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A cross-sectional observational study of helmet use among motorcyclists in Wa, Ghana

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ABSTRACT

Motorcyclists' injuries and fatalities are a major public health concern in many developing countries including Ghana. This study therefore aimed to investigate the prevalence of helmet use among motorcyclists in Wa, Ghana. The method used involved a cross-sectional roadside observation at 12 randomly selected sites within and outside the CBD of Wa. A total of 14,467 motorcyclists made up of 11,360 riders and 3107 pillion riders were observed during the study period. Most observed riders (86.5%) and pillion riders (61.7%) were males. The overall prevalence of helmet use among the observed motorcyclists was 36.9% (95% CI: 36.1–37.7). Helmet use for riders was 45.8% (95% CI: 44.8–46.7) whilst that for pillion riders was 3.7% (95 CI: 3.0–4.4). Based on logistic regression analysis, higher helmet wearing rates were found to be significantly associated with female gender, weekdays, morning periods and at locations within the CBD. Riders at locations outside the CBD were about 7 times less likely to wear a helmet than riders within the CBD (48.9% compared to 42.3%; $\chi^2_{(1)} = 49.526$; $p < 0.001$). The study concluded that despite the existence of a national helmet legislation that mandates the use of helmets by both riders and pillion riders on all roads in Ghana, helmet use is generally low in Wa. This suggests that all stakeholders in road safety should jointly intensify education on helmet use and pursue rigorous enforcement on all road types especially at locations outside the CBD to improve helmet use in Wa.

1. Introduction

Motorization rates are increasing globally particularly in developing countries. Along with this growing motorization levels, the ownership and use of motorcycles and other two-wheelers is increasing in many countries and relatively high in most low-income and middle-income countries. Motorcycles account for 95% of vehicles in Vietnam (Hung et al., 2006), 67% of vehicles in Taiwan (Chang and Yeh, 2007), 63% and 69%, respectively, of all motor vehicles in China and India (Khan et al., 2008) and 52% in Nigeria (Oluwadiya et al., 2009).

The increased use of motorized two-wheeled vehicles is accompanied by an increase in road fatalities and injuries among their users, with head and neck injuries being a major concern as they are the main cause of severe injury, disability and even death among motorcycle users (WHO, 2006). It is estimated that motorcyclists constitute a third of all traffic fatalities in South East Asia and are also currently increasingly represented among road deaths in Africa and the Americas. Head injuries are estimated to be responsible for up to 88% of motorcycle user fatalities (WHO, 2013). Motorcycles are thus regarded as the most dangerous form of motorized transport (Huang and Preston, 2004; Elliott et al., 2007). Per vehicle mile travelled in the US, motorcycles have estimated fatality rates 35 times and injury rates 8 times that of automobile occupants (NHTSA, 2007).

The safety benefits of correctly using a standard motorcycle helmet are well documented in literature. Helmets are regarded as the single most effective way of reducing head injuries and fatalities resulting from motorcycle crashes (WHO, 2006). From a review of several studies, Liu et al. (2009) concluded that motorcycle helmets are effective in reducing the risk of head injuries in a motor vehicle crash by about 69% and death by around 42% (Liu et al., 2009; Keng, 2005). According to NHTSA (2008), motorcyclists who do not wear helmets are 40% more likely to suffer a fatal head injury and 15% more likely to suffer a non-fatal injury than a helmeted motorcyclist. Dee (2009) concluded that crash helmets reduce fatality risk by 34% whilst Xuequn et al. (2011) asserted that unhelmeted motorcyclists in Taiwan are 4 times more likely to suffer head injuries during a crash and 10 times more likely to have brain injuries compared to helmeted motorcyclists. Servadei et al. (2003) alluded that introducing and effectively enforcing legislation on helmet use can increase helmet-wearing rates to over 90% and thus reduce head injuries. These benefits notwithstanding,

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helmet wearing rates among motorcyclists remain low in developing countries (Kulanthayan et al., 2000; Hung et al., 2006; Ackaah and Afukaar, 2010; Sreedharan et al., 2010; Ali et al., 2011).

Motorcycles play an important role in Ghana's transportation system, particularly in Northern Ghana where they are the most popular mode of transport for both humans and goods. As a result of their low cost, convenience, and ability to manoeuvre on congested roads, motorcycles are also becoming commonly used for commercial passenger transport in major cities in Ghana although they are not an authorized means of public transportation. Motorcycle accidents are a major cause of out-patient attendance and admissions in most hospitals and health centres in the northern Ghana (Kudebong et al., 2011). According to the National Road Safety Commission (NRSC), motorcyclist fatalities accounted for 14.2% of road accident deaths in Ghana in 2011, an increase over the 2001 figure of 2.7%. Motorcycle fatalities are more pronounced in the three regions of northern Ghana. In 2010, motorcycle user fatalities represented 23.6% of traffic fatalities in the Tamale Metropolis, 54.8% in the Wa Municipality and 36% of fatal accidents in the Bolgatanga Municipality (NRSC, 2011).

