Mortality and Injury from Motorcycle Collisions in Phetchaburi Province

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Abstract

A retrospective analysis was done in 3,225 injured motorcyclists treated at Phra Chom Klao Hospital between April 1, 1999 and March 31, 2000. The peak of all motorcycle crashes was found between 6 p.m. and 9 p.m. Male motorcycle riders accounted for 69 per cent of the accident population, and most riders were under 21 years of age. Approximately 21 per cent of the accident-involved riders had been drinking alcohol and about half of the riders were unlicensed. Only 4 per cent of the riders were wearing helmets at the time of the accident. Helmet usage was much lower among passengers, only about 1 per cent. The upper and lower extremities were injured most frequently, although these injuries were not life threatening. The most fatal injuries to the motorcyclists were to the head, abdomen, and chest in decreasing frequency.

Key word : Motorcycle Accident, Helmet, Alcohol, Injury

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Motorcycle accidents are well known as a major traffic safety problem. According to the U.S. National Highway Traffic Safety Administration, motorcycle riders had a higher rate of fatalities per registration as well as higher fatalities per miles traveled than cars about 3 times and 18 times, respectively[1]. In Thailand, many individuals rely on motorcycles as the sole mode of personal transportation[2-4]. Both motorcycle riders and/or passengers are vulnerable to injury in an accident, because, except for their helmets, they have no crash protection system as do the occupants of cars. Furthermore, motorcycles are vulnerable to falling over due to loss of balance and traction[5]. Therefore, the number of

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motorcycle accidents and injuries to riders and passengers has increased and has become a major cause of mortality and morbidity in Thailand.

The objective of this study was to investigate the general characteristics of motorcycle accidents, and injuries sustained by both riders and/or passengers.

MATERIAL AND METHOD

The data required for this study was obtained from the clinical records of 3,225 injured motorcyclists from motorcycle collisions who were treated in the emergency room of Phra Chom Klao Hospital between April 1, 1999 and March 31, 2000. All injuries were coded using the Abbreviated Injury Scale (AIS), 1990 revision, ranging from 1 (minor), 2 (moderate), 3 (serious), 4 (severe), 5 (critical) to 6 (fatal or untreatable). Essential information regarding age, gender, time of accident occurrence, and location of accidents, alcohol involvement, helmet wearing, and injury severity, etc. was extracted from their hospital records.

RESULTS

A total of 2,335 motorcycle crashes involving 3,225 injured motorcyclists (2,335 riders and 890 passengers) were collected in the present study. About 47 per cent of all crashes (1,097/2,335 cases) occurred in Muang District. The peak of all motorcycle crashes was found between 6 a.m. and 6 p.m. accounting for 57.6 per cent (1,344/2,335 cases) as shown in Table 1. There were 40 accidents involving fatal injuries which included 30 motorcycle riders and 13 passengers. Three accidents were double fatalities, which involved both rider and passenger. Nearly two-thirds of all fatal crashes (27 / 43 cases) occurred between 6 p.m. and 6 a.m. (Table 2). The accidents were recorded most frequently in January, followed by May, April and June (Table 3). The number of accidents began to drop in August, through October.

The youngest motorcycle rider was 9 years old; the oldest rider was 70 years and the median age was 26 years (Table 4). Riders who were under 21 years of age accounted for about 31 per cent of all accident cases. Passengers, generally, were younger than riders. The youngest passenger was 3 years old; the oldest passenger was 72 years and the median age was 20 years. There were 149 passengers (17%) who were under the age of 11 years and about half of the passengers were below 21 years.

Male motorcycle riders accounted for 69 per cent of all cases and out-numbered female riders by a ratio of 2.2 to 1 (Table 5). By contrast, female passengers out-numbered males by 1.6 to 1. Only half of the accident-involved riders had a motorcycle license. Approximately, one-fifth of all riders (498/2,335 cases) had been drinking alcohol before the

Table 1. Accident time of day.

Accident time	Number of cases	Per cent
0.01-3.00	115	4.9
3.01-6.00	54	2.3
6.01-9.00	226	9.7
9.01-12.00	352	15.1
12.01-15.00	334	14.3
15.01-18.00	432	18.5
18.01-21.00	514	22.0
21.01-24.00	308	13.2
Total	2,335	100.0

Table 2. Time of fatal accident.

Accident time	Number of fatal cases	Per cent
0.01-3.00	5	11.6
3.01-6.00	4	9.3
6.01-9.00	5	11.6
9.01-12.00	3	7.0
12.01-15.00	2	4.7
15.01-18.00	6	14.0
18.01-21.00	9	20.9
21.01-24.00	9	20.9
Total	43	100.0

Table 3. Month of accident.

