NON-FATAL INJURIES SUSTAINED IN ROAD TRAFFIC ACCIDENTS : A PILOT STUDY IN PROVINCIAL HOSPITALS IN CHON BURI, THAILAND

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Abstract. The characteristics of patients with non-fatal road traffic injuries who received care from non-referral hospitals are described; an assessment of the difference between the characteristics of patients who received care at a referral hospital and those of patients who were treated at non-referral hospitals is made. A retrospective study, conducted in Chon Buri Province, Thailand, reviewed information from two sources: 324 records from eight non-referral hospitals and the 1999 Injury Surveillance Report of Chon Buri Hospital, a referral hospital. A data collection tool was designed to retrieve information from the non-referral hospitals. Data were analysed descriptively and analytically. The majority of the patients of the non-referral hospitals were male (71.1%) motorcyclists (84.2%), and received ambulatory care (83.9%). Young patients had a higher risk of being admitted to these hospitals. Non-motorcyclists, pedestrians, and non-local persons were more likely to receive care from the referral hospital. The results were similar to those of previous studies. The different characteristics of patients who receive care at referral – and non-referral hospitals need to be taken into account when designing traffic accident reduction programs.

INTRODUCTION

In the last two decades, road traffic injury in Thailand has been the fourth-ranked cause of death among males (60.9 per 100,000 population) and the fifth-ranked cause of death among females (14.6 per 100,000 population) (Sintuvanich, 1997; Chuprapawan, 2000). Compared with many developing countries, Thailand has a moderate level of automobile use and a moderate risk of fatality due to road traffic accident (World Health Organization, 1989). The preventable premature death caused by road traffic accidents – so often among the young – has financial, social, and psychological implications for families, communities, and nations as a whole.

Prior to this study, the majority of studies undertaken and the epidemiological data gathered in Thailand were based in public hospitals (Swaddiwudhipong *et al*, 1994; Suksawasdi Na Ayuthya and Bohning, 1997; Kijmahatrakul, 1999; Tepahudee and Phuenpathom, 2000). These studies showed that motorcyclists and their pillion passengers have a higher risk of sustaining traffic injuries compared with the users of other vehicles (cars, utility vans or trucks). Motor cycle users have a higher rate of severe injury, including head injury, and need long-term hospital care more often than those who use other vehicles. However, national data from the Police Department indicate that users of utility vans or trucks are more likely to sustain severe or fatal injury (Medical Institute of Accident and Disaster, 2000). In 1997, the Police Department also estimated that the cost of traffic accidents was more than US$ 40 million. No information was available regarding to hospital fees, healthcare costs or the casualties' occupation. It is resonable to assume that the characteristics of people with injury included in police reports are

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different from those of patients receiving care from health centers: police reports tend to feature individuals that are subject to the legal process or that are involved in severe accidents or crashes between two or more parties.

There is very little data that allows the comparison of referral hospitals and non-referral hospitals. This paper presents the results of a pilot study conducted in Chon Buri Province, eastern Thailand. The study aimed both to describe the characteristics of patients who had non-fatal traffic injuries and received healthcare from non-referral hospitals and to consider the relationship between the injured patients' characteristics and the severity of their injuries. The study also compared selected characteristics of patients with non-fatal injury who received care at a referral hospital with those of patients treated at non-referral hospitals.

STUDY SETTING

Chon Buri Province is some 150 km east of Bangkok; the provincial population was 1,053,000 in 1999 (Public Health Office, Chon Buri Province, 2001a). Manufacturing, tourism and agriculture are the major sources of income. In 1999, compared with six other provinces in the same region, Chon Buri had the highest rate of injury due to traffic accident (4058/100,000 population) and the highest traffic accident rate (73.1/100,000 population). The death rate was almost twice the national traffic accident death rate (37.7/100,000 population) and higher than the national target (50/100,000 population) (Public Health Office, Chon Buri Province, 2001a;b). Public hospitals, including a major referral hospital (Chon Buri Hospital) and nine non-referral hospitals, provide care to 55% of patients with traffic injury while private hospitals care for the remainder (45%) (Public Health Office, Chon Buri Province, 2001b).

MATERIALS AND METHODS

Information from two major sources was reviewed: the records of eight non-referral hospitals and the 1999 Injury Surveillance Report of Chon Buri Hospital (Chon Buri Hospital, 2000). One non-referral hospital was excluded from the study because of difficulty accessing hospital records. A stratified sampling method was used to select patients who had received care from the emergency units of the eight hospitals between January and December 1999. A data collection tool was designed by the research team. Information was retrieved from the records of 324 patients with traffic injury and was recorded by four trained research assistants.

