

Pattern of Motorcyclist's Mortality in Mazandran Province, Northern Iran

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Abstract

Background: Road traffic accidents (RTA) is recognized internationally as the major threat to human health and, motorcycle collision victims form a high proportion of those killed or injured in RTA. This study was performed to evaluate the patterns of motorcyclist's mortalities.

Methods: All motorcyclists' corpses that were presented to the legal medicine center of Mazandaran Province during January 2002 to January 2004 were enrolled and the patterns of motorcyclist's mortalities were determined.

Results: Of the 89 bodies, 93.3% were male and 84.2% were riders. About 60% sustained injuries from collision with a car. Two third of the deaths occurred in the first half of the year. Three fourth of the death occurred in heavy traffic volume time of a day (7 am to 10 pm) peaking at 9 pm (21%). Fifty seven percent died on the rural roads collisions and 47% on the urban road collisions. Head injury was the main cause of death (50.6%).

Conclusion: Motorcyclist's mortalities were prevalent in young motorcycle riders (males), collision with a car, first half of the year, heavy traffic volume time, riding on rural roads, and head injury was the main cause of death.

Keywords: Pattern; Motorcyclist; Mortality; Iran

Introduction

Road traffic injuries and deaths caused by motor vehicles are a growing public health problem all over the world.¹ Several studies have shown that road traffic injuries are a major cause of death and disability globally, with a disproportionate number occurring in developing countries.² Worldwide, an estimated 1.2 million people are killed in road crashes each year and as many as 50 million are injured. Projections indicate that these figures will increase by about 65% over the next 20 years unless there is new commitment to prevention.³ By 2020 traffic accidents are projected to be the third leading cause of death and disability worldwide after ischemic heart disease and unipolar major depression.⁴

At present, motor vehicle accidents are the main

cause of unintentional death in the United States in ages of 1 to 34. Annually, about 42000 people die, more than 3000.000 are injured and 500.000 are hospitalized due to traffic accidents.⁵ In other thickly populated and heavy traffic countries such as China and Singapore, motor vehicle accidents are the main cause of death.^{6,7}

Motorcycles are the most dangerous form of motorized transportation. Per vehicle miles traveled, motorcycles are about 3 times as likely as passenger car occupants to be injured in a crash, and 16 times as likely to die.⁸ Motorcycle riders due to small size of vehicle represent a vulnerable group of road users. Contrary to a car crash, in a motorcycle crash, the riders often absorb all kinetic and compressive energy resulted from the crash. In motorcycle crashes, every part of the body as head, spine, chest, pelvis and limbs may be injured. The kind and severity of injury are related to many factors such as kind of motorcycle, using of preventing devices, speed and anatomical position of the riders at the time of collision. Head injuries comprise up to 75% of death in motorcycle

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accident victims.⁵ The purpose of this study was to evaluate the patterns of motorcyclist's mortalities in this region.

Materials and Methods

The study was a cross-sectional and census sampling method. All motorcyclists' corpses presented to legal medicine center of Sari, Center of Mazandaran Province in the northern Iran during January 2002 to January 2004 were evaluated. The bodies were examined thoroughly and their injured parts were determined and recorded. Information including gender, age, being rider or pillion passengers, kind of opponent object, pattern of injuries, place and time of death, being on rural or urban roads and main cause of death were collected according to the information obtained from police collected crash and injury data, ambulance staff, hospital files and relatives. The aggregated data were analyzed, using SPSS statistical software and Chi-Square test. In this study, 8 am to 10 pm and 10 pm to 8 am were assumed as heavy traffic volume time and light traffic volume time in a day, respectively and 15 to 25 year old cases as young age group

Results

Among 348 road traffic accidents (RTA)-induced deaths, 89 (25.6%) were the motorcyclist ones. Of the 89 motorcyclists bodies, 83 (93.3%) were male and 6 (6.7%) were female with the mean age of 28.1 ± 13.3 years. The youngest victim was 1.5 year and the oldest one was 75 years old. Fifty two (58%) were between age range of 15 to 25 years who were called the young age group.

