CHARACTERISTICS OF MOTOR VEHICLE ACCIDENT PATIENTS PRESENTING TO A NATIONAL REFERRAL HOSPITAL IN WEST JAVA, INDONESIA

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Abstract. Motor vehicle accidents are a major cause of morbidity and mortality in Indonesia. We aimed to determine the characteristics of motor vehicle accident patients presenting to a national referral hospital in West Java, Indonesia in order to inform motor vehicle accident morbidity and mortality prevention programs. We reviewed the medical records of motor vehicle accident patients who presented to the Emergency Department of Dr Hasan Sadikin General Hospital Bandung, Indonesia during January 2015 – December 2016. The following were obtained for each victim: patient demographics, use of personal protective equipment, the GAP score [a combination of the Glasgow Coma Scale (GCS), age and systolic blood pressure (pulse)] of the patients, the case outcome, the imaging results and whether the victims had health insurance. The cases were selected through random sampling and the minimum number required cases was reached. A total of 198 patients (78.8% men) were seen in the Emergency Department for a motor vehicle accidents during the study period. Twenty-six point eighth percent were aged 17-25 years. Fifty-one point five percent of subjects had accident outside the city of Bandung. Six point six percent of patients died. Thirty-six point five percent of those on a 2-wheel vehicle wore a helmet. Seventy-six point three percent of subjects had a mild injury, based on the GAP score. Fifty-four percent of subjects sustained a skull fracture. Fifty-seven point six percent of patients were uninsured. Our study showed a high skull fracture rate and a low helmet use rate. Our results show the hazards of lack of helmet use. Prevention programs should especially target male 2-wheel vehicle drivers aged 17-25, encouraging them to wear helmets and showing the consequences of not wearing a helmet. Further studies are needed to determine the most effective methods to ensure helmet use in this young age group.

Keywords: patients' characteristics, road-traffic accident

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INTRODUCTION

Motor vehicle accidents are a major cause of morbidity and mortality. In 2010, road-traffic accident-related injuries comprised the eighth most common cause of death in the world; this is estimated to increase to the fifth most common cause of death worldwide by 2030 (Lozano *et al*, 2012). It is estimated 1.25 million people worldwide died due to road-traffic accident-related injuries in 2013 (WHO, 2015). In Indonesia, the mortality rate due to road-traffic accidents in 2013 was 15.3 per 100,000 persons (WHO, 2013). The risk factors for severe injuries due to road-traffic accidents include not wearing a helmet and not using a safety belt or a child car seat (Peden *et al*, 2004). Of 2,108 head injury cases presenting to the Emergency Department, Dr Hasan Sadikin General Hospital Bandung (RSHS) during January 2013-June 2014, 1,324 were caused by road-traffic accidents involving two-wheeled motor vehicles (Faried *et al*, 2017). Those injuries could be prevented by wearing personal protective equipment during the ride. The use of personal protective equipment when driving is required by law (Republic of Indonesia, 2009).

In spite of laws to reduce risk of road traffic accident injuries, during 2016 in Indonesia, 22,558 people were injured and 26,185 people died (Statistics Indonesia, 2018). Therefore, we aimed to assess the characteristics of patients injured in road-traffic accidents who presented to Dr Hasan Sadikin General Hospital Bandung in order to inform motor vehicle accident morbidity and mortality prevention programs.

MATERIALS AND METHODS

We conducted a descriptive, retrospective review of the charts of road-traffic accident victims who presented to Dr Hasan Sadikin General Hospital Bandung, a referral hospital in West Java, Indonesia, during January 2015 – December 2016. Incomplete medical record cases were excluded from the study. The cases were selected through random sampling, collecting several cases in each month during the study period until the minimum number of required cases was reached. The minimum number was calculated based on the estimated sample proportion formula $n = \frac{Z\alpha/2^2 P(1-P)}{E^2}$ with an alpha (α) of 5% ($Z\alpha/2$ is normal deviate for two-tailed alternative hypothesis at a level of significance; for example, for 5% level of significance, $Z\alpha/2$ is 1.96), a prevalence in studies (P) of 50% (P is the prevalence or proportion of event of interest for the study based on previous literature), and a margin of error (E) of 10%; so $n = \frac{1.96^2 \times 0.5x \ (1-0.5)}{0.1^2} = 96.04$. (Suresh and Chandrashekara, 2012).

This study was approved by the Ethics Committee of the Faculty of Medicine, Universitas Padjadjaran, (approval number 349/UN6.C.10/PN/2017) and the Education and Training and Ethics Committee of Dr Hasan Sadikin General Hospital, Bandung, West Java Province (approval number LB.02.01/X.2.2.1/9575/2017).

Data collected from each case were: patients' sex, age, home address, location of accident, personal protective equipment used during the accident, the GAP score [a combination of the Glasgow Coma Scale (GCS), age, and systolic blood pressure (pulse)], patient outcome, imaging results, and type of health insurance, if any. The age group was classified according to the study of Zulkipli *et al* (2012). The GAP score was used to categorized the severity of the trauma as mild (19-24), moderate (11-18) or severe (3-10) (Kondo *et al*, 2011; Ahun *et al*, 2014).