Month	Number of cases	Per cent
January	220	9.4
February	194	8.3
March	194	8.3
April	206	8.8
May	210	9.0
June	200	8.6
July	192	8.2
August	185	7.9
September	181	7.8
October	168	7.2
November	197	8.4
December	188	8.1
Total	2,335	100.0

Table 4. Age of motorcycle rider and passenger.

Age (years)	Motorcycle riders		Motorcycle passengers	
	Frequency	Per cent	Frequency	Per cent
0-10	2	0.1	149	16.7
11-20	736	31.5	346	38.9
21-30	677	29.0	180	20.2
31-40	439	18.8	86	9.7
41-50	266	11.4	54	6.1
51-60	132	5.6	36	4.0
>60	83	3.6	39	4.4
Total	2,335	100.0	890	100.0

Table 5. Gender distribution of rider and passenger.

Gender	Motorcycle rider		Motorcycle passenger	
	Frequency	Per cent	Frequency	Per cent
Male	1,607	68.8	347	39.0
Female	728	31.2	543	61.0
Total	2,335	100.0	890	100.0

Table 6. Helmet use by motorcyclists.

Helmet use	Motorcycle rider		Motorcycle passenger	
	Male	Female	Male	Female
No	1,549	694	345	536
Yes	58	34	2	7
Total	1,607	728	347	543

accident. In addition, alcohol use was found in 8 of the 27 fatally injured male riders and 7 of the 13 passengers who were killed. About 4 per cent of all accident-involved riders were helmeted (Table 6). Female riders were more likely to use a helmet than male riders (4.7% *versus* 3.6%). Helmet use by passenger was much lower than riders. Only 9 of them (1%) were wearing a helmet at the time of the accident. None of the fatally injured riders and passengers were helmeted.

A total of 5,877 injuries were recorded among 2,335 accident-involved riders, for an average of 2.5 injuries per rider while passengers sustained about 1.7 injuries per person. Tables 7 and 8 show the distribution of injuries to the body of riders and passengers found in the present study. About 60 per cent of the injuries involved the upper and lower extremities followed by injuries to the face and head regions. Injuries to the chest and abdomen were the least common. Regarding the injury severity (AIS, 1990 revision), about 78 per cent of the riders' and passengers' injuries were minor, 17 per cent were moderate and 5 per cent were serious-to-fatal. The most frequent causes of death were injuries to the head, chest and abdomen as listed in Table 9. Eleven fatally injured motorcyclists were dead on arrival, five cases survived 1-2 hours after the crash and 27 motorcyclists lived longer than 12 hours ranging from one to 22 days. The median survival time was 2 days.

DISCUSSION

The general characteristics of the accident-involved motorcycle riders and passengers found in the present report agree with Kasantikul who con-

Table 7. Rider injury region and severity.

Body region	Injury severity						Total
	Minor AIS 1	Moderate AIS 2	Serious AIS 3	Severe AIS 4	Critical AIS 5	Fatal AIS 6	
Head and Neck	256	200	18	30	54	9	567
Face	658	109	6	2	1	0	776
Thorax	86	26	8	6	0	1	127
Abdomen	68	29	8	12	3	0	120
Upper extremities	1,329	308	2	0	0	0	1,639
Lower extremities	2,208	348	90	2	0	0	2,648
Total	4,605	1,020	132	52	58	10	5,877

Table 8. Passenger injury region and severity.

Body region	Injury severity						Total
	Minor AIS 1	Moderate AIS 2	Serious AIS 3	Severe AIS 4	Critical AIS 5	Fatal AIS 6	
Head and Neck	99	70	3	5	22	2	201
Face	156	27	0	0	0	0	183
Thorax	18	8	0	0	1	1	28
Abdomen	16	13	8	4	0	0	41
Upper extremities	396	61	0	0	0	0	457
Lower extremities	516	82	36	2	0	0	634
Total	1,201	261	47	11	23	3	1,546

Table 9. Most frequent causes of death.

Body Region	Injury Severity			Total
	Severe AIS 4	Critical AIS 5	Fatal AIS 6	
Head and Neck	3	23	10	36
Face	0	1	0	1
Thorax	3	1	2	6
Abdomen	3	4	0	7
Lower extremity	1	0	0	1

ducted a study of 1,082 on-scene, in-depth motorcycle accident investigations in Thailand[3,4]. Most accidents occurred during daytime. While the nighttime accidents were found to occur most often between 6 p.m. and 9 p.m. Accident rate is relatively level throughout the year with dips in August through October which are rainy season. Most riders tended not to ride during the rain. It is clear that motorcycle riders under the age of 21 years contributed to nearly one-third of all crashes. Female riders also made up over 31 per cent of the motorcycle collisions. Furthermore, nearly half of the accident-involved riders in the upcountry data had no motorcycle license[3,4,6]. Hence, they are candidates for countermeasures of motorcycle safety training and licensing. In the authors' previous investigation, rider error was the most prominent accident cause factor because many accident-involved riders were unaware that they had violated the law engaged in certain unsafe actions that led to their accidents[6]. Basic safety information and defensive driving practice, thus, are essential as a primary means of accident prevention[3,4].

