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Pedestrian road traffic accidents in the USA, is age a crash outcome Determinant?

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Abstract
Background and Aim: Traffic accidents rank among the top ten leading causes of death worldwide in 2021. Of all traffic fatalities, pedestrians accounted for 17% and everyday approximately 854 pedestrians worldwide will never make it back to their homes because they would have died in traffic accidents. The aim of this retrospective study is to ascertain the pattern and characteristics of pedestrian traffic accidents as well as the impact of age on crash outcomes in the United States during a five-year period (2017-2021).
Methods: The National Highway Traffic Safety Administration's Fatality Analysis Reporting System online database provided secondary data for this cross-sectional study. Using the specified variables, pedestrian characteristics frequencies and percentages were calculated. Statistically significant relationships between variables were identified using the Chi-Square test.
Results: The findings revealed that the age range of 31–40 years accounted for a large percentage (18.5%), that men made up 70% of the population, and that pedestrian fatalities were common (94.8%). A statistically significant association ($p<0.05$) was found between the age of the pedestrian and the crash results.
Conclusion: The 31 to 40 years age group constitutes part of the economically active age group hence, any public health issue affecting them may have an impact on the economic wellbeing of a nation. Morbidity or mortality from pedestrian road traffic accidents disproportionately affecting this age group should spur policy formulation to reduce this menace.

Keywords: Pedestrians, road traffic accidents, USA, fatality.

Introduction

In the world, traffic accidents rank among the top ten leading causes of death [1]. The first pedestrian death was officially documented in 1899, and since then, the incidence has increased [2] up till now when there is an average of one fatal traffic accident worldwide every 50 seconds and one injury each two seconds [3]. Over two individuals lose their lives in traffic accidents per minute, according to a 2020 World Health Organisation report [4]. Kendi *et al*. noted that whether they are using assistive equipment or walking alone, almost everyone is a pedestrian at some point during the day [5]. In the United States of America, CDC noted that walking makes up 10.5% of all trips, which are defined as any movement between two addresses [6]. A fourth of all fatalities or serious injuries on the roads occur among pedestrians, even though they pose virtually no risk to other drivers [7]. Pedestrian injury rates increased by 3.31% worldwide between 1990 and 2017 [8]. The National Highway Traffic Safety Administration, in 2022 noted that in 2021, pedestrians accounted for 17% of all road fatalities in the United States [9] and 7,388 pedestrians lost their lives in motor vehicle crashes, a 12.5% increase from 2020. This amounts to an average of one pedestrian murdered every 71 minutes, 20 pedestrians killed daily, and 142 pedestrians killed throughout a week [9]. The death rate in 2021 was also the greatest number since 1981, when 7,837 pedestrians died in traffic accident [9]. The European commission in 2018, remarked that Pedestrians accounted for 20% of all traffic deaths in the European Union [10]. Road traffic deaths are most common in low-income countries (24.1 per 100,000), followed by middle-income countries (18.4 per 100,000), and high-income countries (9.2 per 100,000) each year [10].

A World Health Organization Global Status Report on Road Safety in 2018 highlight that every day, 854 pedestrians lose their lives in traffic-related incidents, making it impossible for them to return home [11]. It is shown that the leading cause of death for youths aged 15 to 29 is road traffic accidents [12].

Understanding the impact of pedestrian age on crash outcomes will be helpful in developing an age-specific policy to lessen the burden of this condition. Public health is greatly impacted by traffic accidents, which the World Health Organisation estimates would become the sixth leading cause of death globally by 2030 if nothing is done [13].

According to the Centre for Disease Control, in the USA, the cost of fatal injuries was estimated at 2.69 trillion dollars in 2020, with unintentional motor vehicle accidents accounting for 15.4% of this total [14]. Chen *et al*. noted that according to their estimates, in constant 2010 US dollars, the cost of traffic accidents to the global economy between 2015 and 2030 will be $1.8 trillion, which is equivalent to a 0.12% annual tax on the global gross domestic product [15].

