Motorcycle accidents: characteristics of victims admitted to public hospitals and circumstances

ABSTRACT | Background: Motorcycle accidents are a considerable cause of morbidity and mortality in Brazil, with high social and economic costs. Victims are mostly men, young and vulnerable. Objective: To characterize motorcycle accident victims and circumstances among patients admitted to a public hospital. Methods: We administered a questionnaire to 74 victims of motorcycle accidents in the period from January through July 2018 among patients admitted to a referral hospital for elective orthopedic surgery in Salvador, Bahia, Brazil. Results: Most victims were male (98.4%), up to 31 years old (49%), black or brown (84%) and had low educational level (54%). Motorcycling was the occupation of 50.8%. Drinking was less frequent among motorcyclists in the capital compared to the interior of the state (16 vs. 26%) and a larger proportion had a driving license (72 vs. 39%). Conclusion: Main victims of motorcycling accident victims were male, with low educational level, and without a driving license. Actions are needed to promote road safety, including educational programs to protect life and reduce the social and economic costs of accidents. Keywords | motorcycles; accidents, traffic; accidents, occupational; Unified Health System.

RESUMO | Introdução: Acidentes com motociclistas são causa importante de morbimortalidade no Brasil, com altos custos sociais e econômicos. Suas vítimas são na maioria homens, jovens e em situação de vulnerabilidade. Objetivo: Caracterizar a população de motociclistas vítimas de acidentes de trânsito, bem como as circunstâncias em que esses eventos ocorreram, em população de pacientes internados em um hospital do Sistema Único de Saúde. Métodos: Foi aplicado um questionário a 74 motociclistas, vítimas de acidente de trânsito, no período de 13 de janeiro a 9 de julho de 2018, em um hospital referência em cirurgias ortopédicas eletivas em Salvador, BA. Resultados: Homens (98,4%), jovens com até 31 anos (49%), negros ou pardos (84%) e com baixa escolaridade (54%) eram a maioria das vítimas. Em relação ao uso da motocicleta, 50,8% estava em situação de trabalho. Quando comparados às vítimas no interior do estado, os motociclistas na capital haviam feito menos uso de bebida alcóolica (16% estavam alcoolizados contra 26% no interior), e maior proporção possuía habilitação (72% de habilitados contra 39% no interior). Conclusão: Indivíduos homens, com baixa escolaridade, muitos dos quais sem habilitação, foram as principais vítimas dos acidentes de motocicleta, exigindo medidas de promoção ao trânsito seguro, com programas educativos, visando proteger a vida e diminuir os prejuízos econômicos e sociais envolvidos.

Palavras-chave | motocicletas; acidentes de trânsito; acidentes de trabalho; Sistema Único de Saúde.

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INTRODUCTION

Traffic accidents are a considerable cause of injury and deaths worldwide. In “Global Status Report on Road Safety1,” the World Health Organization observes that the number of road traffic deaths is still high, especially in the poorest countries.

In Brazil, traffic accidents are the leading cause of death among the external causes of injury, following aggression2. Those involving motorcycles are the leading cause of death and admission to hospitals within the Unified Health System (SUS). While motorcycles represented only 22% of the total number of vehicles in the country in 2019, accidents accounted for 52% of hospital admissions3,4. There is something curious in the nature of this type of accidents: while they are a considerable cause of injury, they could be avoided by means of interinstitutional, low-technology actions4.

According to Seerig et al.,5 low price and easily obtained credit contributed to make motorcycles popular in cities — which often provide very poor public transportation — in the past decade. This is also the case in the world of work. Diniz et al.6 observed that the number of professional motorcyclists — including motorcycle taxis and delivery services — did not only increase for representing novel job opportunities, but also reflects the urban space and organization of present-day society, which demands fast services. This remarkable growth in the number of motorcycles and the fact that motorcyclists are exposed to poor traffic conditions partially accounts for the increase in the rate of accidents involving this type of vehicles in Brazil7-11.

Data made available by the SUS Department of Informatics (DATASUS) show that the absolute number of deaths increased 35% from 2008 to 2017, and that of admissions to SUS hospitals 96% from 2009 to 2018. The situation in the state of Bahia is even worse: the number of deaths increased 170% and that of admissions 116%. In addition to financial losses, these accidents lead to the loss of young people of economically active age, who are the main victims.

