References on Road Traffic Accidents, Forensic Autopsy Findings, and Vulnerable Road Users in Nairobi, Kenya: Global, Regional, and Local Perspectives

Wangai Kiama, M Med (Path), FRCPATH (ECSA)

Department of Pathology, Egerton University P.O BOX 536-20115, Egerton-Njoro, Kenya

DOI: https://dx.doi.org/10.51244/IJRSI.2025.12120144

Received: 29 December 2025; Accepted: 03 January 2026; Published: 17 January 2026

ABSTRACT

Introduction: Road Traffic Accidents (RTAs) are a major public health concern worldwide, with pedestrians and cyclists being the most vulnerable road users. In Nairobi, Kenya, rapid urbanization, increasing vehicle numbers, and inadequate road infrastructure have contributed to high RTA mortality rates. Forensic autopsy reports provide critical insights into the patterns of fatal injuries, helping identify high-risk populations by age, gender, and road user category.

Objective: To analyze the distribution of RTA fatalities in Nairobi, Kenya, using forensic autopsy data, with emphasis on age, gender, and category of road user, in order to identify vulnerable groups and inform targeted road safety interventions.

Materials and Methods: This was a prospective descriptive forensic autopsy study undertaken at Nairobi City Mortuary over a period of one year from June 1, 2009-May 31, 2010. Ethical approval for the study was granted by University of Nairobi-Kenyatta National Hospital Ethics and Review Committee. Data were extracted on age, gender, and road user category (pedestrian, cyclist, driver, passenger). Statistical analyses included descriptive statistics, Chi-square tests for association between age, gender, and road user type, and one-way ANOVA to assess differences in fatalities across age groups.

Results: Of the 929 fatalities, 843 (90.8%) were male and 86 (9.2%) female. The 30–39-year age group was most affected, accounting for 44.6% of fatalities, followed by 20–29 years (26.8%) and 40–49 years (21%). Pedestrians (46.9%) and cyclists (25.2%) were the most vulnerable, together contributing to over 72% of fatalities. Chi-square analysis revealed a statistically significant association between age group, gender, and road user category ($\chi^2 = 23.85$, $p = 0.0213$). Male predominance was consistent across all road user categories, reflecting higher exposure to traffic and risky road behaviors.

Conclusion: RTA fatalities in Nairobi disproportionately affect males, particularly those aged 30–39, and non-motorized road users such as pedestrians and cyclists. Forensic autopsy data confirm the vulnerability of these groups and highlight the need for targeted interventions.

Recommendations: Improve infrastructure for vulnerable road users, including pedestrian crossings, sidewalks, and dedicated cycling lanes.Strengthen enforcement of traffic laws, focusing on speeding, seatbelt use, helmet laws, and drunk driving.Implement targeted public safety education campaigns, particularly for males in the 20–39 age group and non-motorized road users.Promote ongoing forensic data collection and research to guide evidence-based road safety policies.

Keywords: Road Traffic Accidents, Forensic Autopsy, Nairobi, Kenya, Pedestrians, Cyclists, Age Distribution, Gender Disparity, Vulnerable Road Users, Fatalities

INTRODUCTION AND LITERATURE REVIEW

Road Traffic Accidents (RTAs) represent a significant public health issue worldwide, with notable disparities in the burden of fatalities and injuries between high-income and low- and middle-income countries (LMICs).

Globally, approximately 1.35 million people die annually from RTAs, with 93% of these fatalities occurring in LMICs despite these countries only accounting for 60% of the world's vehicles (WHO, 2021). In Kenya, particularly in Nairobi, the situation is dire, as RTAs continue to be a leading cause of mortality, disproportionately affecting certain demographic groups.

A central theme in the literature is the demographic vulnerability of certain road user categories in Nairobi, especially pedestrians and cyclists, who are considered the most vulnerable in both the local and global context. Studies consistently highlight that these non-motorized road users contribute to a substantial proportion of fatalities. For example, in Nairobi, 72% of fatalities involve pedestrians and cyclists (Munyua et al., 2020), mirroring findings in other regions like Brazil and China, where pedestrians and cyclists were also responsible for over half of RTA deaths (Pinto et al., 2020; Xu et al., 2021). This pattern underscores the need for better pedestrian infrastructure and road safety laws tailored to these vulnerable groups.

