BRIEF REPORT

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Should Traffic Offenders Undergo Compulsory "Mental Test": A Study of Mental Health and Crash Involvement Among Commercial Motorcyclists in Ibadan, Nigeria?

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Abstract

Government policies on commercial motorcycle crash prevention are often not driven by data in terms of mental health risks. In this cross-sectional study, data was obtained from 508 commercial motorcyclists (CMs) in Ibadan, Nigeria on psychological distress, personality, suicidality, impulsivity, substance use and Intelligence Quotient, to determine the mental health correlates of road crash involvement. One-month and 12-month accident rates were 7.9 and 28.9% respectively. One-month crash involvement was independently associated with helmet non-use (OR 2.2, 95% CI 1.1–4.7, p = 0.03) and poor knowledge of road signs (OR 2.5, 95% CI 1.2–5.3, p = 0.02). The odds of 12-month crash involvement was increased among lifetime users of alcohol (OR 2.0, 95% CI 1.3–3.0, p = 0.001) and those with fewer than two children (OR 2.0, 95% CI 1.2–3.3, p = 0.006), but was reduced among riders with primary school education (OR 0.2, 95% CI 0.1–0.7, p = 0.007). Crash involvement rate in this population is high. Results from the study do not support routine psychiatric evaluation for traffic offenders, but are more in favour of safety education and traffic law enforcement.

Keywords Road traffic crash · Commercial motorcyclists · Mental health · Accident prevention · Nigeria

Introduction

Commercial motorcycles are a major means of transportation in many low and middle income countries (International Road Federation 2011) but they also account for up to 80% of injuries and up to 90% of deaths that occur in road traffic accidents in some of these countries (Santikarn et al. 2002). According to the World Health Organisation (WHO 2013), Nigeria has the highest accident fatality rate within the African sub region at 33.7 per 100,000 population per year, and the country is therefore a good model for understanding road crashes among commercial motorcyclists (CMs).

Although aetiology of road crashes are complex and multifactorial, human factors, either alone or in combination with other factors (motorcycle and environmental factors), have been shown to contribute up to 95% of all crashes, thus emphasizing the immense benefit of studying the motorcycle rider himself (Sabey and Taylor 1980). Factors reported to be associated with motorcycle accidents include younger age of the rider, alcohol use (Adogu et al. 2009; Oluwadiya 2010; Owoaje et al. 2005; Silva et al. 2012), over speeding/impatience, inexperience, the use of the motorcycle for private or company transport (Oluwadiya 2010; Silva et al. 2012), low level of education, visual impairment (Owoaje et al. 2005), operating part time, earning below minimum wage on the job and being unaware of the Highway Code (Arosanyin et al. 2013). The National Road Traffic Regulations (Federal Republic of Nigeria 2004) addresses many of these findings, as well as issues related to motorcycle use and licencing. However some jurisdictions within Nigeria have also adopted other policies such as psychiatric evaluation for

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traffic offenders, including CMs (Lagos State of Nigeria 2012). Apart from the fact that, to the knowledge of the authors, this is not based on any empirical data on mental health determinants of road crashes in Nigeria, there is also the potential that such policies could be misapplied or lead to stigma and discrimination against the mentally ill.

Mental health considerations feature in accident prevention because driving and riding are complex activities that require a lot of cognitive input. Mental illnesses can impair several domains of mental functioning such as perception, information processing, attention and concentration, impulse control, judgement, planning, organisation and motor coordination. Also certain diagnosable mental illnesses such as adult onset ADHD and personality disorders, especially antisocial personality disorder, have been linked with road crash liability (El Farouki et al. 2014; Sadeghi-Bazargani et al. 2015) and increased risk of traffic violations (Kieling et al. 2011) among motorcyclists. Psychoactive substances, by virtue of their propensity to cause impairments in cognitive and motor functions, especially with binge drinking and intoxication, have also been associated with motorcycle crash occurrence. Regardless of the method of ascertainment, several studies have reported associations between crash involvement and psychoactive substance use, especially alcohol, among CMs in this environment (Alti-Muazu and Aliyu 2008; Oladele et al. 2012; Owoaje et al. 2005) and elsewhere (Bastos et al. 2005; Kasantikul et al. 2005; Lardelli-Claret et al. 2005). A second potential link between road crashes and mental health is via the concept of risk taking. Risk-taking connotes 'consciously or non-consciously controlled behaviour' with a perceived uncertain outcome and possible costs in terms of physical, economic or psycho-social well-being of the risk taker or others (Trimpop 1994). The term has been used to link, conceptually, a number of health damaging behaviours such as psychoactive substance use, reckless driving and neglect of safety measures. There is a significant correlation between use of safety measures and safe riding behaviour (Farris et al. 1997).