The aim of the present study was to characterize the population of motorcyclists involved in traffic accidents and the circumstances under which accidents happened based on data collected from patients admitted to a SUS hospital.

METHODS

The present epidemiological and descriptive study was performed with motorcyclists admitted following a traffic accident to a SUS hospital in Salvador, Bahia, Brazil from 13 January through 9 July 2018. The study population comprised both motorcyclists hospitalized before the onset of data collection and waiting for elective surgery and those admitted along the study period.

Motorcycle riders or passengers admitted to hospital due to injuries in traffic accidents were included for analysis, while pedestrians hit by motorcycles were excluded. Eligible subjects were recruited at the wards of a hospital in Salvador to which trauma patients are referred for elective surgery. This hospital does not perform emergency surgery, therefore it does not receive critical patients or at risk of death, but non-critical patients who spontaneously seek care at the emergency department. The level of complexity and size of hospitals define the type of care they may provide to accident victims; this information was relevant to characterize both the sample and nature of accidents analyzed in the present study.

Second- and a third-year medical students — duly trained to minimize the odds of bias — administered a questionnaire to eligible subjects who agreed to participate. The questionnaires were administered at the bedside twice per week, on Tuesdays and Saturdays, morning or afternoon. In addition, we collected information on the involved body site(s) from medical records, which was recorded at the end of the questionnaire form. Items to characterize victims included: motorcyclist or passenger, sex, birth date, ethnicity, educational level, main occupation, and employment relationship. Accident circumstances considered were: reason to be riding a motorcycle at the time of the accident, having or not had a driving license, daily hours riding, number of hours riding before the accident, alcohol consumption, and traffic fines in the past year. The participants were also inquired about the date, time and place of incidents, status of roads, and whether it was or not raining.

In statistical analysis continuous variable age was described as median; the sample was stratified per age and absolute and relative frequencies were calculated. All the other were categorical variables and were described as absolute and relative frequencies. The pie chart in Figure 1 depicts the
proportional distribution of involved body sites. The histogram in Figure 2 represents the time and day of the week when incidents took place.

The present study was approved by the research ethics committee of School of Medicine of Bahia, Federal University of Bahia, Certificate of Presentation for Ethical Appraisal no. 75566317.8.0000.5577, ruling no. 2,406,526. We complied with the recommendations by the National Research Ethics Committee Resolution no. 466/12. All the participants signed an informed consent form.

RESULTS

The sample comprised 74 participants, 63 of whom were motorcyclists (85.1%) and 11 passengers (14.9%) with median age 63 and 39 respectively. Most motorcyclists were male (98.4%) and 54.5% of passengers were female (Table 1). About 50% of motorcyclists were 31 years old or younger; one was a minor. The largest proportion of motorcyclists self-reported as brown skinned (44.4%), followed by blacks (39.7%); 12.7% were white. Most motorcyclists (54%) had completed elementary school, only 4.8% had completed secondary school. About 54% of the motorcyclists did not have a formal employment relationship; together with those who rode motorcycles to help some family member this group — characterized by precarious working conditions — represented 63.5% of the sample. Motorcyclists with formal employment relationship corresponded to 31.8% (Table 1).

Table 1 also describes the mean daily number of hours riding the week before incidents. Motorcyclists who spent up 1 hour/day or 1-3 hours/day accounted for 28.6% of incidents each. Most victims had ridden less than one hour on the day of the accident (58.7%) (Table 1). In 90.5% of cases it was not raining at the time of the accident (data not shown).

Comparison between Salvador, the state capital, versus the interior of the state is shown in Table 2. Most victims in Salvador (aged 18 to 25) had a driving license, while those in the interior of the state (60.5%) did not. Few victims had consumed alcohol in either capital (16%) or the interior of the state (26.3%).

The main reason to ride a motorcycle was related to work (riding as job or commuting). Thirty-two participants rode motorcycles as their job, more frequently those in Salvador (16/25). Leisure or eventual use corresponded to 36% of the cases in Salvador and 57.6% in the interior of the state.

Most participants reported that roads were in good conditions (Table 2).