Because of the small sample size, the severity of injury was categorized: patients who had received ambulatory care and patients who had been admitted to hospital. The relative risk and 95% confidence limits of hospital admission or ambulatory care, classified by selected patient characteristics, were calculated. Student's *t*-test was used to compare the average hospital fees for both patient groups (Brase and Brase, 1995).

Selected information in the Injury Surveillance Report of all 6776 patients with non-fatal injuries who received care at Chon Buri Hospital between January and December 1999 was reviewed. The characteristics of patients at this referral hospital were compared with the characteristics of those receiving care from the non-referral hospitals by estimation of the difference between the two proportions and their respective 95% confidence limits (Brase and Brase, 1995).

RESULTS

General characteristics of injured patients at the eight small hospitals

The majority of the injured patients were from Chon Buri (n = 313; 96.6%). One-third of the patients were aged between 20 and 29 years. More than twice as many men (n = 230, 71.0%) than women (n = 94; 29.0%) were injured. 69.6% of injured patients were manual workers; 84.2% of those injured were motocycle

Table 1
Characteristics of patients with non-fatal accidents who received care from non-referral hospitals, January-December 1999.

Characteristic	Number[a]	Percent
Age (years) (Range 1-72 years; mean age = 28 years)		
Less than 10	12	3.7
10-19	74	23.1
20-29	108	33.8
30-39	71	22.2
40-49	40	12.5
50 and older	15	4.7
Occupation		
Manual worker	224	69.6
Student	39	12.1
Unemployed	15	4.7
Trader	9	2.8
Housewife	8	2.5
Farmer	5	1.6
Others	22	6.8
Type of vehicle		
Motorcycle	266	84.2
Utility car or van	28	8.9
Truck	7	2.2
Tricycle	5	1.6
Car	5	1.6
Others	5	1.6
Driving status/Pedestrian		
Driver	222	69.2
Passenger	89	27.7
Pedestrian	10	3.1
Method of transfer to hospital		
Transferred by self or family member	116	37.1
Volunteer organization	27	8.6
Referred from another hospital	2	0.6
Others, including ambulance	37	11.8
Unknown	131	41.9
Time of injury		
00.00-06.59	38	12.0
07.00-09.59	42	13.2
10.00-12.59	37	11.7
13.00-15.59	34	10.7
16.00-18.59	67	21.1
19.00-21.59	73	23.0
22.00-23.59	26	8.2
Month of injury		
January	21	6.6
February	17	5.3
March	16	5.0
April	25	7.9
May	39	12.3
June	55	17.3
July	20	6.3
August	28	8.8
September	31	9.7
October	26	8.2
November	19	6.0
December	21	6.6

Table 1 (continued)

Characteristic	Number[a]	Percent
Site of injury[b]		
Legs and arms	247	76.2
Face	112	34.6
Head and neck	43	13.3
Chest	18	5.6
Abdomen	3	0.9
Others	27	8.3
Severity of injury		
Ambulatory care	230	83.9
Admitted 3 days or less	25	9.1
Admitted 4 days or more	19	6.9

[a]The total number of patient characteristics may not be equal to 324 because of missing data.
[b]A patient may have had more than one injury site.

Table 2
Relative risk (and 95% confidence limits) and *t*-test results of patients with non-fatal accidents being admitted to non-referral hospitals compared with those who received ambulatory care.

Characteristic	Admission n (%)	Ambulatory care n (%)	RR (95% CL)
Age (years)			
Less than 19	9 (12.2)	65 (87.8)	3.5 (0.6-15.5)
20-29	19 (21.8)	68 (78.2)	7.0 (1.5-26.5)
30-39	2 (3.8)	50 (96.2)	1.0
40 and older	5 (10.9)	41 (89.1)	3.1 (0.5-15.6)
Methods of transfer to the hospital			
Transferred by self or family member	9 (8.7)	95 (91.3)	1.0
Transferred by others	16 (32.7)	33 (67.3)	5.1 (1.9-14.0)
Gender			
Male	23 (12.2)	166 (87.8)	1.0
Female	12 (15.8)	64 (84.2)	1.4 (0.6-3.1)
Occupation			
Manual worker	27 (14.9)	154 (85.1)	1.0
Student	4 (11.8)	30 (88.2)	0.8 (0.2-2.5)
Others	4 (8.3)	44 (91.7)	0.5 (0.1-1.7)
Type of vehicle			
Motorcycle	24 (11.3)	189 (88.7)	1.0
Others	8 (18.2)	36 (81.8)	1.8 (0.7-4.5)
Driving status			
Driver	20 (11.1)	160 (88.9)	1.0
Other	15 (18.1)	68 (81.9)	1.8 (0.8-3.8)
Time			
Day time (7.00-18.59)	20 (13.1)	133 (86.9)	1.0
Night time (19.00-6.59)	13 (12.3)	93 (87.7)	0.9 (0.4-2.1)
Day			
Weekdays	22 (13.0)	147 (87.0)	1.0
Weekend	11 (12.2)	79 (87.8)	0.9 (0.4-2.1)
	Mean (SD)	Mean (SD)	t (*df*) p
Hospital fee (US$)	136.3 (110.4)	27.1 (44.2)	-8.9 (166) <0.001

