Causes and Trends of Motorcycle Accidents

Mohamed M. Benzair
Department of Civil Engineering ,Faculty of Engineering
Misurata University, Misurata, Libya
Mzair84@gmail.com

***Abstract*— Road safety has long been considered as one of the social responsibilities to the Malaysian Government. In the visibility of this responsibilities, multiple bodies concern on road safety has been formed within the government departments, private agencies, and voluntary organizations. The current study was carried out to understand the recent trend and statistics of road motorcycles in Kajang, Malaysia. The statistics for road accidents and the related casualties in Malaysia from 2005 to 2008 was obtained from the Bukit Aman Police Headquarters. The statistics of registered motor vehicles in Malaysia will be provided by Road Transport Department of Malaysia. Data will be analyzed using SPSS software. Descriptive and hypothesis testing techniques were used to obtain the results based on the stated objectives of the study. From the crash statistics, it can be revealed that Kajang has a relatively higher incidence of casualties (dead, seriously injured and lightly injured). In addition, the results show that the young riders of motorcycles among the age of 16 to 20 years from the majority of those who die in motorcycles accidents. Moreover, it is recognized that the considerable percentage of the motorcyclists and the pillion riders did not wear safety helmets when they were traveling on the roads network. The Malaysian government has to organize many motorcycle safety campaigns in the coming few years.**

Index Terms: **Traffic accidents , Motorcycles safety , Motorcycles in Kajang, Malaysia , Road safety , Motorcycles accidents**

I. INTRODUCTION

The number of motor vehicles in the world is growing rapidly. Between 1980 and 1995- just fifteen years - the global fleet of cars, trucks, and buses increased by 60% with a third of the increase in developing countries. The increasing number of vehicles brings many benefits, but it is associated with worsening negative externalities including congestion and air pollution. In addition, motor vehicles need roads, and road networks have been expanding to accommodate the increasing number of vehicles. Roads are costly to build and maintain, and they also produce externalities. For example, road network expansion is a major determinant of development patterns, particularly in urban areas.

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Opinions are divided on the desirability of increased motorization. The effects of the growth of motor vehicle use and road networks are viewed by some commentators as inevitably adverse, while others argue that national patterns of motor vehicle use are sustainable [1].

Motor vehicles are central to policy debates on urban transport because their increased use causes congestion, contributes to low-density development, and reduces transit use. Some analysts have argued that urban development densities must be increased to reduce auto dependence and promote transit use. Moreover, vehicular emissions have contributed to the degradation of the air quality in many cities, particularly in developing countries [2].

Injuries and deaths from traffic crashes have become a major public health and socioeconomic problem in Malaysia. Injuries, fatalities and economic losses due to traffic crashes have increased with the rising level of motorization. Road Traffic Injuries kill over one million people worldwide annually [3]. Traffic accidents in Malaysia have been growing at the average rate of 9.7% per annum over the last three decades [4]. Compared to the past days, the number of road accidents had increased from 24,581 cases in 1974 to 328,264 cases in 2005, reaching more than 135% increase of accident cases over 30 years. The number of fatalities (death within 30 days after the accident) also increased but at the slower rate compared to total road accident from 2,303 in 1974 to 6,200 in 2005 [5]. However, the upward trend of fatalities dropped in 1997 after Malaysia Government established a five years national road safety target to reduce road accident deaths by 30% by the year 2000 [4].

The increase of road accidents is in link with the rapid growth in population, economic in development, industrialization, and motorization encountered by country. Since1970's, Malaysia had experienced a remarkable growth in these sectors [6-7].

In fact, there is an increase in Malaysian population from 10.4 million in 1974 to 26.1 million in 2005 at an average growth rate of about 2.1% per year. Furthermore, the total length of the road had also increased from 11,161 km in 1974 to 71,814 km in 2005 to accommodate an increase in numbers of vehicles in Malaysia. This can also lead to an increase of ownership from 9.6 persons per vehicle in 1974 to 1.7 persons per vehicle in 2005. The total numbers of registered vehicles also increased from 1,090,279 to 15,026,660 vehicles in 2005 [8].

