

TRENDS OF MOTORCYCLIST ACCIDENTS IN KELANTAN BETWEEN 1998-2003

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ABSTRACT

Motor vehicle crashes (MVCs) contribute large proportion of death and disability globally and motorcyclists are the most vulnerable group. In Malaysia, motorcycles are one of the most important forms of personal transportation. More than 50% of the registered vehicles in this country are motorcycles. Casualties among motorcyclist form a large portion of traffic injury problems in Malaysia and are ranked among the highest in comparison to other countries. The objective of the study was to determine the trend of motorcycle crashes in Kelantan, between 1998 and 2003. This was a retrospective record review of MVCs data in Kelantan. Data gathered were input into SPSS version 11 and Microsoft Excel and analyzed using decomposition method to explore the seasonality and simple linear regression to explore the trend. The study revealed that majority of road traffic injuries involved motorcycle users (58.5% to 63.1%). The proportion of fatality was between 8.6% and 10.7% and majority involved 11-30 years (60.0% – 69.7%). About 90% of the fatal motorcycle injuries were male. The peak hour for fatality was between 4.00 to 8.00 afternoons. No seasonal pattern of motorcycle accidents but, there was significant linear increasing trend ($p < 0.001$) with an average of 9 cases increasing every year. Based on the results above, we conclude that the trend of motorcycle accidents was increasing in year 1998 - 2003, but no seasonal pattern. Most of the fatal motorcycle crashes involved young men riders and occurred at afternoon. We recommend that public education and enforcement on accident prevention should be given a priority.

INTRODUCTION

All road users have a risk to be involved in MVCs. A study on road traffic accident mortality from MVCs in Singapore found that the largest group of road traffic accident fatalities involved motorcyclists (39.8%) (Wong *et al.*, 2002). In Malaysia, in 2001 the largest group of motor vehicle injuries was motorcyclists (60.1%), followed by occupants (9.3%), motorcar drivers (8.6%) and pedestrians (7.4%). Out of 6,035 fatalities, 51.7% involved motorcyclists, 12.3% passengers, 11.9% pedestrians and 9% motorcar drivers (RMP, 2001). In Kelantan, approximately 52.2% of all fatalities and 70.9% of all casualties related to RTAs were motorcycle riders and pillion riders (RMP, 2003). A number of risk factors have been established in the relationship between road users and traffic accidents.

Factors that are of importance are related to the road-user, the vehicle as well as road and traffic conditions (Subramaniam, 1998).

METHODS

The design of the study was a cross-sectional and data collection was started in January 2004. The data were extracted from the secondary data of all MVCs in Kelantan from 1998 to 2003 at the Kelantan Police Contingent Headquarters. All cases of MVCs in Kelantan was taken according to districts, types of vehicles, types of injuries, by age, by gender, by time of accident occurred in term of days of the week, hours, year and month. Data entry was done using SPSS® version 11.0 (SPSS Inc., 2000) and Microsoft Excel®. To observe the trends of motorcycle accidents in Kelantan, firstly the sequence plot was used and then the analysis was done using decomposition methods for time series analysis. Initially the deseasonalisation was done using twelve months moving average and followed by central moving average. Seasonal components (SC) and seasonal indexes (SI) for all months were calculated. To look the pattern of SC compared to the average of SC for all months, the results of SCs were plotted in a graph for every month. The same steps were used using the eleven months moving average. Simple linear regression analysis was used to determine the trend of motorcycle accidents. The goal of this study was to determine the trend of motorcycle crashes in Kelantan between 1998

