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Motorcycle helmet use in Calicut, India: User behaviors, attitudes, and perceptions

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ABSTRACT

Objectives: The objectives of this study include assessing the motorcycle helmet use pattern in Calicut, India, and analyzing the factors influencing helmet use including motorcyclists’ perceptions.

Methods: Field observational studies at 15 locations were conducted to determine the helmet use rate among motorcyclists and pillion passengers. A structured questionnaire interview survey was conducted with 709 motorcyclists to evaluate the users’ perceptions and opinions regarding the use of motorcycle helmets.

Results: There was a considerable difference in the level of motorcycle helmet use observed between the locations within and outside the city limits, where different levels of helmet law enforcement were exercised. The helmet use was observed at a maximum of 89% within the city and a minimum of 23% in some locations outside the city. The decreasing percentage of helmet use while moving toward the locations outside the city was confirmed statistically through t tests ($t = 1.771$, $df = 13$, $P < .05$). It was found that only 42% of users revealed that helmets are comfortable and 42% expressed that helmets affect hearing ability. It is important to note that 57% of users are of the opinion that there is no need to use a helmet if you drive slowly and carefully. The price of the helmet was not a deterrent for helmet use. In addition, it was observed that only 45% of helmets used by the motorist were standard helmets with an Indian Standards Institute (ISI) mark.

Conclusion: The widely varying helmet use pattern observed in the study area may be attributed due to the users' behaviors; that is, using a helmet only when the helmet law is strictly enforced rather than using a helmet as a protective device. Further, some of the problems and beliefs associated with helmet use prevent motorcyclists from using a helmet. Hence, the road safety of motorcyclists can be improved only through addressing the identified measures comprehensively.

Introduction

In the recent past, motorized 2-wheelers have increased exponentially in many developing countries like India. Motorized 2-wheelers share about 72% of 141.86 million total registered motor vehicles on Indian roads in 2011 (Ministry of Road Transport and Highways 2014). In the year 2010, there were nearly 0.5 million road accidents on Indian roads, which accounts for 134,513 deaths (Ministry of Road Transport and Highways 2011). As per the World Health Organization’s (2009) Global Status Report on Road Safety, India leads the world in road accident deaths. At least 13 people die every hour in road accidents in India and this high accident rate is causing a loss of 3% gross domestic product for the country. By the year 2020, the major killer in India will be road accidents and will account for nearly 546,000 deaths. Because motorized 2-wheelers provide no protection to the rider’s body, any accidents can lead to partial disability, permanent impairment of essential body organs, and in extreme cases, fatality.

Because head injuries are considered one of the leading causes of death in motorcycle crashes, many countries have passed laws that mandate the use of helmet by motorcyclists (Houston and Richardson 2008; Hung et al. 2006; Kraus et al. 1995; Rodrigues et al. 2014; Watson et al. 1980). Implementation of a universal helmet law is effective in reducing motorcyclist fatalities, especially for young riders. It was observed that a 31% reduction in fatality rates among young motorcyclists between the ages of 15 and 20 when a helmet law was implemented that mandated that all motorcyclists wear a helmet (Houston 2007). The effectiveness of helmet laws on helmet use and injury patterns showed that of every 100 motorcyclists killed in crashes while not wearing helmet, 37 can be saved when all riders wear a helmet (NHTSA 2004). A large number of research works have been conducted and reported in different countries across the world to study helmet use patterns, various determinants associated with helmet use, and the socioeconomic benefits of helmet use, such as reduction in motorcycle crash fatalities, injuries, hospitalization, medical treatment expenses, etc. (Coben et al. 2007; Dandona et al. 2006). A study on the effect of repeal of universal helmet laws revealed that there was significant increase in the motorcyclist fatality rate of up to 12% over what would have been expected had universal coverage been maintained (Houston and Richardson 2007).

