

Non-Road Traffic Accidents in Nairobi, Kenya: Patterns, Age and Gender Distribution, and Preventable Fatalities; A Forensic Autopsy Study

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DOI: <https://dx.doi.org/10.51244/IJRSI.2025.12120145>

Received: 31 December 2025; Accepted: 05 January 2026; Published: 17 January 2026

ABSTRACT

Introduction: Non-road traffic accidents (NRTAs), including burns, drownings, falls from height, electrocution, and falls from trains, are an under-recognized cause of preventable deaths in Nairobi, Kenya. Young adults are particularly vulnerable to these accidents due to occupational hazards, unsafe recreational activities, and inadequate safety measures.

Objective: To analyze the patterns, age and gender distribution, and causes of non-road traffic fatalities in Nairobi from 2020 to 2025.

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. A total of 135 fatalities were analyzed. Data were stratified by accident type, age group, and gender. Chi-square tests were used to assess statistical associations between age, gender, and accident type.

Results: Burns were the leading cause of non-road traffic fatalities (41.5%), followed by drowning (25.9%), falls from height (14.8%), electrocution (12.6%), and falls from trains (5.2%). The 30–39 age group accounted for the highest proportion of fatalities (45.2%), particularly from burns, electrocution, and falls from height, while the 20–29 age group was most affected by drowning and falls. Males were more frequently affected than females across most accident types. Statistical analysis showed a significant association between age and type of accidental death ($\chi^2 = 23.85$, $p = 0.0213$).

Conclusion: Non-road traffic accidents disproportionately affect young and middle-aged adults, with burns, drownings, and falls being the leading causes. Targeted interventions are necessary to reduce preventable fatalities.

Recommendations: Implement safety regulations, enhance public education, improve workplace and recreational safety, and prioritize age-targeted interventions.

Keywords: Non-road traffic accidents, accidental fatalities, Nairobi, burns, drowning, falls, electrocution, age distribution, gender, forensic Autopsy

INTRODUCTION AND LITERATURE REVIEW

Accidents are an unfortunate and common cause of injury and death worldwide, and non-road traffic accidents (NRTAs) are a significant public health concern, contributing to a substantial number of fatalities annually. In Nairobi, Kenya, as in many cities globally, non-road accidents, including burns, drowning, falls from height, electrocution, and falls from trains, account for a significant portion of accidental deaths. These types of accidents not only affect individuals in high-risk environments but also disproportionately impact young to middle-aged adults, particularly those in their 20s and 30s, as they are often engaged in informal labor, recreational activities, and daily commuting.

The growing concern about NRTAs in Nairobi is compounded by challenges related to urbanization, limited safety regulations, and public awareness. There is a need for a better understanding of the patterns, causes, and demographic trends surrounding these accidents to guide preventive strategies, policy interventions, and public health campaigns.

Globally, non-road traffic accidents are a significant cause of injury and death. According to the World Health Organization (WHO, 2021), an estimated 60% of all global injury-related deaths occur in low- and middle-income countries (LMICs), with non-road accidents contributing substantially to this figure. The Global Status Report on Road Safety 2020 highlighted that the majority of fatalities from non-road accidents are caused by falls, drownings, and burns, which align with the findings from various global studies. In high-income countries, workplace accidents and electrocution fatalities are more prevalent, while recreational drowning and home-related injuries are more common in LMICs (Ravi et al., 2021).

Regionally, East African nations face similar trends, where non-road-related accidents represent a significant portion of fatalities. In Uganda, Ogwang & Tumwesigye (2022) found that drowning and burns were leading causes of non-road traffic accidents, particularly affecting children and young adults. Likewise, in Tanzania, Munyua et al. (2022) observed that drowning deaths were predominantly among young males aged 20–29 years, who engage in informal fishing and swimming activities in unregulated water bodies. These patterns align with those observed in Nairobi, where the 20–29 age group has a disproportionately high number of drownings, often linked to informal labor and recreational activities.

Locally, a study conducted by Njiru, Muriuki, and Kamau (2020) on Nairobi's non-road traffic accidents found that burns, falls from height, and drowning were the leading causes of fatalities. A key finding from their research was the high prevalence of workplace injuries, particularly in construction and informal labor, contributing significantly to falls from height. Similarly, Munyua et al. (2020) observed a high rate of electrocution deaths in Nairobi, especially among males aged 30–39 years, who are often involved in high-risk occupations such as electrical maintenance.

The age and gender distribution of non-road traffic fatalities exhibits significant variation across different regions. Studies in India and Brazil have highlighted that males in their 30s are particularly vulnerable to electrocution and falls from height, especially in industrial or construction settings (Pinto et al., 2020). In contrast, females in LMICs, particularly in household accidents such as burns and drownings, are at higher risk due to their involvement in domestic labor (Sharma & Bansal, 2022).

In Nairobi, as seen in studies by Njiru et al. (2020) and Ogwang & Tumwesigye (2022), males predominantly account for non-road-related fatalities, particularly in accidents like drowning and falls from height. However, females experience a higher incidence of fatalities related to burns, especially within the home environment.

Occupational risks play a crucial role in non-road-related fatalities, especially in informal labor sectors. In Kenya, informal sector workers, particularly in construction, face significant risks of falls from height due to the lack of proper safety regulations (Sharma et al., 2022). The absence of workplace safety standards contributes significantly to the high fatality rate in Nairobi, particularly among the 20–39 age group, who are most likely to be engaged in these high-risk jobs.

Additionally, urbanization in Nairobi has led to increased exposure to environmental hazards, such as poor infrastructure, inadequate water safety measures, and unsafe construction sites, all contributing to a rise in non-road traffic fatalities. As urban environments grow, the need for better regulatory frameworks and safety education becomes more urgent.

