Road traffic accidents involving elderly people: an integrative review

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Abstract

Objective: To identify the epidemiological and socio-demographic profile of elderly victims of traffic accidents reported in articles published in scientific literature from 2013 to 2018. *Method:* The Literatura Latino Americana em Ciências da Saúde (Latin American Literature in Health Sciences), Base de Dados de Enfermagem (Database in Nursing), Scientific Electronic Library Online, and Medical Literature Analysis and Retrieval System Online databases were used, with the guiding question being: *What is the scientific production on traffic accidents involving elderly people?* A total of 355 articles were found. After the application of the selection criteria, 16 were evaluated, and nine remained for final analysis. *Results:* The age range was 60 to 69 years and the majority of the sample were men, who were married and had low schooling. Being run over was the most frequent accident. The width of the traffic lanes and the time of the accident influenced the frequency and risk of accidents and the severity of the injuries. *Conclusion:* Younger elderly persons were the most affected, and being run over was the most frequent type of accident.

Keywords: Accidents Traffic. Health of the Elderly. Wounds and Injuries. Health of the Elderly. Elderly Population.

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INTRODUCTION

Traffic accidents are one of the main causes of death in the young and adult population. This cause is also significant among the elderly, especially with the increasing size of the older population[1-4].

A study on external causes carried out by the SEADE Foundation in the state of São Paulo, Brazil, found that car accidents and falls are among the main causes of death among the elderly. When the other causes of death among this population are compared, external causes have a lower impact, but are greater within the group itself[5].

Although external causes affect the younger population more frequently, the risks of dying from accidents or violence increase dramatically among those over 60. This is caused both by the condition of exposure to risk due to locomotion and other tasks that are part of activities of daily living, as well as by the inherent difficulties of age.

Among the accidents that can affect the elderly population are Road Traffic Accidents (RTA). The number of existing vehicles is a preponderant factor for the occurrence of these accidents, involving both automobiles and motorcycles, as they cause complications in the traffic in general, and increase the risks of this type of accident[5,6]. With the changing age of the population[4,6], RTA suffered by the elderly have become a major public health problem, and one with an increasing trend[7].

People in the 60 years or older age group have a higher mortality from external causes in Brazil, as well as hospitalizations from these causes within the Unified Health System (or SUS), with rates of 109 and 650 per 100,000 inhabitants, respectively, in 2008. Between 2008 and 2010, there were 413,139 hospitalizations for external causes among the elderly in the SUS, costing approximately R$570 million. These hospitalizations were mainly due to falls (62.4%), traffic accidents (8.1%) and unclassified external causes (7%)[8].

Between 2000 and 2010, the mortality rate from RTA increased from 18 to 22.5 deaths per 100,000 inhabitants in Brazil. Such accidents were also the second most frequent cause of hospitalizations in the SUS between 2002 and 2011, resulting in costs estimated at R$50 billion[9-11].

Although older people are living longer and more healthily, they face new challenges, among which are traumas resulting from RTA, which significantly affect this group[10].

It was therefore felt that there was a need to better understand how RTA affect this population through the identification of published works on the subject in scientific literature, and from this knowledge provide a foundation to contribute to the preparation of preventive public policies to benefit this age group.

Therefore, the present study aimed to identify the epidemiological and sociodemographic profile of elderly victims of RTA through articles published in scientific literature from 2013 to 2018.

METHOD

An integrative review of literature was carried out, which consists of the creation of an evidence-based scientific framework. This form of knowledge production requires a methodological rigor and is effective for the analysis and critique of literature, constituting one of the main research modalities in the context of health[12].

As a research strategy, the electronic databases Medical Literature Analysis and Retrieval System Online (PubMed), Latin American & Caribbean Health Sciences Literature (LILACS), the Scientific Electronic Library Online (SciELO) virtual library and the ScienceDirect platform were used.

The inclusion criteria were: (a) articles indexed by descriptors registered in the Medical Subject Headings (MeSH) database: "Traffic Accidents", "Elderly", "Old Age", "Old Adults" and in the Health Sciences Descriptors (DeCS): "Traffic Accidents" and "Elderly"; (b) articles published from 2013 to 2018 involving people over 60 years of age and (c) articles that answered the research question. The exclusion criterion was published literature other

than primary articles, excluding, in this manner, case studies, monographs, master's dissertations, doctoral theses, chapters of books and systematic reviews.