In Malaysia, evaluation of improvements is essential because of the lack of data on the benefits (or otherwise) of road safety measures. It is recommended that

improvements are introduced on a pilot basis and evaluated before being implemented. Nationwide, the government is giving priority to research road safety countermeasures but, owing to the long-term nature of many of the studies and the limited resources available; there are only a few published results about the road accident in Bangi Area. In spite of this lack of information the remainder of this project paper attempts to give an idea of likely priorities for future road safety action and research by reviewing studies of remedial measures in developing countries with reference to the developed country.

II. LITERATURE REVIEW

Since the invention of the wheel, people have striven for fast and comfortable travel. The automotive industry started with the invention of an internal-combustion engine. Serial manufacturing of Ford Model T made automobiles accessible to lower income classes. In this way, automobiles slowly became a necessity rather than luxury goods. Beside obvious advantages, there are many disadvantages of automobiles. The most important negatives are pollution and road accidents. The first pedestrian died in 1896, while the first driver died in 1899 [9]. There were about 30 million deaths as a result of road accidents in the past century, with 1.17 million people dead in road accidents in 1998 alone. The annual costs of road accidents equal 1% of the World's GDP [10].

Malaysia has been experiencing rapid growth in population, economy, and motorization. This increase in population and motorization has led to an alarming increase in the number of road accidents. There were 341,252 road accidents in the year 2006 with 6,287 road deaths [11]. Clearly, road accidents pose a major health and social problem in this country and there is an urgent need to implement known and effective intervention programmers to reduce the number of accidents and the severity of the injuries sustained by accident victims.

Malaysia, which has the second highest motor vehicle ownership level among the developing countries in the Asian and Pacific region, does not appear to have a serious pedestrian accidents problem [12]. Since 1987, pedestrian casualties have increased significantly with a 77% increase in fatalities. Between 1986 and 1988, pedestrians accounted for 15% of total casualties compared to the current 10%, implying that the accident involvement rate for other road user groups is increasing even faster than for pedestrians [13].

In the year 1996, the Malaysian government established a five years national road safety target to reduce road accident deaths by 30% by the year 2001 [14]. During that period, several road safety initiatives from national to community levels were initiated. A series of intervention programs on strategic issues, such as lack of conspicuity and protection, speeding, bad driving behavior and unsafe road conditions, were proposed. An integrated safety program was introduced to both prevent and reduce future traffic accidents, as well as to reduce injuries during and after accidents. Strategies were categorized into; (a) accident prevention and reduction, (b) injury control and (c) post injury reduction. Targeted televised motorcycle safety campaigns, more stringent traffic legislation, national accident blackspot programs, road safety auditing, construction of new motorcycle lanes and better protection for motorcyclists were among the integral components of this comprehensive approach [15]. By 2001, the concerted efforts by Malaysian government show an 11, 10.7 and 29% decrease in the number of deaths, serious and slight injuries, respectively, in spite of a dramatic increase in vehicle ownership in the same period. The road accident death rate dropped from 6.2 deaths per 10,000 vehicles in 1999 to 5.6 deaths per 10,000 vehicles in 2001. However, the nation's safety performance is still far behind the world-class standard, which is below three deaths per 10,000 vehicles. Hence, in 2001, the Malaysian government adopted a new national road safety target of four road accident deaths per 10,000 vehicles by 2010 [16]

Motorcycles can be harmful so safety precautions must be taken (Figure 1). Incidentally, airbags can be used to help decrease the number of injuries and deaths. The origin of airbags began back in the 1950s with Walter Linderer. He developed an airbag that would inflate by using a compressed air system. Consequently, the airbag did not inflate fast enough to help reduce injuries, but it is still the initial invention of the airbag. Years later, in 1968, Allen Breed designed the first airbag with crash sensing technology. In the 1970s, airbags were incorporated into cars. Passenger and driver airbags were invented, but they had numerous design flaws. Some of these flaws even resulted in the death of the occupants of the car. Since then, airbag designs have been improved, and airbags have been mandatory in cars since 1998.

