

Children Pillion Rider Safety Awareness among Motorcycle Users in Malaysia

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ABSTRACT:

Motorcycle is one of the more popular modes of transport for Malaysian people due to its low price and easy usability. This paper reviews the current safety initiatives undertaken to address the need to enhance children's safety whilst riding as pillion on motorcycles and suggest possible remedial action to counter the possible lack of awareness for child pillion riders. A search was undertaken of all the major database of articles. Articles related to children's safety systems, children related injuries, children related accident data, available laws and legislation were reviewed. There is a greater need for the stricter enforcement of safety laws in Malaysia due to the fact that the accident statistics show a large percentage of motorcycle accidents involve pillion riding children. However, enforcement of laws in developing countries is not easy and one has to start at the root of the problem, i.e. the parents and adults who ride these children as pillion on motorcycles. This paper highlights the need for new safety initiatives and programmes to be undertaken by the government, law agencies and non-governmental organisations for parents and adults to understand the importance of their children's safety while riding on motorcycles. Engineering countermeasures and intervention are needed to protect these vulnerable users. Besides the helmet, a device capable of providing some sort of protection to the child whilst riding pillion should be designed and developed.

KEYWORDS:

Motorcycle safety; Pillion rider; Children; Malaysia; Awareness and measures

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1. Introduction

Motorcyclists are a unique group of road users who have to deal with unusually high accident risks. There have been questions raised previously whether or not motorcyclists are able to make good traffic safety decisions [1]. As such, motorcyclists who carry child pillion riders have a greater burden and responsibility on themselves to ensure the safety of the passengers that they carry [2]. In Malaysia, new motorcycle registration makes up around 50% of all new vehicles registered whereas cars registration makes up only 35% [3]. Motorcycles are popular due to its affordable price, low running and maintenance cost and most importantly, ease of travel on roads. By using motorcycles congestion prone areas like the city centre, a person is able to get to their destination quicker than using cars or public transportation [4].

In South East Asia, parents start bringing their children on their motorcycles at a quite young age. Usually the child would be sitting either in front or behind the rider [5]. In some developing countries like Malaysia and Thailand, the extremes can be seen where babies can also be seen being carried on motorcycles

either by one or both parents. The infants are either carried by the rider where the babies are kept in front of driver (on the tank or even in the basket) or they are seated in between the rider and the second parent [6][7]. It is worth to take note that in these developing countries, by the time the child is 15 or 16 years of age (depending on the country) a child is permitted to ride a motorcycle without any supervision [5]. The situation with multiple child pillion riders on motorcycles is also a road safety concern. In school zones, it is common to see parents ferrying more than one child on their motorcycles. In fact it is common to see multiple pillion riders on motorcycles in Malaysia even though it is illegal to do so [8].

Injuries are the main reason for fatalities among children and the social gradient for fatalities from injury is steeper than that for any other factors of fatalities in childhood [9]. The World Health Organisation postulates that the roads are a dangerous place for children as they are vulnerable beings whose world mostly extends from their home to school and back. The current transport system does not have much consideration towards the vulnerability of children. Hence child motorcyclist are at risk to injuries and other mishaps due to the lack of protection whilst riding as pillion on motorcycles as

children have always would succumb to their injuries during an accident. This would certainly apply to younger children, with their limited weight and height [10] [11]. The low to middle income countries have a higher child injury fatality rate among those aged 15 years or less. This is a fivefold increase compared to high-income countries [12]. In South Asia, road traffic related injuries contribute to a large proportion of child death and disability [13].

Previous studies carried out have shown that young children are far less competent and able when put in traffic situations compared to older children due less developed cognitively at young age. Their small size makes it difficult for them to see and judge traffic [5] [14]. According to Peden et al, in certain countries young riders or their passengers make up to one third of all motorcycle related deaths. In these countries, the usage of helmets among motorcycle users and their pillion riders are still not mandated and this then becomes a significant risk factor for possible head injuries during an accident [7].