In the present report, alcohol-involved riders were present in about 21 per cent (498/2335) of the accident population. Alcohol is generally considered to be one of the most outstanding contributing factors in motorcycle accidents because it affects the alcohol drinker by causing attention, reaction and detection failure[3]. According to Kasantikul, alcohol-involved accidents occurred most often at night, were found to involve higher speed, to be inattentive, to run off the roadway and were also found to be more likely to violate traffic control signals[3,4]. They were found less likely to involve female riders or young students. In the present study, there were 15 fatalities among 498 alcohol-involved accidents or about one death for every 32 alcolhol-involved crashes. Among the non-alcohol-involved accidents, 25 fatal crashes were found in 1,837 crashes, amounting to one death in every 73 accidents. Therefore, alcohol-involved accidents are more likely to cause fatalities than non-alcohol-involved accidents. Helmets have long been proved to prevent or reduce head injuries particularly if the helmet stays on the motorcyclist's head through the entire collision sequence[7,8]. In a study of 1,082 on-scene, in-depth motorcycle accident investigations in Thailand, Kasantikul reported that 1 in 19 unhelmeted motorcyclists were killed, while for those whose helmets remained in place the fatality risk was 1 in 54 accidents[3,4]. Although Thailand has had a mandatory helmet use law since 1993, compliance varies widely[8]. In the present study only 4 per cent and 1 per cent of the accident-involved riders and passengers were helmeted. It should be noted that none of the fatally injured motorcyclists in the present study were wearing a helmet. Additionally, the most frequent causes of death were injuries to the head (36/43). Therefore, strict law enforcement together with an educational program regarding the importance of helmet usage are essential to reduce the incidence of head injury among motorcyclists.

Injuries to the extremities were the most frequent injuries accounting for 60 per cent of the injured motorcyclists in the present report. Very few were serious or severe and in no case were they considered to be a threat to life. Although life-threatening is not the problem with significant injuries to the extremities, physical impairment and long-term disability could represent the primary threat posed by serious and severe injuries to the joints and long bones. Many riders make their living by doing manual labor due to their minimal education. Therefore, they are at serious risk of losing their ability to earn a living[3,4,6]. For example open fractures of the long bone are more likely to be disabling.

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การเสียชีวิตและบาดเจ็บจากอุบัติเหตุรถจักรยานยนต์ในจังหวัดเพชรบุรี

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ได้ทำการศึกษาและวิเคราะห์สาเหตุการเสียชีวิตและบาดเจ็บจากผู้ขับขี่และผู้โดยสารรถจักรยานยนต์จำนวน 3,225 ราย ที่ได้รับการรักษาพยาบาลจากโรงพยาบาลพระจอมเกล้า จังหวัดเพชรบุรี ตั้งแต่วันที่ 1 เมษายน 2542 ถึงวันที่ 31 มีนาคม 2543 อุบัติเหตุรถจักรยานยนต์พบบ่อยที่สุด ในช่วงเวลา 18.00 น. ถึง 21.00 น. ผู้ขับขี่ร้อยละ 69 เป็นเพศชาย และส่วนใหญ่มีอายุต่ำกว่า 21 ปี พบจำนวนผู้ดื่มสุราประมาณ ร้อยละ 21 ของผู้ขับขี่ที่ได้รับอุบัติเหตุ และในจำนวนนี้ พบผู้ขับขี่ที่ไม่มีใบขับขี่ถึงร้อยละ 50 การศึกษานี้พบผู้สวมหมวกนิรภัยเพียงร้อยละ 4 ของผู้ขับขี่รถจักรยานยนต์ และ เพียงร้อยละ 1 ของผู้โดยสารเท่านั้น การบาดเจ็บส่วนใหญ่พบที่แขนและขา แต่ไม่ใช่สาเหตุของการเสียชีวิต ซึ่งส่วนใหญ่จะเป็นการบาดเจ็บในบริเวณศีรษะ, ช่องท้องและทรวงอก

คำสำคัญ : อุบัติเหตุรถจักรยานยนต์, หมวกนิรภัย, สุรา, การบาดเจ็บ

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