Data analysis was performed using Microsoft, Excel, 2010 to calculate numbers and percentages of variables.

RESULTS

A total of 198 cases were reviewed in this retrospective study.

Table 1 shows the demographics of patients injured in road-traffic accidents. Seventy-eight point eight percent of subjects were men. Twenty-six point eight percent of subjects were aged 17-25 years. Fifty-one point five percent of subjects had their accident outside Bandung. Sixty-three point one percent of subjects had a GCS score of 13-15, 70.7% had a systolic blood pressure 60-120 mmHg and 75.8% were treated conservatively.

Table 2 shows the proportions of the study subjects who were referred to or presented directly to the study institution by location of accident. Among 29 cases where the accident occurred in Bandung City, 9 presented directly to the study institution and the rest were referred from other institutions. All the cases where the accident occurred outside Bandung City were referred to the study institution, none presented directly.

Table 3 shows the use of personal protective equipment by type of vehicle involved in the accidents. Only 36.5% of two-wheeled vehicle drivers used a helmet. None of the four-wheeled vehicle cases reported using seat belt. Fig 1 shows that 76.3% of the study subjects had mild trauma.

Table 4 shows the outcomes of the study subjects. Ninety-three point four percent of patients treated as an inpatient recovered and were discharged home, while 75% of patients treated in the Intensive Care Unit recovered and were discharged. The remainder of both these groups died.

Table 1
Demographics of study subjects.

Variable	Number (%)
Sex	
Male	156 (78.8)
Female	42 (21.2)
Age group, (years)	
Toddlerhood (0-5)	10 (5.1)
Childhood (6-11)	12 (6.1)
Early adolescence (12-16)	38 (19.2)
Late adolescence (17-25)	53 (26.8)
Young adulthood (26-35)	32 (16.2)
Adulthood (36-45)	22 (11.1)
Early senior (46-55)	17 (8.6)
Late senior (56-65)	9 (4.5)
Elderly (>65)	5 (2.5)
Home address	
Bandung City	27 (13.6)
Bandung Regency	75 (37.9)
Outside Bandung	96 (48.5)
Location of accident	
Bandung City	29 (14.7)
Bandung Regency	67 (33.8)
Outside Bandung	102 (51.5)
Glasgow Coma Scale (GCS) Score	
13-15	125 (63.1)
9-12	67 (33.9)
3-8	6 (3)
Systolic blood pressure	
>120 mmHg	58 (29.3)
60-120 mmHg	140 (70.7)
<60 mmHg	0 (0)
Treatment	
Conservative	150 (75.8)
Operative	48 (24.2)

Table 2
Direct presentation and referral to the study institution by location of accident.

Location of accident	Referred n (%)	Presented directly n (%)
Bandung City	20 (10.1)	9 (4.6)
Bandung Regency	67 (33.8)	0
Outside Bandung	102 (51.5)	0

Table 3
Use of personal protective equipment by types of vehicle involved in the accident.

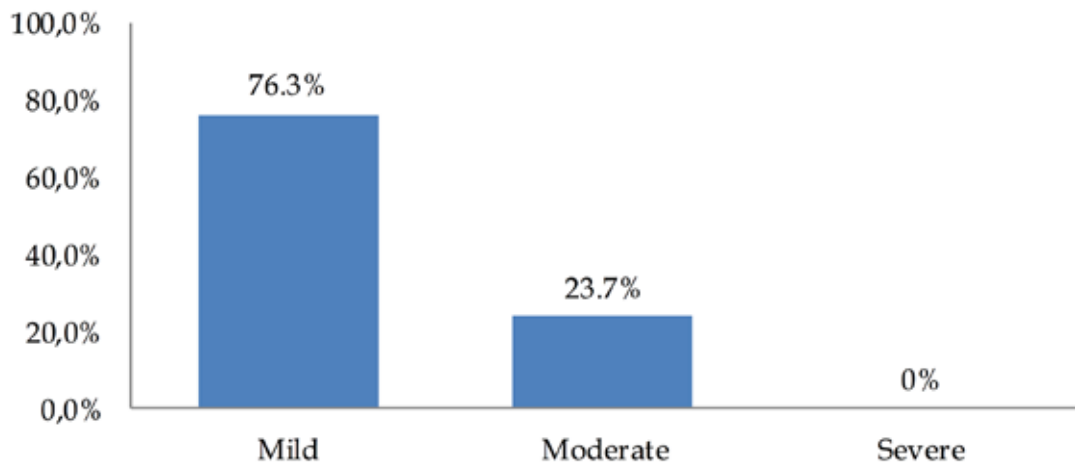| Personal protective equipment	Two-wheeled vehicles, n (%)	Four-wheeled vehicles, n (%)	Pedestrians
Helmet			
Yes	57 (36.5)	-	-
No	99 (63.5)	-	-
Data not available	0 (0)	-	-
Safety belt			
Yes	-	0 (0)	-
No	-	0 (0)	-
Data not available	-	7 (100)	-
None	-	-	35 (100)

Fig 1-Category of trauma severity based on the GAP score.