2. Problem objective and research methods

Child pillion riders are a common sight in Malaysia. However, there have not been much studies being carried out to address the safety awareness of child pillion riders in the Malaysia context. There are adverts and articles in the newspapers and other print media, television and radio adverts and internet that advocate motorcycle rider's safety by reminding them to use their helmets and wear bright reflective coloured clothing. However, a general observation is that no one adheres to this law [2]. This paper reviews the reasons behind the lack of awareness for the safety of Malaysian child pillion riders and possible remedial action in getting children better protected whilst riding pillion on motorcycles. Various Universities' databases and scientific literature were reviewed with specific search terminologies. The keywords searched were helmet, Malaysia, accidents, injury, fatalities, motorcycles and children. The screened research has covered a time span from 1988 to 2014. This large span of time was taken in order to ensure that all research undertaken in this field has been thoroughly covered [15]

3. Results and discussion

Due to the easy affordability of motorcycles in Malaysia, the motorcycle is now a major form of transport for individuals and fatalities in the lower income group. As such, children will start to travel on motorcycles with their parents or other adults at an early age. These children usually sit in the front or behind the rider based on their size and weight. According to Norlen et al [5], when a child gets injured, the impact to a child is more serious than it is to an adult. When a road traffic accident occurs, children are more susceptible of getting injured. The injuries that a child sustains during road accidents could possibly lead to impairment and disability which would then impede the progress and growth of the child in their growing years. This in turn will require these children to get long term care to get them back to normal health. This long term care would possibly deprive these

children from school going time and social development opportunities. Children motorcycle pillion riders are currently in the leading group of traffic-related deaths in Malaysia. Children between the ages of 15 to 18 years old are in top list of traffic related fatalities. In the 1-4, 5-9, and 10-14 years old age brackets, child pillion riders were the top three group of traffic related deaths. In the year 2008, the Malaysian Institute of Road Safety Research (MIROS) said that 410 children aged between 1 to 15 years were killed in road accidents in Malaysia, and another 2,797 children had serious and light injuries [5][8]. Furthermore, according to the World Health Organisation, in 2007, riders of motorised 2 or 3 wheelers in Malaysia made up 58% of all road deaths. This is shown in Fig. 1 [16].

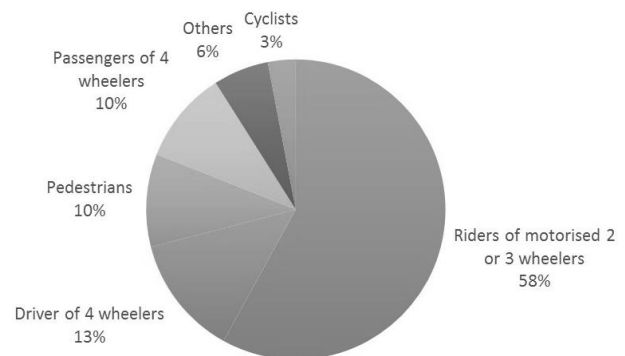


Fig 1: Deaths by road users' category [16]

Another point noted in this review of articles is that there are many parents who have carried more than one child on their motorcycles. It is actually quite common to see two children on the motorcycle at times. The centre of gravity (C.G) of motorcycles is affected when the motorcyclist is ferrying more than one pillion rider at the same time. Children do normally find it difficult to balance themselves on motorcycles due to their small posture. Hence sudden changes on the C.G can affect the stability of the motorcycle which could then lead on to an accident [8]. Peden et al [7] has noted that children rarely ride as pillion on motorcycles in most developed countries and in many parts of South East Asia. A helmet is currently the accepted form of protection for the head of motorcycle users be it the rider or pillion. Helmets reduce the risk of serious brain and head injuries by reducing the impact of the resultant force to the head during an accident. [7][10].

Various studies have shown that the use of helmets is highly dependent on the presence of motorcycle helmet laws in those countries. Motorcycle helmet laws have been proven an effective strategy as motorcycle helmets have reduced motorcycle related crash injuries. The prevalence of low helmet usage in many countries may be due to the non-availability of a universal helmet law that generally covers people of all ages. This coupled together with poor enforcement and high prices for standard helmets generally does not encourage the use of helmets [7] [17]. From a motorcycle usage point of view, even in developed countries, the available data show that the rate of non-fatal and fatal injuries caused by road traffic accidents are on the rise due to the non-usage or improper usage of helmets. In a study conducted in the west, it was noted that the relative risk

of death among riders with helmet to riders without helmet was 0.616 comparatively [18]. Whenever a child is involved in a motorcycle accident, society will be the ones to be burdened with the cost. Hence the usage of a helmet will directly save the cost incurred by the society [19]. According to Peden et al [7], the benefits of a child using a helmet outweighs its disadvantages. When a child uses a helmet, the severity and risk of injuries decreases by around 72%. The risk of death decreases by around 39%, with the probability dependent on the motorcycle's speed and this then subsequently reduces the health care costs linked to crashes. It is therefore important that children are protected by the correct size and quality of helmets.

