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RESEARCH

Prevalence and factors associated with traffic accidents involving motorcycle taxis

Prevalência e fatores associados a acidentes de trânsito com mototaxistas

Prevalencia y factores asociados a accidentes de tránsito con mototaxistas

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ABSTRACT

Objective: to determine the prevalence of motorcycle accidents involving motorcycle taxi drivers and associated factors. **Method**: this is a cross-sectional and exploratory study, with application of questionnaires to motorcycle taxi drivers of 32 regions of Caicó, Rio Grande do Norte, Brazil (N = 420). **Results**: motorcycle taxi drivers have a high level of daily working hours (12 hours on average), and it was found that 63.6% were involved in at least one motorcycling accident. The occurence of motorcycling accidents was significantly associated only to level of education ($p < 0.001$), with no significant association with the other variables, such as age ($p = 0.132$), time of service ($p = 0.744$) and working hours ($p = 0.830$). **Conclusion**: it is necessary to implement preventive and educational actions with motorcycle taxi drivers and users of this service concerning accidents and emergency measures, due to constant exposure to accidents during work routine.

Key words: Traffic Accidents; Accidents at Work; Motorcycles; Epidemiology; Prevalence.

RESUMO

Objetivo: identificar a prevalência de acidentes motociclísticos envolvendo mototaxistas e fatores associados. **Método:** estudo transversal e exploratório, com aplicação de questionários aos mototaxistas das 32 praças de Caicó, Rio Grande do Norte, Brasil (N = 420). **Resultados:** os mototaxistas têm alta carga horária de trabalho diária (12 horas em média) e foi verificado que 63,6% já se envolveram em pelo menos um acidente motociclístico. A ocorrência de acidentes motociclísticos foi associada significativamente apenas com escolaridade ($p < 0,001$), não havendo associação significativa com as demais variáveis, tais como idade ($p = 0,132$), tempo de serviço ($p = 0,744$) e carga horária de trabalho ($p = 0,830$). **Conclusão:** é necessário implementar ações preventivas e educativas com os mototaxistas e usuários do serviço acerca dos acidentes e condutas emergenciais, devido à constante exposição a acidentes durante sua rotina de trabalho.

Descritores: Acidentes de Trânsito; Acidentes de Trabalho; Motocicletas; Epidemiologia; Prevalência.

RESUMEN

Objetivo: identificar la prevalencia de accidentes motociclísticos involucrando mototaxistas y factores asociados. **Método:** estudio trasversal y exploratorio, con aplicación de cuestionarios a los mototaxistas de las 32 plazas de Caicó, Rio Grande do Norte, Brasil (N = 420). **Resultados:** los mototaxistas tienen alta carga horaria de trabajo diario (12 horas en media), y se verificó que 63,6% ya se involucraron en por lo menos un accidente motociclístico. La ocurrencia de accidentes motociclísticos se asoció significativamente apenas con escolaridad ($p < 0,001$), no habiendo asociación significativa con las demás variables, tales como edad ($p = 0,123$), tiempo de servicio ($p = 0,744$) y carga horaria de trabajo ($p = 0,830$). **Conclusión:** es necesario

implementar acciones preventivas y educativas con los mototaxistas y usuarios del servicio acerca de los accidentes y conductas emergenciales, debido a la constante exposición a accidentes durante su rutina de trabajo.
Palabras clave: Accidentes de Tránsito; Accidentes de Trabajo; Motocicletas; Epidemiología; Prevalencia.

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INTRODUCTION

The easy acquisition of motorcycles and its low maintenance cost, combined with the known flaws of collective transport, have created an environment conducive to the use of motorcycles as an instrument of work, mostly informal[1-2]. In this context, especially in small towns, emerges the individual service of passenger transport, popularly known as motorcycle taxi. On the other hand, there are also the motorcycle couriers, understood as motorcyclists rendering small services[3]. Both meet the needs of speed and agility of contemporary consumer society[4].

Importantly, 80% of accidents involving motorcyclists cause some sort of injury. Motorcyclists are more vulnerable to injury when there is collision with a larger vehicle, and women have increased risk of suffering injuries[5]. Risk of death involving motorcyclists is evident and most fatal cases occur at the site of accident or within 24 hours after the event[6].