Figure 1. Motorcycle accidents in Malaysia Source: Sarawak update 2009

Malaysia, like many of its neighbours in the region, is completing its transition from non-motorized to motorized modes of transport. The number of vehicles in Malaysia has been seen to have increased tremendously at the rate of 8% annually over the past few decades without the sign of slowing down. Of all the total number of vehicle ownerships, it was estimated that more than 25% are operated in Klang Valley alone [17]. It is also recorded that motorcycles constitute about 49% of the total vehicles and at the same time, 59% (6378 cases) of the total numbers of deaths resulting from road accidents involved motorcyclists and pillion riders were reported in 2006 alone [18]. With the high popularity of motorcycles, it is not surprising that they constitute the majority of road traffic fatalities and injuries in Malaysia. Out of the 6268 fatalities resulting from road traffic crashes in 2003, almost 60% (3635) were motorcyclists. In addition, 46455 motorcyclists suffered injuries from a crash the same year. In addition, the alarming data and strong public interest in road traffic injuries one of the motivation for policy-makers to take action, their primary interest was in implementing programs and campaigns, research was secondary.

Malaysia has been experiencing a rapid growth in population and wealth since the 1970s. As a result, vehicle ownership has been growing at a fast pace. The rapid growth in vehicle population has resulted in a considerably high increase in road traffic accidents in Malaysia. In 1998, a total number of 5,740 road accident fatalities were reported and this figure increased to 6,286 deaths in 2003. This phenomenon was estimated to consume about six billion of Malaysian Ringgit (RM) due to the loss of productivity, medical costs, management costs, property damage and others [19]. To help address this problem, the Malaysian government in 2001 set a new national road safety target of 4 deaths per 10,000 vehicles by the year 2010. This new goal means that there must be a total of 28% reduction in the fatality from the 5.6 fatalities per 10,000 vehicles in 2000 to 4 fatalities per 10,000 vehicles in 2010. Of the 28% reduction envisaged over the 10-year period, 22% of the reduction is expected to come from motorcycle safety programs.

Recent data suggest that deaths and injuries due to motorcycle crashes are becoming a larger element in the public health problem of road safety. The coordinated effort needs to take place at all levels involving federal and state governments, and community to reduce the number of motorcycle crashes, fatalities, and injuries. Realizing the severity of motorcycle-related road accidents, the Road Safety Research Centre (RSRC) of the Faculty of Engineering of Universiti Putra Malaysia (UPM) was appointed by the Ministry of Transport Malaysia as the consultant to carry out research on motorcycle safety programmers in Malaysia. Motorcycle safety is one of the many fields of research conducted by RSRC, which including road safety modeling and management, motor vehicle safety and pedestrian safety. Over the years, the core discipline of road safety branches out into pavement engineering research. The center fulfills its research and consultancy functions through the collaboration of key researchers from the Unit of Highway and Traffic Engineering at the Civil Engineering Department and other researchers from disciplines such as mechanical engineering, economics, social science, communication, epidemiology, medicine and agencies concerned with road safety.

Most injuries among motorcycle riders are to the head, so helmets could significantly reduce the severity of head injuries. Studies have revealed that the death of almost half (49.2 %) of the motorcyclists in Malaysia is due to head injuries [20]. Therefore, the proper use of safety helmets is one of the best ways to reduce the likelihood of death resulting from head injuries. This is supported by a study undertaken in California, USA, which showed that following the introduction of the helmet use law in 1992, the incidence of motorcycle crash fatalities reduced by 37.5 % compared to the previous year, and the number of injured motorcyclists sustaining head injuries also decreased significantly (Kraus 1994). A study was conducted by RSRC to explore the attitudes of Malaysian motorcyclists towards the proper usage of safety helmets, using questionnaire survey and interviews in Kajang, Selangor, and then the data was analysed using the logistic regression method [20]. Out of the 500 respondents, 54.4% were found wearing properly secured helmets, 13.6 % wore loosely fastened helmets, 7.8% were found with untied helmets and the remaining 24.2% did not wear a safety helmet. Interestingly, the survey also reveals that older citizens and females are more likely to comply with the safety helmet rule, and the same is also true for those with a higher education level.

