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The validity of self-reported helmet use among motorcyclists in India

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ABSTRACT

Background: Motorcyclists are the most vulnerable vehicle users in India. No published study has assessed the validity of self-reported estimates of helmet use in India. The objectives of this study were to assess helmet use by comparing observed and self-reported use and to identify factors influencing use among motorcyclists in Hyderabad, India.

Methods: Population-based observations were recorded for 68 229 motorcyclists and 21 777 pillion riders (co-passengers). Concurrent roadside observations and interviews were conducted with 606 motorcyclists, who were asked whether they "always wear a helmet". Multivariate logistic regression analyses were conducted to determine factors influencing helmet use.

Results: In the population-based study, 22.6% (*n* = 15,426) of motorcyclists and 1.1% (*n* = 240) of pillion riders (co-passengers) were observed wearing helmets. In roadside interviews, 64.7% (*n* = 392) of the respondents reported always wearing a helmet, 2.2 times higher than the observed helmet use (29.4%, *n* = 178) in the same group. Compared with riders aged ≥40 years, riders in the age groups 30–39 years and 18–29 years had respectively 40% (95% confidence interval [CI]: 0.4 to 1.0, $P < 0.05$) and 70% (95% CI: 0.2 to 0.5, $P < 0.001$) lower odds of wearing a helmet after controlling for other covariates. Riders with postgraduate or higher education had higher odds of wearing a helmet (adjusted odds ratio [OR]: 4.1, 95% CI: 2.5 to 6.9, $P < 0.001$) than those with fewer than 12 grades of schooling. After adjusting for other covariates, younger riders also had 40% (95% CI: 0.3 to 0.9, $P < 0.05$) lower odds of self-reporting helmet use, while those with postgraduate or higher education had 2.1 times higher odds (95% CI: 1.3 to 3.3, $P < 0.01$) of reporting that they always wear a helmet. Police had stopped only 2.3% of respondents to check helmet use in the three months prior to the interview.

Conclusion: Observed helmet use is low in Hyderabad, yet a larger proportion of motorcyclists claim to always wear a helmet, which suggests that observational studies can provide more valid estimates of helmet use. Interview findings suggest that a combination of increased enforcement, targeted social marketing and increased supply of standard helmets could be a strategy to increase helmet use in Hyderabad.

Key words: India, helmet, motorcycle, road safety, road traffic injury

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INTRODUCTION

It is estimated that, worldwide each year, 1.24 million deaths and 20 to 50 million injuries are caused by road traffic crashes (RTCs).[1] The burden of road traffic injuries (RTIs) is increasing and, unless addressed, is projected to become the fifth-leading cause of death by the year 2030.[2] Low- and middle-income countries account for 92% of global RTI deaths, although their share of global vehicles is only 53%.[1] Motorcyclists are a group of vulnerable road users, representing 23% of the global RTI burden.[1]

In India, 136 834 persons reportedly died due to RTI in 2011 and an estimated 2 million people have disabilities as a result of RTCs.[3,4] India has also experienced increased motorization, with the total number of registered vehicles increasing by as much as 161% between 2000 and 2010.[5] Motorcyclists constitute the largest proportion (71%) of vehicle users in

India and, compared with other vehicle users, this group has a higher proportion of RTIs (22.5%).[3,5–7] Like the country as a whole, Andhra Pradesh (now bifurcated into Andhra Pradesh and Telangana states) state in India, with a population of 85 million, has observed a substantial increase in the number of vehicles, and motorized two-wheelers constituted 73.2% of all vehicles in 2010.[8,9] Previous studies conducted in the capital, Hyderabad city, have estimated an annual incidence of 1919 per 100 000 for RTCs and 14.4 per 100 000 for fatal RTIs among motorcyclists, indicating their vulnerability.[10] Helmet use is mandatory for both motorcycle drivers and pillion riders (co-passengers) in Andhra Pradesh, with a penalty of ₹100 (US$ 1.80) for the first offence and ₹300 (US$ 5.40) for subsequent offences.[11] Compared with the average monthly income of ₹5357 in India in 2010, this fine is very low.[12] Also, the enforcement of helmet law in Hyderabad has been sporadic and an issue of much political debate.[13–16]

Among motorcyclists, injury to the head and neck is often the main cause of death and disability, and helmet use can reduce this risk substantially.[17,18] Non-use of helmets is associated with injuries and disabilities that result in higher treatment costs in the event of a crash.[17] Also, enforcement of helmet laws has demonstrated a decrease in rates of head injuries and deaths, while repealing these laws has shown an increase in these rates.[17]

Data on helmet use can help assess enforcement, develop programmes and establish baseline rates for monitoring and evaluation of interventions to increase helmet use.[17] Two methods are commonly used for gathering data on helmet use – population-based observations and roadside interviews/surveys.[17] Both these methods have their strengths and demerits.