Manufacture of motorcycles in Brazil increased almost 600 percent from 1996 to 2008[4]; on the other hand, traffic in Brazil is considered one of the most dangerous in the world[4,7], and researches conducted in Brazilian cities revealed that motorcyclists are the most involved in traffic accidents, being subject to multiple traumas of greater severity[1-2,4,8-10]. Among Brazilian regions, the Northeast region is prominent with a high increase in the rate of mortality due to motorcycle accidents, highlighting the need for actions in this region[11].

In this context, in small municipalities many people work as motorcycle taxi drivers, informally and unstably. This fact leads these professionals to high workload and precarious labor conditions, which result in a large number of deaths and sequelae due to accidents. These sequelae (physical and/or emotional) can cause the removal of motorcycle taxi drivers from their labor activities, and should thus be object of study in the field of public health[12].

Considering this context, the objective of this study was to determine the prevalence of motorcycle accidents involving motorcycle taxi drivers and associated factors in Caicó, Rio Grande do Norte (RN), Brazil.

METHOD

Ethical aspects

The research was conducted in accordance with Ordinance 466/12 of the National Health Council, which regulates research with human beings, and approved by the Research Ethics Committee of the University of the State of Rio Grande do Norte (UERN).

Study design and location

Cross-sectional study of exploratory character, conducted at Caicó, municipality in the rural area of the state of Rio Grande do Norte, Brazil.

Population

We observed the existence of 615 motorcycle taxi drivers registered on the Municipal Department of Infrastructure and Urban Services of the municipality of Caicó. Of this total, the 510 who had worked for more than two years in the 32 work stands were included. As our intention was to detect the occurrence of accidents and associated factors, we decided to choose a minimum time of service in the profession (two years) for better analysis of the variables of the study regarding the work routine. Based on previous studies[3,12], the minimum time of professional experience is two years.

Of the 510 motorcycle taxis eligible for the study, 17.6% refused to participate, which resulted in a final population of 420 professionals. Most were male (99.2%), aged 26-30 years (42.6%), married (52.6%), no children (42.9%), with a monthly family income of one Brazilian monthly minimum wage (48.3%), native of Caicó, Rio Grande do Norte, Brazil (82.4%), complete secondary education (37.9%), time of service ranging from 2 to 5 years (46.2%) and average daily working hours of 12 hours (55.7%).

Data collection

Data collection was conducted at the workplaces of the motorcycle taxi drivers through the application of questionnaires with open and closed questions. To reduce loss of subjects, we visited the same region up to five times.

The data collection instrument was developed after three stages, with a view to its improvement. Firstly, the instrument was sent to professors in the field of Collective Health and Surgery, from programs of Dentistry and Nursing of University of the State of Rio Grande do Norte and Federal University of Rio Grande do Norte. We explained the purpose of the research to professors and, based on on this, suggestions for changes in and/or additions to the questions of the survey were presented. After individual suggestions from specialist professors, there was a meeting with the researchers to discuss and, subsequently, carry out necessary modifications in the questionnaire. After adjusting the instrument, a second stage was conducted with the research subjects. A pilot study was carried out with 35 motorcycle taxis with the purpose of testing the instrument. In a third stage, based on the questionnaires from the pilot study, further changes were made according to the understanding of the motorcycle taxi drivers. Based on that, we removed questions that generated double interpretation or were not clear. In addition, open questions were turned into multiple choice questions.

The instrument featured questions relating to socioeconomic conditions and demographic information (sex, age, number of children, income, level of education, and housing conditions); relating to work (time of service and working hours); to situations of protection in traffic (individual protection equipment, helmet model and its correct use); and access to educational information.

The dependent variable of the study refers to the occurrence of motorcycle accidents. Considering the evaluation by specialists and the pilot study with the subjects of the survey, the instrument was tested and improved to meet the objectives. However, instrument validation techniques were not used.

Results analysis and statistics

For the electronic processing of data, descriptive statistics and inferential statistics, we used the program Stata 10.0. The data were obtained through absolute frequencies and percentages.

We used the Chi-square test to determine the association between the independent variables and the occurrence of accidents. Variables that had Chi-square test value of $p < 0.20$ were used in the multivariate analysis to determine those that were significant, independently from the other variables of the model Multivariate analysis was performed based on the Multiple Logistic Regression, with the following variables included in the model: level of education, age, time of service, working hour, location of the motorcycle taxi region and, participation in educational activities. Since qualitative (categorical) variables were used, odds ratio is not suitable as a measure of magnitude, which is generated in Multiple Logistic Regression. Given the nature of the variables, the more appropriate is to use prevalence ratio. Thus, the adjusted prevalence ratios and their respective confidence intervals (presented in multiple analysis) were estimated based on data obtained in logistic regression, according to conversion formulas[13-14]. The significance level considered in all analysis was 5%.

