Factors affecting motorcycle helmet use in the population of Greater Athens, Greece

Alkistis Skalkidou, Eleni Petridou, Fotios C Papadopoulous, Nick Dessypris, Dimitrios Trichopoulos

Abstract

Objectives—Helmet use is the best preventive measure available against two wheel motorized vehicle (TWMV) related head injuries. In some countries, however, helmets are used only by a minority of TWMV riders. In collaboration with the Road Traffic Police Department, an inspection survey was undertaken to assess the prevalence and to determine predictors of helmet use.

Setting—The Greater Athens area, Greece, during July and August 1998.

Methods—A total of 982 TWMVs were stopped, 349 of which had two riders (36%). All riders were interviewed by staff members of the Centre for Research and Prevention of Injuries among the Young.

Results—The average prevalence of helmet use was 20.2%. It ranged from 9.7% on small suburban roads to 50.8% on highways. Prevalence of use was significantly lower during the weekend days and at night. Women were significantly more likely to wear a helmet and, controlling for gender, drivers were significantly more likely to be helmet users. Riders of more powerful TWMVs and passengers, who themselves had a TWMV driving license, were helmet users more frequently. Among non-users, the majority (46%) indicated that “the helmet made them feel uncomfortable”, particularly in warm weather, whereas 18% claimed that there was little need for a helmet in low speed riding.

Conclusions—A multipronged campaign is urgently needed in Greece to increase the prevalence of helmet use by TWMV riders. The campaign should include not only police enforcement but also initiatives to make helmets more convenient to wear and less expensive.

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Keywords: motorcycle helmet; motorcyclist; risk factor; road traffic accident

Mortality from road traffic injuries in Greece follows an upward trend, whereas in several European countries it has dramatically decreased.1 For example, Greece has had an average increase in annual two wheel motorized vehicle (TWMV) rider deaths of 8.8% per year from 1980 to 1993; in the United Kingdom and in Sweden, however, the corresponding percentages were −4.5% per year and −1.9% per year. Greece ranks second worst among other European countries with an annual road traffic injuries toll exceeding 2500 deaths per year.

The proportion of injuries caused during collisions that include TWMVs is very high, and also shows an upward trend, following the increasing number of licensed TWMVs. TWMVs include motorbikes, which possess engines of 50 cc or less, and motorcycles, which possess more powerful engines. Two wheel vehicles represent an inexpensive and easy to use means of transportation,2 both in the heavy traffic of large cities, notably Athens, and also in the isolated parts of Greek islands. The number of private TWMVs in 1997 was twice that of the corresponding number 10 years ago, while the number of private cars has increased by only 60% over the same period.

The majority of TWMV riders involved in road accidents are young people, who generally tend to adopt risky attitudes and behaviors.3–5 Many young TWMV users in Greece frequently ride without a helmet, even though helmet use has been mandatory both for TWMV drivers and passengers since 1977, possibly because of the inadequate enforcement of the law. The difficulty in enforcing a law which is massively resisted is widely known, but substituting “wearing” in place of the word “carrying”, should help the implementation of this law. Helmet use laws are well established as factors contributing to the high helmet wearing rates in many countries where the law is strictly enforced.6–11

No routine data for helmet use are available in Greece: according to traffic police injury data and everyday experience, the estimated prevalence of helmet use is extremely low, especially during the warm months of the year. Traffic police data indicate that among those who were killed in fatal crashes, the frequency of helmet use was 11%, whereas among those injured, the frequency of helmet use was higher, at 16%.

Helmet use has been shown to be highly effective in reducing the adverse outcomes of TWMV injuries12–17 and contributing to the reduction of health care expenses.18–23 From a nationwide study in Greece, it was estimated that if all TWMV riders were using safety helmets, some 200 deaths per year could have been avoided.24

This study attempts to estimate helmet use patterns in the Greater Athens area, and to determine factors affecting use of helmets, in order to propose evidence based means to address this important public health problem.

