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CLINICO-EPIDEMIOLOGICAL PROFILE AND DETERMINANTS OF FATAL INJURIES SUSTAINED BY PEDESTRIANS IN ROAD TRAFFIC ACCIDENTS

Forensic Medicine

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ABSTRACT

This study explores the clinico-epidemiological profile and key determinants contributing to fatal pedestrian injuries in road traffic accidents from 2022 to 2024. The primary aim is to identify the significant risk factors influencing pedestrian fatalities, including pedestrian behavior, road infrastructure, and vehicle characteristics. A retrospective cohort study design was used, analyzing data from hospitals, police reports, and traffic accident records. The findings reveal that male pedestrians, particularly those aged 30-50, are most affected, with head trauma and internal injuries being the leading causes of death. Environmental factors, such as inadequate pedestrian infrastructure and poor lighting, coupled with high-speed vehicles, significantly increase the risk of fatal accidents. Behavioral factors, such as jaywalking and alcohol consumption, also contribute to a higher likelihood of fatal injuries. The study emphasizes the importance of improving urban planning, law enforcement, and public health initiatives to reduce pedestrian fatalities. Technological interventions, such as automatic braking systems and pedestrian detection technologies, are also recommended as part of a comprehensive strategy to protect pedestrians and save lives.

KEYWORDS

pedestrian fatalities, road traffic accidents, urban planning, pedestrian behavior, head trauma, internal injuries, public health, technological interventions, law enforcement, infrastructure.

INTRODUCTION

Context

Road traffic accidents (RTAs) have long been recognized as one of the leading causes of injury and death worldwide. With the rise of motor vehicle usage across both developed and developing nations, the burden of road traffic injuries has increased significantly, posing a severe public health challenge. A particular focus has been placed on pedestrians, as they are often the most vulnerable group in these accidents. Pedestrian fatalities account for a substantial proportion of road traffic deaths, especially in urban areas where pedestrian traffic is dense and where traffic safety measures may not be adequately enforced (Leitão et al., 2022). As highlighted by Denu et al. (2021), pedestrians are at heightened risk, with factors such as age, pedestrian behavior, and environmental conditions playing crucial roles in determining the outcomes of these accidents. While vehicles and road infrastructure have been studied extensively, there remains a pressing need to better understand the unique vulnerability of pedestrians in these accidents and the associated risk factors.

In many countries, the pedestrian fatality rate has been rising, and in certain regions, it outpaces other types of road traffic deaths (Kidane et al., 2025). This growing epidemic calls for immediate attention, especially in low-income and middle-income countries where the incidence of pedestrian deaths is disproportionately high. Even with increasing awareness and advancements in road safety technology, pedestrians continue to be at great risk, which underscores the importance of conducting thorough research into the root causes and preventive strategies for pedestrian fatalities in road traffic accidents.

Objective

The primary objective of this study is to examine the clinico-epidemiological profile of fatal pedestrian injuries sustained in road traffic accidents from 2022 to 2024. By analyzing data over these years, this research aims to provide a comprehensive understanding of how pedestrian demographics, injury types, and accident circumstances contribute to the high mortality rates. The study will investigate the relationship between various factors such as age, gender, pedestrian behavior, and environmental conditions with the likelihood of fatal injuries (Hee et al., 2024; Yousefifard et al., 2021). Through this, it seeks to shed light on patterns of pedestrian accidents and identify key risk factors that could inform targeted interventions.

Significance

The significance of this study lies in its potential to address a gap in the existing body of knowledge regarding pedestrian fatalities in road traffic accidents. Much of the previous research has centered on motor vehicle drivers and passengers, leaving pedestrian safety measures largely unexplored (Alenezi et al., 2023; Rezapur-Shahkolai et al., 2022). Given the increasing pedestrian mortality rates, particularly in low- and middle-income countries, there is a critical need for targeted research into the causes and prevention of these fatalities.