The survey was conducted between February and April 2018, with data collection performed at two different moments. The first was the selection of articles for a complete reading, the description of which is detailed in figure 1. Initially, 936 articles were established from the chosen descriptors. A total of 848 were discarded as they did not meet the inclusion criteria (n=840) or were duplicates (n=8), leaving 90 articles potentially eligible for the study.

From a careful reading of the titles and abstracts, 65 articles were excluded because they were outside the defined age group (n=49) or did not relate to the studied subject (n=16) and, thus, 25 articles were chosen as they responded closely to the guiding research question proposed.

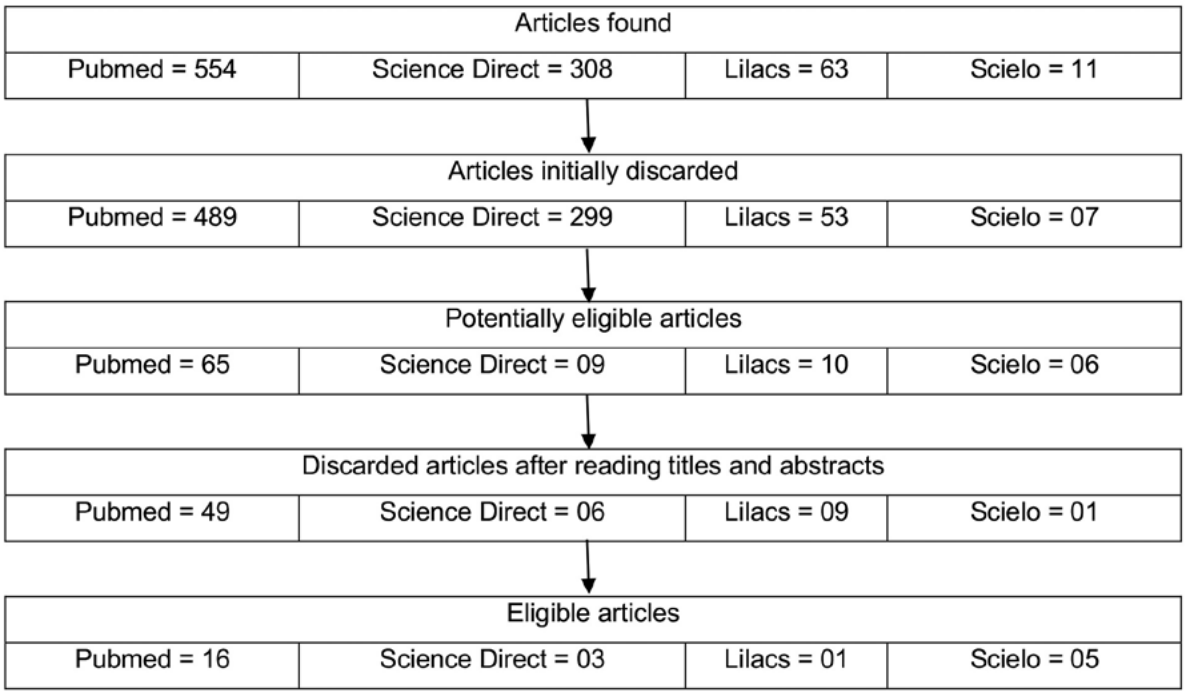

Figure 1. Selection process of articles included in the present review. Recife, Pernambuco, Brazil, 2018.

For the second part of the data collection, an instrument was created by the research team that contained the following items: article title, year of publication, country of affiliation of the main author, type of study and main results. Data analysis was performed in a descriptive manner, based on the Thematic-Categorical Content Analysis[13]. This process was divided into three stages, namely: pre-analysis, exploration of material or coding and treatment of results - inference and interpretation.

RESULTS

Chart 1 lists the studies included in the review.

Chart 1. Studies included in review, Recife, Pernambuco, 2018.