users; 68.9% were drivers of all types of vehicles. Approximately one-fifth of the injuries were sustained during hours after finishing work or school (between 16:00 hrs and 18:59 hrs); a further one-fifth were sustained during the early evening (between 19:00 hrs and 21:59 hrs). More than one-third of injuries (n=111; 34.9%) were sustained during weekends. The majority of patients (n= 230; 83.9%) received ambulatory care, but 10 patients (3.1%) were admitted to hospital for 4 days or more. At the time of arrival at hospital, 294 (96.7%) of casualties were conscious. The hospital fees ranged from US$ 0.1 to US$ 510.00 (average US$ 48.00). Table 1 gives a summary of the selected characteristics of the patients with non-fatal traffic injury of these non-referral hospitals.

Characteristics of patients who received ambulatory care and in-patient care at the non-referral hospitals

Compared with patients aged 30-39 years, patients aged 20-29 years were seven times more likely to be admitted to hospitals (Table 2). The younger age group (< 19 years) and the older age group (≥ 40 years) were, respectively, 3.5 times and 3.1 times more likely to be admitted to hospital than patients aged 30-39 years, but these figures were not significantly higher. As expected, there was a significant association between the severity of the injury and the methods of transfer to hospital. Those admitted to the hospitals paid a significantly higher hospital fee (average US$ 27.10) than patients who received ambulatory care (average US$ 136.30). No significant association was found between the severity of injury and the following patient characteristics: occupation, gender, type of vehicle, driving status (*ie* driver or passenger), time and day of injury (Table 2).

Different characteristics of injured patients who received care from Chon Buri Hospital and small hospitals

Of the 6,776 patients with non-fatal injuries, 2,893 (42.7%) were admitted to Chon Buri Hospital while 3,883 (57.3%) received ambulatory care. The proportion of patients admitted to this referral hospital was significantly higher than the proportion of patients admitted to the non-referral hospitals (0.27; 95%CL = 0.22, 0.31). A significant lower proportion of patients using motorcycles received care from Chon Buri Hospital compared with the proportion of patients receiving care from the non-referral hospitals. The proportion of pedestrians with injury seen at Chon Buri Hospital was significantly higher (5%) than the proportion of pedestrians receiving care from the non-referral hospitals. A significantly higher proportion of non-local patients (15%) received services at Chon Buri Hospital compared with the percentage of non-locals seen at the non-referral hospitals. The proportions of patients with injury who received care from Chon Buri Hospital and other eight hospitals were not significantly different with regard to the age of local drivers and the type of motorcycle user (Table 3).

DISCUSSIONS

Our study investigated the characteristics of non-fatal road traffic injury patients who received treatment at one referral – and eight non-referral public hospitals in a province with high morbidity and mortality rates. Our study results were similar to the results of other studies conducted in referral hospitals in urban and rural Thailand. The majority of patients who sustain traffic injuries are young male motorcyclists (World Health Organization, 1989; Swaddiwudhipong *et al*, 1994; Suksawasdi Na Ayuthya and Bohning, 1997; Kijmahatrakul, 1999; Tepahudee and Phuenpathom, 2000). The expoure of motorcyclists, their speed, their limited driving experience and their risk-taking behavior are some of the factors related to preventable injury. We found that the majority of patients were manual workers: owing, possibly, to the preponderance manufacturing and tourism in the province.

Intervention studies conducted at a vocational college and in rural communities have demonstrated that comprehensive and system-

Table 3
Comparison of the proportions of patients with non-fatal injury receiving care at Chon Buri Hospital and the non-referral hospitals and 95% confidence limits, January-December 1999.