RESULTS

The prevalence of accidents involving motorcycle taxi drivers was 63.6% (n = 267), of which 26.6% (n = 71) reported some kind of injury to the face or maxillomandibular region, more frequently in the younger age group (20 to 30 years). Regarding the use of helmets, we found that 97.4% (n = 409) of respondents used one, justifying its use by the protection and security provided (62.1%; n = 261), as well as a decrease in the exposure of face and jaw (17.6%; n = 74).

However, according to the report of 85.5% (n = 359) of the motorcycle taxi drivers, passengers prefer the helmet without protection for the mandible, claiming mostly factors such as hygiene, convenience, and comfort (42.6%; n = 179). No motorcycle taxi driver reported the use of other personal protective equipment, such as reflective vest or protective gear. When asked about participation in any sort of educational activity or receipt of information about accident prevention and/or conduct to be adopted after involvement in traffic accidents, 89.0% (n = 374) answered that never participated in educational activities nor received information on the subject.

The occurrence of accidents involving motorcycle taxi drivers showed significant association with level of education, both in the Chi-square test ($p < 0.001$) and the Logistic Regression ($p = 0.001$), as observed in Table 1. The occurrence of accidents was higher among the motorcycle taxi drivers with higher level of education, since those with complete secondary education accounted for the vast majority of professionals under study.

Table 1 - Association between occurrence of accidents and independent variables (N = 420)

	Suffered an accident					
	Yes	No				
Variáveis Independentes	n (%) 267 (63.6)	n (%) 153 (36.4)	RP*	95%CI	RPadj**	95%CI
Education level***						
Illiterate/Elementary School	100 (53.8)	86 (46.2)	0.75	0.64-0.88	0.66	0.31-0.72
Secondary/Higher Education	167 (71.4)	67 (28.6)				
Age						
> 40 years	49 (55.1)	40 (44.9)	1.20	0.98-1.47	1.15	0.86-2.38
≤ 40 years	218 (65.9)	113 (34.1)				
Time of service						
< 5 years	121 (62.4)	73 (37.6)	0.96	0.83-1.12	1.11	0.88-2.11
≥ 5 years	146 (64.6)	80 (35.4)				
Daily working hours						
< 12 hours	90 (64.3)	50 (35.7)	1.02	0.87-1.18	0.99	0.62-1.50
≥ 12 hours	177 (63.2)	103 (36.8)				
Location of Taxi region						
Periphery	99 (66.4)	50 (33.6)	0.93	0.80-1.08	0.90	0.48-1.16
Downtown	168 (62.0)	103 (38.0)				
Received information on accidents/ participated in educational activities						
Yes	34 (73.9)	12 (26.1)	1.19	0.98-1.43	0.89	0.33-1.40
No	233 (62.3)	141 (37.7)				

*Notes: Adjustment of the model: Hosmer and Lemeshow Test (p = 0.959); *Ratio of Prevalence; **Adjusted Ratio of Prevalence; ***In the bivariate analysis, p-value < 0.001 and in the multiple analysis P value = 0.001.*

DISCUSSION

In Brazil, traffic accidents involving motorcyclists are quite prevalent, and high morbidity and mortality rates are a public health problem, resulting in high social and economic costs[6], especially regarding health care, material loss and social security expenditure, in addition to great suffering for the victims and their families.

On the other hand, studies on traffic accidents in Brazil are scarce[15], especially in the cities away from the state capitals, and the prevention and control activities are conducted in holidays and periods of the year with increased risk of traffic accidents and are sporadic.

Since this theme is little explored in Brazil[3], direct comparisons with other works are difficult. Most of the data in the scientific literature comes from researches with motorcycle couriers that circulate in urban streets of large cities, especially studies in Monte Plata (Dominican Republic)[16], in Feira de Santana (Bahia-Brazil)[12] and in Santo Ângelo (Rio Grande do Sul-Brazil)[17], which also used the motorcycle taxi drivers as subjects of research.