Database	Título of article	Author	Year of publication	Country of origin	Main results
PubMed	Associations of Near-Miss Traffic Incidents with Attention and Executive Function among Older Japanese Drivers	Makizako H, Shimada H, Hotta R, Doi T, Tsutsumimoto K, Nakakubo S, et al.[14]	2018	Japan	Visual and auditory acuity deficits increased the risk of collisions of vehicles between elderly drivers. Attention may be one of the measurable and modifiable contributors related to car accidents in the general population of older drivers.
PubMed	What are the differences in injury patterns of young and elderly traffic accident fatalities considering death on scene and death in hospital?	Heinrich D, Holzmann C, Wagner A, Fischer A, Pfeifer H, Graw M, et al.[15]	2017	Germany	The majority of pedestrian deaths were caused by polytrauma. Most deaths at the scene of the crash were due to thoracic and pelvic injuries, while in hospital the most prevalent were abdominal injuries.
PubMed	Age-related differences in fatal intersection crashes in the United States	Lombardi DA, Horrey WJ, Courtney TK.[16]	2017	USA	Accidents involving the elderly mostly occurred during the day, from Tuesday to Friday, with a lower collision speed than in accidents involving younger people. Older drivers were more likely to make mistakes regarding the culpability of the accident.
PubMed	Features of fatal injuries in older cyclists in vehicle–bicycle accidents in Japan	Matsui Y, Oikawa S, Hitosugi M.[17]	2017	Japan	Head injuries were the most common causes of cyclist fatalities after collision with a vehicle among those aged over 75 years, with severe injuries even at low speeds.
ScienceDirect	Predictors of older drivers' involvement in rapid deceleration events	Chevalier A, Coxon K, Chevalier AJ, Clarke E, Rogers K, Brown J, et al.[18]	2017	Australia	64% of participants were involved in at least one rapid deceleration event over one year, with most of those involved being older drivers with declining sensitivity and reduced confidence.
PubMed	Elderly road collision injury outcomes associated with seat positions and seatbelt use in a rapidly aging society - A case study in South Korea	Noh Y, Yoon Y.[19]	2017	South Korea	When younger (65-74 years) and older (75 years or more) elderly persons were compared, it was observed that older individuals were more likely to suffer serious injury. Severe injuries due to the absence of seat belts were also more frequent in the elderly. The proper application of the use of safety restrictions plays an important role in reducing injuries among the elderly in these accidents.

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Database	Título of article	Author	Year of publication	Country of origin	Main results
LILACS	Trends in mortality from road traffic accidents in the elderly in Brazil	Scolari GAS, Derhun FM, Rossoni DF, MathiasTAF, Fernando CAM, Carreira L.[20]	2017	Brazil	27% of registered causes of death were due to road traffic accidents. There were greater growing trends in: the northeast region, accidents involving elderly pedestrians, cyclists, motorcyclists and occupants of automobiles. The elderly are more susceptible to being knocked down.
SciELO	Trauma from traffic accidents among the elderly: risk factors and consequences	Santos AMR, Rodrigues RAP, Diniz MA.[21]	2017	Brazil	The elderly were between 60 and 79 years of age, male, married, with elementary school education, pedestrians, followed by motorcyclists, and not drunk.
ScienceDirect	Pedestrian injury risk and the effect of age	Niebuhr T, Junge M, Rosén E.[22]	2016	Germany	Age and physical conditions are the main risk factors for traffic injuries, and age groups from the youngest and oldest extremities present a higher risk of fatalities. The risk for the elderly is double that of adults, with more serious consequences for elderly persons over 65 years.
PubMed	The characterization of drug and alcohol use among senior drivers fatally injured in U.S. motor vehicle collisions, 2008 2012	Rudisill TM, Zhu M, Abate M, Davidov D, Delagarza V, Long DL, et al.[23]	2016	USA	20% of the tested drivers were considered drug-positive. The highest prevalence was in the elderly of 65-69 years. The most commonly reported drugs were antidepressants and narcotics, as well as benzodiazepines. Those who tested positive for drugs were 43% more likely to not be wearing a seat belt at the time of the collision.
PubMed	Age-Related Differences in Vehicle Control and Eye Movement Patterns at Intersections: Older and Middle-Aged Drivers	Yamani Y,Horrey WJ, Liang Y, Fisher DL.[24]	2016	USA	Older drivers had difficulty performing simultaneous tasks. Older drivers (over 70 years) have a high risk of a fatal vehicle accidents at intersections, as elderly drivers generally do not look twice for potential hazards at intersections.
Scielo	Trauma among the elderly: access to the health system through mobile pre-hospital treatment.	Silva HC, Pessoa RL, Menezes RMP.[25]	2016	Brazil	Among the victims of trauma, women were most prevalent, and were victims of falls, with pre-hospital treatment (basic life support), who were then transported to a tertiary referral unit.