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RESULTS

Distribution of motorcycle crashes

The total number of MVCs in Kelantan in this five year period was 3, 5261 cases. The number of MVCs increased every year within a ranged of 3.9% to 12.3 with relatively highest in year 2000. Most of the MVCs occurred in Kota Bharu District and the least was in Jeli. Majority of MVCs in Kelantan in 1998-2003 involved car ranging from 58.7% to 64.4% out of total MVCs. The total number of motor vehicle injuries between 1998 and 2003 was 14,875 cases and motorcycle accidents contributed the largest proportion of motor vehicle injuries. The number of injuries due to motorcycle accidents increased yearly, ranging from 58.5% to 63.1% out of total road traffic injuries in Kelantan (9068 cases). The trend of injuries was shown in sequence plot (Figure 3.1). The type of injuries was categorized into fatal and non fatal. Fatal injury represents any person who died within 30 days as a result of an accident and non fatal injury included both

serious and minor injuries. This study found that the number of fatalities among motorcycle crashes in Kelantan were increasing and ranged from 8.6% to 10.7% in 1998 to 2003. Only three years data were available for the fatal motorcycle injuries by age. Most of fatal motorcycle injuries involved young riders aged 11-30 years (60.0%, 62.1%, and 69.7% in 2001, 2002 and 2003 respectively). The proportions of fatalities among age group more than 50 years were 18.7% (2001), 20.0% (2002) and 22.1% (2003). Regarding gender, days of the week and time-of-day distribution, data was available for only year 2002 and 2003. The proportion of male involved in fatal motorcycle injuries in this two years period were 89.7% and 92.2% respectively. The highest number of fatality in 2002 and 2003 were on Friday (18.2%) and Monday (20.8%). The time-of-day distribution for the occurrence of fatal motorcycle injuries exhibited peak at 4.0 to 8.00 pm (26%-28%) followed by at 12.00 – 4.00 pm (16% - 24%), while the lowest numbers of fatal motorcycle injuries occurred between 12.00 midnight and 4.00 am (6%-10%).