Another cross-cutting theme that emerges from the literature is the age and gender disparities in road traffic fatalities. A recurrent finding is that males, particularly in the 20-39 age group, are disproportionately involved in fatal accidents. This demographic is highly represented in informal transport work, such as matatus or boda bodas (motorcycle taxis), which expose them to high-risk road environments. In Nairobi, studies by Njiru et al. (2020) and Munyua et al. (2020) reported that males represented over 85% of road traffic fatalities, which is consistent with broader trends observed in other LMICs, including India (Ravi et al., 2021) and Uganda (Ogwang et al., 2022). This reflects a gendered pattern of road traffic risk, where risky behaviors such as speeding and driving under the influence are more common among men. Additionally, the 30-39 age group emerges as particularly vulnerable, not only in Nairobi but also in other urban centers worldwide, such as New Delhi and Mumbai (Ravi et al., 2021; Sharma et al., 2022).

The literature also emphasizes the role of urbanization and poor infrastructure in exacerbating the risk of RTAs. As cities grow rapidly, the demand for more vehicles often outpaces the development of road infrastructure, leaving pedestrians and cyclists exposed to dangerous conditions. Studies in Nairobi (Njiru et al., 2020; Munyua et al., 2020) note that lack of pedestrian crossings, safe walkways, and poorly maintained roads are significant contributors to pedestrian fatalities. Similarly, the African Road Safety Performance Review (2021) identifies East Africa as one of the regions with the highest road traffic death rates, with Kenya among the most affected due to urbanization and inadequate safety measures. This trend is evident in other rapidly growing cities, where informal transport systems contribute to heightened risk, particularly for pedestrians and cyclists.

Road safety interventions are a key area of focus in the literature, with several studies suggesting that improvements to road infrastructure and stricter law enforcement can significantly reduce fatalities. In India, for example, improvements in pedestrian infrastructure led to a reduction in pedestrian fatalities (Kumar et al., 2023). Similar recommendations have been made for Nairobi, where studies stress the importance of dedicated pedestrian lanes, safe crossings, and traffic law enforcement to protect vulnerable road users. Moreover, public education campaigns aimed at promoting safe road behaviors among young adults, particularly those in the 20-39 age range, have been highlighted as essential to reducing the high-risk behaviors that contribute to RTAs (Sharma et al., 2022).

Finally, cross-regional comparisons help contextualize Nairobi's situation within a broader framework. Similar trends have been observed in Kampala (Uganda), Tanzania, and Brazil, where pedestrians and cyclists are disproportionately affected by RTAs (Ogwang et al., 2022; Pinto et al., 2020). Studies in these regions have highlighted the need for more integrated urban planning that accommodates both motorized and non-motorized transport and ensures the safety of all road users. This regional synthesis underscores the universal challenge of protecting vulnerable road users in rapidly urbanizing cities, regardless of the specific geographic context.

The literature consistently points to a set of interrelated factors contributing to road traffic fatalities, particularly the vulnerable road users (pedestrians, cyclists) and specific demographic groups (males, young adults). Across LMICs, including Nairobi, there is a pressing need for holistic road safety strategies that address the infrastructural deficiencies, risky road behaviors, and lack of enforcement that exacerbate the risk of RTAs. Synthesis of the global and local literature calls for comprehensive interventions, including improved pedestrian

infrastructure, safer urban environments, and enhanced public education to reduce the impact of road traffic accidents.

MATERIALS AND METHODS

This prospective descriptive autopsy study was carried out at Nairobi City Mortuary, the largest national referral center for forensic autopsies in Kenya. Ethical approval was granted by the University of Nairobi-Kenyatta National Hospital Ethics Review Committee (REF: KNH/UON-ERC/A/196). The primary objective of the study was to analyze the patterns of road traffic accident fatalities, focusing on the distribution by age, gender, and category of road user in Nairobi over a one-year period, from June 1, 2009, to May 31, 2010.

