ORIGINAL ARTICLE

REVISITING PEDESTRIAN CASUALTIES IN MALAYSIA AND THE ESCALATING NEW THREATS

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ABSTRACT

Pedestrians' fatality trend in road crashes has been improving in recent years though it remains third in rank behind motorcyclists and car occupants. Based on the statistics, young pedestrians were the most affected group and the commonest injury regions were head and legs. Pedestrian crashes occurred primarily in rural areas and straight roads and at low light environment, and often involve cars and motorcycles. In addition to existing issues of careless and illegal crossing practices, there are potential new hazards face by pedestrian, which are mobile electronic device use and electric vehicle, especially when crossing roads. Road safety programs and interventions shall consider these new issues.

***Keywords**: pedestrian safety; pedestrian distraction; Malaysia*

INTRODUCTION

Walking though recognized as the oldest form of transportation, is seriously becoming a road hazard and poses a life-threatening risk to many around the world. Globally, approximately 22 percent of all road traffic accidents involved pedestrians and are very prevalent especially in developed countries. Malaysia recorded more than 500 pedestrian fatalities each year and by rank, pedestrian is consistently third after motorcyclists and car occupants. This figure represents about 7 percent of Malaysia's annual fatalities of more than 6,500[1].

Unsafe and illegal pedestrian crossing behaviour is becoming more common and frequently reported as the primary issues in many pedestrian crashes[2]. Their vulnerability is often associated with high injury severity and mortality when compared to other road users[3,4,5]. A study done by Queensland Transport in 2005 reported that approximately 15 percent fatalities and 8 percent injuries were associated to illegal crossing[6]. In addition to that, Zeedyk et al.[7] highlighted that pedestrian violations were commonly observed at blackspot locations. The unsafe behaviour practiced in attempt to reduce travel time and distance.

In Malaysia, Aqbal et al.[8] revealed that carelessness and illegal crossings – had caused more than two-thirds (70%) of the reported casualties, primarily happened at Areas adjacent to shopping centres and marketplaces. It is rather ironic since these places are normally equipped with crossing facilities[8]. In addition, performed by Hamidun et al.[9] reported that pedestrians in Malaysia were less likely to use the pedestrian bridge if they need to travel more than their acceptance distance.Therefore, this review aims to revisit the earlier work by Aqbalet al.[8]provide updates of pedestrian casualty records for the subsequentfive years, i.e.2011 until 2015, and also deliberateon the escalating new threats to pedestrian such as crossing distraction.

METHODOLOGY

Data for the descriptive study was obtained from the MIROS Road Accident Analysis and Database System (M-ROADS), which has been developed based on the Royal Malaysian Police's (RMP) road accident database[10,11]. RMP is the main organization that is responsible for road accident management in the country, including officialaccident reporting and data collection. For the purpose of this review, the authors considered both fatal and non-fatal (serious and slight injury) records, for the 10-year period from 2006 to 2015 (a continuation from the previous work as mentioned earlier). With regard to the second part of this review, the authors had considered several selected articles and reports relating to new threats to pedestrians in Malaysia, i.e. the mobile electronic device use (internal threat) and the increasein volume of electric vehicles on Malaysian roads (external threat).

RESULTS AND DISCUSSION

Descriptive Analysis

There were around 17,300 pedestrian-related cases were reported during the 11-year period. Of these, approximately 53 percentof them killed or severely injured (KSI) cases. In total, 6,161 pedestrians died on Malaysia roads for the past eleven years with the highest death toll recorded in 2007 (M-ROADS). According to WHO, Malaysia is at seventh place among ten ASEAN countries, with 7% of road deaths involved pedestrian[12]. Figure 1 shows the fatality rate (by 10,000 vehicles and 100,000 population) in five years. Figure 1 shows the fatality rate (by 10,000 vehicles and 100,000 population) there was pedestrian fatality and three severely injured pedestrians every single day during the period. Over the years, there was a reduction of around 20% in pedestrian deaths.