Irrespective of the angle it is viewed from, impairment in mental status often manifest in abnormal or risky riding behaviours which increase the risk of road crashes and may lead the lay public and policy makers to prescribe psychiatric evaluation for road traffic offenders. Unfortunately, such behaviours can also be the product of ignorance, incorrect beliefs and attitudes to safety, that are amenable to less extreme interventions. It is therefore important to determine if indeed persons with mental illnesses are over represented among commercial motorcyclists in Nigeria and, taken within the context of other human and machine factors, if these mental health problems are important enough in road crash causation to warrant widespread routine psychiatric evaluation. This is the focus of the current study.

Methods

Study Site and Design

This was a cross-sectional study conducted in Ibadan metropolis, Oyo State. Ibadan is the capital of Oyo state, Nigeria. The city is located in the south-western part of the country, 128 km inland northeast of Lagos and 530 km southwest of Abuja, the federal capital. Ibadan metropolis is comprised of 11 local government areas (LGAs) and has a population of over 2.5 million (RUAF foundation 2010).

Sampling Method

Systematic stratified sampling method was used to sample 509 CMs from four enumeration areas selected from LGAs in Ibadan metropolis. The first stage involved classifying all 11 LGAs into urban and semi-urban each based on State fund allocation (Ibadan Development Association 2018). The second stage was the selection of a local government randomly from each group. There were 2016 enumeration areas in the two LGAs, out which about 120 hosted a motorcycle union unit. Two of these units per LG were then randomly selected at the third stage, making a total of four union units. Each of the units had approximately 150 registered CMs. All consenting CMs in the four units were then recruited into the study and interviewed. The lone female cyclist was excluded from statistical analyses, for ease of generalisation of the results, leaving a total of 508 male CMs.

Instruments

Data was collected using the following instruments:

Socio-demographic Questionnaire

This was designed by the investigators and was in three parts, namely: (1) Socio-demographic and family variables; (2) variables related to motorcycle operations and (3) knowledge and beliefs about accidents and safety, as well as safety practices. An "accident" was defined as a fall of one or both the rider and passenger, a derailing of the motorcycle from the road leading to injury of rider and/or passenger; collision with a pedestrian, another motorcyclist, vehicle or other stationary or moving objects.

General Health Questionnaire (GHQ-12)

GHQ-12 is a self-administered, brief, easy to complete 12-item questionnaire used to assess minor mental illnesses or general psychological distress in the general population and within community or non-psychiatric clinical settings (Goldberg and Williams 1988). The GHQ-12 gives a total score of 12 using the recommended bi-modal scoring system (0–0–1–1). The Yoruba version of the GHQ-12, with the above-mentioned scoring system, was used in this study. Individuals scoring a total greater or equal to the cut-off of 2 were regarded as cases.

Standardized Assessment of Personality Abbreviated Scale (SAPAS)

This is a brief questionnaire that consists of eight dichotomously rated items, employed in screening for personality disorders (Moran et al. 2003). Each of the eight items describes a person's attitude, behaviour or habit, and is scored 0 or 1 for a "No" or a "Yes" response, respectively. The scores are then added to give a maximum score of 8 and a minimum of 0. SAPAS has been validated in this environment (Ojediran et al. unpublished data), and has been found to have good sensitivity and specificity at the cut off of 3 as earlier reported by the authors of the instrument (Moran et al. 2003).

Mini International Neuropsychiatric Interview (MINI), Version 6 (Suicidality and Antisocial Personality Modules)

The suicidality and antisocial personality modules of this tool were used to assess the respective psychological concepts in this population (Sheehan et al. 2010). The suicidality module consists of items on suicidal ideation, plan and attempt, each scored from 0 to 9, all totalling up to a maximum of 17 points. A total score of 1–8 denotes low suicidality, 9–16 moderate suicidality and 17 or greater, high suicidality. In this study, because of the low basal rates of suicidal behaviour, moderate to high suicidality were merged for ease of analysis. The antisocial personality module consists of items arranged in an algorithm that leads directly to the diagnosis of antisocial personality disorder.

