

CLINICAL SEVERITY AND FINANCIAL BURDEN AMONG ROAD TRAFFIC INJURY PATIENTS IN KUNMING, CHINA

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Abstract. This study aimed to describe the severity of injury (RTI), length of stay, costs, financial burden, and sources of payment for RTI patients in the Kunming area, Yunnan Province, China. Information was collected from interviewing 420 patients admitted with RTI during January to May 2005 and from medical records reviewed of all the patients admitted from January to 30 May 2005. The costs and financial burden of road casualties on the medical sector resources were found to be large (median = RMB 94,496) compared to the average per capita monthly income of the Yunnan population (RMB 798). Most patients had injuries of moderate severity. Pedestrians and passengers had the highest Injury Severity Score (ISS). The mean payments out-of-pocket, from the government and by compensation were RMB 5,320, 10,190 and 11,190, respectively. In addition to prevention of RTI, a suitable insurance system is needed in the country.

INTRODUCTION

There has been a rising incidence in road traffic injuries (RTI) in China. From 2001 to 2003, traffic death toll exceeded 100,000 per year, with injuries averaging over 500,000. The annual direct and indirect costs have been estimated to be between US\$12 and 21 billion, approximately 1.5% of China's GNP (WHO, 2004).

Kunming, the capital of Yunnan Province with a population of 5.8 million, is an important tourism city in China. In 2004, there were 3,782 reported accidents with 432 fatalities and 2,082 injuries. The direct economic loss was RMB 12,861,313 (US\$ 1 is approximately RMB 8) (Traffic Administration Bureau of Yunnan Province, 2004). There have been no detailed studies of the severity of injuries and

financial burden break-down among the various classes of road users. Such information is important for further planning and intervention. It can also serve as an example of a developing country with a rapidly increasing level of high-speed traffic.

The objective of the study was to document the severity of injuries and the financial burden to the different types of road users.

MATERIALS AND METHODS

This was a cross-sectional study. Due to data quality concerns we selected six hospitals with high quality facilities as the study sites. The trauma patients were transferred from the accident scene or referred by nearby hospitals. The catchment area had an estimated population of 5.8 million.

The study protocol was approved by the Ethics Committee of Prince of Songkla University, Research Committee of Kunming Medical College and the relevant authorities in Kunming.

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This study consisted of two parts. In Part I the database of the admission records from January 2003 to March 2005 for the hospitals was reviewed. Since there was not enough information regarding the financial burden to the patients, Part II of the study was added in which RTI patients staying at the hospitals during January to May 2005 were interviewed face-to-face, each after informed consent.

The injuries were coded according to the 1985 Abbreviated Injury Score (AIS) due to its common use in international accident surveys (States *et al*, 1985). The severity component ranges from one to six and describes the relative severity of the injury (minor, moderate, serious, severe, critical and unsurvivable) in 6 body regions (head, face, thorax, abdomen, extremity and external). The total Injury Severity Score (ISS) is equal to the sum of the squares of the top three items of the body regions (Baker *et al*, 1974).

The sample size for Part II was calculated based on the estimation that the high-cost subgroup of victims would have a mean payment of RMB 1,300 and a standard deviation of RMB 700, whereas the low-cost subgroup would have a mean and standard deviation of RMB 1,000 and RMB 700, respectively. Setting the alpha at 0.05 and the power at 80 percent, the sample size required for each group was 86. There were five groups of road users in Kunming: pedestrian, passenger, bicyclist, motorcyclist and car driver, therefore, the total sample size was set at $86 \times 5 = 430$. For practical reasons, all RTI patients in the study hospitals were recruited without any initial classification.

The data were computerized and validated using Epidata to set up databases. The analysis was carried out using R Software version 2.0.1(R Development Core Team, 2004) with Epicalc Library (Chongsuvivatwong, 2005) which was validated against other commercial software.