Only five riders had received traffic fines in the past year; 58 stated they had never received one in life (data not shown).

The largest proportion of incidents took place on Saturdays (20.3%) followed by Wednesdays (17.6%), and from 18:00 to 18:59 and 20:00 to 20:59 (n=8 each, 10.8%) (Figure 2).

Figure 1 depicts the distribution of involved body sites; the highest rates corresponded to the legs (29%) and forearms (17%). As was expected, we did not detect any case of traumatic brain injury (TBI).

DISCUSSION

In the present study with patients admitted to a medium-sized trauma hospital for non-critical cases or without risk of death, participants were exclusively users of the public health system; none had private health.
insurance. The analyzed hospital does not admit patients with high-complexity problems or severe trauma, but performs elective orthopedic surgery to repair injuries after minor to moderate accidents. Legs and forearms were the body sites most frequently involved. We did not detect any case of TBI as was expected as a function of the hospital characteristics, since TBI demands immediate care. These patients are referred to large emergency departments with neurosurgery facilities.

Most participants exhibited a profile characterized by high vulnerability: young men, black or brown skinned, with low educational level, and outside the formal labor market. Many were fully or almost illiterate: some of them even had to check their ID card for their birth date. Despite substantial miscegenation in Bahia, the proportion of blacks and brown skinned participants (84%) was higher than that found in the last census by the Brazilian Institute of Geography and Statistics (76.3%)\textsuperscript{12}.

Most victims were male, as was also reported by other authors\textsuperscript{5,7,8,10,13-20}. Men represent the largest proportion of motorcyclists, professional or not, which explains their predominance among accident victims\textsuperscript{5,11}. In addition, some sex-related sociocultural determinants result in higher exposure to hazards among men, while use of motorcycles is historically associated to the male sex despite the growth of female motorcyclists\textsuperscript{8}. Women were involved in accidents mainly as motorcycle passengers, as also in other studies performed in Brazil\textsuperscript{5,8}. According to the literature, the odds of injury in accidents is higher for women than for men, whence also this group should be considered in prevention campaigns\textsuperscript{5,16}.

The fact that victims were predominantly of economically active age, mainly in the second or third decade of life, also agrees with findings in other studies performed in Brazil\textsuperscript{5,8,11,13,14,17,20}. And also as other authors observed\textsuperscript{5,8} some motorcyclists were minors. Since the Brazilian Traffic Code\textsuperscript{21} bans minors from motorcycling, our findings therefore point to shortage of preventive and control policies.

The characteristics of the analyzed sample indicate precarious safety conditions among a significant proportion of motorcyclists: 30/63 did not have a driving

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![Figure 2. Distribution of accidents per time and day of the week. Bahia, Brazil, 2018 (n=74).](image-url)
Their low educational level — as also found in other studies 7,8,14,17 — hindered them from obtaining a driving license, made them work under illegal conditions, and reduced their ability to protect themselves and avoid accidents. A study from 2016 found that more motorcyclists who had attended higher education wore helmets by comparison to all others 22.

Most studies in the literature focus on the magnitude of traffic accidents in large cities or large emergency referral hospitals. Instead, we analyzed accident victims admitted to a medium-sized hospital specialized in elective surgery. This choice enabled us to identify extremely precarious working conditions, which we believe is our main finding. About half the participants did not meet the requirements to obtain a driving license and 47% rode without one,