Barratt Impulsiveness Scale (BIS-) 11 (Patton et al. 1995)

The Barratt Impulsiveness Scale (BIS-) 11 is a self-reported, 30 item questionnaire that measures impulsivity on three domains: non-planning, attention and motor. Each item is answered on a 4-point scale. Items are scored 1, 2, 3, and 4; with 1 indicating the least impulsive and 4 indicating the most impulsive response. Higher level of impulsiveness corresponds to higher summed score for all items on the questionnaire. Response sets are avoided by wording some of the items in the reverse to indicate non-impulsiveness, and the responses are reverse-coded accordingly. The total sum is then computed for each respondent.

The Alcohol, Smoking and Substance Involvement Screening Test (ASSIST)

The alcohol, smoking and substance involvement screening test (ASSIST) was developed for screening for alcohol and other psychoactive substances, as well as for managing psychoactive substance-related problems in primary care and general medical care setting (World Health Organisation 2010). It provides data on current and lifetime use of alcohol, tobacco, Amphetamines, Inhalants, Sedatives, and Hallucinogens. ASSIST has been reported to be valid, reliable and cross-culturally relevant (World Health Organisation 2010).

Ravens Progressive Matrices (RPM)

The RPM is a widely used, culture fair nonverbal test that measures abstract thinking, deductive reasoning, visuo-spatial reasoning, and general intelligence (Raven 1958). It consists of 60 multiple choice questions arranged in five sets of 12 items each, with items within a set becoming increasingly difficult and requiring increasing cognitive ability to encode and analyse information. In each test item, the subject is asked to identify the missing component that completes a pattern. The scores are then classified based on percentile scores into grades I–V, corresponding to "intellectually superior", "above average intellectual capacity", "intellectually average", "below average intellectual capacity", and "intellectually defective" respectively. RPM has been validated for use for Nigerian children (Ogunlade 1978) and has also been widely used to assess cognitive functions in this environment (Boyede et al. 2013; Daramola et al. 2010). The tool was considered appropriate for this sample because of the respondents anticipated low level of education and because it is non-verbal in nature.

Visual Acuity Test

Visual acuity of the respondents was assessed using the Snellen's chart, which consists of about 11 rows of capital letters that are not arranged in a recognisable order, with letters in each row growing progressively smaller down the rows.

All relevant instruments were translated into Yoruba, the predominant language of the inhabitants of the study area.

Procedure

Before the study participants were approached, chairmen of the central National Union of Road Transport Workers (NURTW), Motorcycle section, and the various branch and unit chairmen, as well as the representatives of the CMs within the study areas were met and the objectives of the study described to them. They were then encouraged to inform their members so as to work out the modalities of the study. Consenting respondents (who showed up for interview after being informed by their chairmen and signed written informed consent) were interviewed, with as much privacy as possible, by psychiatry residents and trained research assistants with a minimum of Master's Degree in public health. The visual acuity test was carried out in a separate booth by trained nurses. Participants were compensated with souvenirs. The nature of the souvenirs had earlier been agreed upon with the union chairmen and representatives. Participants also had free blood pressure check and referral for further assessment if indicated.

Analyses

The data generated was entered into computers and then analysed using the Statistical Package for the Social Sciences (SPSS), version 23 software. Frequencies and cross tabulation of variables were generated. The prevalence of mental disorders, including substance use and personality disorders, and socio-demographic variables were assessed using descriptive statistics. The relationship and significance of association between self-reported accidents on the one hand, and other independent variables were tested with Chi square test, and emerging associations further tested with logistic regression. Statistical significance was set at $p < 0.05$ for all analyses. However, only variables that were significantly associated with accidents at $p < 0.01$ at bivariate analysis were further explored in the multivariate model to avoid exceeding ten independent variables per outcome variable.