Motorcycle riders included 84.3% and pillion passengers comprised 15.7% of cases. All female cases were pillion passengers. Motorcyclists sustained injuries from collision with a car in 59.1%, collision with a heavy lorry in 11.4% and collision with other objects in 29.5%. Pattern of injuries to different parts of the body as shown in Table 1 included: skull and face (95.5%), extremities (93.3.1%), brain (74.2%), trunk (66.3%) and neck (14.6%).

Twenty eight percent died at the scene of accident; 9% during transportation to the hospital and 63% at the hospital. Twenty one cases (23.6%) underwent multiple surgical procedures and 68 (76.4%) had no surgery. 66.3% of the deaths happened in the first half

of the year and 33.7% in the second half.

Table 1: Frequency of injuries in 89 motorcyclist' corpses in Mazandaran Province, northern Iran

Site of injury	No (%)
Skull and face	85 (95.5)
Extremities:	83 (93.3)
Upper extremity	27 (30.3)
Lower extremity	23 (25.8)
Both	33 (37.0)
Brain	66 (74.2)
Trunk:	59 (66.3)
Chest	29 (32.6)
Abdomen	18 (20.2)
Both	12 (13.5)

The maximum mortality was in June [13, 14.6%] and September [13, 14.6%] and the minimum in January (2, 2.2%). Forty eight (53.9%) of the deaths occurred between 4 pm to 9 pm with peaking at 9 pm (19, 21.3%). Fifty one (57.3%) deaths occurred on the rural roads and 38 (42.7%) on the urban roads. On the rural road collisions, 42 (82.3%) deaths occurred in heavy volume traffic time (8 am to 10 pm) and 9 (17.6%) in light traffic volume time (10 pm to 8 am). On the urban road collisions, these proportions were 25 (65.8%) and 13 (34.2%), respectively ($p=0.073$). The frequency of death in the young age group (15 to 25 years) in light and heavy traffic volume time was 18 (81.8 %) and 34 (50.7%), respectively ($p= 0.010$).

Head injury was the main cause of death in 45.1% and 57.9% of cases on the rural and urban road collisions, respectively ($p= 0.232$). Head injury and its complications were the cause of 44.6 % (30) and 81.8% (18) of the deaths in the heavy and light traffic volume time, respectively ($p<0.001$). Generally in 45 (50.6%) cases, head injury was found as the main cause of death.

Discussion

Road traffic injuries and fatalities have become a major public health and socio-economic problem in Iran. Injuries, fatalities and economic losses due to RTA have increased with the rising level of motorization. Basic information on the risk factors of road traffic injuries in Iran is scare.⁹ In the years 2002 and 2003 in Mazandaran Province, 1119 and 1353 people died due to RTA, respectively. Among them 166 and 307

people were motorcyclists, respectively. So there was a rising rate of 21% and 85% for RTA and motorcyclists death in these consecutive years.

In this study, we evaluated the patterns of motorcyclist's mortalities in Mazandaran Province. Most of motorcyclist bodies (93.3%) were male and 58% were in the young age range. This finding is compatible with other investigations.¹⁰⁻¹² We found that 84.3% were motorcycle riders and 15.7% pillion passengers. Stela et al. showed that 35 out of 39 (89.7%) were motorcycle riders and 4 out of 39 (10.3%) were pillion passengers.¹¹ In our cases, the most common collision (59.9%) was the collision with a car. Langley et al. found the majority of deaths (63%) were attributable to a collision with another motor vehicle.¹⁰ We found skull and face, extremities, brain, trunk and neck were injured in a decreasing frequency. Sirathanont and Kasantikul showed that the most fatal injuries to the motorcyclists were to the head, abdomen, and chest in decreasing frequency.¹² In another investigation, head injury followed by chest and abdominal trauma were found to predict a reduced survival rate.¹³