In Ghana, it is common to find both riders and the pillion riders (passenger) riding without wearing helmets even though there is a legislation requiring the use of helmets by both riders and pillion riders. As a result, in the event of an accident the risk of obtaining head injuries are high whereas the risk could be reduced if they wear crash helmets. Reported accidents in the Upper West Region which has Wa as its capital town indicate that at least an unhelmeted motorcycle rider is seriously injured every fortnight and the number of motorcycle injuries has reportedly increased in recent times. Despite these statistics and the existence of helmet legislation in Ghana, the rate of helmet use in the Wa Township is unknown. Limited scientific studies have investigated the prevalence of helmet use among motorcyclists in Ghana. The existing studies (Ackaah and Afukaar, 2010) focused on the helmet use in the largest city in Northern Ghana, Tamale with none conducted in the Wa Township, one of the fastest growing towns in northern Ghana. The aim of this study therefore is to investigate the prevalence of helmet use among different categories of motorcyclists in Wa since evidence-based traffic injury prevention interventions are considered a public health priority in developing countries. By measuring the prevalence of helmet use among various categories of motorcyclists, this study can help in the formulation of evidence-based recommendations for the design of more effective educational programs about helmet wearing as well as enforcement of helmet legislation in growing cities in developing countries. This is particularly important in the light of the renewed interest by the National Road Safety Commission to reduce fatalities and injuries to motorcyclists in the Upper West Region.

2. Methods

The methodology used for the study involved cross-sectional observations in which research assistants observed motorcyclists travelling or stopping along selected routes within and outside the Central Business District (CBD) of Wa at pre-determined time periods. Wa doubles as the capital town of the Wa Municipal Assembly and the regional capital of the Upper West Region of Ghana. It has population of 78,993 (Ghana Statistical Service, 2010) and is one of the major towns in Northern Ghana where motorcycles are a major mode of transport. To select observation sites, all possible observation locations and routes leading to the city centre in the study area were first identified and categorized into two: locations within the CBD of Wa ($\geq$ 1 km) and locations outside the CBD of Wa (>1 km). Observation sites were then selected from these two categories based on the following eligibility criteria: the site is deemed safe for the research assistants/observers; the site is in a location where motorcyclists significantly slowed or stopped for example roundabouts, junctions, traffic calming areas and signalized intersections so as to enable observations to be undertaken; and the location should be along a route that was frequented by motorcyclists. A total of 12 sites (6 within the CBD and 6 outside the CBD) that met all the outlined criteria were then selected from the pool of all eligible locations using a random selection process.

At each site, observations were conducted on two week days and one weekend on the 5th, 7th and 8th of June, 2013 at three different time periods each lasting 1 h (8–9 a.m.; 12–1 p.m. and 4–5 p.m.) to account for variations in helmet use during the different time periods as well as during the week day and during the weekend. To reduce the likelihood of having one particular motorcyclist observed multiple times at the same location, observers remained at each site for at most 1 h so as to reduce manifold observations of a single motorcyclist. The average minimum and maximum daily temperature ranged between 25 °C and 35 °C during the days the study took place. At each observation site, two observers/research assistants, each responsible for observing a different direction of traffic flow made the observation and recorded on a standard data recording form as motorcyclists slowed down or stopped at the predetermined observation sites. Both the rider and pillion rider/passenger (if present) constituted the units of observation. Data were collected on helmet use status, sex, the location (Within CBD and Outside CBD), the start and end times of the observation, date and day of the week and the travel direction of both the rider and pillion rider (if present). Prior to the commencement of the observation sessions, the observers/research assistants were trained in the observation methodology and the type of data to be gathered. There was consensus on all observation methodology and data to be gathered except for age estimates. As a result, age was not included as a key variable.

Data collected was managed and analysed using SPSS (Version 20). Both descriptive and inferential statistics were used to analyse the survey data and interpret relationships between variables of interest. Cross tabulations were done to determine helmet use among variables such as sex, location, time of day and day of the week. In addition, Pearson chi-square test (χ^2) for independence was also used to determine whether the differences between observed and expected frequencies were statistically significant. p-values less than 0.05 were defined to be statistically significant. In addition, logistic regression analysis was used to calculate odds ratios (OR), adjusted odds ratios (AOR), and 95% confidence intervals (CI) for variables associated with helmet use. Helmet use was treated as a dependent variable with the variables defined to be 'yes' and 'no' whilst gender (Male, Female) observation site (Within CBD, Outside CBD), time of day (Morning, Afternoon, Evening) and day of the week (Weekday, Weekend) were treated as independent variables.

3. Results

A total of 14,557 motorcyclists were observed at the 12 observation sites during the study period. Analysis was however conducted on 14,467 motorcyclists that had complete data recorded. Out of the 14,467 motorcyclists observed, 11,360 were riders whilst 3107 were pillion riders (passengers). Most observed riders (86.5%) and pillion riders (61.7%) were males. Up to 73.5% (8349) riders had no pillion rider, 2967 (26.1%) had one pillion rider whilst 44 (0.4%) riders had two or more pillion riders. As shown in Table 1, the majority of riders (67.9%) and pillion riders (72%) were observed during the weekday. Fifty four percent of pillion riders were observed within the CBD whilst 46% were observed outside the CBD.