Results

Demographic Characteristics

A total of five hundred and nine CMs participated in the study. Only one respondent was female and was excluded from further analyses. Mean age of the respondents was 33.5 ± 9.0 years. Majority of them (85.8%) were married while the rest were single, separated or divorced. Four hundred and sixty-two (91%) had up to secondary school education, 28 (5.5%) had post-secondary education, and 18 (3.5%) had no formal education. Concerning the primary trade of the respondents, three hundred and six (60.2%) claimed they were artisans, 146 (28.7%) were traders, 48 (9.4%) were in other skilled professions while the rest (1.6%) had no primary profession. Majority of the respondents (93.7%) reported underemployment as the main reason for engaging in commercial motorcycling.

Accident Rates

One hundred and forty seven (28.9%) of the CMs had been involved in at least one accident in the 12 months preceding the study. Forty (7.9%) of the respondents reported that their accidents occurred in the 30 days preceding the study.

Mental and Physical Health Profile

The prevalence of lifetime substance use among the respondents was 53%. Alcoholic beverages (48.9%) and Tobacco (21.8%) were the leading psychoactive substances reported among lifetime users, with cannabis being a distant third (8.4%). Current use of any substance was 35.8%. Alcoholic beverages (32.6%), tobacco (11.6%) and cannabis (4.5%) were the most commonly used psychoactive substances currently.

About a third (29.5%) of the respondents screened positive for psychological distress and 2.2% of them had suicidality scores within "moderate" to "high" range while the rest had scores in the low range. Concerning the respondents personality attributes, 29.5% screened positive for any personality disorder while 1.4% met the criteria for antisocial personality disorder. The mean score on BIS was 54.2 ± 7.08, with 48.9% of the respondents scoring below the median score while the rest had the median score or above.

Of the 435 respondents who completed the Raven's Progressive Matrices for Intelligence Quotient measurement (IQ), 13% had "above average" IQ, 95 (21.8%) "average IQ", 120 (27.6%) "below average IQ" and the rest 207 (47.6%) had "defective IQ". Also, of the 478 respondents who consented to visual acuity measurement, 4.5% had impaired vision in at least one eye, while 2.0% had impaired vision in both eyes.

Bivariate Associations

Socio-demographic Characteristics

Bivariate analyses showed that involvement in road crashes in the previous 12 months were associated with age ($p = 0.002$), marital status ($p = 0.012$), number of children ($p < 0.001$) and educational status ($p = 0.008$), while crash involvement in the previous 1 month was

significantly associated with age (p = 0.001), educational status (p = 0.008), number of children (p < 0.001) and average daily income (p = 0.011).

Mental and Physical Health Variables

The proportion of CMs who had been involved in accidents in the previous 12 months was significantly higher among lifetime users of any substance (p = 0.011), lifetime tobacco users (p = 0.04) and lifetime alcohol users (p = 0.006). The proportion of respondents who reported being involved in crashes in the previous 1 month was also significantly higher among current users of any substance (p = 0.01) and current alcohol users (p = 0.02). Commercial motorcyclists who had been involved in crashes and those who had not been involved in one in the previous 12 and 1 month respectively did not differ significantly in terms of psychological distress, suicidality, personality disorders generally, antisocial personality disorder, impulsivity, intelligence quotient and visual impairment status.

Motorcycle Operations Characteristics

Incidence of accidents in the previous 12 months was significantly higher among CMs who had no prior training before riding commercially (p = 0.02). Accident in the previous 12 months was also significantly associated with the make of the motorcycle of the CMs. There were no significant associations between crash involvement in the previous 1 month and any of the motorcycle operation characteristics.

Knowledge, Beliefs and Practices

In the previous 12 months, crash involvement was significantly associated with non-use of helmets (p = 0.001) and frequent passenger complaints about the CMs' riding behaviour (p = 0.019). Also, self-reported crash in the previous 1 month was associated with self-reported lack of knowledge of road signs (p = 0.002), lack of knowledge of the Highway Code (p = 0.018), non-use of helmet (p < 0.001) and passenger complaints on CMs' riding behaviour (p = 0.03).