RESULTS

For Part I of the study, 5,537 complete records were analyzed. The patient characteristics are summarized in Table 1. The cost and financial burden of the road casualties on medical sector resources was found to be large (median = RMB 94,496) compared to the average per capita monthly income of the Yunnan population (RMB 798). Table 2 and Figs 1 and 2 show that head injury was the

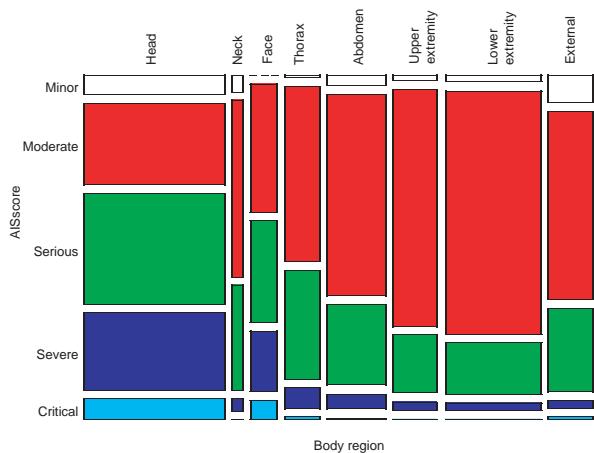


Fig 1–Mosaic plot of AIS score by body region.

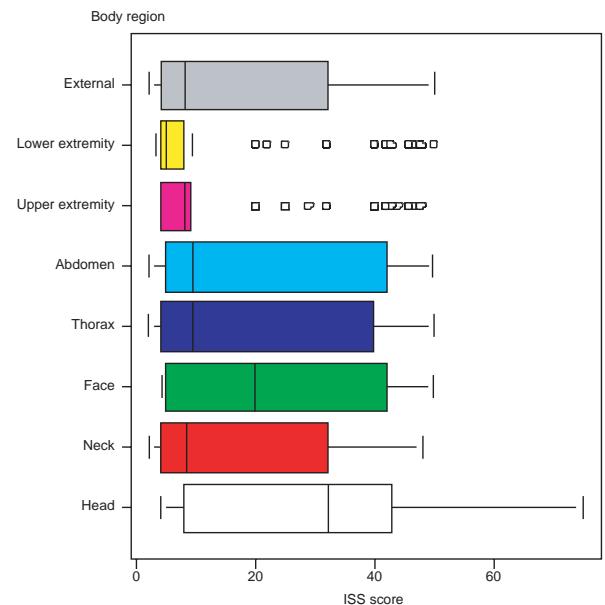


Fig 2–Distribution of ISS by most seriously affected body region.

Table 1
Demographic characteristics of subjects
from the medical records (n=5,537).

	Frequency	%
Sex		
Male	3,713	67.1
Female	1,824	32.9
^a Age group (year)		
≤20	807	14.6
21-40	2,744	49.6
41-60	1,450	26.3
>61	530	9.5
Occupation		
Farmer	1,807	32.6
Worker	1,473	26.6
Public service	538	9.7
Professional	804	15.2
Driver	263	4.7
Other	616	11.1
Type of vehicle		
Pedestrian	2,335	42.2
Special vehicle	1,034	18.7
Bicycle	729	13.2
Motor-cycle	661	11.9
Motor-tricycle	19	0.3
Pick-up	487	8.8
Car	216	3.9
Bus	42	0.8
Heavy transport	14	0.3

^aMean age (SD) = 36.6(16.7) years

most common reported major body region of injury. It also had highest severity. Fig 3 shows that there were no major differences in severity among the different types of vehicles.

In Part II of the study, of 430 patients who were approached, 420 agreed to participate. The subjects were predominantly young male adults. Low income and unemployed groups also comprised a large position of the study group (Table 3).

Table 4 shows that 194 patient needed to pay money out of their own pockets. For them, the mean payment of RMB 5,320 was much more important than the loss of income (mean = RMB 40.2). Payment from the government and compensation played an important role in 30-50% of the patients. Fig 4 shows that for the low-cost treatment, the out-of-pocket payment contributed substantially. For high-cost treatment, most were covered by other sources. Table 5 shows the total costs were not significantly different among types of road users, but car divers generally reported a higher level of income loss than other groups.

DISCUSSION

Males and young adults predominated among the study victims. Head injury was the most common cause and had the highest se-

Table 2
Distribution of AIS score by body region: frequency (%).