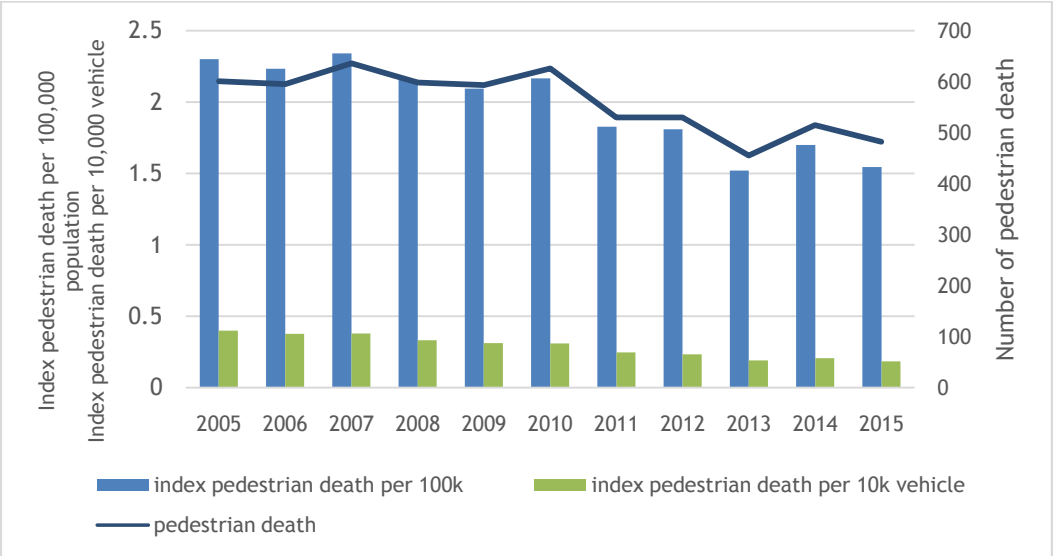


Figure 1 - Fatality rate (by 10,000 vehicles and 100,000 population) from Year 2005 to 2015[10]

Age and Gender

Figure 2 shows the proportion of pedestrian casualties by age group., middle-aged pedestrians (aged 26 to 60 years) recorded the highest KSI with 40.5% followed by elder pedestrian (aged more than 60 years old) group and children (aged 0 to 15 years old) with 21% and 23.5%, respectively. Young adult has the lowest proportion of casualties recorded (aged 16 to 25 years) at15%. By gender, KSI for male is 1.75 higher than female.

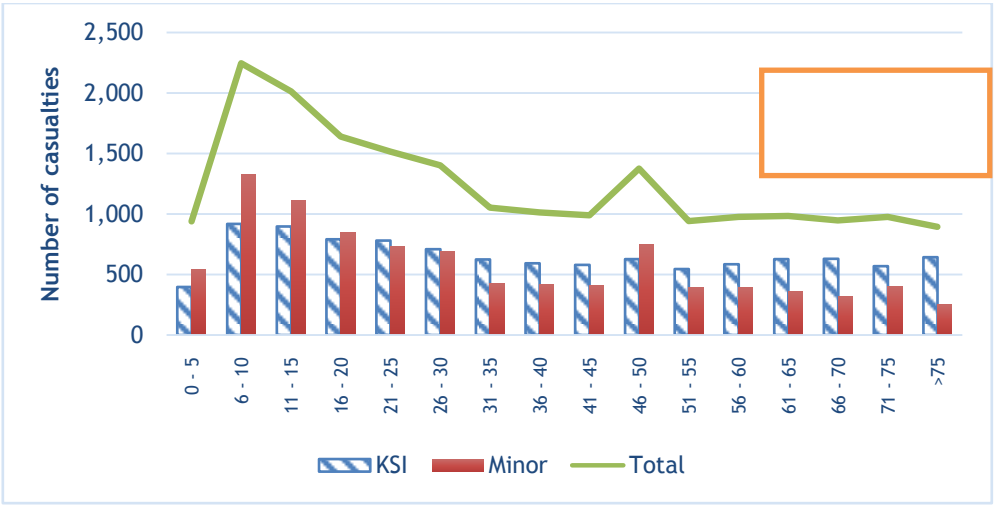


Figure 2 -Pedestrian KSI and minor injury by age group [10]

Types of Injury

The most common injured body regions were head (including face; 38.3% KSI), and legs (23.4%). Multiple injuries contributed about 19.5% in KSI cases. Neck and upper/lower back were the lowest with less than 3% each. Figure 3 shows the distribution of injuries by body region.