Multivariate Analysis

Results of logistic regression showed that 1-month crash involvement was independently associated with helmet non-use (OR 2.2, 95% CI 1.1–4.7, p = 0.03) and poor knowledge of road signs (OR 2.5, 95% CI 1.2–5.3, p = 0.02). The odds of 12-month crash involvement was increased among lifetime users of alcohol (OR 2.0, 95% CI 1.3–3.0, p = 0.001) and those with fewer than two children (OR 2.0, 95% CI 1.2–3.3, p = 0.006), but was reduced among riders

with primary school education (OR 0.2, 95% CI 0.1–0.7, p = 0.007) compared to those without any formal education.

Discussion

Although, there is an abundance of literature on motorcycle accidents in Nigeria, to the best of our knowledge, this is the first comprehensive study that addressed some of the major limitations in previous studies (Adogu et al. 2009; Arosanyin et al. 2013; Oladele et al. 2012; Oluwadiya 2010; Owoaje et al. 2005). In this study, we found that the average CM is a young male in his twenties or thirties, who is a poorly educated former trader/artisan, and who has had to veer into commercial cycling due to unemployment. This finding, which has been reported by previous studies (Alti-Muazu and Aliyu 2008; Arosanyin et al. 2013; Johnson and Adebayo 2011; Oginni et al. 2007; Oladele et al. 2012; Owoaje et al. 2005), suggests the need for economic policies that address unemployment in the informal sector, so that semi-skilled workers can return to their primary trade. This may ensure that only those who are primarily trained for commercial motorcycling and are willing to invest time and effort in safety are left on the job, as opposed to those who after quick income.

In this study, the incidence of accidents in the previous one year was 28.9%, a figure higher than 22% reported by Oluwadiya (2010) but much lower than 38.2% reported by Arosanyin et al. (2013), 37.1% by Silva et al. (2012), 45.3% by Owoaje et al. (2005), 46% by Oginni et al. (2007) and 59.5% by Alti-Muazu and Aliyu (2008). The discrepancy may be accounted for by methodological differences. While the study by Arosanyin et al. (2013) was conducted on a university campus where commercial motorcycling is expected to be well-regulated, with more attention paid to safety, the one conducted by Owoaje et al. (2005) was conducted in a rural area where bad road segments are ubiquitous. Also, two of the earlier studies reported lifetime crash involvement (Arosanyin et al. 2013; Oginni et al. 2007), as opposed to 12-month crash involvement reported in the current study. Regardless of the differences, the high incidence of CM road crashes is not acceptable and concerted efforts are required from all stakeholders to stem the tide.

Generally, the mental health profile of this sample mirrors closely what is found in the general population and in similar occupational groups. The prevalence of psychological distress in this study was 29.5%, comparable to a figure of 26.5% found among inhabitants of a low socio-economic community in Lagos, Nigeria, using the same instrument (Mba et al. 2008). Studies have reported much higher rates for occupational groups such as students (Adayonfo and Akanni 2015), nurses (Lasebikan and Oyetunde 2012) and resident doctors (Esan et al. 2014). Although, commercial

motorcycling is a stressful occupation, it is not inconceivable that CMs do not perceive it as such or that they have adjusted well to the vagaries of the profession. In similar fashion, the proportion of the recipients who scored in the moderate to high suicide risk range in this study (2.2%) compares well with 3.5% reported for a control group of relatives of patients with tuberculosis in Southwest Nigeria (Lasebikan and Ige 2016). Lifetime substance use in the study was found to be 53%, with alcohol and tobacco being the most commonly used substance. This closely mirrors the findings in the Nigerian Survey of Mental Health and Well-being (NSMHW) (Gureje et al. 2007), a large epidemiological survey in Nigeria, and also compares well with findings from earlier studies among this population (Alti-Muazu and Aliyu 2008; Oladele et al. 2012; Owoaje et al. 2005). Occupational reasons given for substance use in previous studies include its use to keep awake, to elevate mood, to keep fatigue at bay and to combat cold weather (Alti-Muazu and Aliyu 2008; Oginni et al. 2007).