Oxley et al [11] carried out a study in 2013 to identify the contributing factors to serious and fatal injuries during motorcycle accidents involving children in Malaysia. They found that a substantial amount of motorcycle deaths and serious injuries involved children on motorcycles. Most of these motorcycle accidents were severe in nature which resulted in higher fatality rates due to head injuries. They also found that there was a significantly high number of children pillion rider involved in these motorcycle related collisions. A worrying trend found was that among children pillion riders, the rate of helmet usage was quite low, especially amongst children in the younger age group bracket. In a study carried out in Pakistan (where motorised two wheelers are a common mode of transport), it was noted children whose parents had a lower level of education were had a higher probability of being involved in road traffic accidents compared with parents of higher levels of education [20]. A similar study has to be carried out in Malaysia to determine whether there is a link between the parents education level and safety awareness for their children and if there is a link, then a greater emphasis on educating and creating awareness of safety should be carried out for these group of parents. Parents should be made to understand the importance and protection provided by a proper fitting helmet.

Ameratunga et al [21] postulates that properly worn helmets are able to reduce motorcyclist head injuries by up to 72%. The introduction of mandatory helmet laws in high income countries many years ago has managed to lead to a reduction of between 20% to 40% injuries to motorcyclist over the years thus showing the effectiveness of the helmets in reducing the injury rates. Noor Faradila [8][22] has noted that the usage of helmets in Malaysia as mandated in the Safety Helmet Regulation in 1971 has overwhelmingly reduced the number of motorcycle injuries, death and subsequently cost of the treatment. So it is important for parents to ensure that their children use and fasten their safety helmets correctly as the improper usage of the safety helmet may result in deaths and injuries among children. Studies carried out previously have shown that during a crash or accident, motorcycle users often sustain multiple injuries. Head injuries are commonly seen during fatal crashes where it makes up to about one half of all motorcycle injuries. Other types of injuries that caused fatalities in motorcycle crashes were chest, abdominal, spinal, upper torso and leg injuries. These findings confirm previous studies that the helmets

significantly reduce the severity of head related injuries during an accident and therefore reduce the risk of head and brain injuries. Oxley et al however noted that it was a matter of importance that a proportionally high number of children were injured although these children were reported to have been using a helmet during the accident. When it comes to considering the effectiveness of the helmet especially in the Asian context, other factors such as the type of helmet (standard or non-standard like the half-head helmets), proper fitting helmet (correct size) and properly fastened helmets (loose fitting helmets will compromise the protection that is supposed to be afforded by helmets) need to be taken into account.

A study carried out by Kulanthayan et al in 2012 found that motorcycle riders with many years of experience in riding motorcycle also continually used non-standard motorcycle helmets because they believed they were not prone to crashes due to their experience to predict and avoid crashes. Some motorcyclists see the usage of helmets merely as compliance with the law and to avoid being fined by the Police and Road Transport Department. Hence, they do not understand the full significance of the helmet use [11] [23]. In a study carried out to gauge the use of non-standard safety or motorcycle helmets in various lower to middle income developing countries, the researchers concluded that about 50% of the helmets being currently used may be non-standard types of helmets. The cheaper price of these types of helmets is the major reason for their popularity among motorcycle users. Their study found that motorcycle users place a high importance on the price of the helmet when choosing helmet although the quality is a relevant factor while purchasing a helmet. Their survey found that there was a threefold difference between the price of non-standard and standard helmets. Hence, motorcyclists will buy the cheaper lower quality helmets over higher and better quality helmets alternative. The lack of enforcement and legislation in place specific for the usage of non-standard helmets does not discourage the purchase of these cheaper and poorer quality helmets [24]