Characteristic	Chon Buri Hospital	Non-referral hospitals	p_1-p_2[a] (95% CL)
Type of vehicle			
Motorcycle	5190 (79.5)	266 (84.2)	-0.05 (-0.09, -0.01)
Others	1341 (20.5)	50 (15.8)	0.05 (0.01, 0.09)
Road user			
Driver	4489 (64.4)	222 (69.2)	-0.05 (-0.10, 0.002)
Passenger	2047 (22.3)	89 (27.7)	-0.05 (0, -0.1)
Pedestrian	437 (6.3)	10 (3.1)	0.03 (0.01, 0.05)
Age of local driver			
Less than 20	1040 (26.8)	52 (24.8)	0.02 (-0.04, 0.08)
20-39	2161 (55.6)	122 (58.1)	-0.02 (-0.09, 0.04)
40 and older	683 (17.6)	36 (17.1)	0.01 (-0.05, 0.05)
Type of motorcycle user			
Driver	3962 (76.3)	197 (75.2)	0.01 (-0.04, 0.06)
Pillion	1228 (23.7)	65 (24.8)	-0.01 (-0.06, 0.04)
Residence			
Local	4076 (81.9)	313 (96.6)	-0.15 (-0.13, -0.17)
Non-local	902 (18.1)	11 (3.4)	0.15 (0.13, 0.17)

Note: [a]p_1 was the proportion of a selected characteristic of patients at Chon Buri Hospital and p_2 was the proportion of the selected characteristic of patients at the non-referral hospitals.

atic health education programs can foster injury-prevention behavior among participants (Swaddiwudhipong *et al*, 1998; Liewchanpattana *et al*, 1999a, b). Nevertheless, law enforcement and the regular delivery of health education messages are needed because the compliance rates for seat-belt and helmet use decrease after the enactment of new or modified regulations (Swaddiwudhipong *et al*, 1994; Aekplakorn *et al*, 2000; Phuenpathom *et al*, 2000).

The high number of injuries that occur in May and June might be caused by road and traffic conditions during the early rainy season and at the beginning of the school and university term. The low percentage of injury during the holiday and festival months, including New Year and *Songkraan* (April), was unexpected: it is likely that health education campaigns during the festive season increased the awareness of traffic injury among high-risk groups and resulted in a reduction in risk-taking behavior.

A higher percentage of patients with arm and leg injury was expected. Motorcyclists are more exposed to injury than other vehicle users. The high percentage of patients with face, head and neck injuries is concerning because of the possibility of neurological insults, which may lead to death or the need for long-term care. However, as the number of patients who required admission was small and the details of their injuries were vague, the degree of neurological impairment or the severity of head injury could only be surmised.

Our study confirmed that patients transferred to hospital by ambulance or by voluntary organizations have relatively worse health outcomes compared with those who transfer themselves or who are transferred by family members (Swaddiwudhipong *et al*, 1994). At least three factors may explain this finding: patients with severe injuries, unable to transfer themselves to hospital and unable to be tranferred by their relatives, required assistance from others, including ambulance offic-

ers and volunteers; inadequate or inappropriate care may have been provided to patients by ambulance officers or by volunteers while the patient was being transferred; the transfer time, from the site of the accident to hospital, may have resulted in the patients' deterioration. In-service training and education programs for the personnel of the various organizations that deal with traffic injury patients is one strategy that may optimise the health outcomes for transferred patients (WHO, 1989).

A difference between the characteristics of patients who received care from a referral hospital and those of patients treated at non-referral hospitals has been demonstrated: a high proportion of pedestrians, non-motorcyclists and non-locals received health services from a referral hospital. This study did not collect other information, such as the use of alcohol among pedestrians (Swaddiwudhipong *et al*, 1994); which has been shown to be related to a high injury rate among pedestrians in rural communities. Risk-taking behaviors of the population may affect the characteristics of patients receiving care from both kinds of hospital. The high proportion of pedestrians, non-motorcyclists and non-locals at a referral hospital compared with non-referral hospitals should be taken into account by health planners that are designing programs or interventions to reduce traffic injury.

Studies that rely on routine hospital records have limited validity and reliability (Beaglehole *et al*, 1993). Information on some aspects of non-fatal injury was not gathered because data were either scanty or not uniformly recorded: these aspects included the use of preventive health measures (*eg* the wearing of helmets and seat belts), the number of pillion passengers, the road conditions, drivers' experience, weather conditions, the number and type of parties involved in the injury, and the use of drugs and alcohol.

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