There are limited risk-factor-specific data on RTIs in India and there is also limited published research on evaluation of RTI interventions.[19,20] Some hospital-based studies from India have estimated helmet use among RTI victims.[21–24] However, there are fewer population-based studies on helmet use from India. A recent study conducted in New Delhi used video recording to determine helmet use among pillion riders and found 99% of female pillion riders were not wearing a helmet and they accounted for 81% of all pillion riders who were not wearing a helmet.[25] In a previous study conducted in Hyderabad, 70% of motorcyclists self-reported that they do not always wear a helmet and some of the predictors for not always wearing a helmet included driving a borrowed motorcycle, driving a lower-capacity motorcycle, older age, lower education and male sex.[26] Another study conducted in New Delhi with female pillion riders, using an interview method, found religion to be a significant predictor for agreeing with mandatory helmet law without exemptions.[27]

Previous studies from India have used either an observation method or roadside interviews/surveys to study helmet use. To the authors' knowledge, no study in India has directly compared observed and self-reported helmet use among motorcyclists. Such a comparison allows for cross-validation of findings. The specific objectives of this study are: (i) to assess helmet use in Hyderabad city, India; (ii) to compare observed and self-reported helmet use; and (iii) to identify factors influencing helmet use.

The present study was part of an ongoing evaluation of Bloomberg Philanthropies Global Road Safety Program, implemented in 10 countries that account for nearly half of the global burden of fatal RTIs.[28,29] The overall goal of the programme was to reduce the burden of RTIs and fatal RTIs in selected countries, by "focusing on proven preventive and care interventions, identifying high-performing, experienced partners for implementation, and rigorously evaluating outcomes".[28,29] The city of Hyderabad was one of the programme sites in India, with a population of 7.7 million and 11.8 million registered vehicles.[8,9]

METHODS

The local study team and traffic police of the city selected eight sites for the study. The criteria considered in selecting sites included: (i) the location was safe for the observer/interviewer; (ii) the location was a site where the observer is at a level that is equal to or higher than the height of a motorcycle; and (iii) the location was where local residents rather than tourists are likely to be observed. In addition, it was ensured that at least one site was selected from each of the six administrative zones in Hyderabad. To ensure representativeness, an additional site was selected from the two larger zones. In each zone, the site or sites selected was the one or ones with the highest average traffic volume, estimated from monthly data available from traffic police.

During July 2011, data were collected from these eight sites, using two methods: (i) population-based observation to assess helmet use; and (ii) roadside interview to understand knowledge, attitudes and practices related to helmet use among motorcyclists and to identify factors influencing helmet use. The data-collection procedures for these methods is described next.

Population-based observational study

At each site, observations were recorded on one weekday (Monday to Friday) and one weekend day (Saturday to Sunday). Two data collectors (one recording observations for motorcyclists and the other for pillion riders) took position on the side of the road close to a traffic signal and observed all motorized two-wheelers moving in one direction, continuously for 90 minutes at three different times of the day, that is, morning (10:00 to 11:30), afternoon (13:30 to 15:00) and evening (17:00 to 18:30). Observations were recorded if motorcyclists and pillion riders were wearing helmets correctly (strapped), wearing helmets incorrectly (unstrapped) or not wearing helmets. If more than one pillion rider was on the motorcycle, observations were recorded for all of them. If more than one motorcycle was passing at the same time, observations were recorded for the motorcycle that was closest to the kerb/side of the road. In this study, "motorcyclists" refers to riders of any motorized two-wheeler, that is, motorcycle, scooter or moped. "Pillion rider" refers to any rider (adult or child) riding on a seat behind the rider of a motorized two-wheeler. Observations were recorded on paper forms developed for this study.

Data collectors received classroom-based, followed by in-field, training. Frequent refresher training was also organized for data collectors. During these training sessions, inter-rater reliability was assessed and was found to be high (>85%). However, no reliability or validity checks were made during data collection.