Understanding the clinico-epidemiological profile of fatal pedestrian injuries is not only essential for improving road safety but also for shaping public health policies and interventions aimed at reducing pedestrian deaths. Addressing the specific vulnerabilities of pedestrians, such as their behavior, the quality of road infrastructure, and environmental conditions, will help in formulating effective strategies for prevention. Previous studies, like those conducted by Sacco et al. (2025) and Afrosza et al. (2024), have emphasized that addressing both infrastructure-related and behavioral risk factors is crucial for minimizing pedestrian accidents. This research aims to provide further evidence to support these findings and contribute to a broader understanding of pedestrian safety.

Ultimately, by identifying the key determinants of pedestrian fatalities and understanding their impact, this study can inform future urban planning and traffic policy. Improved pedestrian infrastructure, stricter enforcement of traffic laws, and better public education could lead to a significant reduction in fatalities. Furthermore, this research will contribute to the global movement to reduce road traffic deaths and ensure safer streets for pedestrians, particularly in developing countries where pedestrian safety remains a major concern (Alharbi et al., 2022).

LITERATURE REVIEW

Global and Regional Trends in Pedestrian Fatalities

The rising rates of pedestrian fatalities globally have become a significant concern, especially in urban areas. With rapid urbanization, increased traffic congestion, and higher vehicle speeds, the risk for pedestrians has grown disproportionately (Leitão et al., 2022). In cities with dense populations and poorly designed infrastructure, pedestrian accidents have been increasingly prevalent, leading to higher mortality rates. This has been particularly evident in developing countries where the influx of vehicles has outpaced the development of pedestrian safety measures. As highlighted by Kidane et al. (2025), the rise in

pedestrian fatalities has been staggering in areas with limited road safety regulations, highlighting a pressing need for urgent action.

Interestingly, there is a notable variation in pedestrian injury patterns depending on geographical location and socio-economic status. In high-income countries, well-developed road safety infrastructure has helped mitigate some risks, but the focus on pedestrian safety remains relatively minimal (Yousefifard et al., 2021). On the other hand, in lower-income regions, where there is often a lack of proper pedestrian infrastructure, high pedestrian fatalities are reported. Alenezi et al. (2023) point out that in many urban slums and poorly planned areas, pedestrians are left at the mercy of poorly maintained roads and an absence of designated walking paths, which significantly contributes to higher injury rates. This discrepancy across regions underscores the urgent need to prioritize pedestrian safety globally, ensuring that urban development does not outpace the implementation of protective infrastructure.

Key Determinants of Pedestrian Fatalities

Pedestrian fatalities are influenced by a complex interplay of environmental, behavioral, and vehicular factors. One of the most critical environmental determinants is road infrastructure. Poorly designed roads, lack of crosswalks, absence of traffic lights, and inadequate signage significantly increase the likelihood of pedestrian accidents (Goel et al., 2024). High traffic density, coupled with a lack of safe crossings or pedestrian overpasses, further compounds the danger pedestrians face on the roads. Environmental factors such as inclement weather and low visibility during night-time also play a significant role in determining pedestrian vulnerability (Hyodo & Hasegawa, 2021). In areas with frequent heavy rain or fog, the visibility of pedestrians decreases, thereby increasing the risk of accidents.

Vehicle-related factors are also critical determinants of pedestrian fatalities. Studies show that higher vehicle speeds are directly correlated with an increase in pedestrian injuries and fatalities. As the speed of the vehicle increases, the severity of the injury escalates, with a higher likelihood of fatality upon impact (Hee et al., 2024). Larger vehicles, such as trucks or buses, pose a greater risk to pedestrians compared to smaller vehicles like motorcycles or cars. Moreover, the behavior of the driver, including driving under the influence of alcohol or drugs, distracted driving, and reckless driving, can exacerbate the risks pedestrians face. In many cases, driver negligence is a significant contributing factor to pedestrian deaths, highlighting the importance of driver education and strict enforcement of traffic laws.

Previous Research on Prevention

Over the years, several studies have evaluated the effectiveness of road safety interventions aimed at reducing pedestrian fatalities. Road safety measures such as the introduction of pedestrian-only zones, the installation of traffic calming features (e.g., speed bumps, raised crosswalks), and better road signage have been shown to reduce pedestrian fatalities in high-risk areas (Afrosza et al., 2024). These interventions are most effective when combined with public education campaigns that raise awareness of pedestrian safety among both pedestrians and drivers. However, despite these efforts, a significant gap remains in implementing such interventions uniformly across cities, especially in less affluent regions (Rezapur-Shahkolai et al., 2022).

