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Prevalence of Carrying Multiple Pillion Riders On The Route to School

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Abstract. A cross-sectional observation survey was carried out among 6 to 12 year old child pillion riders travelling to and from schools by motorcycle. The study focuses on the prevalence of carrying multiple child pillion riders at the same time, to determine the relationship between child pillion riders' safety helmet compliance, and their seating position and foot peg use. A total of 701 riders and 913 school children were observed. Riders' safety helmet use rate was found to be significantly higher (66.8%) than that of child pillion riders' helmet use (14.7%) with OR=11.7 (95%CI 9.2-14.9). It was observed that 29.1% riders were carrying more than one child pillion rider; with female riders more likely to carry more than one pillion rider (OR=1.6, 95%CI 1.1-2.2). Observation on foot peg use showed that the rear motorcycle pillion rider (BP) are more likely to use the foot pegs as compared to the one in the middle (MP) (OR=11.7, 95%CI 7.8, 17.5). Safety helmet use by child pillion riders on route to school was found to be generally low. Furthermore, there is a significant difference in the child pillion rider safety helmet use compliance, according to the seating position. Children who are seated in the middle are less likely to use the safety helmet. Rear child pillion riders are more likely to use the foot pegs. To increase helmet use there is a need for public awareness campaigns on the safety benefits of safety helmet use among school children. In addition, to increase safety of children while riding as pillion rider, the law of carrying only one pillion rider must be enforced strictly.

Introduction

Road traffic injuries are the leading cause of death and disability to children [1,2,3]. Boys face greater risk of death and serious injury than girls whereby boys recorded 9.6, while girls 5.1, injury per 100,000 children death [2,3,4]. Children suffer injuries while in a variety of roles related to different types of transport i.e. pedestrians, bicyclists, car occupants, or motorcycle pillion riders. Children motorcycle pillion riders have been identified as the top group of traffic-related fatalities among children aged 15 – 18 years old. Children pillion riders are the third leading group of traffic-related-fatalities among children aged 1-4, 5-9, and 10-14 years old [5]. According to the Malaysian Institute of Road Safety Research (MIROS), in 2008, road accidents in Malaysia killed 410 children aged between one and 15 years, and inflicted suffered serious and light injuries on 2,797 children.
Adults, especially parents, play an important role in supervising their children, to keep them safe and in equipping them with optimum protection while travelling [6]. Helmet is designed to cushion and protect riders' heads from the impact of a crash. Proper helmet use significantly decreases the risk of head and facial injuries [7].As motorcycles are commonly family vehicles in Malaysia; children may begin to travel on motorcycles at an early age. However, the rate of helmet use among these small children is very low, partly as a result of the lack of appropriately-sized helmets, or of their cost. As discussed in the previous study [8], the observed difference on the rate of safety helmet use among riders and child pillion riders is statistically significant. Generally, riders are 11.7 times as likely to use safety helmet as compared to child pillion riders. Safety helmet use rates of 16.3% and 13.2% were observed for male and female child pillion riders, respectively. The reported

safety helmet use compliance rate [8] for riders is higher than that of the child pillion riders' as in accordance with other studies [9,10,11]. A majority of Malaysian population is aware of the safety helmet law, however the compliance rate is still low among child pillion riders [8].

As motorcycles are common family vehicles in Malaysia, there are additional problems besides low helmet use compliance rate. Even though carrying multiple pillion riders has been illegal in Malaysia, riders tend to do so while commuting their children to school. Thus, the current study focuses on the prevalence of carrying multiple pillion riders on the same motorcycle, especially child pillion riders. The number of child pillion riders carried on a motorcycle in relation to their seating position is also a road safety concern. Hence, this study is vital in improving the safety of children motorcyclists.

Methodology

A cross-sectional roadside observational survey of motorcycle riders and pillion riders was conducted during weekdays between 12:00 pm and 2:00 pm (primary school transition time) covering all 9 districts in Selangor, Malaysia. Multistages sampling method was adopted in selecting the study sample. For each district, three primary schools comprising one National Primary School (SR Kebangsaan), one National Type Chinese Primary School (SRJK Cina) and one National Type Tamil Primary School (SRJK Tamil) were selected according to their rural or urban setting, which was based on the school's classification by the Ministry of Education. Schools with the highest number of students were nominated for data collection due to the higher possibility of encountering relevant respondents. All of the students in the primary schools, comprising Standards 1 to 6 (age from 7 to 12 years old), who were either going to or coming back from school by motorcycle were observed.