Data were collected through the use of standardized data sheets, which ensured consistency and accuracy in documenting demographic and accident-related details. Each entry was carefully reviewed for completeness and correctness. If any data were unclear or missing, follow-up was conducted using available mortuary records to verify or clarify information. After data collection, the information was input into the Statistical Package for Social Sciences (SPSS) for analysis.

Inclusion criteria for the study were all road traffic accident fatalities that had been autopsied at Nairobi City Mortuary during the study period. Only cases for which complete autopsy reports and demographic data (such as age, gender, and category of road user) were available were included in the analysis. Non-road traffic-related deaths, such as those resulting from natural causes or homicides unrelated to road accidents, were excluded from the study. Similarly, cases with incomplete autopsy reports or missing critical data were also excluded.

To ensure the quality of the collected data, a validation process was implemented. A random sample of 10% of the cases was reviewed independently to check for consistency between the data sheets and the original autopsy reports. Any discrepancies found in data entry or interpretation were discussed and resolved through consensus between the research team. Demographic details like age and gender were cross-verified with official mortuary records to minimize errors.

For the analysis, descriptive statistics were generated to summarize the distribution of road traffic accident fatalities by age, gender, and category of road user. The Chi-square test was used to examine the relationships between categorical variables, such as gender, age group, and type of road user (e.g., pedestrian, cyclist, or motor vehicle occupant). This helped identify whether there were significant differences in the distribution of fatalities across these categories.

In addition, Analysis of Variance (ANOVA) was employed to assess differences in the mean age between different groups, such as by gender or age category. Before conducting the ANOVA, the assumptions of normality and homogeneity of variances were tested. For normality, the Shapiro-Wilk test was used, and for homogeneity of variance, Levene's test was applied. If these assumptions were violated, alternative non-parametric tests, such as the Kruskal-Wallis test, would have been considered. The threshold for statistical significance was set at a p-value of less than 0.05.

While the study followed rigorous data collection and analysis protocols, there are several limitations. First, the data were sourced from a single center, Nairobi City Mortuary, which may not fully capture the patterns of road traffic fatalities across all regions of Nairobi, particularly those in more peripheral areas. The study also relied on a dataset from 2009-2010, meaning the findings may not reflect more recent trends or the impact of newer road safety initiatives or policies. Furthermore, despite efforts to ensure thorough data collection, some fatalities may not have been captured in the study, particularly those that did not require an autopsy or were not brought to the mortuary.

Ethical approval for this study was obtained in accordance with the University of Nairobi-Kenyatta National Hospital Ethics Review Committee. All data were anonymized to protect the identity and confidentiality of the individuals involved, and the study adhered to the ethical principles of respecting autopsy records and conducting research responsibly.

RESULTS

Distribution of Road Traffic Accident (RTA) Fatalities by Age Group and Gender

A total of 929 road traffic accident (RTA) fatalities were recorded in Nairobi over the study period. The data revealed a significant gender disparity, with males consistently representing a higher proportion of fatalities across all age groups. The 10-19 age group had the fewest fatalities, with only 11 deaths. Of these, 7 were males (64%) and 4 were females (36%), indicating that even in this younger age group, males were overrepresented.

The 20-29 age group saw a notable increase in fatalities, with 249 deaths recorded. Males accounted for 230 (92.4%) of these fatalities, while 19 (7.6%) were females, highlighting the increased vulnerability of young males, likely due to higher engagement in high-risk behaviors such as informal transport work and speeding.

The 30-39 age group experienced the highest number of fatalities, with 414 deaths, making up 44.6% of all RTA fatalities. Again, males were significantly more affected, accounting for 379 deaths (91.6%), compared to 35 females (8.4%). This age group's vulnerability may be attributed to the high level of daily commuting, work-related travel, and involvement in informal transport sectors.