III. AIMS AND OBJECTIVES OF THE STUDY

The aim of this study is to evaluate and understand the recent trend and statistics of road motorcycles accidents in Kajang, Malaysia. Therefore, following objectives were conducted to achieve this aim of the study:

a. To investigate the background information relating to road crashes, in particulars the analyses of crash data, the incidence of motorcycle crashes,
b. To investigate the characteristics of crashes and injury types sustained in motorcycle accidents, and the motor vehicle ownership and usage,
c. To identify possible causes of motorcycle accidents, and
d. To provide recommendations on improving road safety for motorcyclists and pillion riders.

IV. METHODOLOGY

A methodology was developed and used for this study to be successful. Initially, through reviewing the literature, a group of factors that associated with road accidents in Kajang was identified. The literature review was done to satisfy some of the stated objectives, and to gain more knowledge regarding those traffic accidents in the area of Kajang and to help the researcher to

generalize his research findings. Then a methodology on means to solve the defined problem was developed. In order to make possible the methodology, relevant data was collected from the respective authorities. Data was obtained from the Traffic Police Department of Kajang City. Traffic accidents statistics for the period of 2005 to 2008 was collected. The collected data was then analyzed.

A. *Study Location*

The scope of this study was to cover the analysis of traffic accidents at intersections of Kajang city, Selangor. Kajang is a town in the eastern part of Selangor, Malaysia. It is the district capital of Hulu Langat. It is located 21 kilometers from Malaysia's capital, Kuala Lumpur. Moreover, the current locations gravity of growth in Kajang would be Sungai Chua. In addition, the Population of the city is 342,657 in 2010. The location is as shown in Figure 2.

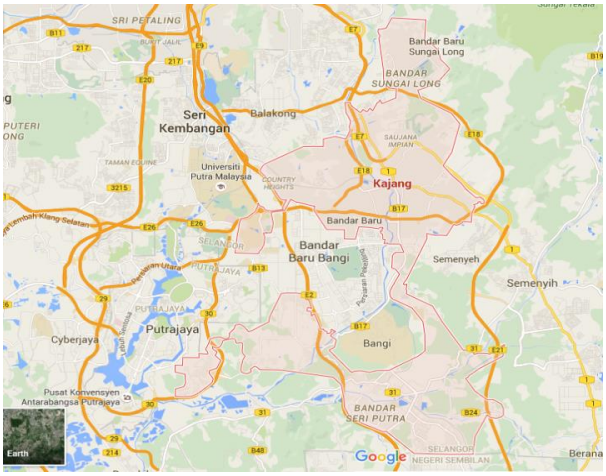

Figure 2. the location of Kajang city Source: Google map 2010

Besides that, statistical analysis was conducted based on descriptive and inferential methods to drive some information. Recommendations based on this analysis will be provided to policy makers and transport engineers to relook in the design urban roads' designs.

B. *DATA COLLECTION AND STATISTICAL ANALYSIS*

Data were collected directly from the police records in the city of Kajang during 2005 to 2008. Therefore, the data were analyzed using Statistical Package for Social Sciences (SPSS) with univariate and bivariate comparisons.

V. RESULT AND DISCUSSION

A. *Accidents per year*

The data obtain from the Director of Traffic, Kajang, was analyzed for the accident number from 2005 to 2008. The total accidents in Kajang area were found to be 7274, 7504, 8521 and 8738 per year, respectively. This implies that the number of accidents in Kajang Area is increasing from 7274 to 8738 accidents, with a total of 1464 accidents in four years as shown in Figure 3.