The population of the Greater Athens area
Factors affecting motorcycle helmet use

Table 1  Distribution of the 1331 interviewed TWMV riders by the use of helmet and studied variables; values are number (%)

<table>
<thead>
<tr>
<th>Variable</th>
<th>Use of helmet</th>
<th>p Value</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>Place of inspection</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Suburban roads</td>
<td>57 (9.7)</td>
<td>528 (90.3)</td>
</tr>
<tr>
<td>Main roads</td>
<td>79 (16.3)</td>
<td>405 (83.7)</td>
</tr>
<tr>
<td>Highways</td>
<td>133 (50.8)</td>
<td>129 (49.2)</td>
</tr>
<tr>
<td>Day of inspection</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Weekday</td>
<td>211 (21.3)</td>
<td>778 (78.7)</td>
</tr>
<tr>
<td>Weekend</td>
<td>58 (17.0)</td>
<td>284 (83.0)</td>
</tr>
<tr>
<td>Time of inspection</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Day</td>
<td>214 (23.5)</td>
<td>697 (76.5)</td>
</tr>
<tr>
<td>Night</td>
<td>55 (13.1)</td>
<td>365 (86.9)</td>
</tr>
<tr>
<td>Gender and position of TWMV rider</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Male driver</td>
<td>220 (23.8)</td>
<td>705 (76.2)</td>
</tr>
<tr>
<td>Male passenger</td>
<td>7 (6.4)</td>
<td>102 (93.6)</td>
</tr>
<tr>
<td>Female driver</td>
<td>14 (24.6)</td>
<td>43 (75.4)</td>
</tr>
<tr>
<td>Female passenger</td>
<td>28 (11.7)</td>
<td>212 (88.3)</td>
</tr>
<tr>
<td>Age (years)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>≤24</td>
<td>55 (23.6)</td>
<td>408 (76.4)</td>
</tr>
<tr>
<td>25–34</td>
<td>130 (24.1)</td>
<td>409 (75.9)</td>
</tr>
<tr>
<td>35–44</td>
<td>55 (25.4)</td>
<td>162 (74.6)</td>
</tr>
<tr>
<td>≥45</td>
<td>29 (26.0)</td>
<td>83 (74.0)</td>
</tr>
<tr>
<td>TWMV power capacity (cc)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>≤50</td>
<td>62 (14.3)</td>
<td>370 (85.7)</td>
</tr>
<tr>
<td>51–200</td>
<td>53 (12.6)</td>
<td>366 (87.4)</td>
</tr>
<tr>
<td>201–400</td>
<td>90 (31.8)</td>
<td>193 (68.2)</td>
</tr>
<tr>
<td>401+</td>
<td>64 (32.5)</td>
<td>133 (67.5)</td>
</tr>
<tr>
<td>Age of the TWMV (years)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>0–1</td>
<td>95 (17.9)</td>
<td>439 (82.1)</td>
</tr>
<tr>
<td>2–5</td>
<td>93 (21.6)</td>
<td>337 (78.4)</td>
</tr>
<tr>
<td>6–9</td>
<td>43 (20.9)</td>
<td>163 (79.1)</td>
</tr>
<tr>
<td>10+</td>
<td>38 (23.2)</td>
<td>126 (76.8)</td>
</tr>
<tr>
<td>Consider helmet useful in reducing risk</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>235 (21.8)</td>
<td>843 (78.2)</td>
</tr>
<tr>
<td>No</td>
<td>34 (13.4)</td>
<td>219 (86.6)</td>
</tr>
<tr>
<td>Issue year of the driving licence</td>
<td></td>
<td></td>
</tr>
<tr>
<td>No driving licence</td>
<td>32 (9.7)</td>
<td>299 (90.3)</td>
</tr>
<tr>
<td>&lt;1990</td>
<td>119 (27.2)</td>
<td>319 (72.8)</td>
</tr>
<tr>
<td>1990–1995</td>
<td>66 (22.8)</td>
<td>224 (77.2)</td>
</tr>
<tr>
<td>1996+</td>
<td>52 (19.1)</td>
<td>220 (80.9)</td>
</tr>
</tbody>
</table>

*p Value derived from χ² test with (n-1) degree of freedom; †p value derived from χ² test with 1 degree of freedom; ‡p value derived from trend test.