Some countries have only now begun to mandate the helmet use regulation. In a study conducted by Previn et al [25], they note that Vietnam has seen a significant spike in the use of helmets among adults after the new regulation was put in place. However, even with the new regulation in place, usage of helmet has been low among children. There were significant differences between the usages of helmets in adults compared to the children. Whilst riding pillion on motorcycles, children can also be susceptible to spoke wheel injuries. It usually affects the heel region [26]. Motorcycle spoke injuries are more severe than bicycle spoke injuries due to the higher speed and energy involved [27]. Motorcycle spoke injuries involve the ankle and foot of the pillion rider where the ankle and foot may get stuck between the chain guard, spokes and the rear suspension, rear brake or even the shock absorber. For children, these types of injuries are more severe compared to an adult due to the child's ankle and foot being small and easily being able to pass through the spokes of the wheels. Injuries can vary from mild to severe where amputation of the limb would be necessary to save the lives of the child. In

order to repair the damaged heel, complex and repetitive surgeries might be required as well. In the worst case scenario, due to the motion of the motorcycle wheel, the spoke can push the ankle down and hence cause it to be shared by the rear disc brake which would result in subtotal amputation for the child [27][28]. There is not much literature available on Malaysian children's spoke wheel injuries. However, in a study carried out in China by Zhu et al in 2011 showed that 55% of heel injuries studied involved children or adolescents. Zhu also noted that motorcycle spoke injuries occurred more often in Asian countries due to the prevalence of motorcycles in this region. Zhu also noted that bumpy roads and multi-passengers on one motorcycle exacerbated the occurrence of the injury [27].

Another injury that children can be susceptible to while riding pillion is exhaust system contact burns. This is another area where there is a lack of data in Malaysia. Even though these burns only could be small, they were usually severe and required surgery. Exhaust systems contact burns in children could be associated with considerable morbidity. Young children are in the high risk group for exhaust burns due to their thinner skin which will burn more deeply at lower temperatures. Children are disproportionately affected by exhaust burns due to their small size, exposed limbs and thin dermis influence them to these sort of injuries [29][30]. In a study carried out by Nelson et al [29], 90% of the children in their study had to undergo some form of surgical intervention to treat their exhaust burn. Matzavakis et al [31] noted that children are risk of exhaust burns two times more compared to an adult. This could be due to the fact that neither the parents nor children realise the danger of being so close to a hot motorcycle exhaust pipe. Clothing does not offer proper protection against exhaust burns. In a study carried out by Roberts et al [32], they noted that even though one child had shoes while riding motorcycle, the child experienced exhaust burns, leaving a full thickness injury on the dorsum of the right foot. Exhaust burns would take an average time of 20 days to heal. These injuries are inconvenient due to multiple hospital visits, causes indirect costs to the engagement of nurses and medical care professionals [30].

Helmets, protective clothing, lower limb protection devices such as fairings and crash bars and airbags [33] [34] are the key protection systems. It has to be noted that the lower limbs protection devices and airbags are mostly available for users of higher end types of motorcycles and not the everyday motorcycle which is the "kapcai" or underbone motorcycles. Besides using safety equipment to address the safety of children whilst they are on motorcycles, Oxley et al suggests that both parents and their children use the Safe System approach. The Safe System approach focuses on two areas which are ensuring that parents adopt safe riding practices and that the road infrastructure is properly designed to provide a safe crashworthy environment [11]. Parents of children should be emphasising safe riding practices when they have a child riding pillion with them. Information, education, an appropriate licensing system and practical training are necessary towards getting the knowledge, skills and attitudes that are essential for safe

road use. Initiatives aimed at raising the awareness among parents and children for motorcycle safety in the rural areas should be implemented more rigorously. The school going children must be taught specific motorcycle safety program with a focus on wearing helmet and practising safe riding practices. More regular enforcement to ensure higher helmet wearing success among children is also important [11]. Public health agencies should create media campaigns to target parents to focus on the realistic portrayal of the health consequences of not using helmet and ferrying more than one child on motorcycles. Tighter legislative approaches should be undertaken by the government to make mandatory use of safety devices for children whilst they are on motorcycles [35]. Awareness programmes on child safety should be carried for parents. Doong et al [36] suggests that the development of specific training courses for road safety and tools for parents to adequately guide their young children (especially those 0–6 years old) to be more attentive and behave safely. These courses should be carried out on a wider scale and not just concentrated to the urban areas. The educational programmes for road safety should be continuously taught in schools, colleges and universities as these programmes will create a greater awareness among young children which will hopefully stay with them when they reach adulthood [37].