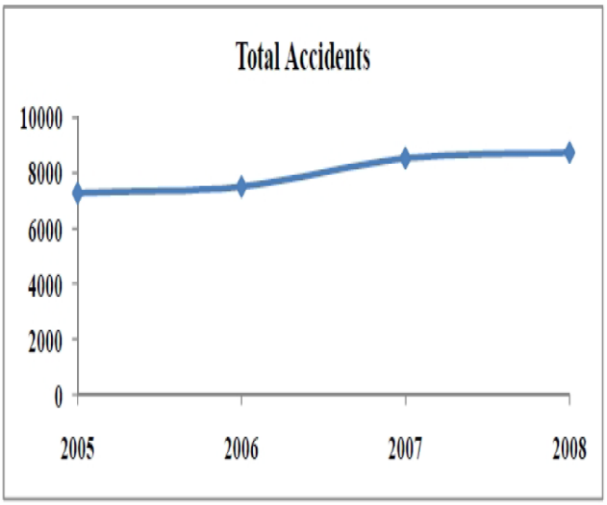

Figure 3. Total accidents in 2005 to 2008 Source: PDRM 2005 to 2008

B. *Death Due To Accidents*

The rate accident of people involved in accidents in Kajang Area is presented in Figure 3. The number of died people from 2005 to 2008 is presented in Figure 4. In 2005 number of killed people was 105 while increased to 119 in 2008.

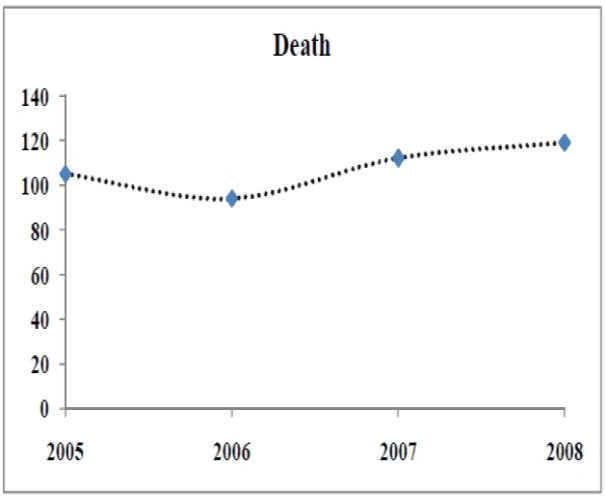

Figure 4 Death due to accidents Source: PDRM 2005 to 2008

C. Accident Severity

The study explores the accident severity in a large urban area, drawing on Kajang's local police database (2005 to 2008). Roads accidents severity was categorized as minor and serious injuries. The number of serious accidents in the period of 2005 to 2008 was observed to be 68, 37, 13 and 27, respectively as shown in Figure 5. While minor accidents were 410, 323, 371 and 224 for years 2005, 2006, 2007 and 2008, respectively.

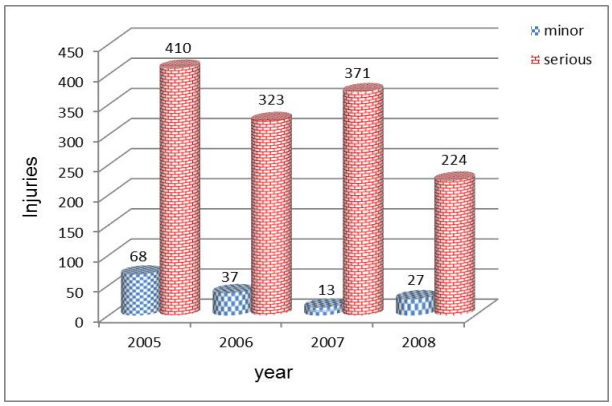

Figure 5. Accident severity

D. Accident Severity among Drivers, Passengers and Pedestrians

The data obtained from the Director of Traffic, Kajang, was analyzed for the Accident Severity among drivers, passengers and pedestrians from 2005 to 2008. In this study, it was observed that traffic fatalities are higher among drivers compared to passengers and pedestrians as shown in Figure 6. However, drivers also seem to have the higher rate of serious and minor accidents. In 2008, the number of minor injuries was higher among pedestrians as compared to passengers. Vehicle-pedestrian interactions are big problems in residential neighborhoods or on roads characterized by strip development.