Body region	Minor	Moderate	Serious	Severe	Critical	Total
Head	106 (6.2)	452 (26.5)	610 (35.8)	424 (24.9)	112 (6.6)	1,704 (30.8)
Neck	7 (5.4)	74 (56.9)	44 (33.8)	5 (3.8)	0 (0)	130 (2.3)
Face	0 (0)	138 (41.3)	110 (32.9)	66 (19.8)	20 (6.0)	334 (6.0)
Thorax	3 (0.7)	241 (56.7)	149 (35.1)	29 (6.8)	3 (0.7)	425 (7.7)
Abdomen	23 (3.3)	460 (65.2)	184 (26.1)	36 (5.1)	3 (0.4)	706 (12.8)
U-extremity	10 (1.9)	411 (76.4)	101 (18.8)	15 (2.8)	1 (0.2)	538 (9.7)
L-extremity	26 (2.2)	914 (78.7)	192 (16.5)	28 (2.4)	2 (0.2)	1,162 (21.0)
External	48 (8.9)	326 (60.6)	146 (27.1)	14 (2.6)	4 (0.7)	538 (9.7)

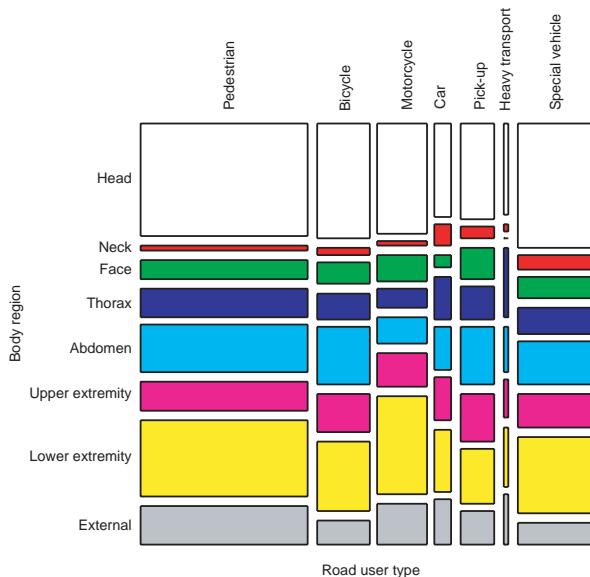


Fig 3–Mosaic plot of most serious body region by road user type.

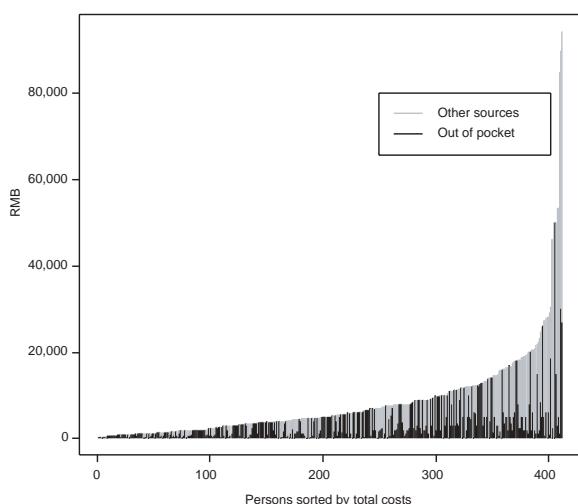


Fig 4–Distribution of payment by source among the RTI patients .

verity. There were no significant differences in severity or financial cost among the different types of road users. Out-of-pocket payment played an important role. A difference among the road users was observed for loss of income, with car drivers having the highest loss.

The demographic profile of our RTI victims is similar to that reported elsewhere

Table 3
Demographic characteristics of sample from interviewed patients (n=420).