Engineering countermeasures is essential to effectively and quickly create a more 'crashworthy' and safer travel environment for child pillion riders. When it comes to engineering countermeasures, rural roads in small town should be a key focus on the efforts undertaken. The urban road systems in Malaysia's main cities are equivalent to the first world road system. However, in the rural areas, the roads lack hard-shoulder and proper barrier system to tackle the run-off road collisions. Measures undertaken could be to reduce the speed limits on these rural roads to calm the traffic, make improvements to the roads for higher standard with provision of clear zones, improved hard-shoulder areas, conversion of un-divided roads to divided roads, provision of barrier systems, and provision (and maintenance) of separate motorcycle lanes [11]. With these countermeasures in place, it will make the road safer for the motorcycle users in general. The Road Safety Marshal Club of Malaysia (RSMC) have been carrying out a children helmet initiative programme to provide protection for all child pillion riders between the ages of 7 to 11 years and going to school every day with the hope of reducing child fatality rates from road traffic accidents. RSMC have requested donation of helmets to be distributed to school going children [38].

Sweden has long had a great awareness on road traffic safety. Sweden was the country that introduced the 3-point seat belt in cars through Volvo. As such, Sweden has actually seen a threefold reduction in children fatally injured in road traffic accidents annually that have occurred between 1975-1979 and 1993-1994. Further research should be done to follow the Swedish example on successfully reducing the number of children killed in road traffic accidents [39]. Engineering intervention to the motorcycle is also urgently needed. This intervention will need to specifically address the

prevention of injuries typically sustained by child pillion riders on motorcycles. A device or intervention that will be able to protect the chest, neck, foot and ankle, backbone of the child should be designed and developed. This backrest should be able to provide a form of protection to young pillion riders [2].

4. Summary

The practice of a child riding pillion without any protection used is more commonly observed in residential areas and schools in Malaysia. In order to prevent further injuries and fatalities from road traffic accidents among children, children should be made to wear protective wear to safeguard them better. WHO has postulated that when a motorcycle accident occurs, the best possible way of preventing head injuries and fatalities is to enforce the use of helmets [5]. In light of the high fatality rate of motorcyclist in developing countries, policies need to be changed or amended to reflect the vulnerability of motorcyclists as a whole [40]. According to a study carried out by Hendrie et al, they postulate that although motorcycles are used in high numbers in the lower and middle income countries, child motorcycle safety devices were most often not cheap or affordable and sometimes not easily available. This is completely opposite to the developed countries where these child safety devices are more readily available and affordable to the income levels. Local production of these devices, lowering or abolition of tariffs, social marketing, advocacy, mandatory use legislation might stimulate the market growth for these devices. Arguably, a moral obligation exists to offer children a fair chance of surviving to adulthood [41] [42].

A Motorcycle Safety Programme (MSP) was launched in 1997 to tackle the issue of motorcycle related accidents and crashes which aimed at changing motorcyclist attitudes and behaviours on motorcycles safety issues such as the proper use of helmets, excessive speeding and lack of visibility. A study carried out by Law et al [43] found that the MSP has been effective in tackling motorcycle safety issues. It has to be noted that MSP did not specifically address the child pillion rider safety issue. This is where a new Child Pillion Rider Safety Programme should be carried out. Children are one of the most vulnerable groups of road users. Their safety should always be the utmost importance for the adults accompanying them. Hence the adults need to always ensure that the safety of these vulnerable group, otherwise there will not be any significant reduction in the burden of road traffic injuries [44]. In developing countries, protecting a child pillion rider's body is neither easy nor cheap. The only exception to this is protecting the child's head (with a helmet). Hence a system needs to be engineered to address this issue for the child pillion riders [44]. A study conducted by Noor Faradila et al [45] in 2013 found that there is a significant variance in anthropometric dimensions between a child and an adult whilst riding a motorcycle. This variance warrants a revision of the Malaysian law on the suitability of children as pillion riders on motorcycles.

5. Conclusion

There is a pressing need to educate parents and adults on the urgent undertaking of child safety whilst on motorcycles. Therefore, this paper highlighted the need for safety initiatives such as helmets and other protection devices and educational programmes to be undertaken by the government, law agencies and non-governmental organisations for parents and adults to understand the importance of safety of their children while riding on motorcycles. Children should be taught continuously from a young age on safety and the perils whilst riding motorcycles as pillion. These education programmes should not be just limited to schools but should carry on to colleges and universities so that it will stick with these children till they become adults. The government and relevant agencies should stop the sale and availability of non-standard helmets from the market to encourage the use of only standard helmets especially for children. A possible review of the Malaysian law pertaining suitability of children pillion rider with a set age limit should be carried out for the benefit of this vulnerable group. Engineering countermeasures should be implemented to create a safer and more 'crashworthy' travel environment for child pillion riders. A device capable of providing some sort of protection to the child whilst riding pillion should be designed and developed for motorcycles.

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