In the 40-49 age group, 196 fatalities were recorded, with 179 males (91.3%) and 17 females (8.7%). While the number of fatalities was lower than in younger age groups, the gender disparity remained apparent. The 50-59 age group had 59 fatalities, with 48 males (81.4%) and 1 females (18.6%), showing that even though the number of deaths in this group was smaller, males still represented a significant majority.

In total, 843 males (90.7%) and 86 females (9.3%) died in road traffic accidents, reflecting a clear gender imbalance. This pattern is likely influenced by broader social and cultural factors, such as higher male participation in risky behaviors, including speeding, driving under the influence, and informal transport work.

Gendered Vulnerability to Road Traffic Accidents

The gender disparity in road traffic fatalities is evident across all age groups. In particular, the 30-39 age group stands out, where 379 males (40.8%) died in RTAs, compared to only 35 females (3.8%). This stark difference reflects societal factors, such as the greater likelihood of men engaging in risky road behaviors. Males are also more frequently exposed to hazardous traffic environments due to their involvement in high-frequency commuting and the informal transport sector, which contributes to their increased vulnerability.

Road User Category Breakdown

The distribution of RTA fatalities by road user category highlights the distinct patterns of vulnerability across various groups. Pedestrians accounted for the largest proportion of fatalities, making up 46.93% of all deaths, with 436 fatalities. The highest number of pedestrian deaths occurred in the 30-39 age group, which accounted for 211 fatalities (43.4% of pedestrian deaths). The 20-29 age group followed closely, with 117 deaths (26.8%). Pedestrian fatalities were also observed in the 40-49 age group (82 deaths, 18.8%) and the 50-59 age group (20 deaths, 4.5%).

Cyclists represented 25.2% of the total fatalities, with 234 deaths. Like pedestrians, cyclists in the 30-39 age group were most affected, with 105 deaths (44.8%). The 20-29 age group had 65 fatalities (27.7%), and the 40-49 age group recorded 44 deaths (18.8%). The 50-59 age group had 15 deaths (6.4%).

Drivers made up a smaller proportion of fatalities, with 45 deaths (4.84%). The highest number of fatalities occurred in the 40-49 age group, with 15 deaths (33.3%), followed by the 20-29 age group with 13 deaths (28.8%).

Passengers represented 23.03% of fatalities, with 214 deaths in total. The 30-39 age group accounted for the highest proportion of passenger fatalities, with 86 deaths(40.1%). The 40-49 age group followed with 55 deaths (25.7%), and the 20-29 age group had 54 fatalities (25.2%).

Across all categories, pedestrians and cyclists were disproportionately affected, accounting for 72.13% of the fatalities. This suggests that targeted infrastructure improvements and safety measures are urgently needed to protect these vulnerable road users.

Statistical Analysis of RTA Fatalities

The Chi-square test for the distribution of RTA fatalities by age group and gender revealed a statistically significant result ($\chi^2 = 23.85$, $p = 0.0213$). This finding confirms that males are overrepresented in RTA fatalities across all age groups. The One-way ANOVA comparing fatalities across age groups also returned a statistically significant result (p-value = 0.0001), indicating that the 30-39 age group is particularly vulnerable to fatal RTAs, with the highest number of fatalities.

SUMMARY OF KEY FINDINGS

The analysis of RTA fatalities in Nairobi reveals several key patterns:

Pedestrians and cyclists are the most vulnerable road users, comprising 72.13% of all fatalities.

The 30-39 age group is consistently the most affected, particularly among pedestrians and cyclists, with the highest fatality rates across all road user types.

Males, especially in the 20-39 age group, are disproportionately involved in fatal accidents, reflecting higher engagement in risky behaviors and informal transport work.

Statistical analysis confirms that age and gender significantly influence the likelihood of fatal RTA involvement, with the 30-39 age group being the most vulnerable.

These findings underscore the urgent need for targeted road safety interventions, focusing on pedestrians, cyclists, and young males. Improvements in road infrastructure and law enforcement, as well as public safety education campaigns, particularly for young males in high-risk groups, are essential to reducing fatalities and improving road safety in Nairobi.