Though the effectiveness of mandatory helmet law and use of helmet by motorcyclists have been investigated in several research works, observed helmet use was found to be low (Alkisti et al. 1999). The various reasons for not wearing a helmet...
include problems with physical comfort, obstructed vision, reduction in hearing level, etc. In addition to the reasons revealed by the motorists for not wearing a helmet, some of the beliefs and opinions users have regarding helmet use also affect helmet use (Akaateba et al. 2014; Li et al. 2008).

The objectives of the present study include assessing the motorcycle helmet use pattern in the study area and identifying the factors influencing the helmet use from the motorists’ perspectives as well as ranking the various intervention measures based on their relative effectiveness in improving helmet use according to users’ opinions.

Methods

Study area

Calicut (Kozhikode) is a major city in the northern part of Kerala State located on the west coast of India with a metropolitan population of 2,030,519 as per the 2011 census. In 2012 there were 36,174 accidents on the road network of Kerala State, of which more than one third were motorized 2-wheelers accidents. Motorized 2-wheelers share about 39% of fatal accidents and 38% of injuries. Kozhikode district shares about 9% of the state population and accounts for the same proportion of road traffic accidents in the state. As per the prevailing laws, “Motor Vehicle Act of India, 1988 (MVA), Central Motor Vehicle Rules 1988 (CMVR) and Rules of Road Regulation 1989 (RRR) under rule/section M129 and 177, driving a motor cycle without protective headgear (helmet) is a traffic offence” (Indian Roads Congress 1996; p. 94). In July 2007, a helmet law went into effect in Calicut; as per the law, helmet use is mandatory for all 2-wheeler riders. Motorcycle helmet use rate can be considered as the primary measure of the degree of conformity to the above law. In this study, 15 observational locations were randomly selected, covering both within and outside the city limits, with varying levels of helmet law enforcement. The following study locations were selected (see Figure 1).

- Observation locations within the city
  - TBS Junction
  - Kallai Railway Station Junction
  - Chungam
  - Chevayoor
  - Eranjiapalam
  - MIMS Hospital Junction
  - Thondayad Bypass Junction
  - M.M. Ali road
  - Railway Station Road
- Observation locations outside the city
  - Mediical College–Mavoor Road
  - Kunnamangalam–Mukkam Road
  - Kettangal–Mavoor Road
  - Kunnamangalam–Koduvally Road
  - Mukkam–Thamarassery Road
  - Mukkam–Tiruvumbadi Road

Helmet use observational survey

Helmet use by motorcyclists was observed at the selected locations in each direction through observers manually using pencil and paper without stopping the motorcyclists. Observations for the locations within the city were carried out during both morning and evening hours, and for the locations outside the city either morning or evening normal daylight hours. Motorized 2-wheelers that pass through a study location were observed for helmet use by the motorcyclists and passengers. When more than one motorized 2-wheeler passed the location simultaneously the possible number of vehicles from the left edge of the road was observed.

Questionnaire survey

The questionnaire survey locations were selected closer to the observational survey locations. Suitable locations for the survey were identified as those places where motorcycles parked in large numbers, including service stations, supermarket parking lots, and some petrol stations. Drivers were selected opportunistically from these sites to participate in a face-to-face interview. Participants were informed about the aim of the survey and asked to respond to the questions from their experience and opinion regarding using helmet. Studies conducted in some developing countries showed that the purchase price of a helmet influences the percentage and the proportion of the standard quality helmet used by the motorcyclists (Hung et al. 2008). Hence, the questionnaire used in this study included questions regarding the motorcyclists’ perceptions and opinions on the price of a helmet from an affordability point of view. In addition, questions were included regarding comfort, vision, hearing, vehicle control ability, law enforcement, etc. Further, motorcyclists were asked to rank the factors, such as strict enforcement, better helmet design, reduction in helmet price, and helmet use awareness, based on their relative influence in improving helmet use.
Table 1. Observed helmet use among motorcyclists and passengers at locations within the city.