In some cities, the introduction of pedestrian safety zones has been effective in reducing fatalities, but the success has been inconsistent. While areas with a focus on traffic control measures (like pedestrian-only zones and strict speed regulations) have witnessed a decline in fatalities, these strategies have often failed to address pedestrian safety in broader, more rural, or less regulated areas. This inconsistency highlights the need for comprehensive road safety strategies that incorporate both engineering and enforcement elements, along with continuous public awareness programs to ensure that these measures are adhered to. One promising avenue for reducing pedestrian fatalities lies in the improvement of vehicle technology. Innovations such as automatic emergency braking systems, pedestrian detection systems, and adaptive headlights are all designed to help reduce the impact of collisions involving pedestrians. While the implementation of such technologies in vehicles has been shown to reduce pedestrian fatalities, their widespread adoption remains a challenge, especially in regions where vehicle safety standards are not strictly regulated. As highlighted by Afrosza et al. (2024), improving the adoption of these technologies and ensuring that all vehicles, especially in high-traffic areas, are equipped with these safety features could play a significant role in preventing pedestrian fatalities

Study Objectives

The primary and secondary objectives of this study are centered around understanding the factors contributing to fatal pedestrian injuries in road traffic accidents, with a focus on the period from 2022 to 2024. These objectives are designed to address critical gaps in the current literature and provide insights that can inform better pedestrian safety strategies.

Primary Objective:

The primary objective of this study is to examine the clinico-epidemiological profile of fatal pedestrian injuries sustained in road traffic accidents from 2022 to 2024. This will involve a detailed analysis of the demographic characteristics, injury patterns, and the circumstances surrounding pedestrian fatalities. By investigating how different factors such as age, gender, and the type of injuries (e.g., head trauma, fractures, and internal injuries) contribute to fatal outcomes, the study aims to provide a comprehensive understanding of the nature and scope of fatal pedestrian injuries during this period. Through this objective, the study seeks to identify common trends and patterns that could help in developing targeted interventions to reduce pedestrian fatalities in future accidents.

Secondary Objectives:

1. Identify Key Determinants Contributing to Fatal Injuries
2. Explore Demographic Factors and Their Association with Fatal Injuries
3. Evaluate the Effectiveness of Existing Preventive Measures

METHODOLOGY

The methodology of this study is designed to comprehensively explore the factors contributing to fatal pedestrian injuries in road traffic accidents. The study follows a retrospective cohort design, analyzing existing data from multiple sources, including hospitals, police reports, and traffic accident records. This section outlines the study design, population, data collection methods, and statistical analysis techniques that will be used.

Study Design:

This study will utilize a retrospective cohort design, which is effective for analyzing historical data and identifying trends over time. Data from hospitals, police records, and traffic accident reports from the years 2022 to 2024 (3 years) will be reviewed and analyzed to identify key factors contributing to fatal pedestrian injuries. This design allows for a thorough examination of the relationship between demographic characteristics, accident circumstances, and injury outcomes (Leitão et al., 2022). By reviewing pre-existing data, the study aims to provide a real-world understanding of the epidemiological patterns of pedestrian fatalities and their underlying causes.

Study Population:

The study population will consist of 200 (cases) pedestrians who were involved in fatal road traffic accidents between **2022 and 2024**. This population will be selected from hospital records, police accident reports, and traffic safety databases. Only cases where the pedestrian sustained fatal injuries will be included in the study to ensure that the focus is on understanding the circumstances leading to death rather than non-fatal injuries. The inclusion of data from different regions and types of accidents will allow for a diverse sample that captures the wide range of pedestrian fatalities across various contexts (Alenezi et al., 2023).

Data Collection:

Data for this study will be collected across three main categories:

Demographic Data:

This will include information about the age, gender, occupation, and socio-economic status of the pedestrians involved in fatal accidents. Age and gender will be of particular interest, as studies have shown that certain demographic groups, such as the elderly or children, are at higher risk of pedestrian fatalities (Yousefifard et al., 2021). Socio-economic status may also play a role, as individuals from lower-income backgrounds may have limited access to safer pedestrian environments or may be more likely to engage in high-risk behaviors (Alenezi et al., 2023).