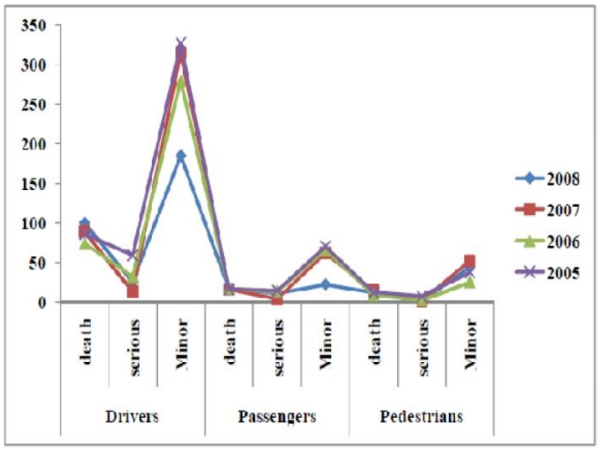

Figure 6. Accident severities among drivers, passengers and pedestrians

E. Number of Vehicles

The number of vehicles involved in the accidents in Kajang Area is as shown in Figure 7. Surprisingly the number of vehicles involved in accidents is increasing from 6690 in 2005 to 8361 in 2008.

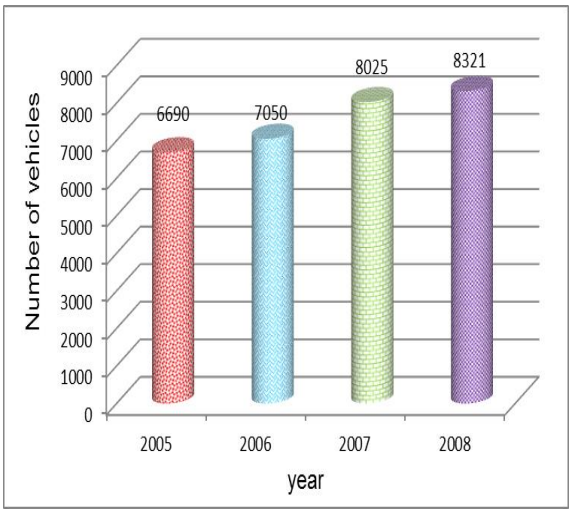

Figure 7. Number of vehicles

F. Discussion

The primary aim of traffic legislation is to improve both road safety and transport by providing a legal framework governing the drivers' and pedestrians' behavior. However, since such rules can be successful only if they are well known and widely obeyed, close monitoring by police officers is necessary to control the traffic on the roads and take action against various forms of unwanted behavior such as reckless driving and drink driving. The top consistent leading contributory factors to road accidents suggest that these are mostly the drivers' responsibility. The Malaysia government should carefully devise effective countermeasures such as raising the penalties as the deterrent against disobedience and carelessness behavior. The availability of new and smart surveillance technologies should be regularly reviewed based on experience from overseas to determine which ones could be applicable to the local environment. However to augment the overall effectiveness of influencing people's behavior as road users, the considerations of using dual approaches of persuasion and deterrence at the same time should be deployed.

VI. CONCLUSION

Engineering approach can be divided into the long-term alteration of the road environment by implementing certain countermeasures to achieve a lasting reduction in road accidents and localized sites where low-cost remedial measures that are known to be effective in lowering the chance of accidents can be implemented. The long termed objective is to promote on a wide area basis the fundamental designs of streets and roads in

order to raise the appropriate safety standards. What the government lacks is a comprehensive program and policy of safety audits to evaluate on a systematic basis to determine if remedial or larger scale measures need to be deployed with an aim to reduce occurrences and severity of accidents. However, the work of making improvements in road safety has never been an exact science. A section of road might appear to be dangerous but if it shows very few accidents in the records this will cause some hesitation as to whether remedial should be carried out to reduce the danger or whether it should be left as it is. The engineers must take into consideration the background of a particular site before recommending the changes.

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BIOGRAPHIES

Mohamed Meftah Benzair was born in 1984 in Misurata, Libya, and he received his B.Sc. degree in Civil Engineering in 2008 from Misurata University, Faculty of Civil Engineering , Libya. He got his Msc. degree in Civil and structural Engineering in 2010, from University kebangsaan , Malaysia. Currently he is a lecturer in Department of Civil Engineering at Misurata University/Libya. His research field highway and transportation Engineering.