² Third, community residents or bystanders in Vietnam have not been trained in first aid.²⁹ They were, therefore, not always aware of the correct techniques for carrying, immobilising or transporting patients (which could cause further delays and mishandling) as well as of a lack of life support enroute, so that many severely injured cases did not survive to reach a hospital.

In Southeast Asian countries, communication systems required for effective emergency care are generally lacking.¹³ For example, in India only 4% of the pre-hospital care system has an operational comprehensive network between hospitals and ambulances.¹⁴ Our study also found that a comprehensive communication system was lacking in Hanoi, though all the basic technological resources (telephone, computer, internet line and fax) required for such a system were available. This was due to the lack of an effective coordination program, which would serve to link all levels of the pre-hospital care system.³ Emergency medical dispatching should assist patients in receiving timely medical care by providing clear pre-arrival instructions. Whether enroute or at the scene, pre-hospital care providers should also have the ability to communicate with the receiving hospital, both for patient reporting and to ensure that all necessary resources, such as a trauma team, are mobilised and ready by the time the patient arrives.

The study population had been selected so as to be representative of the entire Hanoi population; it would then be valid to generalise the results of the survey to that population. Hanoi is a major city and has an emergency service centre, the results of the survey would be generalised to other cities with the same physical, environmental and socio-cultural factors and having an emergency service centre. There were limitations in this study. First, our information about injury morbidity was based on proxy reporting (for household members), which is subject to recall problems. It is certainly possible that each study respondent was not aware of all the injuries incurred by each person in his/her household. This could have resulted in underreporting of non-fatal injuries, the extent of which is difficult to ascertain. However, a study in Ghana reported that severe injuries were not affected when data were collected from proxy (other family members).²⁰ Second, we could not collect information on groups by age and sex of the general population of the communes studied because such data were simply not available. Therefore, the injury mortality rate we reported was not adjusted for age and sex.

Conclusions

This study provides useful baseline information on injury occurrence and death among the Hanoi population. Our results reveal that injury is a major health issue in Hanoi, leaving no groups of people unaffected regardless of age or sex, and that it is

caused mainly by road traffic injuries. The study also examines key elements and operations of the existing pre-hospital trauma care system in Hanoi. The system lacks many components and a coordination program, both of which are required for effective pre-hospital trauma care.

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Conflict of interest

There is no conflict of interest.

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