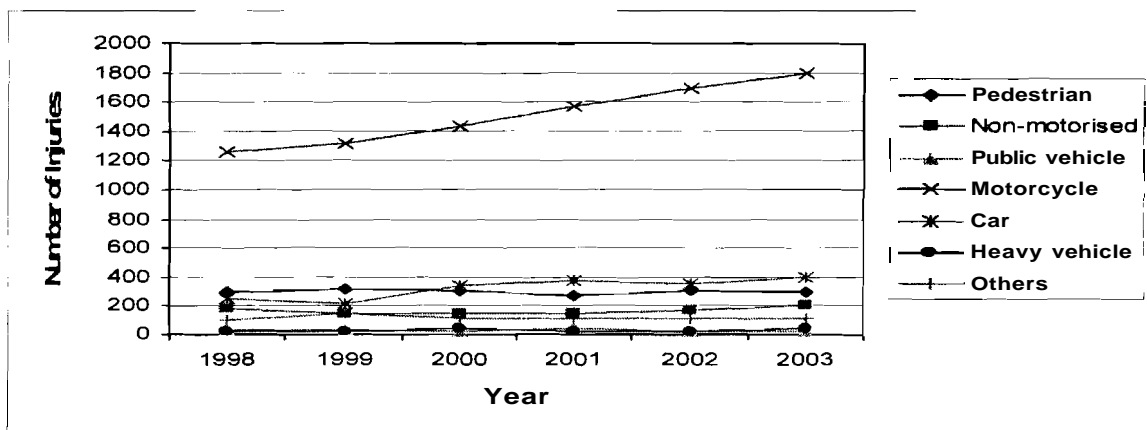


Figure 3.1 Sequence Plot Of Motor Vehicle Injury By Types Of Road User

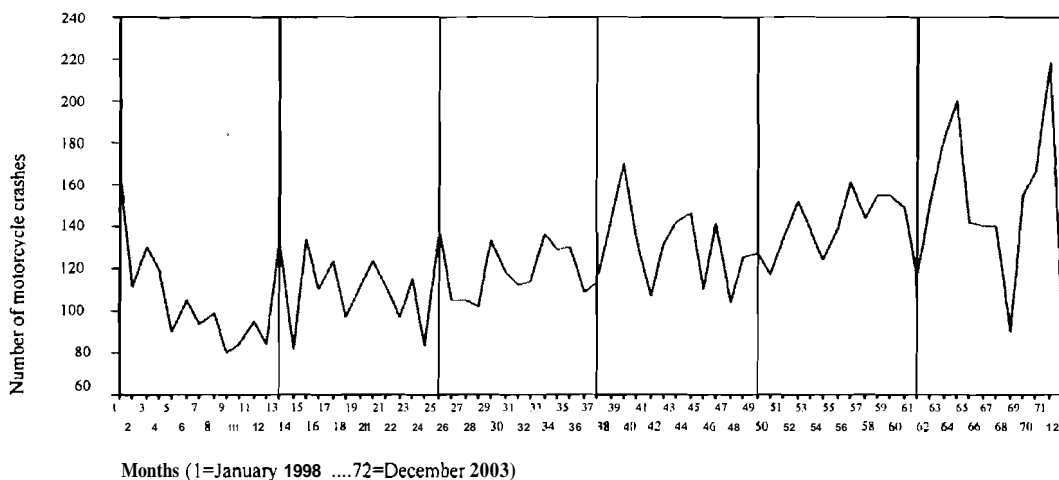


Figure 3.2 Trend Of Motorcycle Crashes By Month In Kelantan (1998-2003)

Pattern of motorcycle crashes

The pattern of motorcycle crashes in Kelantan between 1998 and 2003 was described in Figure 3.2. Generally, no systematic or consistent seasonal pattern was observed. However, obvious increasing trend was observed. The results of seasonal components and indexes (based on seasonal decomposition method) were presented in Table 3.1. This result clearly showed that there were no consistent seasonal components. For example in January, the number of cases was above the average in 1999 and 2002, but below the average in 2001 to 2003.

Except in December, the result showed some consistency (consistently below the average). However, the magnitude of the fluctuation was quite low (Seasonal Index -14.4: in average of 14.4 cases below the average). Therefore, the result suggested that there was no definite seasonal pattern in the data for 1998 to 2003. The analysis on the linear trend by using Simple Linear Regression was presented in Table 3.2. The result suggested that, there was a significant linear increasing trend ($p < 0.001$). There were about an average of 9 cases increasing every year ($0.74 \text{ cases} \times 12 \text{ months} = 8.8 \text{ cases}$). The linear model well fit as indicated by the residual plot.

Table 3.1 Seasonal Components And Seasonal Indexes For Number Of Motorcycle Crashes In January – December (1998-2003)

Month	Seasonal Component						Seasonal Index
	1998	1999	2000	2001	2002	2003	
January		31.000	27.000	-15.667	-2.875	-37.792	0.451
February		-21.750	-6.625	12.750	-13.375	0.125	-6.116
March		27.917	-7.250	38.500	1.583	35.625	19.634
April		2.042	-12.583	3.083	17.583	51.708	12.784
May		13.667	16.458	-23.333	0.875	-9.375	0.418
June		-13.125	-0.250	1.083	-16.250	-11.833	-8.232
July	-9.375	1.667	-6.250	10.833	-1.750		-3.004
August	-1.792	11.458	-4.792	15.375	19.375		7.984
September	-19.750	0.708	12.875	-18.000	-1.042		-4.866
October	-15.542	-12.750	1.833	13.750	5.917		-0.949
November	-5.542	5.167	2.583	-25.292	3.750		-3.699
December	-17.583	-28.125	-17.875	-5.292	-3.083		-14.366

Table 3.2 Trend Of Motorcycle Accident Cases By Using Simple Linear Regression

Variable	Regression coefficient (b)	95% CI	I-statistic	p-value
Month	0.74	0.48-0.99	5.69	<0.001

Analysis of simple linear regression: residual plot suggest SLR fits well. R^2 of the model is 0.316.

Dependent variable is number of motorcycle accidents and independent variables is months in sequence number.