According to the census of 1991 is approximately four million—that is, 40% of the total Greek population.

Methods

An inspection survey of helmet use was conducted in July and August 1998. July and August are usually the hottest months in Greece. Teams consisting of one of three trained interviewers, staff members of the Centre for Research and Prevention of Injuries among the Young (CEREPRI) and one road traffic policeman were chosen by simple random sampling, given the different traffic density in the road system of the Greater Athens area. During the survey, 982 TWMVs were stopped and all 1331 involved TWMV riders were interviewed. After the TWMV was stopped, the interviewer ascertained helmet use by the TWMV riders and completed a structured questionnaire with a few open ended questions concerning basic sociodemographic data as well as vehicle related variables. The interview ended with recommendations for helmet use at all times. In no instance were the riders fined for non-use of helmet or any other road traffic violation during this survey.

For the analysis, simple cross tabulations were initially used; subsequently the data were modeled through multiple logistic regression to evaluate factors affecting helmet use, controlling for possible confounding by other variables.25 26

Results

Table 1 presents the distribution of the 1331 TWMV riders by helmet use and, alternatively, by a series of the studied variables. These data incorporate confounding and should be interpreted with caution. Overall, only 20.2% of TWMV riders were using helmets of any type. The prevalence of use ranged from 9.7% on small suburban roads to 50.8% on highways. Older and female TWMV riders appeared to be more frequent helmet users, as are riders of TWMVs with higher engine capacity. There is also some evidence that helmet use is more frequent during day rather than night hours and during weekdays rather than weekends. There were very few unlicensed drivers (4%) but a substantial number of passengers were unlicensed (82%) and they were less likely to use a helmet compared with those who were licensed. A considerable proportion of riders (19%) claimed that use of a helmet increased rather than decreased the risk of an injury by reducing their field of vision, creating discomfort, etc.

Table 2 presents multiple logistic regression derived odds ratios for helmet use associated with a series of potential risk factors. This table allows a better assessment of mutually independent associations between several variables, on the one hand, and helmet use on the other. The odds for helmet use were 10 times higher in highways in comparison with small suburban roads. During the weekends and night hours the prevalence of helmet use was significantly lower. Passengers were less likely than drivers to wear helmets and, after controlling for riding position, the odds of a woman using a helmet were almost twice those of a man. Riders of larger engine capacity TWMVs were...
explained by minor biases. The overall results were too striking to be
conditioned sense but all our results were presented representative estimates in the strict statistical sampling method used did not generate patterns of non-use should allow rational plan-
results was unexpected, the extremely low incidence of injuries among TWMV riders—are likely to benefit most from the application of respective preventive measures. Therefore, they are highly motivated to adopt the proposed preventive measures. Nevertheless, the attributable risk, which best reflects a public health problem, is mostly contributed to by the far larger number of those who are at moderately increased risk—in this instance, medium speed TWMV riders in city conditions. In our study, more than 50% of those riding in highways were using a helmet, whereas the prevalence of helmet use was less than 15% among the far larger number of TWMV users riding in main city and suburban roads. A subst-
tutional rate for campaigns or measures targeting extensive helmet use by TWMV riders. The results and the conclusions derived from studying these factors provide the necessary documentation for the priorities for campaigns or measures targeting extensive helmet use by TWMV riders. In addition, personal complaints, such as those concerning the field of vision, hearing ability, or hairstyle, should be taken into account. Reasons for non-use of helmets are revealing. Helmets have been primarily and exten-
sively used in North American and Northern European countries, so that their design did not take into account the hot weather conditions prevailing in the Mediterranean countries. Moreover, most TWMV riders in Greece ride small engine capacity mopeds, which are relatively inexpensive. For the young and financially stressed TWMV rider, it may appear irrational to pay an extra 20% to purchase a standard helmet in addition to the light TWMV he has just managed to buy, or to even think about replacing the helmet accord-
Epidemiology and preventive medicine have been criticized for having gradually lost their