In relation to age group, national surveys[6-7,18-19] and international surveys[16,20-22] state that, in accidents involving motorcyclists, the age group of 21 to 30 years old is the most affected. In Argentina, traffic accidents had an increase in rate among the causes of violent death of young people in the period from 2000 to 2008[23]. A systematic review on motorcyclists also revealed that the younger ages are considered most at risk for involvement in accidents, as well as association with greater severity or death[22].

In this context, the group of young adults was predominant in our study and, although most of the ones who were aged less than 35 years have suffered accidents, association with age was not significant. On the other hand, in researches developed in Feira de Santana (BA)[12] and Santo Ângelo (RS)[17], most motorcycle taxi drivers were more than 30 years old, observing that in the first study there was also no significant association between age group and accidents ($p = 0.30$).

In this research, the age group that had the highest frequency of facial injuries was the youngest age group, which may be related to the greater severity of the accidents, corroborating data from a systematic review that presents more injuries to the head and face in this age group[22].

A relevant information[3,12,16-17,22] is the predominance of males in the professions of motorcycle courier and motorcycle taxi driver, corroborating our study, in which the presence of only four women was observed. Men predominate among the young victims[15], which is associated with the greater exposure in traffic, which may have influence from society and culture, due to the strong sexist traits rooted in the educational process[24]. From an early age, men are encouraged to drive, due to a belief that this activity is best exercised by them, as well as professions associated with the traffic.

Regarding the level of education, in our study prevailed the completion of secondary education, similar to that found among the motorcycle taxi drivers of Feira de Santana (52.8%)[12]. On the other hand, in surveys conducted in Monte Plata (Dominican Republic)[16] and Santo Ângelo (RS-Brazil)[17], most professionals had completed only the elementary education. In Caicó and Feira de Santana[12], municipalities located in the countryside of Northeastern Brazil, there are possibly less opportunities of occupations for professionals with higher educational level, given the location and lower socioeconomic development of the municipalities.

Although education level had statistical significance ($p = 0.001$) with motorcycle accidents in this research, the highest frequency occurred with motorcycle taxi drivers who had completed high school or higher education. According to a systematic review[22], lower education level was considered a risk factor for accidents involving motorcyclists, opposed to the results found in our study. A possible explanation for this result in this study may be related with the fewer opportunities of occupation in other areas. Despite the higher education level, the motorcycle taxi drivers cannot find better occupations, being subjected to heavy workload to ensure the livelihood. Considering that the municipality in which the research was conducted is located in the countryside of the state, the limitations of employment can be explained, since there is a tendency that individuals with higher education level migrate to the capital or more developed urban centers seeking better opportunities. Those individuals who even with higher education level remain in the countryside can occupy positions also common among those with lower education level. Importantly, the vast majority of motorcycle taxi drivers in the research had complete secondary education as education level.

Concerning the vulnerability of motorcycles, studies have shown a high participation of motorcyclists as victims in accidents, with proportions ranging from 45% to 60%[1-2,17]. In our study, more than half the motorcycle taxi drivers have been involved in a motorcycle accident. On the other hand, in a study developed in Feira de Santana[12], the annual incidence of accidents involving motorcycle taxi drivers was 10.5%, less than the value found in other researches reported by considering only accidents that occurred in the period of one year.

Therefore, the rate of hospitalization in the Brazilian Unified Health System (SUS) due to traffic accidents is 64 hospitalizations for every 100 thousand inhabitants, with an average of 98 deaths per day[25], particularly motorcycles in traffic accidents in Brazil, so that from 2009 the accidents involving motorcyclists were already responsible for the greatest mortality rate for land transport accidents, with 6.2 deaths per 100 thousand inhabitants[26].

One of the reasons for the high number of accidents with motorcyclists may be the high number of motorcycles. Their use as an instrument for work in formal or informal labor market is referred to by several authors as a possible cause for the increase in the number of victims of motorcyclists[1-2,27].

Moreover, among the factors related to the high number of accidents is the high workload of motorcyclists. In this perspective, the high number of days worked and the presence of musculoskeletal fatigue or complaints are considered risk

factors for accidents involving motorcycle taxi drivers[12]. Studies have shown that the vast majority of motorcyclists had time of professional activity greater than two[3] or five years[12], making these drivers more vulnerable to accidents when there is longer time of service, due to increased exposure to risk factors inherent in traffic. In addition, there are high numbers of working hours, with some professionals working, on average, eight hours per day[12], while others, mostly, more than ten[3] or twelve hours per day[17].