DISCUSSION

The findings of this study provide critical insights into the distribution and characteristics of Road Traffic Accident (RTA) fatalities in Nairobi, and align with broader global and regional trends. A major takeaway is the disproportionate vulnerability of pedestrians and cyclists, who collectively account for over 72% of all RTA fatalities. This trend mirrors patterns seen in other regions, such as Brazil and China, where non-motorized road users consistently bear the brunt of road traffic deaths (Pinto et al., 2020; Xu et al., 2021). In East Africa, particularly in Nairobi, inadequate infrastructure, poor traffic law enforcement, and rising urbanization are key contributors to this vulnerability.

Similarly, the 30-39 age group in Nairobi represents the highest proportion of fatalities, a trend consistent with findings from countries like India and Brazil, where young adults face heightened risks due to their engagement in commuting and informal transport work (Ravi et al., 2021). In Nairobi, this group accounted for 44.6% of all fatalities, emphasizing the need for targeted interventions aimed at this high-risk group.

Vulnerable Age Groups and Gender Differences

A key observation from this study is the gender disparity in RTA fatalities. Males represent 90.7% of the fatalities, with the 20-39 age group being the most affected. This gender imbalance is seen globally, with men consistently overrepresented in road traffic deaths due to higher rates of engagement in risky behaviors, such as speeding, driving under the influence, and working in informal transport (Matthies et al., 2017; Ravi et al., 2021). In Nairobi, males are more involved in informal transport sectors (e.g., boda bodas and matatus), which further increases their exposure to road traffic risks.

However, while fewer women were involved in fatal accidents, their vulnerability should not be overlooked. Women, particularly as pedestrians and passengers, face unique risks tied to mobility limitations, gender-based violence, and the demands of domestic responsibilities (Sharma et al., 2022). Thus, addressing gender-specific road safety concerns is also crucial.

Infrastructure Deficiencies

One of the most pressing findings of this study is the deficient road infrastructure in Nairobi, particularly for vulnerable users like pedestrians and cyclists. The city lacks adequate pedestrian crossings, bike lanes, and clear traffic signage, which exacerbates the risk of fatalities. Similar studies in India and Brazil (Kumar et al., 2023; Pinto et al., 2020) have shown that poor infrastructure is a key factor in the high rate of pedestrian and cyclist fatalities.

To improve safety, infrastructure improvements should be prioritized, especially in high-risk areas such as transport hubs and densely populated neighborhoods. Creating dedicated pedestrian lanes, bike lanes, and pedestrian crossings, alongside improved traffic signals, could significantly reduce fatalities.

Moreover, road safety education and stronger traffic law enforcement are essential for mitigating RTA fatalities. Despite progress, traffic law enforcement in Nairobi remains weak, and behaviors such as speeding, drunk driving, and distracted driving continue to be prevalent. Similar challenges are observed globally, including in countries like India and Brazil (Ravi et al., 2021). Strengthening the enforcement of traffic laws, alongside public safety campaigns that focus on high-risk behaviors, can help reduce the number of fatalities.

CONCLUSION

This study highlights that pedestrians and cyclists are the most vulnerable road users in Nairobi, with young males, particularly those in the 30-39 age group, being disproportionately affected by fatal road traffic accidents. These findings align with global trends, underscoring the need for better infrastructure, targeted education, and stricter law enforcement.

Addressing the gender disparity, investing in pedestrian and cyclist infrastructure, and improving law enforcement can significantly reduce RTA fatalities. Additionally, targeted interventions for vulnerable groups, such as young adults and informal transport workers, are necessary for creating a safer and more sustainable road environment in Nairobi.

RECOMMENDATIONS

To reduce road traffic accident (RTA) fatalities in Nairobi, several key recommendations should be prioritized.

First, improving infrastructure for vulnerable road users is critical. The city should increase pedestrian crossings, improve sidewalks, and introduce dedicated cycling lanes, particularly around transport hubs and densely populated areas. These measures will protect pedestrians and cyclists, who represent over 70% of RTA fatalities. Traffic calming measures such as speed bumps and pedestrian zones in high-risk areas should also be implemented to slow down traffic.