Roadside interview

Trained interviewers conducted interviews at the same sites and at the same (three) times of day as the population-based observational study. While one group of data collectors was recording helmet observations, the other group conducted roadside interviews, using a questionnaire consisting of 33 items developed for this study. At each site, the local traffic police stopped motorcyclists and directed them to the study team. The interviewers informed the motorcyclists of the purpose of the study and obtained verbal consent. In the interview, no personal identifiers were collected and each interview took about 5–10 minutes. The interview included 14 points to be observed and 19 questions to be administered. Observations were recorded for helmet use, helmet certification marking/sticker, type of road, type of motorcycle and site. The questions administered focused on knowledge, attitudes and practices related to helmet use. The respondents were asked whether they "always wear a helmet", why they always wear (or do not wear) a helmet, factors considered important when purchasing a helmet, the amount spent on a helmet, and enforcement of helmet use by police. All questions in the survey were closed. The interviewers were trained in asking questions and recording the responses. The interviewers selected the response that most closely related with the response that was provided by the respondent. When in doubt, the interviewer asked the respondent to clarify their response. If the response was not listed as an option, then the interviewer could mark it as "other" and specify the exact response that was provided by the respondent.

Data from both the population-based observational study and the roadside interview were entered into MS Excel and analysed using STATA 12.[30] The data from the population-based observational study were analysed to determine the prevalence of helmet use. Using the test of proportions, the observed helmet use among motorcyclists and pillion riders, and observed and self-reported helmet use were compared.[31] Descriptive analysis of roadside interviews was conducted to understand the knowledge, attitude and practices related to helmet use. Bivariate and multiple regression analyses were conducted to understand the factors associated with observed and self-reported helmet use.[31] Based on the results of previous studies conducted in India, age group, sex, education, type of motorcycle, ownership of motorcycle and purpose of trip were selected as explanatory variables.[26,32] Chi-square tests were used to determine an association between helmet use and explanatory variables.[31] This study was approved by the Institutional Review Board of Johns Hopkins Bloomberg School of Public Health, United States of America, and the Institutional Ethics Committee of the Indian Institute of Public Health, Hyderabad, India.

RESULTS

Population-based observational study

In the population-based observational study, helmet observations were recorded for 68 229 motorcyclists and 21 777 pillion riders. About 22.6% of motorcycle drivers and only 1.1% of pillion riders were found to be wearing helmets. A statistically significant difference was noted in the proportion of motorcyclists and pillion riders wearing helmets ($P < 0.001$; *see Table 1*). Also, among those who were observed wearing a helmet, only 4% were wearing helmets incorrectly (unstrapped).

Roadside interview

Using roadside interviews, a total of 718 motorcyclists were contacted, of whom 606 motorcyclists agreed to participate (response rate 84.3%); reasons for refusal were not collected. The majority of the respondents were male (94.7%), between 18 and 44 years of age (91.8%) and had some school/college education (97.2%). Most of the respondents (96.5%) owned their motorcycle and the main purpose of their trips was to commute to or from work or school (89.1%; *see Table 2*).

In roadside interviews (n = 606), a statistically significant difference was noted between self-reported and observed

Table 1: Comparison of observed and self-reported helmet use among motorcycle drivers in Hyderabad city, India

	Observed helmet use		Self-reported helmet use	*P* value for test of difference in proportions		
	Population-based observational study (n = 90 006[a]), *n* (%)	Roadside interview (n = 606), *n* (%)	Roadside interview (n = 606), *n* (%)	Helmet use observed in population-based observational study versus self-reported in roadside interview	Helmet use observed in roadside interview versus self-reported in roadside interview	Helmet use observed in population-based observational study drivers versus pillion riders
Among motorcyclists	15 426 (22.6)	178 (29.4)	392 (64.7)	0.000***	0.000***	0.000***
Among pillion riders	240 (1.1)	—	—-	—	—	

***$P < 0.001$.

[a]Observations for 68 229 motorcyclists and 21 777 pillion riders combined.