DISCUSSION

This study revealed that the number of MVCs in Kelantan increased within a range of 3.9%-12.3% increment in this five years period. In the year 2000, it was found that MVCs to be relatively higher compared to the other years, corresponding to two Hari Raya Aidilfitri in that year (in January and December). Out of 3, 5261 cases of MVCs in this study period in Kelantan, majority of these crashes occurred in Kota Bharu (16,346 cases) and involved car accidents followed by motorcycle accidents. Out of 14,875 road traffic injuries, 58.5% to 63.1% resulted from motorcycle accidents (9,068 cases). This finding is consistent with report by Radin Umar *et al.* (1998) that approximately 68% of all injuries in Malaysia involved motorcyclists and their overall relative risk is about 20 times higher compared to the passenger cars. Whereas in Indonesia, it was noted that motorcycles were involved in 64% of all traffic accident injuries (Conrad *et al.*, 1996). However, Yuan (2000) reported that motorcyclist and pillion rider only accounted for 49.9% out of total number of road casualties in Singapore in 1996. The obvious higher percentage involved motorcycle users indicate that they are the most vulnerable group on the road. The number of fatalities among motorcycle crashes in Kelantan increased ranging from 8.6% to 10.7% in 1998 to 2003. Study done by Roudsari *et al.* (2004) reported that, the mortality rate for motorcyclists was 2.1%. Another study by Leonard and Frick (1998) stated that the fatality risk in the driver seat of the motorcycle exceeds that in the passenger seat by $26 \pm 2\%$. And Wong *et al.* (2002) found that the relative risk of mortality between motorcyclists and motorcar drivers was 18.8:1. These figures indicate that motorcyclists are exposed to high risk of fatality compared to other types of road users. Most of fatal motorcycle injuries in Kelantan in year 2001-2003 involved young riders aged between 11-30 years (60.0%-69.7%). The involvement of children less than 16 years indicates that the parents still allowed their children to drive in spite of not having driving license. The legal age for riding motorcycle in Malaysia is 16 year. In year 2002 and 2003, majority (89.7% and 92.2% respectively) of these fatal injuries involved man. The outnumbered of this young age group and male also found in Sweden where the median age of motorcycle riders admitted to hospitals due to accidents was 22 years and 95% of the riders were male (Wladis *et al.*, 2003). Thailand also revealed the high proportion of male (69%) motorcycle riders involved in the accidents, and most riders were under below 21 years of age (Sirathranont & Kasantikul, 2003). This could be

explained by behavioral differences between sexes, women being possibly more inattentive or less experienced or skilled than men, but perhaps less risk-taker, less risky driving habits and less risk of loss-of-control accidents. The involvement of younger age group and more confined to men bring a big impact to the country, and can cause economic losses and reduced human power. The peak time for fatal motorcycle injuries was at 4.00 to 8.00 pm. This is comparable with a study in Thailand where the peak of all motorcycle crashes was found between 6.00 pm and 9.00 pm (Sirathranont & Kasantikul, 2003). However, in a study by Yau (2004) commented that a higher risk of severe injury was observed for accidents that happened at 8.00 pm to 11:59 midnight (OR= 6.562, 95% CI= 1.794, 24.002) and from 08:00 am to 11.59 am (OR= 4.220, 95% CI= 1.051, 16.941. Valent *et al.* (2002) also reported the OR of death rather for driving at early morning hours and evening were 13.44 (95% CI= 2.54, 71.05) and 6.67 (95% CI= 1.49, 29.95) respectively. The reasons for the high risk of accidents and fatalities among the motorcycle riders in overseas could be related to the greater used of alcohol during that time. Meanwhile, in Malaysia especially in Kelantan, the use of alcohol is not a major concerned. At 4.00 to 8.00 pm. is the rush hours period after office hour. At this time the riders may trap in heavy traffic congestions and probably go home with a stress mode, sleepy, fatigue or tiredness and therefore affecting the concentration on riding. There was no definite seasonal pattern in the motorcycle accidents data for this study period. Our finding showed that there was probably no effect of the festive seasons or raining seasons on this seasonality pattern. Similar results also found by Singaporean study in which no seasonal effects on injury severity was noted (Quddus *et al.*, 2002). It may be due to lack of seasonal climatic variations in Malaysia as well as in Singapore, which sits near the equator. However, further exploration using larger sample size and longer duration of motorcycle accidents data is suggested to explore the effect of the seasonality. Although this study only look on five years data, but it was found that, there was significant linear increasing trend ($p < 0.001$) with an average of 9 cases increasing every year. This indicates a slow increasing trend in the number of motorcycle accidents in Kelantan. The possible explanation for this is that the number of road users was increasing every year causing traffic congestion and yet this cannot be prevented. In a study done by Wang *et al.* (2003) on the trends in road traffic crashes in China, it was revealed that an increased in the crash, fatality and injury rates was due to increased motorization spurred by rapid