It is notable that none of the mental health parameters, except substance use was associated with road crashes in the short term and long term periods at bivariate analysis, of which only lifetime alcohol use remained significantly associated with 12-month accident at regression analysis. Indeed, the association between alcohol use and commercial motorcycle accidents is one of the most consistent findings in this environment (Alti-Muazu and Aliyu 2008; Oladele et al. 2012; Owoaje et al. 2005) and elsewhere (Bastos et al. 2005; Kasantikul et al. 2005; Lardelli-Claret et al. 2005). The path from alcohol to road crash is mainly via drunk driving as well as possible cumulative neurological sequel of chronic alcohol use. Lasebikan and Ayinde (2012) reported that sellers of psychoactive substances display their wares openly at motor parks, encouraging easy access to these drugs. Thus, measures to combat drunk driving should include banning open sale of psychoactive substances at car parks, and promotion of health and safety education emphasizing substance use, and random sobriety tests. The National Road Traffic Regulations (Federal Republic of Nigeria 2004) provides for random, on-the-spot breath alcohol tests to be administered on drivers and CMs, but the poorly funded, poorly equipped and understaffed Nigerian law enforcement is too overwhelmed to enforce the policy.

It is not surprising that the mental health parameters were not associated with crash risk in this environment. Authors have delineated the different groups of motorcyclists: those who ride for pleasure or thrill and those who ride as a necessity, such as for economic survival (Zamani-Alavijeh et al. 2009). Studies that have been conducted on motorcycle accidents and risk taking in many high-income countries have focused more on those who ride for pleasure and adolescents (Nada-Raja et al. 1997). It is therefore more likely that the personality factors that predispose them to accidents are also the ones that selected them into the motorcycle riding group in the first instance. Impulsivity as a psychological construct linked to frontal lobe function is a prominent feature of certain accident prone personality traits and personality disorders, bipolar disorder, ADHD, substance use disorders and suicidal behaviours (Stanford et al. 2009). Crash involvement rates did not differ significantly by scores on impulsivity scale, lending further credence to the narrative of CMs in developing countries being out mainly to turn profit. Neglect of safe riding behaviour in this group can therefore be understood as stemming mainly from ignorance and poor attitude to safety, as reported by earlier studies (Oginni et al. 2007), as well as a lax law enforcement milieu (Zamani-Alavijeh et al. 2010). Empirical evidence show that the former two factors are amenable to safety education that leads to subsequent riding behaviour modification (Johnson and Adebayo 2011).

Helmet non-use in this study was found to be associated with a twofold increase in odds of crash involvement. It can be argued that a rider who did not use helmet ignored the most important safety measure which is a proxy for other risk taking behaviours such as reckless riding, leading to increased likelihood of crash involvement.

Limitations

This study has a number of limitations, within which the results are to be interpreted. All the measures are self-reports and are therefore prone to recall bias, as well as under- or over-reporting. To ward against this, interviews were conducted in strict privacy. Secondly, specific psychiatric diagnoses were not made. This is informed by available literature. It is possible that those who had died in road traffic accidents and could not be interviewed constitute a special group, the inclusion of whose data might have changed the results significantly. The sampling technique employed did not account for those who engaged in commercial cycling as a part time job and those who engage in the occupation full time. Some of the instrument used in the study, such as the GHQ and ASSIST, are screening instrument and the findings from them should be interpreted bearing this in mind. The direction of causality in the associations highlighted in this study cannot be established as this was a cross-sectional survey.

Conclusion

This study demonstrated that the mentally ill are not over-represented among Nigerian CMs. It showed further that, taken within the broader context of demographic variables, knowledge and attitude of CMs, common mental health

problems are not important factors in the occurrence of accidents at population level. Substance use, especially alcohol use, remains a significant factor in crash occurrence, consistent with cumulative research findings. The main issues in crash occurrence are safety knowledge and practice deficiencies. These findings can be incorporated into culturally nuanced health and safety education within and outside of the licencing process, and law enforcement focal areas. The results from this study do not support routine referral of traffic offenders for assessment at mental health facilities. Since such a policy is not based on current or existing evidence base, it has the potential of constituting a waste and an abuse of mental health resources in a resource-constrained economy, as well as worsening the already enormous stigma experienced by the mentally ill in developing countries. The place for a reasonable public mental health practice is in a general medical fitness-to-drive assessment embedded within a robust licencing process.

Compliance with Ethical Standards

Conflict of interest The authors declare that they have no conflict of interest.

Ethical Approval Ethical approval was obtained from the joint University of Ibadan/University College Hospital Ethical Review Committee.

Informed consent Informed consent obtained from the study participants.

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