### Table 1. Characteristics of motorcyclists and accidents. Bahia, Brazil, 2018 (n=63).

| Motorcyclists (n=63) | Passengers (n=11) |
|---------------------|-------------------|
| Median age (years)  | 33                | 39                |
| Sex                 | n     | %    | n     | %    |
| Male                | 62    | 98.4 | 5     | 45.46|
| Female              | 1     | 1.6  | 6     | 54.54|
| Age (years)         |       |      |       |      |
| <18                 | 1     | 1.6  |       |      |
| 18–24               | 16    | 25.4 |       |      |
| 25–31               | 14    | 22.2 |       |      |
| 32–38               | 15    | 23.8 |       |      |
| >39                 | 17    | 27.0 |       |      |
| Ethnicity           |       |      |       |      |
| Brown               | 28    | 44.4 |       |      |
| Black               | 25    | 39.7 |       |      |
| White               | 8     | 12.7 |       |      |
| Native              | 1     | 1.6  |       |      |
| Asian               | 1     | 1.6  |       |      |
| Educational level   |       |      |       |      |
| Complete secondary school | 26 | 41.2 |       |      |
| Reads and writes    | 16    | 25.4 |       |      |
| Complete elementary school | 15 | 23.8 |       |      |
| Illiterate          | 3     | 4.8  |       |      |
| Higher education    | 3     | 4.8  |       |      |
| Employment relationship |     |      |       |      |
| Informal            | 34    | 53.9 |       |      |
| Formal              | 19    | 30.2 |       |      |
| Unpaid/helps relatives | 6   | 9.5  |       |      |
| Employer            | 3     | 4.8  |       |      |
| Civil servant/military | 1 | 1.6  |       |      |
| Daily motorcycling hours |   |      |       |      |
| <1                  | 18    | 28.6 |       |      |
| 1-3                 | 18    | 28.6 |       |      |
| 4-6                 | 11    | 17.5 |       |      |
| 7-9                 | 6     | 9.5  |       |      |
| >9                  | 10    | 15.8 |       |      |
| Hours motorcycling before incident |   |      |       |      |
| <1                  | 37    | 58.7 |       |      |
| 1-3                 | 16    | 25.4 |       |      |
| >4                  | 10    | 15.9 |       |      |

### Table 2. Characteristics of motorcyclists and incident circumstances per place of residence — capital or interior of the state. Bahia, Brazil, 2018 (n=63).

| Mean age (years) | Salvador | Interior | Total |
|------------------|----------|----------|-------|
|                  | n       | %        | n     | %    |
| Driving license  |          |          |       |      |
| Yes              | 18      | 72.0     | 15    | 39.5 |
| No               | 7       | 28.0     | 23    | 60.5 |
| Alcohol          |          |          |       |      |
| Yes              | 4       | 16.0     | 10    | 26.3 |
| No               | 21      | 84.0     | 28    | 73.7 |
| Reason to motorcycle |     |         |       |      |
| Leisure/eventual | 4       | 16.0     | 22    | 57.9 |
| Job              | 16      | 64.0     | 16    | 42.1 |
| Road conditions  |          |          |       |      |
| Good             | 16      | 64.0     | 23    | 60.5 |
| Average          | 5       | 20.0     | 6     | 15.8 |
| Poor             | 4       | 16.0     | 9     | 23.7 |
| Total            | 25      | 39.7     | 38    | 60.3 |
on average, with some geographical differences (72% in Salvador vs. 39.5% in the interior of the state).

Most participants lived in the interior of the state, mainly in small towns. The victims from Salvador had been most often involved in traffic accidents related to work (motorcycling as job or commuting, 64%). Differently, those in the interior of the state used motorcycles as mode of transport, for shopping or leisure. These findings demonstrate the versatility of the use of motorcycles and why they are considerably used in small towns and rural areas. However, they pose a risk to health no matter their advantages over the use of animals as mode of transport. Therefore, even when free from the risks inherent to traffic in large cities, this population should be prioritized in public policies for prevention of external causes of injuries.

Professional motorcyclists work under pressure and are paid according to their productivity, which often leads them to work long hours and to ride at high speed, with consequent increase of the risk of fatigue and accidents6,11. In addition to very low fares, there are pay deductions for vehicle maintenance and gas, whence profit is minimal, and thus motorcyclists feel compelled to take too many trips every day6. Then, many of them lease their motorcycles and must pay monthly installments. Such precarious conditions did not differ in the interior of the state, where many of the participants lived.

We should call the attention to the fact that risky riding among professional motorcyclists is not motivated by sensation seeking. Rather, it is a means to increase productivity and meet the customers and employers’ demands for rapid and efficient service, thus reproducing the large-scale production patterns in large cities6,10,11. Therefore, this risky behavior is not a personal option, but results from labor relations. The relationship between these aspects and risk of accidents is illustrated by a study performed in the state of Paraná, Brazil, found that 40% of the participants had been involved in more than one accident.