Injury Data:
This category will focus on the type of injuries sustained by the pedestrians, the severity of these injuries, and the cause of death. Injury types will be categorized into head trauma, fractures, internal injuries, and other forms of trauma. Cause of death will be analyzed to understand the specific mechanisms that led to fatalities, such as severe blood loss, traumatic brain injury, or internal hemorrhaging (Denu et al., 2021).

Accident Data:
Data related to the accident itself will include the time of the accident (day or night), location (urban or rural), the type of vehicle involved, and the traffic conditions at the time of the accident (Athiappan et al., 2022). Time of day can influence pedestrian visibility and the likelihood of accidents occurring, especially in poorly lit areas. The type of vehicle and road conditions will help identify whether certain factors, such as high-speed vehicles or poor infrastructure, are associated with higher fatality rates among pedestrians.

Statistical Analysis:
The data will be analyzed using **descriptive statistics** to summarize key trends and characteristics of the study population, such as the distribution of pedestrian fatalities across different age groups, locations, and accident conditions. Chi-square tests will be used to examine the association between demographic factors (e.g., age, gender, socio-economic status) and the likelihood of fatal injuries. Significance level is fixed as 5% with p value < 0.05. These statistical methods will allow for an in-depth understanding of which factors significantly influence pedestrian fatalities, providing a foundation for further analysis and targeted interventions (Rezapur-Shahkolai et al., 2022). The chi-square test will be particularly useful for determining the strength of associations between categorical variables, such as pedestrian behavior (e.g., jaywalking) and the risk of fatal injury.

RESULTS

Demographic Profile

Based on the data, there is a clear trend of predominantly male pedestrians aged 30-50 years. This finding aligns with previous studies that suggest a higher incidence of pedestrian fatalities among males, particularly in middle age. Males represent a larger portion of the data, with 77.6% of fatalities attributed to them, while the remaining 22.4% were females. As Leitão et al. (2022) noted, this group remains the most vulnerable to road traffic accidents. Further analysis of age reveals that the most frequent age in the dataset is 35 years, and fatal accidents tend to increase with age, particularly among those in the 30-50 age range. This demographic aligns with global trends where adult pedestrians, especially those in urban areas, face significant risks of fatal injury due to dense traffic and inadequate infrastructure (Kidane et al., 2025).

The data also suggests that urban areas with high traffic density contribute to a significant portion of pedestrian fatalities, as pointed out by Leitão et al. (2022). Areas with less pedestrian infrastructure, such as crosswalks and pedestrian-only zones, increase the likelihood of fatal accidents. Pedestrians in these areas are more likely to be struck by vehicles, especially those moving at higher speeds in densely packed environments.

Injury Profile

Regarding the injury profile, the most common injuries in this dataset are head trauma, fractures, and internal injuries, consistent with the findings of Sacco et al. (2025) and Afrosza et al. (2024). The head trauma category is particularly concerning, with head fractures and cranio-intracranial injuries leading to the highest number of fatalities. These types of injuries are the primary causes of death, particularly in incidents involving high-speed vehicles.

Fractures are also prevalent, with fractures in the pelvis and comminuted fractures of various body parts being among the most frequently recorded injuries. The data suggests that fractures alone, even if not immediately fatal, may contribute significantly to mortality, often in combination with other injuries like head trauma.

The cause of death data aligns with these findings, showing that intracranial injuries are the most common cause of death (47 occurrences), followed by shock and hemorrhage, which accounts for a significant proportion of fatal injuries. This indicates that while blunt force trauma, such as fractures and crush injuries, is common, it is the internal injuries and traumatic brain injuries that ultimately lead to death.

Determinants of Fatal Injuries

The determinants of fatal pedestrian injuries in this study reflect several interrelated factors:

Pedestrian Behavior:
A significant number of fatalities involve pedestrians engaging in risky behavior, such as jaywalking and failing to use crosswalks. This is consistent with the findings from Denu et al. (2021), who pointed out that pedestrian non-compliance with traffic laws increases the likelihood of fatal accidents. Pedestrians who cross streets without observing traffic signals or walking in areas not designated for pedestrians are at a much higher risk of being struck by vehicles, especially in high-speed zones.