All observations were carried out using video recording at a non-curved road segment along the main road of the main entrance of each primary school. At each site, two trained observers observed and recorded all the motorcycles which were carrying child pillion rider/riders. Data was collected on the number of riders, gender of riders, and safety helmet use status. The observation did not include riders who were not seated on their own (namely; babies and infants). The observation form used had been adapted from a MUARC study [12] to suit the local environment.

Defining Variables. Variables observed for both the riders and child pillion riders during data harvesting from the captured videos, include gender of rider/child pillion rider, number of person on motorcycle, position of each child pillion and compliance of safety helmet use. As described in Noor Faradila et al. [8], child pillion rider's seat position comprises i) front (FP); ii) middle (MP); and iii) back (BP). Front (FP) is defined as a child pillion rider who sits in front of the rider. Middle (MP) is defined as a child pillion rider who sits between the rider and the rear most child pillion rider. The back (BP) seating position is defined as a child pillion rider who occupies the rearmost seat on the motorcycle.

Rider and 1 Front child pillion rider (FP) , 1 Middle child pillion rider (MP) and 1 Back child pillion rider (BP)	Rider and 1 FP , 2 MP and 1 BP
	

Fig. 1: Seat position definition [8]

Data Analysis. The prevalence of safety helmet use (with 95% confidence intervals, CI) for both riders and child pillion riders was determined based on sex, and school location using simple cross-tabulations. Comparisons between groups were tested using Chi-square tests for categorical outcome variables. P values for inclusion to and exclusion from the models were set at 0.05, and the likelihood- ratio test was used to test for significance. All the statistical analyses were performed using SPSS version 17 (SPSS Inc.).

Results

A total of 701 motorcycle riders and 913 child pillion riders from all the 17 locations were observed. From the observation, 436 riders (62.2%) were men and 265 (37.8%) were women. Of the observed motorcyclists, 502 (71.6%) were carrying one child pillion rider, 179 (25.5%) were carrying two child pillion riders, and 20 (2.9%) were carrying more than two child pillion riders. While conducting this research, one motorcycle was spotted to be carrying four child pillion riders, which meant that the total occupant was five. By gender, 48.5% and 51.5% were male and female child pillion riders respectively. Of the total numbers of observed child pillion riders' seat location, 93% of them occupied the seat behind the rider– classified in this study as Back (BP – rearmost child pillion rider, 73.6%) and Middle (MP – any child pillion rider between rider and BP, 19.2%). There were 66 (7.2%) child pillion riders observed to be occupying the front seat.

Prevalence of Carrying Multiple Child Pillion Riders. Table 1 shows the number of riders carrying multiple pillion riders according to location (urban and rural) and gender of rider (male and female). Based on the observation, it was noted that the percentage of multiple child pillion riders on the same motorcycle was higher in rural areas (31.0%) as compared to urban areas (26.2%) but the difference was not statistically significant at 0.05 level (χ^2=2.02, p=0.156).

A similar analysis was also carried out to determine whether there is an association between carrying multiple child pillion riders at the same time, with the gender of the rider. Initial analysis of the data showed that the percentage of carrying multiple child pillion riders was higher for female riders (34.1%) than male (24.9%). Nevertheless, the frequency of riders who carried multiple child pillion riders at the same time was higher for male riders than that of the female. Female riders are 1.6 times more likely to carry multiple child pillion riders at the same time when compared to male riders.

Table1: Single and multiple child pillion riders by location of school and gender of rider

Variables	Multiple child pillion rider		Total no.	Statistical significance
	Yes N (%)	No N (%)		
Location of school				
Urban area	100 (26.2)	282 (73.8)	382	χ^2 = 2.02, 1 df, p=0.156
Rural area	99 (31.0)	220 (69.0)	319	
Gender of rider				
Male	109 (24.9)	328 (75.1)	437	χ^2 = 6.78, 1 df, p=0.009
*Female	90 (34.1)	174 (65.9)	264	Odds Ratio = 1.6 (1.1, 2.2)

Child Pillion Rider Safety Helmet Use in Relation to Seat Position. Table 2 indicates the rate of safety helmet use for child pillion riders according to their seat position. A child pillion rider's seat position plays a significant role in determining the compliancy of safety helmet use. There is a significant difference for child pillion rider safety helmet use compliance, according to the seat position. Children who sit in the MP are less likely to use the safety helmet as compared to FP and BP.