The UN General Assembly issued a resolution in March 2010 establishing the Decade of Action for Road Safety, which ran from 2011 to 2020 [16]. In 2015, the United Nations General Assembly established the Sustainable Development Goal 3.6, which called for a 50% reduction in motor vehicle accident-related deaths and morbidity by 2020. The World Health Organisation's June 2022 Road traffic injury fact sheets, however, revealed that the number of road traffic fatalities worldwide had risen to 1.3 million from 1.25 million in 2013 [13]. It is also shown that approximately one-fourth of all collision fatalities involve pedestrians [18], hence particular attention should be focused on these vulnerable groups of road users with a view to reducing the burden of pedestrian accidents mortality. Research into how variables such as pedestrian age affect crash outcome will be useful in this regard.

The aim of the study is to identify the features of pedestrian traffic accidents and evaluate the impact of pedestrian's age on the crash's outcome in the United States during a five-year period (2017-2021).

Materials and Methods

This study used data from the National Highway Traffic Safety Administration website which includes information on all traffic incidents from 1975 to 2021 in its Fatality Analysis Reporting System (FARS). Every traffic collision that results in a death within 30 days of the incident is surveyed nationwide by FARS [19]. The database is publicly available and designed for use in epidemiology investigations and research. This information is anonymous and can be used without any kind of request or consent. Information about pedestrians who were engaged in traffic accidents between 2017 and 2021 were retrieved.

Inclusion and exclusion criteria

The inclusion criteria are

Traffic accidents involving pedestrians in the United States.

Road traffic accidents involving pedestrians that happened between 2017 and 2021.

Complete and accurate demographic information about the pedestrian.

Accidents involving pedestrians that were entered into the Fatality Analysis Reporting System.

Exclusion criteria are

Missing or inadequately recorded information.

Traffic incidents that do not involve pedestrians.

Non-traffic accidents

The Fatality Analysis Reporting System database contains information on 34,728 pedestrians who were involved in traffic incidents. Among these, 33,021 pedestrians who were involved in traffic accidents received full demographic information for the five years from 2017 to 2021. Of these figures, 1,724 people survived the accidents, while 31,297 died. To ensure a large sample size that will provide more reliability and guarantee an accurate outcome, data from a five-year period was employed.

Statistical analysis

All data were analyzed using the Statistical Package for the Social Sciences (SPSS) version 28. A P value< 0.05 is taken as being statistically significant. Cramer's V to determine the correlation coefficient and the Z- effect were obtained. The r value of 0.04 is taken as small, 0.13 is medium and 0.22 is large effects for a degree of freedom of 6.

Results

Age

The age ranged between less than 1 year and 99 years and the mode of the age range was 31 to 40 years. This is shown in figure 1.

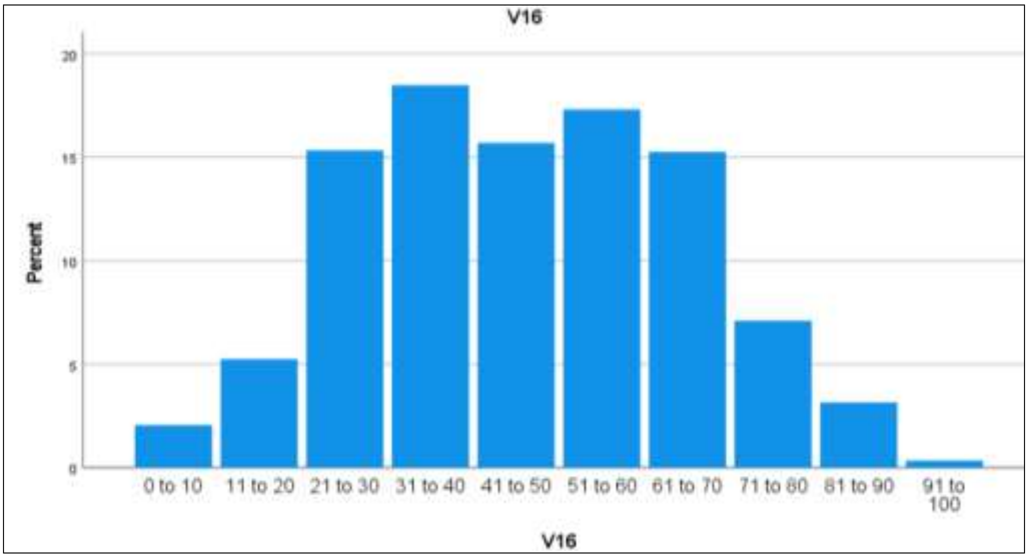

Fig 1: Age range of pedestrians involved in road traffic accidents.