economic growth. At the same time, motorcycle is still the commonest road transport used in Kelantan and as well as in Malaysia because it is the cheapest and efficient road transport that everybody can afford it. According to the Royal Malaysia Police Report (2001), the number of registered private motorcycles in Kelantan was shown to be increased by 2.7% through out the year in 2000 and 2001 (from 210,775 to 216,496). The probable reasons for the slow increasing trend are the increase in the awareness of the riders with the increase in socioeconomic status, continuous enforcement of the road safety policy and increase in the road safety education through billboards, mass media as well as electronic sources by the government. Scuffham & Langley (2002) revealed in their study that the trend of the traffic crashes was influenced by unemployment rate, gross domestic product per capita, alcohol consumption, road policy and economic crisis. Their study found that as economic activities increase drivers may travel further, increasing exposure, and consequently the number of crashes may increase. But, economic growth may also increase the level of vehicle safety measure, and consequently the number of crashes may decrease. Therefore, it is important to look for the other modifiable risk factors that contribute to the increase risk of accident among motorcycle users and factors associated with injury severity. Perhaps, by knowing these, it will help in prioritize and planning the programs related to injury prevention and reduction.

CONCLUSIONS AND RECOMMENDATIONS

The trend of motorcycle accidents has been increasing from the year 1998 until 2003, but there were no definite seasonal pattern. Most of the fatal motorcycle crashes involved young men riders and occurred in the afternoon. In Malaysia, road traffic has increased with the average annual traffic growth is approximately 17% per year (Radin Umar *et al.*, 1996). This may be the possible explanation for the increasing in trend of motorcycle crashes. Obviously, the traffic growth cannot be stopped but, accident prevention and injury reduction programme must address motorcycle riders among male at young age group and motorcyclists who ride their motorcycles in the afternoon. Education focusing to the younger age groups is recommended. This includes a development of a new syllabus to those who are going to get motorcycle license. Currently, all riders that are applying for a driving license must attend a course based on same syllabus regardless of the types of license. But, it is suggested that, the syllabus for the

motorcycle license must include the risk factors such as more safety precautions while riding after office hours and the other road factors. Short-courses on crash prevention especially involving parents, younger age individuals, and students must be introduced and promoted. Learning institutions especially primary and secondary schools should be used as the primary targets to conduct accident prevention programme among this age group. School health units, which are usually responsible for informing pupils about health risks with alcohol, smoking and drug use, also could inform individuals about risk factors when they begin to ride the motorcycles. Driving teachers are another strategic group who could inform future drivers about these risk factors. Lastly but not least, parents can play a significant role in giving continuous education to their kids about road safety measures. Road safety enforcement should be conducted throughout the year and not only focused during certain time periods like the festive seasons. Scuffham & Langley (2002) reported that these road policy factors appeared to have a greater influence on crashes than the role of demographic and economic factors. For example, an 11% increase in accidents was associated with the increase in the open road speed limit from 80 to 100 kph. Proper registration on all trauma cases is suggested. For better documentation, this trauma registry would involve a few major parties such as medical or hospital-based expertise, insurance companies, police department and Road Transport Department. The usual limitation of a police record is that the unreported cases especially for the minor cases of injury or accident that involved unlicensed riders resulted in over represent of severely injured riders. Another limitation is police records only categorized the accident as a fatal accident when the victim died within 30 days due to accident. However, it did not include the long term effect of the accident. Secondary data restrict better measure on the prevalence or rate of the motorcycle accidents. For example the rate of accident per 1000 population or per registered vehicle or road length.

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