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Scielo	Instruction program with emphasis on self-care practices for elderly motorists	Almeida MHM, Caromano FA, Ribeiro SS, Batista MPP.[26]	2016	Brazil	54% of respondents reported difficulty driving, 42.9% reported emotional difficulties, and another 42.9% said they had physical, sensory and/or cognitive difficulties. There was also a deficit related to education, as well as inspection and punishment of traffic violations.
PubMed	Impact of road traffic accidents on the elderly	Etehad H, Yousefzadeh-ChabokSh, Davoudi-Kiakalaye A, Dehnadi AM, Hemati H, Mohtasham-Amiri Z.[27]	2015	Iran	The study divided the elderly into <75 and >75 years of age and, when comparing the two, found that the majority of the injured were male, married, pedestrians, affected by TBI and extremity fractures, while the elderly persons <75 years remained hospitalized for longer, and mortality was higher among the >75 years group
PubMed	Incidence and related factors of traffic accidents among the older population in a rapidly aging society	Hong K, Lee KM, Jang S.[28]	2015	South Korea	The incidence of traffic accidents among elderly Koreans was estimated at 11.74/1,000 inhabitants for men and 7.65/1,000 inhabitants for women. The most common risk factors were: depressive symptoms for both genders, employability for males and comorbidities such as arthritis for females.
SciELO	Elderly persons treated in urgent care services in Brazil: a study of falls and accidents in traffic.	Freitas MG, Bonolo PF, Moraes EN, Machado CJ.[29]	2015	Brazil	Main victims of falls: women with low levels of schooling, without a current job. Main victims of traffic accidents: younger men. Complications were found at similar levels in both sexes.
PubMed	The effects of age, gender, and crash types on drivers' injury-related health care costs	Shen S, Neyens DM.[30]	2015	USA	The estimate of average health costs in in US dollars in 2007 was $2310 for men >65 years and $2055 for women >65 years. In terms of age and gender, drivers in older groups have higher health care costs than drivers in younger age groups. The former have a reduced capacity to recover from lesions, leading to longer hospitalization time

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Database	Título of article	Author	Year of publication	Country of origin	Main results
PubMed	Street crossing behavior in younger and older pedestrians: an eye- and head-tracking study	Zito GA, Cazzoli D, Scheffler L, JägerM, Müri RM, Mosimann UP, et al.[31]	2015	Switzerland	Elderly persons performed significantly worse on the visual acuity test. Older participants significantly overestimated their walking speed, but they needed more time to complete the crossing. Older pedestrians have more difficulty analyzing the movement of an approaching car when it is still far away, increasing risky decisions and decreasing performance at the intersection.
ScienceDirect	Crossing a two-way street: comparison of young and old pedestrians	Dommes A, Cavallo V, Dubuisson JB, Tournier I, Vienne F.[32]	2014	USA	Reduced functional skills increase the risk of collision. The elderly presented flaws when required to increase the speed and the length of their steps in comparison with younger people. The elderly also had difficulty processing information from the visual scene, as well as not looking directly at traffic, in addition to making more risky decisions compared to young participants.
PubMed	Comorbidities and Crash Involvement among Younger and Older Drivers	Papa M, Boccardi V, Prestano R, Angellotti E, Desiderio M, Marano L, et al.[33]	2014	Italy	The burden of comorbidity is a self-limiting factor among elderly drivers, since the increase in comorbidities is associated with a reduction in involvement in collisions. Thus, the burden of comorbidities is a predictor of involvement in traffic accidents, regardless of gender.
PubMed	Association Between Vision Impairment and Driving Exposure in Older Adults Aged 70 Years and Over: A Population-Based Examination	Sandlin D, McGwin Jr G, Owsley C.[34]	2014	USA	Reduced visual processing speed was the strongest risk factor for the involvement of older drivers in vehicle collisions. Self-regulation was a highly adaptive strategy for reducing exposure to this risk.