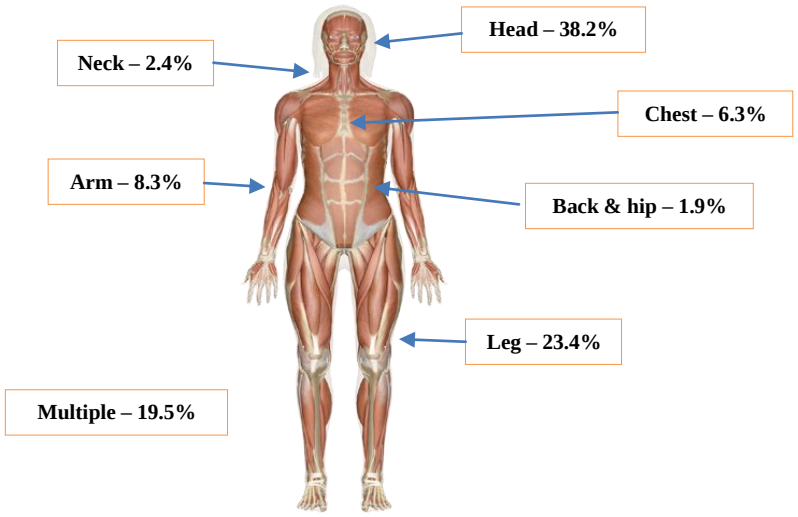


Figure 3- Injuries by body region[10]

Location and Time of Occurrence

Table 1 shows the majority of pedestrian mishaps occurred in rural areas (55%) and followed by urban areas (27.7%). Most of the KSI mishaps occurred on straight roads (81.5%) and followed curves (bends) at about 10.1%.

Based on the junction types, T/Y junctions recorded the highest KSI, 5.2% as compared to cross-junctions and staggered junctions. Rizati et al.[13] revealed that pedestrian-related cases occurred at T/Y junction involved conflict with heavy vehicle and experiencing head/neck injury. This finding lead to increase the likelihood of being fatal. This finding lead to increase in the likelihood of being fatal to the pedestrian.In terms of time of day, higher fatalitycases recorded during PM (1201 to 1159) in contrast with during AM (0001 to 1200). Furthermore, there were substantial number of records with unknown time of occurrence, which was about 20%.

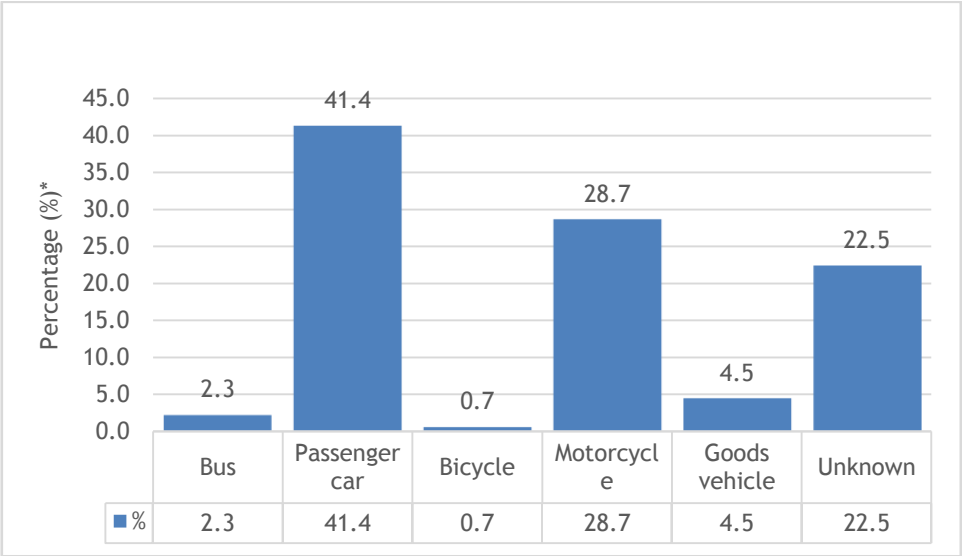
Table 1-Pedestrian casualties by location, road type and time of occurrence[10]

		KSI	Minor	Total
Locality	City/urban	2855	2570	5425
	Built-up Area	1766	1915	3681
	Rural	5675	4885	10560
		KSI	**Minor**	**Total**
Road Type	Straight	9268	8259	17527
	Bend	1153	943	2096
	Roundabout	65	55	120
	Cross Junction	223	275	498
	T/Y Junction	590	830	1420
	Staggered Junction	39	16	55
	Interchange	33	11	44
	Time		**Fatal**	
Time of occurrence (killed only*)	AM (0001am-12pm)		1212	
	PM (1201pm- 2359pm)		1738	
	unknown		764	

Note:2011 data not available due to unavailable sources.