Furthermore, this group of workers is not seen as entitled to rights and respect, in addition to their invisibility as victims of urban violence within a context of precarious work23. Applications for service delivery involving two-wheeled vehicles have gained in popularity recently. Yet this business is often grounded on informal work, which together with the growing unemployment rate in Brazil and flexibilization of the labor laws and impaired social protection might increase the number of accidents and deaths among this population of workers, thus amounting to a public health situation even more serious than that pointed out by Lacerda in 201423.

Our results did not evidence too long daily working hours before incidents: 58.7% of participants had ridden less than one hour before accidents and 57.2% rode less than 4 hours/day, on average. The reason might be that more than half of the participants were not riding for work-related reasons at the time of incidents. Yet some participants reported to ride more than 7 hours/day, also at night, or after many hours of uninterrupted riding. A study performed in Paraná found that due to their low salary, motorcycle messengers felt compelled to work too long daily hours no matter that tiredness is a considerable cause of accidents11.

Motorcycles are dangerous by their very design and concept, and risk increases together with the length of exposure. Professional motorcyclists, especially the younger ones, are intent in increasing their productivity at the expense of safety and dismiss traffic risks as if they were natural14.

Although the Brazilian Traffic Code establishes that the blood alcohol concentration for any vehicle driver must be zero, many participants reported having drunk before incidents. Even in small concentration alcohol is associated with higher risk of traffic accidents by promoting risky behaviors24, including neglect to wearing a helmet1. Given this high rate of drinking and the lack of the due driving license, the fact that very few participants reported having been ever fined points to inefficient traffic inspection, especially in areas away from large cities, where case traffic safety policies seem to lack completely.

Among the limitations of the present study, we call the attention to the small sample size. Yet, it represented all the motorcyclists admitted to the analyzed hospital along the study period, except for a few we lost despite the interviewers’ effort to contact them all. Reasons included: discharge on days the interviewers did not visit the hospital, not at the ward at the time of visits for performing diagnostic tests or personal hygiene. While we did not record such losses, these reasons allow...
inferring that these motorcyclists did not differ essentially from those included. Finally, we cannot rule out the possibility of information bias and consequent underestimation of alcohol consumption, number of motorcyclists who received fines and risky behavior, since the involved participants might have withheld this information. However, we believe that the fact confidentiality was assured and interviewers were medical students at a public university in Bahia, instead of public surveillance or inspection agents, might have reduced the odds of this source of bias.

CONCLUSION

The results of the present study point to the need for better control of traffic and traffic education and safety programs with focus on self-care and defensive riding. Small cities in the interior of states should be duly considered in such programs. In addition, policies should be implemented to incentivize the use of non-motorized, sustainable vehicles beneficial to health, such as bicycles, provided sufficient bike lines are established in both the capital and the interior of the state of Bahia.