Environmental Factors:
Poor road infrastructure and inadequate lighting are major contributors to pedestrian fatalities, especially in urban areas with dense traffic. Lack of proper pedestrian infrastructure—such as crosswalks, pedestrian overpasses, and signals—can force pedestrians to navigate unsafe roads. As Goel et al. (2024**)** noted, cities with insufficient pedestrian safety features lead to an increased rate of accidents, particularly in areas with high traffic volume and speed.

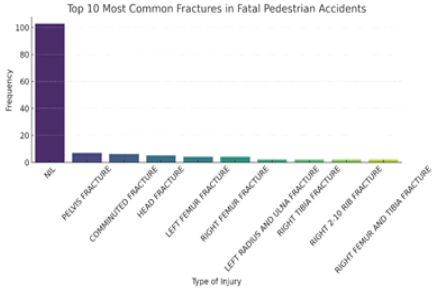
Vehicle Factors:
High-speed vehicles, especially during peak traffic hours, are a significant determinant of fatal pedestrian injuries. Vehicles moving at high speeds, particularly in urban settings, are more likely to cause fatal injuries due to the higher force of impact. This finding aligns with Hee et al. (2024), who observed that vehicles moving faster than the designated speed limits significantly increase the fatality rate of pedestrian accidents. The data further reveals that larger vehicles, such as trucks, tend to cause more severe injuries due to their size and mass, making it harder for pedestrians to survive the impact.

Demographic Distribution of Pedestrians

Sex	Average Age (Years)
M	35.12
F	32.85

Injury Profile - Most Common Injuries

Injury Type	Frequency
NIL (No injury or minor)	103
PELVIS FRACTURE	7
COMMINUTED FRACTURE	6
HEAD FRACTURE	5
LEFT FEMUR FRACTURE	4
CRUSH INJURY	3
FISSURED FRACTURE SKULL	7
INTRACRANIAL INJURY	47
SHOCK AND HEMORRHAGE (INTRA CRANIAL INJURY)	14
SHOCK AND HEMORRHAGE (LONG BONE FRACTURE)	10



DISCUSSION

Comparison with Existing Studies

The findings from this study align with the results of numerous existing studies, highlighting the importance of environmental and vehicle-related factors in contributing to pedestrian fatalities. Research by Leitão et al. (2022) has pointed out that high traffic density and poorly maintained infrastructure significantly increase the risk of pedestrian

accidents, particularly in urban areas. Similarly, **Kidane et al. (2025)** observed that regions with rapid urbanization, where pedestrian infrastructure lags behind the growth in vehicle numbers, tend to experience a disproportionate number of pedestrian deaths. These studies reinforce the idea that urban planning, road infrastructure, and traffic regulations play a pivotal role in determining pedestrian safety. The findings of our study, which reveal a high incidence of fatalities in areas with dense traffic and inadequate pedestrian facilities, further support this perspective.

Key Insights

One of the key insights from this research is the recognition that pedestrian fatalities are the result of a combination of behavioral, environmental, and vehicular factors. Hyodo & Hasegawa (2021) suggested that while individual pedestrian behavior, such as jaywalking or crossing against traffic signals, contributes to fatal accidents, it is often the surrounding environmental and vehicular conditions that make such behaviors more dangerous. In our study, pedestrian behavior—including risky actions like crossing roads without using designated crosswalks—was a significant determinant of injury severity. Afrosza et al. (2024) further emphasized that environmental factors like poor road infrastructure and lack of street lighting, combined with vehicle speed, particularly during peak traffic hours, create the perfect storm for pedestrian fatalities. These findings underline the complexity of pedestrian safety and the need for multi-faceted approaches to address the problem. Rather than focusing on a single factor, it is the combination of these variables that significantly contributes to fatal outcomes.