Sex distribution: A total of 23,258 male and 9,943 female pedestrians were involved in road traffic accidents over the period under study with a Male to Female ratio of 2.3:1 as depicted in figure 2.

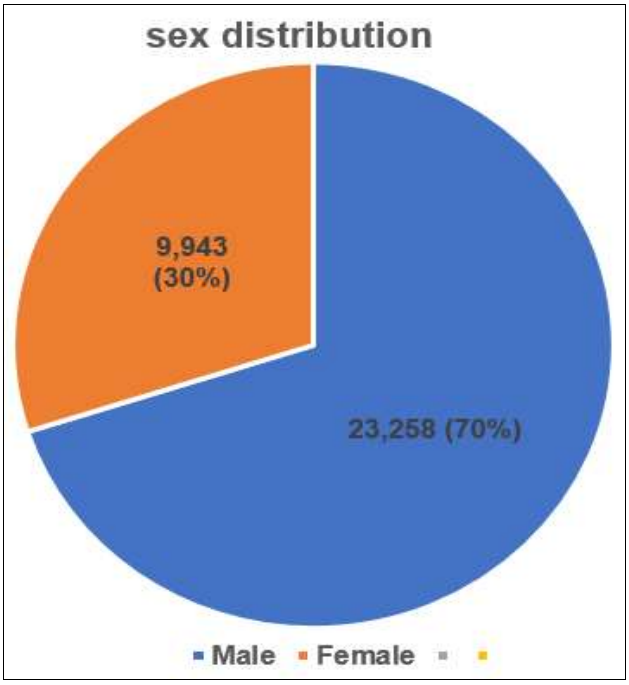

Fig 2: Pie chart of sex distribution of pedestrians involved in road traffic accidents in frequency and percentage.

Outcomes of the crash

The outcomes on the pedestrian involved in a traffic collision showed that 94.8% had fatal injury, while 2.4% and 1.7% had suspected serious injury and suspected minor injury as the outcome respectively. This is illustrated in figure 3.