REFERENCES

1. World Health Organization. Global status report on road safety 2018. Geneva: WHO; 2018.
2. Brasil. Ministério da Saúde. Departamento de Informática do SUS. Informações de Saúde, Epidemiológicas e Morbidade: banco de dados [Internet]. Ministério da Saúde [citado on 2 Jul. 2017]. Available at: http://www2.datasus.gov.br/DATASUS/index.php?area=2033&tid=6926&vObj=http://tabnet.datasus.gov.br/cgi/deftohtm.exe/ti?sih/cnv/fi
3. Brasil. Departamento Nacional de Trânsito. Informações sobre frota de veículos [Internet]. Denatran [citado on 9 Sept. 2019]. Available at: https://infraestrutura.gov.br/relatorios-estatisticos.html
4. Malta DC, Duarte EC, Almeida MF, Dias MAS, Morais Neto OL, Moura L, et al. Lista de causas de mortes evitáveis por intervenções do Sistema Único de Saúde do Brasil. Epidemiol Serv Saúde [Internet]. 2007 [citado on 9 Sept. 2019];16(4):233-44. Available at: http://scielo.iec.gov.br/scielo.php?script=sci_arttext&pid=S1679-49742007000400002&lng=pt
5. Seerig LM, Bacchieri G, Nascimento GG, Barros AJD, Demarco FF. Motorcycle accidents: victims and circumstances. Rev Bras Med Trab. 2020;18(1):51-8
6. Diniz EPH, Assunção AA, Lima FPA. Use of motorcyle in Brazil: users profile, prevalence of use and traffic accidents occurrence - a population-based study. Ciênc Saúde Coletiva [Internet]. 2016 [citado on 9 Sept. 2019];21(12):3703-10. Available at: http://www.scielo.br/scielo.php?script=sci_arttext&pid=S1415-7852201601203703&lng=en http://dx.doi.org/10.1590/1415-7852201601203703
7. Corgozinho MM, Montagner MA, Rodrigues MA. Vulnerabilidade sobre duas rodas: tendência e perfil demográfico da mortalidade decorrente da violência no trânsito motociclistico no Brasil, 2004-2014. Cad Saúde Colet [Internet]. 2018 [citado on 18 Sept. 2019];26(1):92-9. Available at: http://www.scielo.br/scielo.php?script=sci_arttext&pid=S1414-462X2018001000163&lng=en http://dx.doi.org/10.1590/1414-462X201800010163
8. Santos AMR, Moura MEB, Nunes BMVT, Leal CFS, Teles JBM. Perfil das vítimas de trauma por acidente de moto atendidas em um serviço público de emergência. Cad Saúde Pública [Internet]. 2007 [citado on 9 Sept. 2019];24(8):1927-38. Available at: http://www.scielo.br/scielo.php?script=sci_arttext&pid=S0102-311X2008000800021&lng=en http://dx.doi.org/10.1590/S0102-311X20080008000021
9. Soares DFPP, Mathias TAF, Silva DW, Andrade SM. Motociclistas de entrega: algumas características dos acidentes de trânsito na Região Sul do Brasil. Rev Bras Epidemiol [Internet]. 2011 [citado on 16 Sept. 2019];14(3):345-48. Available at: http://www.scielo.br/scielo.php?script=sci_arttext&pid=S1415-790X2011000300008&lng=en http://dx.doi.org/10.1590/S1415-790X2011000300008
10. Amorim CR, Araújo EM, Araújo TM, Oliveira NF. Acidentes de trabalho com mototaxistas. Rev Bras Epidemiol [Internet]. 2012 [citado on 9 Sept. 2019];15(1):25-37. Available at: http://www.scielo.br/scielo.php?script=sci_arttext&pid=S1415-790X2012000100003&lng=en http://dx.doi.org/10.1590/S1415-790X2012000100003
11. Silva DW, Andrade SM, Soares DA, Soares DF, Mathias TAF. Perfil do trabalho e acidentes de trânsito entre motociclistas de entregas em dois municípios de médio porte do Estado do Paraná, Brasil. Cad Saúde Pública [Internet]. 2008 [citado on 9 Sept. 2019];24(11):2643-52. Available at: http://www.scielo.br/scielo.php?script=sci_arttext&pid=S0102-311X2008001100019&lng=en http://dx.doi.org/10.1590/S0102-311X2008001100019
12. Instituto Brasileiro de Geografia e Estatística. Censo Demográfico 2010 [Internet]. IBGE [citado on 14 Feb. 2019]. Available at: https://sidra.ibge.gov.br/tabela/3175
13. Anjos KC, Evangelista MRB, Santos Silva J, Zumiotti AV. A patient victim of car traffic violence: an analysis of socioeconomic profile, accident characteristics and Social Services intervention in the emergency room. Acta Ortop Bras [Internet]. 2007 [citado on 9 Sept. 2019];15(5):262-6. Available at: http://www.scielo.br/scielo.php?script=sci_arttext&pid=S1413-78522007000500006&lng=en http://dx.doi.org/10.1590/S1413-78522007000500006
14. Paixão LMMM, Gontijo ED, Mingoti SA, Costa DAS, Friche AAL, Caiaffa WT. Urban road traffic deaths: data linkage and identification of high-risk population sub-groups. Cad Saúde Pública [Internet]. 2015 [cited on 9 Sept. 2019];31(Suppl. 1):92-106. Available at: http://dx.doi.org/10.1590/0102-311X00081314