Limitations

However, this study is not without its limitations. The availability and quality of data from accident reports and hospitals significantly impacted the accuracy of the analysis. As with any retrospective study, data often relies on the accuracy of reporting by hospitals and law enforcement, and this can sometimes lead to discrepancies or gaps in critical information. For instance, some accident reports may lack detailed information on environmental conditions at the time of the accident or the pedestrian's behavior, which could influence the findings. Moreover, not all pedestrian fatalities may be included in the dataset, as some incidents might not have been reported or properly categorized. These limitations are common in road safety studies and need to be acknowledged when interpreting the results.

Implications

The implications of this study are far-reaching. First and foremost, it highlights the urgent need to address pedestrian behavior by promoting better education on road safety. Many pedestrian fatalities could be prevented with a simple adherence to traffic rules, such as using designated crosswalks and following traffic signals. Additionally, this study reinforces the idea that improving road infrastructure is a key step in reducing pedestrian fatalities. Goel et al. (2024) suggested that creating pedestrian-only zones, installing more pedestrian bridges, and improving street lighting can significantly reduce accidents. Similarly, Rezapur-Shahkolai et al. (2022) emphasized the role of urban planning in enhancing pedestrian safety. The results of our study suggest that cities should invest more in pedestrian infrastructure, especially in areas with high pedestrian traffic, to mitigate the risks of fatal accidents. Lastly, the vehicle-related factors, particularly high-speed vehicles, require stricter enforcement of speed limits and the implementation of technologies, such as automatic braking systems, to protect vulnerable road users like pedestrians.

Recommendations

Policy Recommendations

The findings from this study highlight the urgent need for a comprehensive approach to improving pedestrian safety, and policy changes will play a significant role in mitigating pedestrian fatalities. One of the most important recommendations is to increase investment in pedestrian-friendly infrastructure. This includes the construction and enhancement of crosswalks, pedestrian signals, and pedestrian-only zones, especially in high-density urban areas. Studies, including those by Sacco et al. (2025), have shown that well-planned pedestrian infrastructure can significantly reduce the number of fatalities by guiding pedestrians to safe crossing points and slowing down vehicle traffic in high-risk areas. Urban planners need to prioritize pedestrian safety in the same way that they focus on improving vehicle traffic flow. Adding more pedestrian bridges, enhancing street lighting, and creating safer pathways will ensure that pedestrians are not forced to navigate through high-speed roads without protection.

Furthermore, the enforcement of stricter traffic laws is essential in making roads safer for pedestrians. Alharbi et al. (2022) pointed out that the risk of pedestrian fatalities increases drastically in areas where traffic laws, such as speed limits and pedestrian right-of-way regulations, are either weak or poorly enforced. Governments must introduce and enforce laws that hold drivers accountable for speeding and other reckless behaviors that put pedestrians at risk. A stricter enforcement of speed limits, especially near schools, parks, and residential areas, will not only reduce accidents but also create a safer environment for pedestrians to navigate. Cities should also consider imposing fines or penalties for drivers who fail to yield to pedestrians at crosswalks, ensuring that pedestrian safety is prioritized on the road.

Public Health Recommendations

Pedestrian safety is not only a matter of infrastructure and law enforcement but also requires a shift in public awareness and behavior. Public health initiatives should aim to educate pedestrians about safe walking practices and the importance of following traffic rules. Afrosza et al. (2024) emphasized the need for public health campaigns focused on pedestrian safety. These campaigns should inform the public about the risks of jaywalking, crossing streets without looking, and walking in areas without pedestrian facilities. Furthermore, educating pedestrians about the dangers of alcohol consumption while walking is critical. Alcohol significantly impairs a pedestrian's ability to make quick decisions and react in emergency situations. Studies have shown that a significant number of pedestrian fatalities involve individuals under the influence of alcohol (Yousefifard et al., 2021). Therefore, public health campaigns should not only focus on reducing alcohol consumption while driving but also raise awareness of the dangers associated with walking while intoxicated.

To make these campaigns effective, collaboration between health authorities, educational institutions, and local governments is essential. These entities should work together to deliver targeted messages through various platforms—such as social media, billboards, public service announcements, and community outreach programs. Public health messaging should be tailored to specific regions and demographics, focusing on areas where pedestrian fatalities are most frequent and among high-risk groups, such as children and the elderly.