Table2: Rate of safety helmet use in relation to child pillion riders' seat position

Variables	Safety helmet use compliance		Total no.	Statistical significance	Odd Ratio
	Yes (%)	No (%)			
Child pillion riders' seating position					
FP	6 (9.1)	60 (90.9)	66	$\chi2 = 7.25$, p=.007	5.7 (1.4-23.6)
BP	125 (18.6)	547 (81.4)	672	$\chi2 = 30.87$, p<.001	0.08 (0.02-0.24)
MP	3 (1.7)	172 (98.3)	175		

Foot Peg Use in Relation to Gender and Seat Position. Foot pegs are designed to provide support to motorcycle riders and pillion riders. Only for this section, the FP were excluded from the analysis as this section discusses foot peg use. Table 3 shows the relation between foot peg use with child pillion riders' gender and their seat position. From the observation, the difference in the use of the foot pegs among male and female child pillion riders is not statistically significant (p=0.529). In contrast, by seat position, the use of the foot pegs is significantly significant whereby BP were more likely to use the foot pegs as compared to MP (OR=11.7, 95% CI 7.8, 17.5).

Table 3: Foot peg use in relation to gender and seat position

Variables	Foot peg use		Total no.	Statistical significance
	Yes (%)	No (%)		
Gender				
Male	270 (64.9)	146 (35.1)	416	$\chi2 = 0.38$, 1 df, p=0.529
Female	271 (62.9)	160 (37.1)	431	
Seat position				
Middle (MP)	36 (20.6)	139 (79.4)	175	$\chi2 = 179.2$, 1 df, p<.001
*Back (BP)	505 (75.1)	167 (24.9)	672	Odds Ratio = 11.7 (7.8, 17.5)

Discussion

This study finding highlights the issues of carrying multiple child pillion riders at the same time, safety helmet use among child pillion riders and pillion rider foot peg use. The observed prevalence of multiple motorcycle child pillion riders was at 28.4%. This high percentage is alarming as it compromises safety and increases the risk of a crash. Carrying multiple pillion riders at the same time can affect the centre of gravity (CG) of the motorcycle while riding. Sudden changes on CG might affect the manoeuvring process. Furthermore, riders tend to seat their youngest child in front of them while riding. This can increase the risk of the child being squeezed by the rider during emergency braking or in an accident. A simulation study conducted by How et al. [13] had proven that by installing a utilities basket in front of the rider, most of the impact energy is absorbed by the basket, thus reducing the severity of lower limb injury. However, Malaysian riders tend to use the basket to seat their vulnerable child in. In a crash, the child's lower limb may end up being crushed by the basket.

Since the introduction of the safety helmet regulation in 1971 for motorcyclists, the accumulated evidence is overwhelming that safety helmet use reduces motorcyclist fatalities, injuries, and treatment costs. Therefore it is necessary that motorcyclists, including child pillion riders, use the safety helmet and fasten it properly. The proper use of the safety helmet may be seen to benefit only the motorcyclists, but in actual fact, the failure to use the safety helmet properly may result in injuries or fatalities, especially among children. This in turn will also affect other people either directly or indirectly, including the family members, other road users and also the society at large.

The low compliance rate was most probably due to the short distance between the schools and the students' houses. Since most of the observed schools were located near residential areas, it is assumed that the riders and the child pillion riders opted to not wear a helmet due to the short

distance. As a result, the compliance rate of helmet use among child pillion riders was low. Previous studies had proven that the compliance rate of safety helmet use increases as the travel distance increases [14].

Conclusion

The result of this study shows that the safety helmet use rate is relatively, low even with the implementation of the safety helmet regulation. The study also shows that, about 30% of child pillion riders did not comply with the existing regulation. Thus, it is recommended that the existing laws on safety helmet compliance and the carrying of multiple child pillion riders, be enforced more effectively. It is also suggested that public campaigns, as well as educational programmes be conducted regularly to enhance the awareness level of safety helmet use compliance and the consequences of carrying multiple child pillion riders at the same time.

This study also revealed that there is a statistically significant association between the seat position and foot peg use. It can also be observed that the legs of some of the children could not reach the foot pegs, which may affect their safety while riding. With regards to child pillion riders, the current design of motorcycle foot pegs is only beneficial for those who are sufficiently tall. Thus, motorcycle design engineers need to consider the difference between adults and children‘s sizes. For example, motorcycles should be equipped with “flexible” foot pegs. On top of that, due to the wide variance in anthropometric dimensions between children and adults, a revision of the law on the suitability of children riding as pillion riders should also be made, by including a minimum age limit.

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