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Database	Título of article	Author	Year of publication	Country of origin	Main results
PubMed	Mature Driver Laws and State Predictors of Motor Vehicle Crash Fatality Rates Among the Elderly: A Cross-sectional Ecological Study	Bell TM, Qiao N, Zarzaur BL.[35]	2014	USA	Overweight and a higher percentage of elderly persons >65 years with university degrees were associated with an increase in the rate of collisions between vehicles. Greater access to health services, such as primary care, access to medication and emergency surgeries, were associated with lower rates of fatality.
PubMed	Gender differences among older drivers in a comprehensive driving evaluation	Classen S, Wang Y, Crizzle AM, Winter SM, Lanford DN.[36]	2013	USA	Older female drivers presented more self-reported avoidance behaviors in relation to interstate/highway driving, driving in the rain, and driving at night. Contrast analysis by gender and age revealed that more emphasis should be given to the 75-year-old male and female group for failing the road test.
PubMed	Effect of Driver's Age and Side of Impact on Crash Severity along Urban Freeways: A Mixed Logit Approach	Haleem K, Gan A.[37]	2013	USA	Driver's age was an important predictor, and impacts from injuries, especially side impacts, were greater among elderly drivers.
SciELO	Comparative study of trauma among the elderly and non-elderly in a University Hospital in Curitiba	Broska Júnior CA, Folchini AB, Ruediger RR.[38]	2013	Brazil	The majority of trauma care in the elderly population was for women. Traffic accidents were the 2nd most frequent cause, with being knocked down predominating, while the elderly are most susceptible to femoral fractures and TBI.

DISCUSSION

Globally, trauma cases are the fifth highest cause of mortality among the elderly, with cases of Road Traffic Accidents (RTA) contributing to this increase[35]. In Brazil, the RTA-related death rate among elderly individuals has been increasing since 1996, especially in the northeast region of the country[20].

The demographic profile identified in several studies reveals that younger elderly persons, especially in the 60-69 age group, are the main victims of traffic accidents[16,21,27,29,38]. However, health care costs are higher for the population of drivers aged over 65 years, as they are more likely to suffer more severe traumatic injuries and have a lower recovery capacity for these injuries than younger elderly persons, thus leading to longer hospitalization and higher costs[18,19,30,37].

When the results were analyzed by gender, men were the most affected, which may be related to their greater movement around the urban perimeter of cities, due to their greater involvement in leisure activities and as participants in the labor market[30,36].

In addition, there is a greater proportion of RTA among married elderly persons, as well as those with lower schooling, as this is one of the determinants for a greater occurrence of traumatic lesions[21,29].

Risk factors that increase the vulnerability of the elderly population to traffic accidents may be related to the aging process itself, the prevalence of comorbidities, alcohol use, polypharmacy, traffic dynamics and the structural difficulties of places the elderly attend[21,22,27,37].

When comparing risk factors between genders, employability is found to be the greatest factor for males, with arthritis the most frequent comorbidity among females, and depressive symptoms evident factors for both genders[28]. Being overweight and elderly people over 65 with university degrees were other risk factors cited[35].

Another important risk factor was the use of alcohol and other drugs. One study that characterized such use in elderly drivers involved in fatal automobile collisions in the USA found that among drivers considered drug-positive, there was a 43% greater tendency to be without a seat belt at the time of the collision. The most commonly reported drugs were antidepressants and narcotics, as well as benzodiazepines, many of which can alter driving ability if not prescribed and administered properly[23].

Literature shows that elderly pedestrians are the most vulnerable to traffic accidents. This may be explained, in addition to the functional conditions of the elderly, by current traffic conditions and improper driving behaviors, such as carelessness on the part of car drivers and motorcycle riders, as well as situations where the elderly cross the road away from crossings or when the red light is showing for pedestrians[15,21,38]. Such situations potentiate trauma events in traffic and reaffirm their status as a public health problem[25].