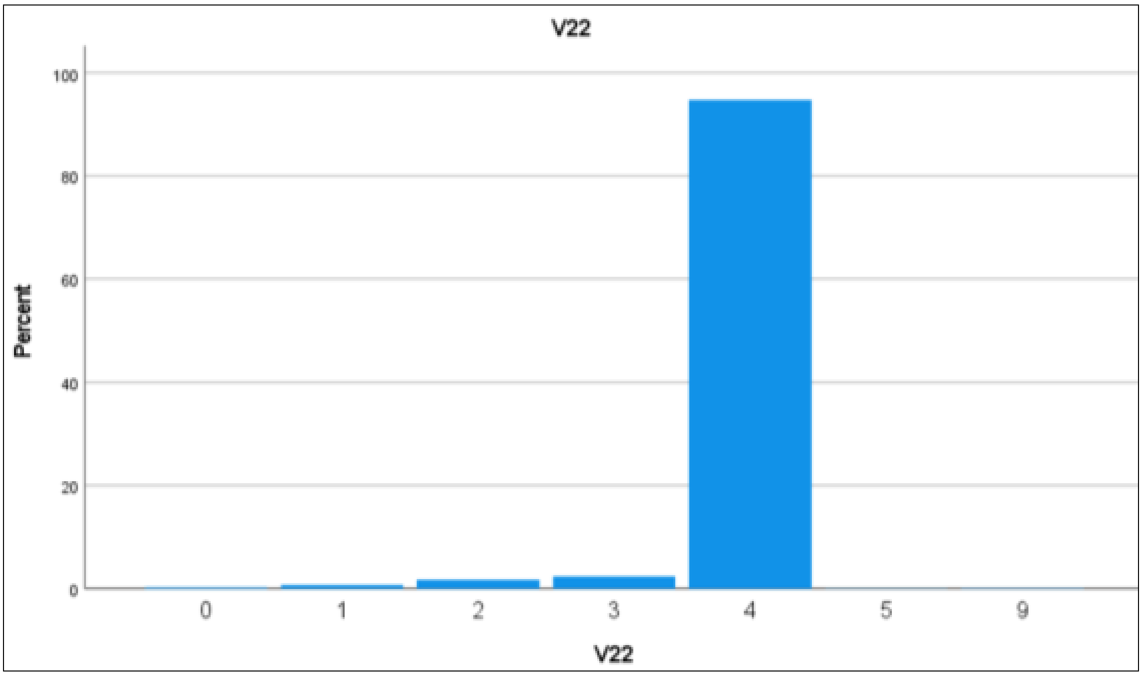

Fig 3: Bar chart showing outcome of the crash on pedestrian in percentages.

Where 0= no apparent injury, 1= possible injury, 2= suspected minor injury, 3= suspected serious injury, 4= fatal injury, 5= injury severity unknown and 9= unknown, not reported.

Outcomes of crash and age group

A cross tabulation of the crash outcomes and the age groups of the pedestrians gave a P-value of <.001 which is statistically significant. The Z-effect shows that there are differences in the proportion of a variable and another affecting the result obtained. The Cramer's V value of. 08 shows a small correlation coefficient or r value. It is therefore concluded that there is a statistically significant association between the outcomes of the crash and the age groups of pedestrians involved in a road traffic accident. The correlation however is small.

Table 1: Chi-Square test table of cross tabulation of outcomes of crash vs. pedestrian age groups.

Chi-Square Tests			
	Value	Df	Asymptotic Significance (2-sided)
Pearson Chi-Square	1254.708[a]	54	<.001
Likelihood Ratio	1024.279	54	<.001
N of Valid Cases	33021		

Table 2: Symmetric measures table of cross tabulation of outcomes of crash vs. pedestrian age groups.

Symmetric Measures[c]			
		Value	Approximate Significance
Nominal by Nominal	Phi	.195	<.001
	Cramer's V	.080	<.001
	Contingency Coefficient	.191	<.001
N of Valid Cases		33021	

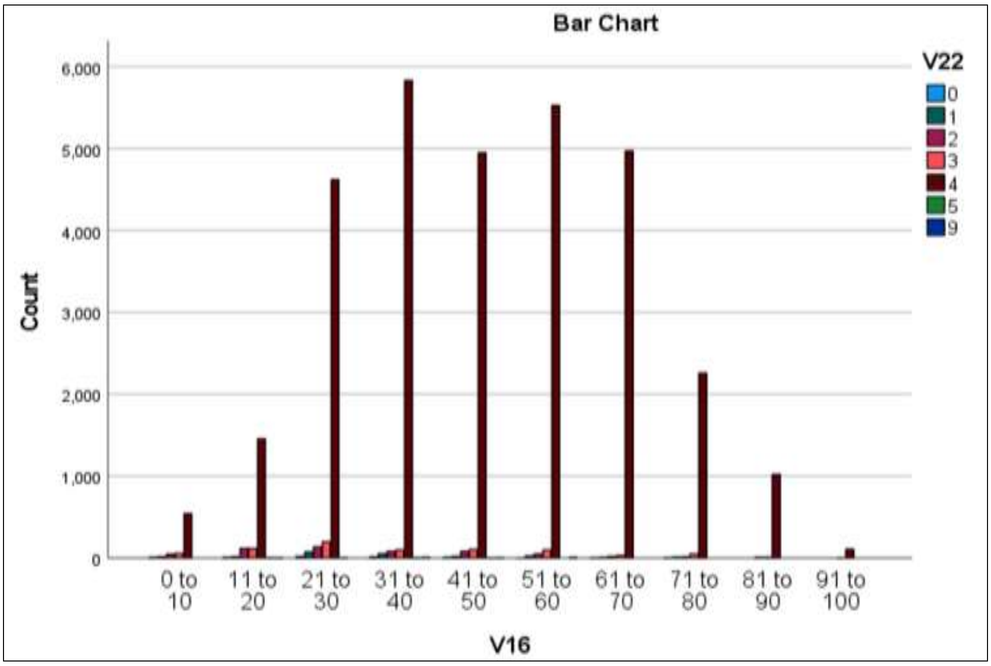

Fig 4: Clustered bar chart of cross tabulation of outcomes of crash vs. pedestrian age groups.