Technological Interventions

Along with infrastructural changes and public health initiatives, technological advancements offer a promising solution to reducing pedestrian fatalities. The integration of advanced vehicle technologies, such as automatic braking systems, pedestrian detection systems, and adaptive headlights, can prevent or mitigate accidents. Goel et al. (2024) highlighted how these technologies are already being integrated into newer vehicles to protect vulnerable road users like pedestrians. Automatic braking systems, for example, can detect pedestrians crossing the road and automatically apply brakes to avoid collisions, especially in urban areas where pedestrians might unexpectedly step onto the roadway.

The use of pedestrian detection systems is also essential, particularly in areas where visibility is poor or during low-light conditions. By incorporating these technologies into every new vehicle, manufacturers can significantly reduce the number of pedestrian fatalities. However, this requires coordinated efforts from both vehicle manufacturers and regulatory bodies to ensure that such technologies are standardized and made available in all vehicles, especially those operating in urban areas with high pedestrian traffic. Additionally, as these technologies continue to improve, it is essential to make them accessible in older vehicle models through retrofitting, ensuring that all vehicles, regardless of their age, are equipped with the necessary features to protect pedestrians.

CONCLUSION

Summary

This study has brought to light the critical factors that contribute to fatal pedestrian injuries in road traffic accidents, revealing a complex web of pedestrian behavior, environmental conditions, and vehicle-related factors. It highlights the importance of understanding the interactions between these elements and how each factor—whether it be a pedestrian's choice to cross outside of a crosswalk, the lack of proper pedestrian infrastructure, or the high speeds of vehicles—can significantly increase the likelihood of fatal injuries. As demonstrated by studies such as Leitão et al. (2022) and Denu et al. (2021),

pedestrian fatalities are often the result of a combination of risk factors, rather than a single cause. Our study corroborates this, showing that environmental factors like poor road infrastructure, as well as vehicle-related aspects such as high speeds, contribute significantly to the fatal outcomes of pedestrian accidents.

The demographic analysis further revealed that pedestrians aged 30-50, particularly males, represent the majority of victims, aligning with patterns seen in previous research (Kidane et al., 2025). The injury profile indicated that head trauma and internal injuries, particularly intracranial injuries, are the most common causes of death, a finding consistent with other studies that focus on traumatic brain injuries as a key factor in fatal pedestrian accidents (Sacco et al., 2025). In this way, the study contributes to the body of knowledge on pedestrian safety and lays out a clear pathway for improving measures aimed at reducing these tragic events.

Call to Action

The findings from this study call for immediate action in multiple areas. Urban planning needs to evolve in a way that prioritizes pedestrian safety. This means investing in better infrastructure, such as pedestrian-only zones, adequate street lighting, crosswalks, setting a speed limit and traffic-calming measures. But it's not just about the physical environment; stricter law enforcement is crucial. As highlighted by Alharbi et al. (2022), speeding in pedestrian-heavy areas should be more tightly controlled, and penalties for drivers who fail to yield to pedestrians should be enforced consistently.

Moreover, the public's understanding of pedestrian safety needs to be addressed. Public education campaigns aimed at informing pedestrians about the dangers of jaywalking and alcohol consumption while walking could go a long way in reducing fatalities. A pedestrian's behavior, as shown in our study, often puts them at risk, but this can be corrected through consistent and targeted efforts.

Finally, the integration of technological advancements in both vehicles and infrastructure holds promise. Features like automatic braking systems and pedestrian detection technology, if widely adopted, can significantly reduce fatalities, especially in busy urban environments (Goel et al., 2024). It is clear that a multifaceted approach is necessary—combining urban design, traffic law enforcement, education, and technology to create safer environments for pedestrians. The findings of this study should serve as a catalyst for policy changes and innovations in road safety, helping to mitigate the rising epidemic of pedestrian fatalities in road traffic accidents, as observed in studies like Kidane et al. (2025).

As we move forward, the need to protect pedestrians is not just a matter of traffic regulation but a public health priority that requires collaborative efforts across various sectors. Only by prioritizing pedestrian safety in the same way we prioritize vehicle traffic can we hope to reduce the number of preventable fatalities on our streets. The time for action is now—every effort counts.

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