Similarly, our study found that the majority of motorcycle taxi drivers reported time of insertion in the profession of 2-5 years and undergoing long working hours, with overtime to make up for the low pay. For some, workload exceeded 12 hours daily, exposing them to greater physical and psychological fatigue, which may favor the occurrence of accidents.

Despite the mandatory use of individual protection equipment for the driver, their use is still neglected, which favors the high index of sequelae in Brazil. According to Santos et al.[19], 60.2% of the motorcyclists did not wear a helmet, which is contrary to data found in Thailand[28], where 65.0% reported wearing it.

In addition to the presence of helmet, it is also important to note its characteristics regarding protection of face. In this context, Silva et al.[3] observed that, among motorcycle couriers, indices for reported use of helmet without mandible protection were high. However, our results showed that almost all motorcycle taxi drivers use the helmet with oral and maxillofacial region protection, which denotes a greater care of these in relation to motorcycle couriers. The helmet with mandibular protection is important because some studies associate fractures in this region to motorcycle accidents, the mandible being the main area affected when there are facial bone lesions[20,29-30].

Thus, the use of helmet is considered as important as the use of safety belt, as it minimizes morbidity and mortality, reducing the number and severity of cranioencephalic traumas and cervical fractures[19]. Importantly, according to Law No. 12009/09[17], individual protection is not restricted to the helmet. Goggles and safety vest with reflective device should be used, and safety equipment should be installed on motorcycles, especially line stopper and fastening device for passenger or cargo and protective equipment for legs and motor[17]. However, in our research, we observed negligence concerning the full use of personal protection equipment required by the resolution in question.

Despite the high frequency of accidents involving motorcycles and absence of complete use of safety equipment, the study showed that the vast majority of motorcycle taxi drivers never received information about prevention and/or conduct after accidents; hence, it is important to expand the educational work in the countryside regions of the country. However, specific actions aimed at changing the behavior of motorcyclists are insufficient and bring few results, since the driver's behavior is not the only factor associated with accidents[9]. Market and economy rules, founded on agility and race against time, contribute heavily to accidents[4]. Therefore, it is increasingly necessary to implement comprehensive control measures in relation to users, to safety equipment, and even to vehicles, with strict inspections and punishments for infractions, in addition to prioritizing the education of new drivers and a continuous policy of inspection[18].

Despite the considerable occurrence of motorcycle accidents in the population under study, little is done by professionals and health institutions to clarify the population on how to proceed in cases of traffic accidents, or even to warn about means of prevention and consequences that can result from traumas.

It is also noteworthy that the profession of motorcycle taxi driver is peculiar to small towns, which usually are little explored in scientific research and, therefore, require greater attention to elucidate aspects related to traffic and to other topics regarding occupational health.

Some limitations of this study - which can be adjusted in future works - would be the nonuse of a validated instrument, no determination of the number of times that individuals suffered an accident, limitation as to age group and time of professional service in the study, as well as the high number of motorcycle taxi drivers who were not willing to participate in the research. Despite the limitations, the research was extremely important, since it already allowed for the conduct of extension research projects focused on the category of motorcycle taxi drivers and users of the service, with health education activities, continuous, based on the results of the research and in partnership with the Municipal Department of Urban Mobility. The aim is also to expand and disseminate campaigns about traffic accidents to reduce them or minimize the injuries resulting from them.

CONCLUSION

Based on what has been discussed, we observed the motorcyclists' exposure to traffic accidents and the need for activities organized between the Department of Infrastructure and Transport and health professionals aimed at the prevention of traumas, emphasizing the individual protection of drivers and passengers. When considering that higher educational level was strongly associated with the occurrence of accidents, we observe that there are still great deficiencies concerning education in traffic, since professionals who should be more cautious - due to higher level of education - were the most involved in accidents.

Among the motorcycle taxi drivers, there was a high prevalence of accidents, with these professionals being subjected to high workload, given the need for productivity, often traffic violations can be observed such as speeding, which increases the vulnerability not only of drivers, but also of passengers.

In this context, we expect that this research can guide actions that involve this group of workers, generally neglected, and which require attention from urban mobility agencies concerning supervision and control, implementation of public policies aiming education in traffic and regulation of the profession.

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