Discussion

Beck *et al*. noted that in the USA fatalities from bicycles and pedestrians increased with age on the average, and males were more likely than females to die [19]. In a Spanish study, a strong relationship was found between age and the mortality rate from pedestrian accidents [20]. Hu and Cicchino noted that in the USA, the highest per capita mortality rate across all age categories examined was seen among pedestrians over 70 [21], this shows that the pedestrian age influences the crash outcome which is similar to finding in this study.

An analysis of pedestrian accident victims in Australia revealed that older people, particularly those 75 years of age and older, had a high death rate [22]. O'Hern *et al*. found that people 75 and over had a death rate of 3.2 deaths per 100,000, while those 65 to 74 had a death rate of 1.3 and those under 65 had a death rate of 0.7 [22]. This indicates a correlation between age and the outcome of a pedestrian collision. The presence of co morbidity in elderly victims which may confound the effect of pedestrian accidents may however partly be responsible for this finding.

Only 13% of Canadians are 65 years of age or older, however they account for 35% of pedestrian fatalities in the nation [23]. Although they only make up 5.3% of the nation's population, pedestrians aged 76 and beyond accounted for 18.5% of pedestrian fatalities [23], suggesting a link between age and the outcome of pedestrian crashes. Henary *et al*., demonstrated that a pedestrian's age increases the risk of their death in a traffic accident [24].

According to a study conducted in northeastern Italy, pedestrians 65 years of age or older were far more likely to be fatally injured than those under 30 [25]. This might be because older people are more fragile, cross the roads more slowly, and have a diminished capacity to determine a safe distance in traffic as they age [26, 27, 28]. In a study conducted in the United States, Demetriades *et al*. discovered that the pedestrian death rate was 7.7%, with the range being 3.2% for those under the age of 14 and 25.1% for those over 65 [29]. In a study in Singapore, Rifaat and Chin came to the conclusion that age has a major impact on the anatomical distribution, degree of damage, and survival prognosis after pedestrian injuries [30]. Compared to their 20% share of the overall population, seniors 65 and older accounted for more than half of all pedestrian fatalities in the EU in 2018 [10]. Deaths from traffic accidents involving senior pedestrians in the EU are comparatively high: three times as many as those between the ages of 25 and 64, and even seven times as many as those under the age of 25 [10]. In pedestrian fatalities, people aged 0 to 24 are significantly under-represented, while seniors are significantly over-represented compared to their percentage of the population [10]. The number of pedestrian fatalities in traffic events on the road climbed continuously and uninterruptedly between the ages of 0 and 4 and 80 and 84, according to the European Commission [10]. This finding shows an increase in the risk of mortality with the pedestrian age. The age of the pedestrian significantly affected the degree of the injury, according to a Singaporean study, with older pedestrians having a larger risk of harm than younger ones [30]. Kim *et al*., discovered that the severity of pedestrian injuries rises with age [31], while Richards and Carroll, discovered that the pedestrian's age was a risk factor in their chance of suffering an intracranial injury [32]. The Centre for Disease Control highlighted that age contributed to the increase in pedestrian fatalities [6]. Rosen & Sander opined that the speed of the car and the age of the pedestrian should both be taken into consideration when estimating the chance of a pedestrian death [33].

Conclusion

The 31 to 40 years age group constitutes part of the economically active age group of a country therefore any public health issue affecting this age group may impact on the economic wellbeing of a nation. Morbidity or mortality from pedestrian road traffic accidents disproportionately affecting this age group should spur research into specific factors predisposing them to this menace with a bid to finding age specific solutions. It will be helpful to conduct more research to describe how other factors affect the accident outcome to help formulate policies that lessen the burden of this condition.

Conflict of Interest

- This publication was part of the findings in a dissertation for a Master of Public Health program
- Financial support
- None received

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