15. Souto CC, Reis FKW, Bertolini RPT, Lins RSMA, Souza SLB. Perfil das vítimas de acidentes de transporte terrestre relacionados ao trabalho em unidades de saúde sentinelas de Pernambuco, 2012-2014. Epidemiol Serv Saúde [Internet]. 2016 [cited on 9 Sept. 2019];25(2):351-61. Available at: http://www.scielo.br/scielo.php?script=sci_arttext&pid=S2237-962220160002000351&lng=en http://dx.doi.org/10.1590/1518-8849-1660-00002000014

16. Oliveira NLB, Sousa RMC. Risco de lesões em motociclistas nas ocorrências de trânsito. Rev Esc Enferm USP [Internet]. 2012 [cited on 9 Sept. 2019];46(5):1133-40. Available at: http://www.scielo.br/scielo.php?script=sci_arttext&pid=S0080-62342012000500014&lng=pt http://dx.doi.org/10.1590/S0080-62342012000500014

17. Corgozinho MM, Montagner MA. Human vulnerability in motorcycle traffic. Saúde Soc [Internet]. 2017 [cited on 9 Sept. 2019];26(2):545-55. Available at: http://www.scielo.br/scielo.php?script=sci_arttext&pid=S0104-129020170002005451&lng=en http://dx.doi.org/10.1590/S0104-129020170002005451

18. Debieux P, Chertman C, Mansur NS, Dobashi E, Fernandes HJ. Lesões do aparelho locomotor nos acidentes com motocicleta. Acta Ortop Bras [Internet]. 2010 [cited on 9 Sept. 2019];18(6):353-6. Available at: http://www.scielo.br/scielo.php?script=sci_arttext&pid=S1413-78522010000600010&lng=en http://dx.doi.org/10.1590/S1413-78522010000600010

19. Oliveira TAB, Andrade SMS, Prado GO, Fernandes RB, Gusmão MS, Gomes EGF, et al. Epidemiology of spine fractures in motorcycle accident victims. Coluna [Internet]. 2016 [cited on 9 Sept. 2019];15(1):65-7. Available at: http://www.scielo.br/scielo.php?script=sci_arttext&pid=S1808-18512016150147174&lng=en http://dx.doi.org/10.1590/S1808-18512016150147174

20. Miki N, Martimbionca ALC, Hira LT, Lahoz GL, Fernandes HJA, Reis FB. Profile of trauma victims of motorcycle accidents treated at hospital São Paulo. Acta Ortop Bras [Internet]. 2014 [cited on 16 Sept. 2019];22(4):219-22. Available at: http://dx.doi.org/10.1590/1413-85322014220400642

21. Brasil. Casa Civil. Lei nº 9.503, de 23 de setembro de 1997. Institui o Código de Trânsito Brasileiro [Internet]. 1997 [cited on 21 Aug. 2017]. Available at: http://www.planalto.gov.br/ccivil_03/leis/L9503.htm

22. Malta DC, Andrade SSCA, Gomes N, Silva MMA, Morais Neto OL, Reis AAC, et al. Lesões no trânsito e uso de equipamento de proteção na população brasileira, segundo estudo de base populacional. Ciênc Saúde Coletiva [Internet]. 2016 [cited on 9 Sept. 2019];21(2):399-410. Available at: http://www.scielo.br/scielo.php?script=sci_arttext&pid=S1413-81232016000200399&lng=en http://dx.doi.org/10.1590/1413-81232016000200399

23. Lacerda KM, Fernandes RCP, Nobre LCC. Acidentes de trabalho fatais em Salvador, BA: descrevendo o evento subnotificado e sua relação com a violência urbana. Rev Bras Saúde Ocup [Internet]. 2014 [cited on 9 Sept. 2019];39(129):63-74. Available at: http://www.scielo.br/scielo.php?script=sci_arttext&pid=S0303-765720140012000636&lng=en http://dx.doi.org/10.1590/0303-76570000064812

24. Phillips PD, Brewer KM. The relationship between serious injury and blood alcohol concentration (BAC) in fatal motor vehicle accidents: BAC = 0.01% is associated with significantly more dangerous accidents than BAC = 0.00%. Addiction [Internet]. 2011 [cited on 9 Sept. 2019];106(9):1614-22. Available at: https://onlineibrary.wiley.com/doi/pdf/10.1111/j.1360-0443.2011.03472.x https://doi.org/10.1111/j.1360-0443.2011.03472.x

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