Table 4
Outcomes of study subjects.

Outcomes	Number (%)
Treated as an inpatient	
Recovered	170 (93.4)
Died	12 (6.6)
Treated in Intensive Care Unit	
Recovered	12 (75)
Died	4 (25)

Table 5
Imaging results of study subjects.

Radiological findings	Number (%)
Head	
Fracture	107 (54)
Subarachnoid hemorrhage	22 (11.1)
Intracranial hemorrhage	16 (8.1)
Subdural hemorrhage	16 (8.1)
Epidural hemorrhage	39 (19.7)
Intraventricular hemorrhage	3 (1.5)
Cerebral contusion	12 (6.1)
Cerebral edema	5 (2.5)
Cerebral prolapse	1 (0.5)
Thorax	
Pleural effusion	1 (0.5)
Fracture	8 (4)
Pulmonary contusion	9 (4.6)
Pneumothorax	2 (1)
Abdomen	
Bladder trauma	2 (1)
Intraabdominal hemorrhage	5 (2.5)
Extremities	
Fracture	19 (9.6)

As seen in Table 5, 54% of study subjects sustained a skull fracture, 4.6% had a pulmonary contusion, 2.5% had an intraabdominal hemorrhage and 9.6% had extremity fracture.

Table 6 shows 57.6% of study subjects were self-pay.

DISCUSSION

Seventy-eight point eight percent of our study subjects were men. In a study from Sri Lanka (Amarasingha, 2015) 90% of study subjects were men and in a study from Malaysia (Zulkipli *et al*, 2012) 86% of subjects were men. This higher percentage of men may be because men travel more often than women; however, risky driving may also be more common in men than women.

Twenty-six point eight percent of subjects were aged 17-25 years, lower than the 45.5% of subjects being aged 16-25 years in a study from Malaysia (Zulkipli *et al*, 2012) and in a study from Tanzania where 52.1% of subjects were aged 21-30 years (Chalya *et al*, 2012) and in a study from United States (Williams, 2003) 46.5% of subjects were aged 16-24 years. This may be because adolescents are more likely to have risk taking behavior and overcon-

Table 6
Health insurance among study subjects.

Health insurance	Number (%)
BPJS non-PBI	37 (18.7)
BPJS PBI	47 (23.7)
Self-pay	114 (57.6)

BPJS non-PBI; national health insurance where the premium is paid by the insured; BPJS PBI; national health insurance where the premium is paid by the government.

fidence. Adolescent drivers also tend to drive vehicles at higher or inappropriate speed (Peden *et al*, 2004).

The most common location of accidents among study subjects was outside Bandung City and Bandung Regency. These data are similar to a study from Malaysia, where 61% of deaths due to road-traffic accidents occurred in rural areas (Manan and Várhelyi, 2012). Forty-eight point five percent patients lived outside Bandung and 37.9% patients lived in Bandung Regency. The road condition outside Bandung City may not be as good as those in the city, increasing the risk of accidents.

Eighty-five point three percent of cases were referrals from other hospitals. This is probably because the other referring institutions did not have adequate facilities and personnel to manage these patients, but the study institution is a national referral institution.

In our study, 63.5% of two-wheeled drivers did not wear a helmet. These findings are similar to a study from Nigeria that reported 96.5% of two-wheeled drivers did not wear a helmet (Oluwadiya *et al*, 2009) and in contrast to a study from Malaysia where 76% of subjects did wear a helmet (Manan and Várhelyi, 2012).

Seventy-six point three percent of our study subjects were categorized as having mild trauma. This should have not occurred since being a referral hospital only moderate to severely injured patients should have been referred to the study institution. This suggests either inadequate facilities and manpower at the referral hospitals or the accident' victims may have had other comorbidities requiring referral.

In our study, 93.4% of regular in patients and 75% of ICU patients survived to go home. These percentages are high, possibly because the majority of patients had only mild injuries or because the study institution has the facilities and staff to manage these types of patients. In our study, the percentage of subjects with head injuries were high, similar to a study from Tanzania (Chalya *et al*, 2012). This may be due to the low proportions of subjects who used a helmet in both studies.

The most common source of funding to pay the hospital bills in our study was self-pay. This means road-traffic accidents constitute a financial burden to the patients. A study from Makassar, Indonesia, found that the average cost for a road-traffic accident-related mild injury case was Rp 1,565,990 (USD 103.90) and the average cost for a severe injury case was Rp 60,058,599 (USD 4,089.18) (Muhtar, *et al*, 2007).

A limitation of this study was incomplete data in the medical records regarding the use of seat belts, so we could not make accurate conclusions based on seat belt use. We also reviewed only in-patient records since the data in the out-patient medical records was incomplete.

Road traffic safety programs need to be aware of our study results, targeting young males, encouraging two-wheeled drivers to wear helmets and four-wheeled drivers to use seat belts. For future studies, more complete medical records are needed to make conclusions regarding seat belt use. Further studies are needed to determine the reasons for low personal protective use in order to develop preventive strategies.

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