Table 2: Characteristics of the roadside interview respondents and factors associated with observed and self-reported helmet use in Hyderabad, India (n = 606)

Variable	Total	Observed helmet use			Self-reported helmet use		
	n (%)	Yes, *n* (%)	No, *n* (%)	$\chi 2$ *P* value	Yes, *n* (%)	No, *n* (%)	$\chi 2$ *P* value
Sex							
Male	574 (94.7)	167 (29.1)	407 (70.9)	0.523	372 (64.8)	202 (35.2)	0.790
Female	32 (5.3)	11 (34.4)	21 (65.6)		20 (62.5)	12 (37.5)	
Age group, years							
18–29	298 (49.2)	68 (22.8)	230 (77.2)	0.001**	183 (61.4)	115 (38.6)	0.142
30–39	195 (32.2)	63 (32.3)	132 (67.7)		128 (65.6)	67 (34.4)	
≥40	113 (18.6)	47 (41.6)	66 (58.4)		81 (71.7)	32 (28.3)	
Education							
Schooling (less than grade 12)	179 (29.5)	36 (20.1)	143 (79.9)	0.000***	105 (58.7)	74 (41.3)	0.016**
Graduate (bachelor's degree)	253 (41.8)	63 (24.9)	190 (75.1)		160 (63.2)	93 (36.8)	
Postgraduate (professional degree, master's degree and above)	174 (28.7)	79 (45.4)	95 (54.6)		127 (73.0)	47 (27.0)	
Type of motorcycle							
<100 cc	43 (7.1)	7 (16.3)	36 (83.7)	0.050	22 (51.2)	21 (48.8)	0.054
>100 cc	563 (92.9)	171 (30.4)	392 (69.6)		370 (65.7)	193 (34.3)	
Owns motorcycle							
No	21 (3.5)	1 (4.8)	20 (95.2)	0.012*	11 (52.4)	10 (47.6)	0.230
Yes	585 (96.5)	177 (30.3)	408 (69.7)		381 (65.1)	204 (34.9)	
Purpose of trip							
Travelling to/from work or school	540 (89.1)	170 (31.5)	370 (68.5)	0.002**	349 (64.6)	191 (35.4)	0.449
Travelling to/from leisure activity or for pleasure	27 (4.5)	6 (22.2)	21 (77.8)		20 (74.1)	7 (25.9)	
Commercial activity	39 (6.4)	2 (5.1)	37 (94.9)		23 (59.0)	16 (41.0)	

***$P < 0.001$, **$P < 0.01$, *$P < 0.05$.

helmet use: 64.7% of the respondents claimed to always wear a helmet, which was 2.2 times higher than the observed helmet use of 29.4% in the same group ($P < 0.001$; see *Table 1*). When the self-reported helmet use from roadside interviews was compared with the helmet use in the population-based observational study, the former was 2.9 times higher than observed helmet use and the difference was statistically significant ($P < 0.001$; see *Table 1*).

Respondents who claimed to always wear helmets cited "it can save my life" (99.2%) as the most common reason. Major reasons for not wearing helmet included: (i) lack of helmet (27.4%); (ii) decision to wear a helmet was dependent on the location of the trip, that is highway or local road (25.1%); and (iii) forgetting to wear one (23.7%). In the three months prior to the interview, only 2.3% of the respondents reported being stopped by the police to check for helmet use.

In roadside interviews, among those who were observed wearing a helmet, a majority (94.2%) had standard helmets (standards set forth by the Bureau of Indian Standards), determined by observing authentic certification/sticker (ISI mark). The average amount spent on a helmet was ₹800 (US$ 16) and 18.3% of respondents had spent less than ₹500 (US$ 10). In purchasing a helmet, respondents gave importance to high quality (66.0%) and certification (15.2%), over price (4.6%) or style/look (2.6%).

In bivariate analysis, a statistically significant association was found between observed helmet use and explanatory variables – age, education, ownership of motorcycle and purpose of trip – whereas for self-reported helmet use, a statistically significant association was found for education (*see Table 2*). In multiple logistic regression after controlling for other covariates, age was a significant predictor of observed helmet

use; compared with those in the age group ≥40 years, those in the age groups 30–39 and 18–29 years had respectively 40% and 70% lower odds of wearing a helmet (*see Table 3*). After controlling for other covariates, riders with postgraduate or higher education also had 4.1 times higher odds of wearing a helmet than those with fewer than 12 grades of schooling (*see Table 3*). Age and education were also found to be significant predictors of self-reported helmet use after adjusting for other factors (*see Table 3*). Compared with those in the age group ≥40 years, those in the age group 18–29 years had 40% lower odds of self-reporting helmet use, while compared with those with no/some schooling, respondents with postgraduate or higher education had 2.1 times higher odds of self-reporting helmet use (*see Table 3*).