	Frequency	%
Sex		
Male	289	68.8
Female	131	31.2
^a Age (year)		
≤20	64	15.2
21-40	205	48.81
41-60	107	25.48
>61	44	10.48
Education levels		
None	45	10.7
Primary	90	21.4
Lower Secondary	92	21.9
Upper Secondary	88	21.0
Vocational	74	17.6
Bachelor or Higher	31	7.4
Employment		
Unemployed	208	49.5
Employed	163	38.8
Self-employed	49	11.7
Main income source		
Government service	112	26.7
Private company	58	13.8
Part-time earning	12	2.9
Self-employment	88	21.0
Other	149	35.5
Monthly Income (RMB) ^a		
Less than 200	100	23.8
201 to 500	52	12.4
501 to 800	60	14.3
801 to 1,000	65	15.5
1001 to 2,000	105	25.0
More than 2,000	38	9.0
Road user/vehicle		
Passenger	87	20.7
Pedestrian	134	31.9
Bicyclist	95	22.6
Motorcyclist	72	17.1
Car driver	32	7.6

^aAge mean (SD) =36.9 (16.7) year

^bAverage income in Kunming population is RMB 798.13 in the period.

Table 4
Distribution of financial loss and source of payment in RMB.

Type of cost	No.	Mean	SD	Median	Min.	Max.
Loss income	420	40.2	57.7	30	320	900
Out-of-pocket	194	5,320	5,814	3,660	320	50,000
Government payment	67	10,190	14,009	6,991	500	94,500
Compensation	159	11,190	12,750	7,579	383	90,000

Table 5
Total costs and loss of income by type of road user (in RMB).

	Car driver N=32	Motorcyclist N=72	Bicyclist N=95	Pedestrian N=134	^a Passenger N=9,581	p-value (Kruskal-Wallis test)
Total costs						0.2344
Mean	10,660	8,829	6,347	8,104	9,581	
Median	5,720	5,762	3,914	5,216	5,825	
SD	16,922.9	12,947.9	6,095.6	10,144.6	10,761.3	
Min-Max	500-85,090	339-94,500	500-27,550	320-90,000	400-53,500	
Income lost						<0.001
Mean	102	45.3	32.3	28.7	38.7	
Median	58	30	30	25	30	
SD	152	43.8	27.3	39.3	34.9	
Min-Max	30-900	0-320	0-120	0-300	0-200	

^aPassengers included car-passengers, motorcycle-passengers and bus-passengers

(WHO, 2003). The majority of victims were male, probably due to the high level of exposure to higher speed traffic as drivers and commuters. The same explanation also holds for young adults, who have risky behavior due to being inexperienced and impulsive.

The head region was most commonly involved and a serious threat to life. It is associated with long-term disability, poor quality of life, pain and suffering. The severity of head injuries identified in this study was similar to that described in the global literature (Odero 1997; Krug *et al*, 2000; Murray *et al*, 2001; WHO, 2003).

If a significant impact on the severity of injuries due to road traffic accidents in Yunnan Province is to be made, attention must be directed toward head and lower-extremity inju-

ries (Evans and Frick, 1988). The number of motorcycles in China has recently increased. Wearing a helmet for motorcyclists and wearing a seatbelt for drivers and passengers of cars have been shown to effectively reduce the severity of RTI (Eastridge *et al*, 2006; Kerwin *et al*, 2006). In Kunming, a helmet law has been enforced since the 1990s and a seatbelt law since 2003. In Kunming city, it is well known that all motorcyclists wear helmets. However, in the countryside, the proportion of motorcyclists wearing a helmet is not known. The proportion of time seatbelts are worn is also unavailable. These issues need to be researched further.

The financial burden of road casualties on medical sector resources was found to be large. Even in developed countries, hospital

reimbursement by the public is inadequate (Henry *et al*, 2000). Out-of-pocket payment is often the first and most tangible economic burden experienced by the family.

In this study, all costs borne by the different income groups were similar. This means the poor would bear a relatively heavier financial burden when income is taken into account.

This study did not include victims with trivial injuries due to RTI who went directly home after the accident or the victims who died at the scene of the accident since they were not included in the clinic hospital database. Therefore, under or over-estimation of the burden may have occurred. The sample size originally prepared to cover all road user groups was distorted by the predominance of pedestrians/passengers. Otherwise, this study sample should represent the population well.

Pedestrians and passengers were the most common victims. Further studies are needed to understand their risk and to prevent unnecessary injuries. Head injury, the most common and most severe form of RTI, needs further attention for research and intervention. The financial burden to the victims was high. A good medical insurance system should be set up.

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