The predominance of being knocked down among traffic accidents involving the elderly is partly related to the difficulty these pedestrians have when crossing the road, as cognitive decline is accentuated by increases in age. A study also showed the unsafe behavior of elderly people when crossing two-way streets, where they have difficulties in increasing step speed and length in comparison with young people[32]. A greater risk was also perceived among elderly drivers when decelerating vehicles due to reduced sensitivity and confidence[18].

A study in Switzerland compared the behavior of young and old people at the intersection of a lane, and found that the latter looked more towards the ground than to both sides of the street before crossing than the former[31]. This was justified by the fact that the elderly do not generally take a second look for potential hazards at intersections[24].

Regarding the day of the week, time of occurrence and speed of collision, when compared to traffic accidents involving younger people, accidents involving elderly people were more frequent during the day, from Tuesday to Friday, and involved a lower collision speed[16].

The most commonly reported injury patterns were traumatic brain injuries (TBI), due to the impact of parts of the vehicle or throwing the victim onto the road, and limb fractures due to the reduction in the bone mineral content characteristic of aging[22,27,38]. In addition, it was also identified that in the elderly, most of the deaths at the scene of the accident were due to thoracic and pelvic injuries, while in hospitals the majority of deaths were due to abdominal injuries[15]. Although these lesions may be conveniently treated, some elderly cyclists died because rescue teams did not identify early retroperitoneal bleeding after pelvic fractures, which require the careful clinical evaluation by the team that provides first response care to the injured elderly person[17].

In contrast, comorbidities help to reduce the risk of the elderly being victims of a RTA event, as they employ self-regulating behaviors. These behaviors are characterized by the self-reported decision to adopt protective strategies in traffic when perceiving their weakened physical condition, such as reducing their exposure to traffic, driving a vehicle at lower speeds and avoiding driving at night, which becomes preventive behavior[14,20,33,34,36].

With regard to the impacts of traffic accidents on the elderly population, it is known that this type of event can negatively affect the functional capacity

of such individuals, depending on the severity of the trauma. Immobilizations were the most frequent results, and the greater the intensity of the trauma, the more serious the consequences and the behavior adopted[26]. It was evidenced that the elderly are more predisposed to suffering fractures or trauma to the cranial and vertebral column[38].

One initiative worthy of note involved the development of a mentoring program for elderly drivers on driving difficulties associated with aging, encouraging self-care[26]. From this perspective, health services that care for the elderly, irrespective of the level of complexity, must be prepared to meet the specifics of trauma among this public, investing in professional training, infrastructure, health education, self-care practice and family participation[24]. These and other initiatives can serve as incentives to prevent the growth of the morbidity and mortality of elderly people due to traffic accidents and should be stimulated in the various contexts of care of this population.

The limitations of the present study concern the heterogeneity of the studies included in the review in terms of the discussion of the results, which may have hampered a more consistent analysis. The descriptors selected may not have found all the published studies. In addition, many of the articles surveyed are restricted access, which can be considered as a limiting factor. It is important that more studies are carried out in the area of gerontology and geriatrics involving traffic accidents.

CONCLUSION

According to this review, the profile of the elderly persons suffering traffic accidents was: elderly persons in the age group of 60 to 69 years, males, married, with low schooling and who worked. Pedestrians were the most vulnerable, with a predominance of being knocked down. The accidents occurred most often during the day, and cranio-encephalic trauma was the most frequent injury.

In view of the results, it can be inferred that there is a need to invest in the area of urgent and emergency care, in the planning of actions that contribute to the preparation of health teams for the integral care for the elderly, noting their particular characteristics, related to the frailty of age, such as the pathophysiological alterations that can compromise the quality of life of these individuals.

A fresh approach should be taken among professionals who work directly with traffic in cities with an elderly population, with the aim of training such individuals and raising their awareness about the treatment of the elderly, avoiding greater harm.

It is hoped that other researchers are encouraged to carry out further studies in the areas of geriatrics and gerontology involving Road Traffic Accidents (RTA) in order to create strategies where this population can have more freedom in their mobility without the risk of accidents, and with a better quality of life.

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