DISCUSSION

The prevalences of observed helmet use from two different methods – population-based observational study and roadside interview – are similar to those reported in earlier studies conducted in Hyderabad city.[22,26] The present study also found self-reported helmet use to be more than twice the observed use. To the best of the authors' knowledge, this is the first study from India to compare observed and self-reported helmet use. The wide difference between observed and self-reported use is similar to that in other studies conducted in settings with low utilization of road-safety interventions.[33–36] A study from Cambodia also found self-reported helmet use to be higher than observed use.[37,38] Similarly, differences have been reported for studies assessing seat-belt use in Turkey, where self-reported rates were found to be greater than observed rates.[33] This suggests that in countries such as India with low rates of helmet use, observational studies can provide more valid estimates of utilization.

Table 3: Multivariate analyses of factors associated with observed and self-reported helmet use in roadside interviews, Hyderabad, India

Variable	Adjusted odds ratio for observed helmet use (95% confidence interval)	Adjusted odds ratio for self-reported helmet use (95% confidence interval)
Sex		
Male	1.00	1.00
Female	1.4 (0.6 to 3.0)	0.9 (0.4 to 1.9)
Age group, years		
≥40	1.00	1.00
30–39	0.6 (0.4 to 1.0)*	0.7 (0.4 to 1.2)
18–29	0.3 (0.2 to 0.5)***	0.6 (0.3 to 0.9)*
Education		
Schooling (less than grade 12)	1.00	1.00
Graduate (bachelor's degree)	1.5 (0.9 to 2.4)	1.3 (0.9 to 1.9)
Postgraduate (professional degree, master's degree and above)	4.1 (2.5 to 6.9)***	2.1 (1.3 to 3.3)**
Type of motorcycle		
<100 cc	1.00	1.00
>100 cc	2.0 (0.8 to 4.8)	1.8 (0.9 to 3.4)
Owns motorcycle		
No	1.00	1.00
Yes	4.5 (0.6 to 35.0)	1.1 (0.5 to 2.8)

***$P < 0.001$, **$P < 0.01$, *$P < 0.05$.

This discrepancy between observed and self-reported helmet use could be because respondents do not want to report their so-called incorrect road behaviour, or they do not consider themselves to be so-called irresponsible drivers and so give a socially desirable answer.[26,39,40] Social desirability bias is to respond in a way "that makes the respondent look good" and a respondent may, therefore, either exaggerate or understate a behaviour, which is a common source of self-reported bias.[40]

This study also indicates that people tend to overestimate their helmet use, and highlights two different categories of helmet non-users – (i) those who do not wear a helmet and do not claim to wear one (32.7%); and (ii) those that do not wear a helmet but claim to always wear (38.0%) (*see Table 4*). This has implications for potential behaviour-change interventions, since these two categories of non-users may have different sets of attitudes and beliefs, and so-called a one-size fits all approach of social marketing campaigns may not work for both these groups. For example, those who do not wear and do not claim to wear a helmet may consider helmet use unimportant, while those who do not wear a helmet but claim to wear one may be aware of the importance of helmet use, though giving a socially desirable answer. The social marketing strategy for the former group could focus on increasing awareness – benefits of helmet use and consequences of non-use – while for the latter group, the focus could be on overcoming barriers, increasing self-efficacy and maintaining helmet-wearing behaviour.[41] In contrast, strong and consistent enforcement of helmet law may increase helmet use in both groups. Further research with a larger set of variables is required to identify predictors of discrepancy between observed and self-reported helmet use among respondents.

The findings from roadside interviews provide insights into the some of the reasons behind low helmet use in Hyderabad. Interview findings indicate that the police stopped only 2.3% of motorcyclists to check for helmet use. India has a national law that makes helmet wearing compulsory for both motorcycle drivers and pillion riders, but its enforcement is generally weak.[1] This is because the enforcement of traffic laws is a state responsibility and enforcement levels vary even within a state. Enforcement of helmet law in Hyderabad has been weak and this can explain the low compliance in the city.[13–16] Previous studies in India have indicated low helmet use; similar findings were noted in an observational study conducted in Bengaluru city, where most of the motorcyclists were wearing helmets but pillion riders were not, as the state law did not specify mandatory use among these riders.[22–24,26,32,42,43] Thus, if there is no enforcement, people are less likely to wear helmets and enhanced enforcement can increase helmet use. In addition, targeted social marketing campaigns, emphasizing penalties for not wearing helmets, can also complement enhanced enforcement efforts.[1]