<table>
<thead>
<tr>
<th>Location</th>
<th>Time of observation</th>
<th>Motorcyclists</th>
<th></th>
<th></th>
<th></th>
<th>Passengers</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Total number</td>
<td>% Wearing</td>
<td>Total number</td>
<td>% Wearing</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>observations</td>
<td>helmets</td>
<td>observations</td>
<td>helmets</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>TBS Junction</td>
<td>Morning</td>
<td>408</td>
<td>85</td>
<td>256</td>
<td>0.8</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Evening</td>
<td>326</td>
<td>81</td>
<td>184</td>
<td>1.1</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Kallai</td>
<td>Morning</td>
<td>365</td>
<td>78</td>
<td>223</td>
<td>0.9</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Evening</td>
<td>390</td>
<td>77</td>
<td>211</td>
<td>0.0</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Chungam</td>
<td>Morning</td>
<td>324</td>
<td>78</td>
<td>217</td>
<td>0.0</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Evening</td>
<td>349</td>
<td>80</td>
<td>189</td>
<td>0.0</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cheyavoor</td>
<td>Morning</td>
<td>360</td>
<td>91</td>
<td>241</td>
<td>1.2</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Evening</td>
<td>342</td>
<td>88</td>
<td>202</td>
<td>1.0</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Eranjipalam</td>
<td>Morning</td>
<td>356</td>
<td>83</td>
<td>233</td>
<td>0.0</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Evening</td>
<td>410</td>
<td>80</td>
<td>252</td>
<td>0.0</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>MIMS</td>
<td>Morning</td>
<td>291</td>
<td>74</td>
<td>194</td>
<td>0.5</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Evening</td>
<td>352</td>
<td>75</td>
<td>197</td>
<td>0.0</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Thondayad</td>
<td>Morning</td>
<td>344</td>
<td>87</td>
<td>211</td>
<td>0.9</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Evening</td>
<td>352</td>
<td>83</td>
<td>178</td>
<td>0.5</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>M.M. Ali Road</td>
<td>Morning</td>
<td>336</td>
<td>82</td>
<td>221</td>
<td>0.5</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Railway Station</td>
<td>Morning</td>
<td>293</td>
<td>88</td>
<td>209</td>
<td>0.5</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Road</td>
<td>Evening</td>
<td>266</td>
<td>85</td>
<td>164</td>
<td>0.5</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Results

Helmet use pattern

During the observational survey, a total of 6,246 motorcyclists and 3,789 passengers in the 9 selected locations inside the city and 2,142 motorcyclists and 1,321 passengers in the 6 locations outside the city were observed. The average helmet use observed for the study locations within the city and outside the city is shown in Tables 1 and 2, respectively.

The estimated $t$ value of 4.77 against the critical table value of 1.771 at a 95% confidence level showed that the helmet use rate in the locations outside the city is significantly lower compared to the locations within the city. Further, it was observed that helmet use of pillion seat passengers was less than 1% in most of the locations.

Table 2. Observed helmet use among motorcyclists and passengers at locations outside the city.

<table>
<thead>
<tr>
<th>Location</th>
<th>Motorcyclists</th>
<th></th>
<th></th>
<th>Passengers</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Total number</td>
<td>% Wearing</td>
<td>Total number</td>
<td>% Wearing</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>observations</td>
<td>helmets</td>
<td>observations</td>
<td>helmets</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Medical college–Mavoor</td>
<td>382</td>
<td>83</td>
<td>259</td>
<td>0.0</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Kunnamangalam–Mukkomb</td>
<td>446</td>
<td>62</td>
<td>271</td>
<td>0.0</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Kattangal–Mavoor</td>
<td>191</td>
<td>26</td>
<td>123</td>
<td>0.0</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Kunnamangalam–Koduvalu</td>
<td>448</td>
<td>23</td>
<td>276</td>
<td>1.1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mukkomb–Thamarassery</td>
<td>324</td>
<td>33</td>
<td>188</td>
<td>0.0</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mukkomb–Thiruvambadi</td>
<td>351</td>
<td>30</td>
<td>204</td>
<td>0.5</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Analysis of questionnaire survey data