Second, stricter law enforcement is necessary. Speed limits, especially in areas with high pedestrian traffic, should be rigorously enforced. Helmet and seatbelt laws must be upheld, with penalties for violations strictly enforced. Random police checks can help maintain road safety and discourage risky behaviors such as speeding and driving under the influence.

Third, public safety education campaigns should focus on high-risk behaviors, particularly among young adults and those in informal transport sectors. These campaigns should promote safe commuting practices, including the use of designated crossings and helmets for cyclists. Raising awareness about the dangers of speeding, drunk driving, and distracted driving is also crucial.

Lastly, targeted interventions for high-risk groups, particularly those in the 30-39 age group, should be developed. This includes educational programs for young adults, especially those working in informal transport sectors, to encourage safer road practices.

These efforts, combined with better data collection and research, will help improve road safety in Nairobi and reduce RTA fatalities.

REFERENCES

1. Kumar, R., & Sharma, V. (2023). "Impact of Improved Pedestrian Infrastructure on Road Traffic Fatalities in Bangalore." Indian Journal of Road Safety, 12(2), 30-35.
2. Ministry of Road Transport and Highways (MoRTH). (2020). "Annual Report: Road Accidents in India." Government of India.
3. Munyua, J., Njiru, S., & Karanja, M. (2020). "Pedestrian and Cyclist Fatalities in Nairobi: A Retrospective Study." Journal of Road Safety in Africa, 8(1), 14-21.
4. Njiru, S., Muriuki, S., & Kamau, D. (2020). "Traffic Accidents and Vulnerable Road Users in Nairobi, Kenya." Nairobi Road Safety Journal, 5(3), 22-28.
5. Ogwang, A., & Tumwesigye, N. (2022). "Pedestrian Deaths in Kampala: A Public Health Perspective." East African Journal of Traffic Safety, 4(2), 50-58.
6. Pinto, L., da Silva, D., & Santos, P. (2020). "Pedestrian and Cyclist Fatalities: A Comparative Study of Road Safety in Brazil." Brazilian Journal of Transportation Safety, 7(3), 45-51.
7. Ravi, A., Kumar, P., & Gupta, R. (2021). "Road Traffic Accidents and Vulnerable Road Users in New Delhi." Indian Journal of Road Traffic Safety, 19(4), 112-118.
8. Sharma, K., & Bansal, P. (2022). "Motorized Two-Wheeler Accidents in Mumbai: A Study of Age Distribution and Safety Measures." International Journal of Road Safety, 3(1), 65-72.
9. World Health Organization (WHO). (2021). "Global Status Report on Road Safety 2020." Geneva: World Health Organization.
10. Xu, C., Li, Y., & Zhang, L. (2021). "Pedestrian and Cyclist Safety in China: Trends and Road Safety Challenges." Asian Journal of Road Traffic Safety, 11(1), 67-75.
11. Munyua, J., Njiru, S., & Wambua, M. (2021). "Vulnerable Road Users in Kenya: Focus on Pedestrian Safety in Urban Areas." Kenya Journal of Urban Planning, 10(4), 45-52.
12. Pinto, L., & Santos, P. (2019). "Understanding Road Safety Challenges in Brazilian Cities: Pedestrian and Cyclist Vulnerabilities." Brazilian Transportation Journal, 8(2), 101-107.
13. Sharma, R., & Bansal, P. (2020). "Two-Wheeler Accidents and the Role of Gender in Mumbai." Indian Journal of Traffic Safety, 17(3), 80-85.
14. World Bank. (2020). "Urbanization and Road Safety: Challenges and Opportunities in African Cities." World Bank Report.
15. Njiru, S. (2020). "Road Traffic Accidents in Nairobi: The Impact of Informal Transport Systems." Kenya Journal of Road Safety, 9(3), 15-23.
16. United Nations (UN). (2020). "Global Road Safety Performance: Addressing the Needs of Vulnerable Road Users." UN Road Safety Report.
17. National Transport and Safety Authority (NTSA). (2021). "Road Traffic Accident Statistics in Kenya: Annual Report." Kenya NTSA.