Table 4: Observed and self-reported helmet use for respondents of roadside interview, Hyderabad, India (n = 606)

		Observed helmet use		
		Yes	No	Total
Self-reported helmet use	Yes	162 (26.7%)	230 (38.0%)	392 (64.7%)
	No	16 (2.6%)	198 (32.7%)	214 (35.3%)
	Total	178 (29.3%)	428 (70.7%)	606 (100%)

Findings in the present study were similar to those of Dandona and colleagues who reported that safety was a major reason cited for always wearing a helmet, whereas lack of a helmet was a major reason for not always wearing a helmet.[26] A smaller proportion of respondents also reported that their helmet was broken (not in usable condition). This highlights the need for increasing the accessibility and availability of good quality helmets. The decision to wear a helmet was also based on the location where the respondents were driving. In other studies, distance, location, time-related factors and day of the week were noted as factors influencing helmet use.[26,43] Studies have also reported aesthetic and physical reasons, such as obstruction of vision, neck pain, hearing problems, headache, heat and heaviness, as reasons for not wearing a helmet.[26,44,45] In the present study, unlike previous ones, relatively fewer respondents reported inconvenience or discomfort as a reason for non use. This could be because of the time of year and differing weather conditions when interviews were conducted; the present study was conducted in July, which is monsoon season in India and a relatively cooler time of the year.

Some of the factors associated with helmet non-use reported in other Indian studies included older age, lower education, driving a motorized two-wheeler other than a motorcycle, and driving a borrowed vehicle.[26] In the present study, a significant relation was found between age and helmet use; those in an older age group were more likely to wear helmets. This highlights the need to focus enforcement and social marketing campaigns to target young motorcyclists.

This study found that nearly all (94.2%) of those who had helmets were wearing standard helmets and respondents also gave importance to quality and certification when purchasing a helmet. A multicentre study conducted in nine low- and middle-income countries found a strong association between the cost of a helmet (those spending less than US$ 10) and use of a non-standard helmet.[46] In the present study, about 18.3% had spent less than US$ 10 and may be using a non-standard helmet. A multicentre helmet study also found that only 46% of helmets had certification markers/stickers and, of these, 19% were not authentic.[46] Enforcement of helmet law may increase helmet use but everyone may not wear standard helmets, as found in an observational study conducted in Bengaluru city, where strong enforcement increased helmet use (64%) but only 53.7% were wearing standard helmets (full-face).[43] With enhanced enforcement, it would be important to ensure availability of standard helmets to meet increasing demands, as well as to prohibit the manufacture and sale of non-standard helmets.[46]

A major strength of this study is that it contributes to the limited literature related to methods for collecting road-safety data. The study has some limitations. Firstly, helmet observations were not conducted at night and helmet use may be different at night. Secondly, compared with the population of 7.7 million in Hyderabad city, with 11.8 million vehicles, the sample size of 606 for roadside interview is small and general application of the responses collected to the total population is difficult. Also, because of sociocultural and environmental differences, the results of this study might not be generalizable to other sites in India. The presence of police may also have influenced helmets observations, as some riders may have put their helmet on because they saw the police. Fourthly, any gender differences in helmet use cannot be determined, as the number of female respondents in the roadside interview was very small because the traffic personnel (mostly male) were less likely to stop women riders for interviews. In addition, in the population-based observational study, the gender of the motorcyclists was not recorded. Lastly, in the population-based observational study, helmet use could not be observed for some motorcyclists, because of high traffic volume.

This study highlights low helmet use among motorcyclists and pillion riders in Hyderabad. The discrepancy between observed and self-reported helmet use suggests that population-based observational studies can provide more valid information on helmet use. There is also a need for further study with a larger sample size, to determine predictors of discrepancy between observed and self-reported helmet use. The study also brings to light the different groups of helmet non-users and the need for a strategy that targets both demand- and supply-side factors to increase helmet use. The demand for standard helmets can be increased through enhanced enforcement and targeted social marketing, while supply and availability of standard helmets also need to be increased.