In the current study, the majority of cases (63%) died at the hospital. At scene deaths were reported in 25 out of 39 (64.1%) and 44 out of 59 (75%) cases previously.^{11,14} This difference may be attributed to the severity of injury, unsafe behavior of riders, and inadequate road traffic safety programmer. Most motorcycle accidents were shown to happen during weekend trips out in summer.^{15, 16} We found most of the deaths happened in the first half of the year (66.3%) and the incidence of death was higher in the two last months of the summer [June (15%): and September (15%)]. In our region, this period is the heavy traffic volume time with most trips and is associated with a high rate of RTA. In the present study, most of the deaths (67, 75%) occurred in heavy traffic volume time with the highest rate (58, 54%) between 4 pm to 9 pm, peaking at 9 pm (19, 21%). Sirathanont demonstrated most of motorcycle crashes were between 6 pm and 9 pm.¹² Ding et al. reported most head injuries occurred between 4 pm and 11 pm, peaking at 9 pm.¹⁷ This threatening period of a day is early night with heavy traffic volume time and high possibility of RTA. Darkness, greater speed and low conspicuity of motorcycle riders at the time of motorcycle crashes were reported to increase the risk and severity of motorcycle collision injuries.^{18,19}

We found that deaths on rural roads were more than that on urban road collisions (57.3% vs. 42.7%) and the frequency of death in young age group in light and heavy traffic volume time was 81.8% and 50.7%, respectively. Lin et al.'s study showed being on rural roads at the time of motorcycle crashes increased the severity of motorcycle injuries among young adult riders with the adjusted odd ratio (OR) of rural to urban roads equal to 1.64.¹⁸ A study from Ghana showed the majority of road traffic fatalities (61.2%) and injuries occurred on roads in rural areas. About 58% more people died on roads in the rural areas than in urban ones, and generally more severe crashes occurred on rural roads compared with urban ones.²⁰ It was also reported 60% of total road crashes and 65% of at-scene deaths occurred in rural areas.²¹

Our study found out that head injury was the leading cause of death in general. Head injury was reported to be the most common reason for death.^{5,22,23} In several studies, it was shown that helmets provided adequate protection and reduced the severity of head injury and death significantly in motorcycle riders who had crash.^{5,17} The use of helmet in our country is not popular and two studies from Tehran noted helmets were used only by 6% to 8% of motorcyclists^{23,24} Motorcyclists' injuries and deaths are also related to the characteristics of geography, climate, people's business, the sense of traffic safety, the basic traffic construction and management and availability of proper emergency care. In our region, these factors may have a role in the occurrence of motorcyclists' injuries and deaths. So it warrants further investigations.

In summary, motorcyclist's mortality was seen mostly in young men motorcycle riders, collision with a car, first half of the year, June and September, heavy traffic volume time, 4 pm to 9 pm and, riding on rural roads. Head injury was found as the main cause of death.