Collision Opponent

In many situations, collision partner is a huge factor influencing the severity of injuries sustained by pedestrians. Figure 4 shows pedestrian accident involvement by type of vehicles (at first collision). Pedestrians mostly injured by passenger cars and motorcycles at about 41% and 28%, respectively. The finding related to passenger cars are somewhat similar with the case of the United States, whereby a study by NTHSA in 2015 shows that 40% pedestrian fatalities in that country involved passenger cars[14]. Furthermore, the second highest collision partners were motorcycles. Since motorcycle represented 47% of total vehicle volumes on the road, the chance for pedestrian-motorcycle mishap was proportionately high considering motorcycles were also the frequent users of the roadsides (road shoulders and sidewalks)[10]. This interaction also posed the injury threats for both motorcyclists and pedestrians since both had minimum protections. There was a high percentage of unknown vehicle type at about 22.5%. This most likely due to unrecorded or missed data during entry



Note :2011 data not available due to unavailable sources

Figure 4- Pedestrian accident by type of vehicle involved[10]

New Threats Concerning Pedestrian in Malaysia

There are other imminent factors that just beginning to affect the group in the recent years, i.e. distractions caused by usage of electronic devices and the growing numbers of hybrid and electric vehicles. The former can be consider as the pedestrians' internal threats in which to be on alert at all time and do not take thing for granted is their own choice. The latter, on the other hand, is an external factor since not only the traditional fossil fuel engines keep going quieter but also there are more cars now propelled by hybrid or fully electric power. This will turn down one of the important cues while being on the road – that is auditory detection.

Mobile Electronic Device Distraction

Distracted pedestrians due to usage of mobile electronic devices isrelatively a new threat in road safety[15]. Pedestrian distraction can be defined as doing other activities (multi-tasking) that take up their focus on the road such as wearing headphones, using mobile electronic devices (texting, talking), eating, drinking, smoking, or talking with another pedestrians as they crossed the street[16,17]. Distraction leads the pedestrians to compromise their sense of hearing and probably sights which in turn putting them into the unnecessary risksespecially while crossing the roads or walking at pedestrian paths. Distraction can significantly affect crossing speed, increase conflict, giving less attention to environment and prone to commit many more errors that possibly end up with unnecessary mishaps. Using mobile electronic device while walking may not be as dangerous as drivers who are engaged in the same behaviour, but still pose a high risk for injury when pedestrians are not focused on their surroundings[16,17]. Study done in the United States in 2016showed an increase of pedestrian injuries as the result of distractions while using mobile phone[17].

Up to year 2016, there has been nearly 2.6 billion smartphone users' worldwide[19]. In Malaysia alone, statistics from the Malaysian Communications and Multimedia Commission (MCMC) revealed that there are more than 44 million mobile phone users in Malaysia in 2015[20]. This statistic shows that Malaysians getting more exposed to in-hand technology and even put them into the potential risk while walking. It noted that younger age group are generally more frequently distracted than older ones. A recent observational study showed that more than 80% of pedestrians in Kuala Lumpur were distracted with the use of mobile electronic devices while crossing, as compared to other kind of distraction such as drinking/eating, reading, smoking or talking with other road users[15].Nevertheless, the current road accident reporting in Malaysia are not able to provide the proportion of such behaviour in pedestrian-related cases.

Growth of Electric Vehicles in Malaysia

Hybrid or full electric vehicles first became available to consumers in the millennium year and are gaining good acceptance from the users since that. Even though electric vehicle technologiesalready existed in the early 1900's, it has becoming a trend and demand from consumers since the oil crisis[21]. Green and sustainable transport initiatives is encouraging the use of energy efficient vehicles has explicitly increasing the demand for electric vehicles, among others. However, due to the quietness of this type of vehicle, it may pose a potential risk of accident especially it travels at low speed[22]. This may give negative implications towards the safety of pedestrians and other vulnerable road users (VRUs) due to the absence of usual sound produced by the conventional cars with internal combustion engine (ICE).