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REFERENCES

1. World Health Organization. Global status report on road safety 2013: supporting a decade of action. Geneva: WHO, 2013.
2. World Health Organization. Global status report on road safety: time for action. Geneva: WHO, 2009.
3. Gururaj G. Road Traffic Injury Prevention in India. Bangalore: National Institute of Mental Health & Neuro Sciences, 2006. Publication No. 56.
4. National Crime Records Bureau. Accidental deaths and suicides in India. New Delhi: National Crime Records Bureau, Ministry of Home Affairs, 2012.

5. Ministry of Road Transport and Highways. Road Accidents in India 2011. New Delhi: Government of India, Ministry of Road Transportation and Highways, Transport Research Wing, 2012.
6. Gururaj G. Road safety in India: a framework for action. Bangalore: National Institute of Mental Health and Neuro Sciences, Publication no. 83, 2011.
7. Mohan D. The road ahead: traffic injuries and fatalities in India. Transportation Research and Injury Prevention Programme (TRIPP), Indian Institute of Technology Delhi, 2004.
8. Government of Andhra Pradesh. Growth of vehicles. Government of Andhra Pradesh, Transport Department. http://www.aptransport.org/html/statistics_vehicles.htm - accessed 25 June 2015.
9. Government of India. Census of India 2011. Government of India, The Registrar General & Census Commissioner, India, New Delhi, Ministry of Home Affairs. http://www.censusindia.gov.in/2011-prov-results/paper2/data_files/AP/4-fig-6.pdf - accessed 25 June 2015.
10. Dandona R, Kumar GA, Raj TS, Dandona L. Patterns of road traffic injuries in a vulnerable population in Hyderabad, India. Inj Prev. 2006;12:183–8.
11. Government of Andhra Pradesh. Penalties. Government of Andhra Pradesh, Transport Department. http://www.aptransport.org/html/prosecution-11–03–10.pdf - accessed 25 June 2015.
12. International Labour Organization. ILOSTAT Database, Country Profile. http://www.ilo.org/ilostat/faces/home/statisticaldata/ContryProfileId?_adf.ctrl-state=rtfry8ttb_42&_afrLooP = 1485392152549666 - accessed 25 June 2015.
13. Buddi M. Why compulsory helmet rule not being implemented in city? The Times of India 12 Jan 2012. http://timesofindia.indiatimes.com/city/hyderabad/Why-compulsory-helmet-rule-not-being-implemented-in-city/articleshow/11643768.cms - accessed 25 June 2015.
14. Mareedu M. Hyderabadis say boo to helmet rule. The New Indian Express 2 Nov 2009. http://www.newindianexpress.com/cities/hyderabad/article125085.ece?service=print - accessed 25 June 2015.
15. Staff reporter. Policeman, buses stoned in old city. The Hindu. 23 May 2006. http://www.thehindu.com/todays-paper/policemen-buses-stoned-in-old-city/article3137077.ece - accessed 25 June 2015.
16. Staff reporter. MIM launches protest campaign. The Hindu. 28 May 2006. http://www.thehindu.com/todays-paper/tp-national/tp-andhrapradesh/mim-launches-protest-campaign/article3139402.ece - accessed 25 June 2015.
17. World Health Organization. Helmets: a road safety manual for decision-makers and practioners. Geneva: WHO, 2006.
18. Liu BC, Ivers R, Norton R, Boufous S, Blows S, Lo SK. Helmets for preventing injury in motorcycle riders. Cochrane Database Systematic Rev (Online). 2008(1).
19. Dandona L, Sivan YS, Jyothi MN, Bhaskar VSU, Dandona R. The lack of public health research output from India. BMC Public Health. 2004;4.
20. Barffour M, Gupta S, Gururaj G, Hyder AA. Evidence-based road safety practice in India: assessment of the adequacy of publicly available data in meeting requirements for comprehensive road safety data systems. Traffic Inj Prev. 2012;13:17–23.
21. Mishra BK, Banerji AK, Mohan D. Two-wheeler injuries in Delhi, India: a study of crash victims hospitalized in a neuro-surgery ward. Accid Anal Prev. 16:407–16.
22. Fitzharris M, Dandona R, Kumar GA, Dandona L. Crash characteristics and patterns of injury among hospitalized motorised two-wheeled vehicle users in urban India. BMC Public Health. 2009;9:11.
23. Jha N, Srinivasa DK, Roy G, Jagdish S. Injury pattern among road traffic accident cases: a study from south India. Indian J Comm Med. 2003;28:85–90.