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References

- 1 Agnihotri AK, Joshi HS. Pattern of road traffic injuries: one year hospital-based study in western Nepal. *Int J Inj Contr Saf Promot* 2006;**13**:128-30. [16707352] [doi:10.1080/17457300500310236]
- 2 Banthia P, Koiraal B, Rauniyar A, Chaudhary D, Charel T, Khadka SB. An epidemiological study of road traffic accident cases attending emergency department of teaching hospital. *JNMA J Nepal Med Assoc* 2006;**45**:238-43. [17189968]
- 3 WHO. World report on traffic injury prevention, 2004.
- 4 Murray CJ, Lopez AD. Alternative projections of mortality and disability by cause 1990-2020: Global burden of disease study. *Lancet* 1997;**349**:1498-504. [9167458] [doi:10.1016/S0140-6736(96)07492-2]
- 5 Book review of The Trauma Manual edited by Peitzman AB, Rhodes M, Schab VW. Textbook of Surgery. Second Edition, Oxford, UK: Oxford Medical Press, 2002.
- 6 Wang SY, Chi GB, Jing CX, Dong XM, Wu CP, Li LP. Trends in road traffic crashes and Associated injury and fatality in the People's Republic China 1951-1999. *Inj Control Saf Promot* 2003;**10**:83-7. [12772490] [doi:10.1076/icsp.10.1.83.14105]
- 7 Lateef F. Riding motorcycle: is it a lower limb hazard? *Singapore Med J* 2002;**43**:566-9 [12680525]
- 8 Branans CC, Knudson MM. State helmet law and motorcycle rider death rate. LDI Issue Brief 2001;**7**:1-4. [12524709]
- 9 Majdzadeh R, Khalaghi K, Narsghi K, Motevalian A, Eshraghian MR. Determination of traffic injuries in drivers and motorcyclists involved in an accident. *Accid Anal Prev* 2008;**40**:17-23. [18215528] [doi:10.1016/j.aap.2007.03.019]
- 10 Langley JD, Begg DJ, Reeder AI. Motorcycle crashes resulting in death and hospitalization. II:Traffic crashes. *Accid Anal Prev* 1994;**26**:165-71. [8198685] [doi:10.1016/001-4575(94)90086-8]
- 11 Stella J, Cooke C, Sprivulis P. Most head injury related motorcycle crash deaths are related to poor riding practices. *Emerg Med (Fremantle)* 2002;**14**:58-61. [11993836]
- 12 Sirathranont J, Kasantikul V. Mortality and injury from motorcycle collision in Phetchaburi Province. *J Med Assoc Thai* 2003;**86**:97-102. [12678145]
- 13 Ankarath S, Giannoudis PV, Barlow I, Bellamy MC, Matthews SJ, Smith RM. Injury patterns associated with mortality following motorcycle crashes. *Injury* 2002;**33**:473-7. [12098541] [doi:10.1016/S0020-1383(02)00048-7]
- 14 Wyatt JP, O'Donnell J, Beard D, Busuttill A. Injury analyses of fatal motorcycle collisions in South - East Scotland. *Forensic Sci Int* 1999;**104**:127-32. [10581718] [doi:10.1016/S0379-0738(99)00104-8]
- 15 Durak d, Fedaker R, Turkmen N, Akgoz S, Baduroglu E. Road traffic collisions in Bursa, Turkey, during 2003, 2004 and 2005. *Injury* 2008;**39**:547-53. [18054020] [doi:10.1016/j.injury.2007.07.013]
- 16 Wick M, Ekkernkamp A, Muhr G. Motorcycle accidents in street traffic: An analysis of 86 cases. *Unfallchirurg* 1997;**100**:140-5. [9157563] [doi:10.1007/s001130050105]
- 17 Ding SL, Pai L, Wang JD, Chen KT. Head injuries in traffic accident with emphasis on the Comparisons between motorcycle - helmet users and non-users. *J Formos Med Assoc* 1994;**93**:S42-8. [7920094]
- 18 Lin MR, Chang SH, Huang W, Hwang HF, Pai L. Factors associated with severity of motorcycle injuries among young adult rider. *Ann Emerg Med* 2003;**41**:783-91. [12764331] [doi:10.1067/mem.2003.186]
- 19 Jackson R, Lay-Yee R, Connor J, Langley J, Norton R, Mullin B, Wells S. Motorcycle rider conspicuity and crash related injury: case control study. *BMJ* 2004;**328**:857. [14742349] [doi:10.1136/bmj.37984.574757.EE]
- 20 Afukaar FK, Antwi p, Ofosu- Amaah S. Pattern of road traffic injuries in Ghana: implication for control. *Inj Control Saf Promot* 2003;**10**:69-76. [12772488] [doi:10.1076/icsp.10.1.69.14107]
- 21 Stella J, Sprivulis P, Cooke C. Head injury-related road crashes mortality in rural Western Australia. *ANZ J Surg* 2001;**71**:665-8. [11736829] [doi:10.1046/j.1445-1433.2001.02229.x]
- 22 Liu BC, Ivers R, Norton R, Boufous S, Blows S, Lo SK. Helmets for preventing injury in motorcycle riders. *Cochrane Database Syst Rev* 2008;**23**:CD004333. [18254047]
- 23 Zargar M, Khaji A, Karbakhsh.M. Pattern of motorcycle-related injuries in Tehran, 1999 to 2000: a study in 6 hospitals. *East Mediterr Health J* 2006;**12**:81-7. [17037224]
- 24 Roudsari BS, Sharzei K, Zargar M. Sex and age distribution in transport-related injuries in Tehran. *Accid Anal Prev* 2004;**36**:391-8. [15003584] [doi:10.1016/S0001-4575(03)00032-0]