A study by NTHSA in 2009 revealed that electric cars and trucks post twice the risk of causing accidents when stopping, slowing, starting in traffic, backing up or when leaving and entering driveways and parking spaces[23]. Altinsoy et al.[24]showed that pedestrians have difficulties to recognise the electric vehicle sound since sound detection distance has decreased significantly. To overcome this issue, there is an idea to introduce the addition of synthetic sounds to act as a warning as provided by the real engine sounds. This kind of improvement is covered under the United Nations Regulation No. 138(UNR138), which need to be addressed by vehicle manufacturers who intent to market their electric vehicles[25]. In Malaysia, electric vehiclesfirst introduced in 2013, which based on hybrid technology. Since then, the volumes and number of vehicle types and models rose rapidly. Since the country is one of the signatory members to the mentioned regulations (UNR), the synthetic sounds addition will also become one of the Vehicle Type Approval requirements. Similar to the previous issue, the causal effect of quiet vehicles and pedestrian casualties is yet to be determined through the current road accident reporting in Malaysia.

Current Interventions and Measures

In the effort to continuously improved road safety in Malaysia, there have been many initiatives and countermeasures implemented by various agencies with the main aim is to reduce the casualties. Malaysia already came out with two road safety plans, which are the Malaysian Road Safety Plan 2006-2010 and the Malaysian Road Safety Plan 2014-2020[26]. For pedestrian safety, the initiatives are focusing more on adding and improving appropriate infrastructures such as user-friendly bus stops for easy access, pedestrian crossings, pedestrian overhead crossings, signage, bollards, footpaths and many more. These initiatives will not only be available in urban areas but also rural areas to improve the pedestrian safety. In order to ensure that the facility is fully utilized, co-operation from other usersis also important, i.e. not to misuse the facility as parking lots or other activitiessuch as petty foods businesses. As the statistics shows the riskiest age group is children, there is progressive countermeasure implemented in Malaysia i.e. implementation of road safety education in all primary school and regular road safety advocacy campaigns held in collaboration with related agencies[26].

In term of infrastructure- segregate pedestrians from vehicles by building a 'Covered Pedestrian Safety Walkway' near a school programme introduced[27]. In case of the new threat for modern pedestrian such as mobile electronic device use, multi-disciplinary parties should do think and react properly to satisfy all aspect such as legislation, enforcement, engineering, education and campaign. In Malaysia, it is uncommon to punish illegal pedestrian behaviours – all this while is just about vehicle offences. Thus, this might need attention by the local authorities and further studies on the implementation be carried out.Traffic engineering measureshave been evaluated for the effects such as (1) pedestrian countdown timer at intersection to ensure pedestrian had sufficient time to cross; (2) sign of low-speed limit at pedestrian concentrated areas to minimize the impact if collision happens with incoming vehicle; (3) development of pedestrian-friendly walkway to eliminate the conflict with other road users; and (4) to provide better design of pedestrian bridgesthat are more attractive to the target users[26].

Moreover, in vehicle safety perspective, there are many technologies provided by vehicle manufacturers to avoid collision (such as warning system; braking technology) with pedestrian and to minimize the injuries (vehicle design and materials).

CONCLUSION

Pedestrian fatality trend has been showing a positive downward trend for the past5 years with fatality numbers has dropped to less than 500 in 2015, possibly indicating that some road safety interventions are beginning to produce favourable results. Monitoring and sustaining effective measures have to continue by all stakeholders. In brief, pedestrian fatalities accounted for 7 percent of total annual road fatalities, averaging 560 deaths in the last eleven years. By age group, the highest contributed in term of KSI is age group between 6-15 years old with 17.3%. The commonest injury region to pedestrians was head and legs. Multiple injuries were also very prevalent. Pedestrian related crashes occurred more frequently in rural setting (55%) and urban areas (27.7%) and most often in straight road sections (81.5%). Most fatal crashes happened at dawn and dusk time zones. The top two crash opponents were cars (41%) and motorcycles (28%).
Recent advancement in technologies has brought along potential new threats to pedestrian on roads, namely mobile electronic device use and electric vehicles. Mobile device may distract pedestrians if used while crossing roads while electric vehicle is rather quiet (relative to conventional engine cars), thus reducing audio cue to crossing pedestrians. These threats need good remedies so that the existing casualties decreasing trend can besustain and continually improved. Road authorities and road safety stakeholders are encouraged to start looking into these potential issues.

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