Six hundred and ninety male motorcyclists and 19 female motorcyclists interviewed during questionnaire survey. Among the total respondents, 51 motorcyclists did not have a helmet of their own. The various reasons for not purchasing a helmet were noted. Among the reasons expressed, 37% of motorcyclists responded that they did not have 2-wheelers or they were not frequent riders. Other reasons expressed include helmets are costly (17%) and helmet use does not increase the safety (10%). The reasons for using a helmet include increasing safety (reducing head injury), avoiding the police, escaping from the rain, and providing protection from dust. Forty-seven percent of interviewed motorcyclists agreed that they use a helmet to increase safety, 43% used a helmet due to police enforcement, and 10% noted other reasons. The analysis of the questionnaire indicates that nearly one third of the motorcyclists used a helmet regularly. The frequency of helmet use by other users is as shown in Figure 2.

Motorcyclists’ perceptions and opinions

Analysis of the questionnaire data indicated that the majority of motorcyclists are aware of the benefits of helmet usage. However, problems with use and users’ beliefs associated with helmet use prevent them from using a helmet. The important issues stated were that they could not hear horns or sounds of other vehicles while wearing a helmet, it is not possible to see vehicles in adjacent lines, it is uncomfortable to use a helmet, and it is irritating when the weather is hot. Helmet use is also affected by users’ opinion, such as helmets are needed only for long trips, and helmets are unnecessary if they drive slowly and carefully. The results of helmet evaluation based on users’ perceptions and opinions are as shown in Figure 3.

The ranking assigned by the motorcyclists for important measures such as strict enforcement, better helmet design, reduction in helmet price, better awareness, etc., is shown in Figure 4.
use rate among pillion passengers was found to be very low—less than 1% in 13 out of 15 locations. Though a majority of motorcyclists were aware of the benefits of helmets, the problems and their beliefs associated with helmet use prevent them from using a helmet. The results of the questionnaire survey showed that only 42% of the respondents were comfortable wearing helmet, and 28% expressed that helmet use caused hair loss. Vision obstruction problems were reported by 36%, and 42% noted that helmet use affects the hearing ability. Helmet use is also affected by the opinions of the user such as helmets are needed only for long trips and helmets are unnecessary if you drive slowly and carefully.

The price of a helmet is not a serious deterrent considering the average earnings of 600 and 400 Rs for 8 h of work for skilled and unskilled workers, respectively. Though more than 80% of the users reported that the current price of helmets is moderate to low, the prevailing low level of standard helmet use among the motorcyclists warrants further investigation to determine the reasons for low helmet use. Analysis of the ranking of important measures to be adopted to improve helmet use from the users’ perspective showed that about 50% of users chose better helmet design as the rank 1 measure. This confirms the comfort problem expressed by the users in this study and the findings of previous studies that suggested ensuring that standard helmets are affordable (Bachani et al. 2012).

The findings of this study need to be considered along with its limitations. Firstly, the period of observation was only part of a day and varied between day and night and the difference between days is not captured in this study. Secondly, the variation in type of motorized 2-wheelers observed is not accounted for when studying the difference in helmet use between locations within and outside the city. Further, the level of helmet law enforcement is noted as a subjective assessment. However, the observed helmet use pattern matches with the reported level of helmet law enforcement, which is in conformity with other studies (Hung et al. 2006; Kasantikul 2001a, 2001b).

Hence, comprehensively addressing measures such as (1) implementing a mandatory helmet use law regularly and consistently for both motorcyclists and passengers in all area; (2) improving the performance of helmets with better designs from comfort, hearing, and vision standpoints; (3) ensuring the availability of standard certified quality helmets at an affordable price for all users; and (4) widespread awareness programs for helmet use will increase helmet use among motorcyclists and result in improved road safety of motorized 2-wheeler users.

**References**