Discussion
This study has several advantages. The sample was reasonably large and designed to be representative. There were essentially no refus-
als and the information elicited during the interviews allowed for a better documentation of factors affecting the use or non-use of helmets in comparison with simple observa-
tional surveys. Moreover, the study was the first of its kind undertaken in Greece. It illustrates a major public health problem that underlies the high incidence of injuries among TWMV riders in this country. Although none of the results was unexpected, the extremely low prevalence of use, and the quantification of the patterns of non-use should allow rational planning of measures to increase use of these protective devices. It is possible that the sampling method used did not generate representative estimates in the strict statistical sense but all our results were presented conditioned on the possible selection factors (age, gender, type of road, etc) and moreover, the overall results were too striking to be explained by minor biases.

It has been established that helmets provide considerable protection in TWMV crashes. In a study in Greece, the risk of death associated with helmet use was reduced by 36%. The high relative risk for injuries during TWMV crashes, associated with helmet non-use, generates a high attributable risk, because transportation by TWMVs is so common. Moreover, TWMV use is increasing in Greece, particularly in large cities, such as Athens, but also in the isolated parts of Greek islands and other urban settings. There are currently some 600 000 motorbikes in Athens, mostly of small engine capacity and mostly used by younger people. It is said that when the Scandinavian countries have succeeded in achieving almost universal use of helmets by TWMV riders, and are now trying to extend the use of helmets to bicyclists as well, the use of helmets among TWMV riders in Greece is limited to fewer than a quarter of TWMV riders, at least during the hot summer months of July and August.

Several years ago Geoffrey Rose pointed out a public health paradox. Those relatively few people at high risk for an untoward event—be it stroke among those with high blood pressure, heart attack among those with very high concentrations of blood cholesterol, or head injuries among high speed TWMV riders—are likely to benefit most from the application of respective preventive measures. Therefore, they are highly motivated to adopt the proposed preventive measures. Nevertheless, the attributable risk, which best reflects a public health problem, is mostly contributed to by the far larger number of those who are at moderately increased risk—in this instance, medium speed TWMV riders in city conditions. In our study, more than 50% of those riding in highways were using a helmet, whereas the prevalence of helmet use was less than 15% among the far larger number of TWMV users riding in main city and suburban roads. A substantial fraction of injuries and deaths could be avoided if the latter group was targeted with the same intensity.

The results of this investigation also highlight other important problems. The likelihood of helmet use is lower during weekends, when many crashes occur, and during the night hours, when the severity of these injuries is generally higher. Male drivers and passengers are more frequently risk takers in comparison with their female counterparts, whereas those with a TWMV driving license and/or understanding of the function of a helmet are more likely to use one. The results and the conclusions derived from studying these factors provide the necessary documentation for the priorities for campaigns or measures targeting extensive helmet use by TWMV riders. In addition, personal complaints, such as those concerning the field of vision, hearing ability, or hairstyle, should be taken into account. Reasons for non-use of helmets are revealing. Helmets have been primarily and extensively used in North American and Northern European countries, so that their design did not take into account the hot weather conditions prevailing in the Mediterranean countries. Moreover, most TWMV riders in Greece ride small engine capacity mopeds, which are relatively inexpensive. For the young and financially stressed TWMV rider, it may appear irrational to pay an extra 20% to purchase a standard helmet in addition to the light TWMV he has just managed to buy, or to even think about replacing the helmet according to the indicated date of expiration.

Epidemiology and preventive medicine have been criticized for having gradually lost their
social origin and public health perspective. This may or may not be generally true but there are some situations in which it certainly is. Mortality and morbidity from TWMV injuries are major public health problems in many countries, including Greece and other Mediterranean countries. Thus, it is sad to realize how little attention TWMV injuries have received in the mainstream epidemiologic research. Our results indicate that there is an urgent need for a multipronged campaign in Greece to increase the prevalence of helmet use by TWMV riders. The campaign should include not only police enforcement but also initiatives to make helmets more convenient to wear and less expensive.

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