24. Tiwari RR, Ganveer GB. A study on human risk factors in non-fatal road traffic accidents at Nagpur. Indian J of Public Health. 2008;52:197–9.
25. Swaroop M, Marie Siddiqui S, Sagar S, Crandall ML. The problem of the pillion rider: India's helmet law and New Delhi's exemption. J Surg Res. 2014;188:64–8.
26. Dandona R, Kumar GA, Dandona L. Risky behavior of drivers of motorized two wheeled vehicles in India. J Safety Res. 2006;37:149–58.
27. Siddiqui S, Arora S, Peipert J, Sagar S, Crandall M, Swaroop M. Survey of helmet influences of female pillions in New Delhi. J Surg Res. 2013;184:404–10.
28. Hyder AA, Allen KA, Di Pietro G, Adriazola CA, Sobel R, Larson K, et al. Addressing the implementation gap in global road safety: exploring features of an effective response and introducing a 10-country program. Am J of Public Health. 2012;102:1061–7.
29. Hyder AA, Allen KA, Peters DH, Chandran A, Bishai D. Large-scale road safety programmes in low- and middle-income countries: an opportunity to generate evidence. Glob Public Health. 2013:1–15.
30. StataCorp. Stata: Release 12. College Station, TX: StataCorp LP, 2011.
31. Armitage P, Berry G, Mathhews JNS. Statistical methods in medical research. 4th ed. Blackwell Science, 2002.
32. Sharma R, Grover V, Chaturvedi S. Health-risk behaviors related to road safety among adolescent students. Indian J Med Sci. 2007;61:656–62.
33. Özkan T, Puvanachandra P, Lajunen T, Hoe C, Hyder AA. The validity of self-reported seatbelt use in a country where levels of use are low. Accid Anal Prev. 2012;47:75–7.
34. Parada MA, Cohn LD, Gonzalez E, Byrd T, Cortes M. The validity of self-reported seatbelt use: Hispanic and non-Hispanic drivers in El Paso. Accid Anal Prev. 2001;33:139–43.
35. Nelson DE. Validity of self reported data on injury prevention behavior: Lessons from observational and self reported surveys of safety belt use in the US. Inj Prev. 1996;2:67–9.
36. Zambon F, Fedeli U, Marchesan M, Schievano E, Ferro A, Spolaore P. Seat belt use among rear passengers: Validity of self-reported versus observational measures. BMC Public Health. 2008;8.
37. Roehler DR, Sann S, Kim P, Bachani AM, Campostrini S, Florian M, et al. Motorcycle helmet attitudes, behaviours and beliefs among Cambodians. Int J Inj Contr Saf Promot. 2013;20:179–83.
38. Bachani AM, Tran NT, Sann S, Ballesteros MF, Gnim C, Ou A, et al. Helmet Use Among Motorcyclists in Cambodia: A Survey of Use, Knowledge, Attitudes, and Practices. Traffic Inj Prev. 2012;13:31–6.
39. O'Neill B, Mohan D. Reducing motor vehicle crash deaths and injuries in newly motorising countries. BMJ. 2002;324:1142–5.
40. Wåhlberg AEa, Dorn L, Kline T. The effect of social desirability on self reported and recorded road traffic accidents. Transp Res Part F: Traffic Psychol and Behav. 2010;13:106–14.
41. National Cancer Institute. Theory at a glance: a guide for health promotion practice. Bethesda MD: National Cancer Institute, 2005.
42. Sood S. Survey of factors influencing injury among riders involved in motorized two-wheeler accidents in India: a prospective study of 302 cases. J Trauma. 1988;28:530–4.
43. Gururaj G, Bangalore Road Safety and Injury Prevention Program Collaboration Group. Bangalore road safety and injury prevention program: results and learning 2007–2010. Publication No. 81. Bangalore: National Institute of Mental Health and Neuro Sciences, 2011.
44. Gururaj G. Head injuries and helmets: helmet legislation and enforcement in Karnataka and India. Bangalore: National Institute of Mental Health and Neuro Sciences, 2005.
45. Patel R, Mohan D. An improved motorcycle helmet design for tropical climates. Appl Ergon. 1993;24:427–31.
46. Ackaah W, Afukaar F, Agyemang W, Anh TT, Hejar AR, Abdul G, et al. The use of non-standard motorcycle helmets in low- and middle-income countries: a multicentre study: Road traffic injuries research network multicentre study collaborators. Inj Prev. 2013;19:158–63.

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