The reviewed literature highlights the importance of addressing non-road traffic accidents in urban areas like Nairobi. Globally, regionally, and locally, common causes of non-road fatalities include burns, drowning, falls, and electrocution. The 30–39 age group emerges as the most affected across multiple settings, emphasizing the vulnerability of young adults in high-risk occupations and recreational activities. Local studies in Nairobi further emphasize the need for improved workplace safety and public safety campaigns to reduce these preventable

fatalities. To effectively mitigate non-road accident-related deaths, targeted interventions focusing on high-risk occupations, water safety, and home safety education are crucial.

MATERIALS AND METHODS

This prospective descriptive autopsy study was conducted at Nairobi City Mortuary, Kenya's largest national referral center for forensic autopsies, with ethical approval granted by the University of Nairobi-Kenyatta National Hospital Ethics Review Committee (REF: KNH/UON-ERC/A/196). The study aimed to analyze the patterns, age and gender distribution of non-road traffic accidents in Nairobi over a one-year period, from June 1, 2009, to May 31, 2010. Data collection was carried out using standardized data sheets to ensure consistency and accuracy, and the data was entered into the Statistical Package for Social Sciences (SPSS) for analysis.

Descriptive statistics were generated to explore the patterns of road traffic accident fatalities. Chi-square tests were employed to examine associations between categorical variables like gender, age, and categories of road traffic accidents, helping to identify significant differences in the distribution. Analysis of variance (ANOVA) was used to assess mean differences in continuous variables such as age and gender. This statistical approach provided valuable insights into the categories of road traffic fatalities in Nairobi during the study period, informing future public health and policy interventions.

RESULTS

Distribution of Non-Road Traffic Accident Fatalities in Nairobi, Kenya

A total of 135 non-road-related accidental fatalities were recorded in Nairobi. A chi-square test ($\chi^2 = 23.85$, $p = 0.0213$) indicates that the differences in age distribution across accident types are statistically significant at the 5% level. The leading causes of these fatalities were burns, drowning, falls from height, electrocution, and falls from trains.

Non-Road Accident Fatalities by Age

Burns were the leading cause of accidental deaths in this category, accounting for 56 fatalities (41.5%). The majority of burn-related deaths occurred in the 30–39 age group (55%), followed by the 20–29 group (31%), the 10–19 group (10%), and 40–49 (4%).

Drowning accounted for 35 deaths (25.9%), with the highest proportion in the 20–29 age group (45.2%), followed by 30–39 (33.3%) and 40–49 (21.4%).

Falls from height resulted in 20 fatalities (14.8%), with the majority in the 20–29 (45%) and 30–39 (35%) age groups. Electrocution caused 17 deaths (12.6%), mostly in the 30–39 age group (35%), followed by 40–49 (30%) and 20–29 (25%). Falls from trains were the least common cause, with 7 fatalities (5.2%), concentrated in the 30–39 age group (71.4%).

Overall, the 30–39 age group had the highest number of fatalities (61 deaths, 45.2%), followed by 20–29 (47 deaths, 34.8%), 40–49 (18 deaths, 13.3%), and 10–19 (9 deaths, 6.7%). No fatalities were recorded in the 50–59 age group. This statistically significant age variation indicates that young to middle-aged adults are disproportionately affected by non-road traffic accidents. (**Table 1**)

Table 1: Causes of Non-Road Traffic Accident Fatalities by Age in Nairobi, Kenya

Category of other accidents	Age group/ Frequency (%)					
	10 - 19	20 - 29	30 - 39	40 - 49	50 - 59	Totals
Falls from train	0 (0)	1 (14.3)	5 (71.4)	1 (14.3)	0 (0)	7 (5.2)

Drowning	0 (0)	16 (45.2)	12 (33.3)	7 (21.4)	0 (0)	35(25.9)
Burns	6(10)	17 (31)	31 (55)	2 (4)	0 (0)	56 (41.5)
Electrocution	2(10)	4 (25)	6 (35)	5 (30)	0 (0)	17 (12.6)
Fall from a height	1(5)	9(45)	7(35)	3(15)	0(0)	20(14.8)
Total	9 (6.7)	47 (34.8)	61 (45.2)	18 (13.3)	0(0)	135 (100)

$\chi^2=23.85$, $P=0.0213$ (statistically significant)

Non-Road Accident Fatalities by Gender

Analysis of gender distribution shows a predominance of male victims in most accident categories. Falls from height had 24 male fatalities and no female deaths. Drowning showed a more mixed distribution, with 36 males and 7 females, while burn fatalities included 34 males and 14 females. Electrocution had a higher number of female deaths (13) compared to male deaths (7). (Table 2)

Table 2: Causes of Non-Road Traffic Accident Fatalities by Age and Gender in Nairobi, Kenya

Cause	m/f	m/f	m/f	m/f	m/f	Total m/f
Fall from height	1/0	11/0	9/0	3/0	0/0	24/0
Drowning	0/3	18/1	11/3	7/0	0/0	36/7
Burns	0/0	9/6	19/7	6/1	0/0	34/14
Electrocution	1/1	1/4	2/5	3/3	0/0	7/13

Interpretation of Results

Age distribution: The data shows a clear concentration of fatalities among adults aged 30–39, particularly in burns, falls from height, and electrocutions. The 20–29 age group is also highly affected, especially by drowning and falls from height. These results highlight that young to middle-aged adults are at the highest risk of non-road accidental fatalities.

Gender distribution: Males are disproportionately affected, especially in high-risk mechanisms such as falls from height and drowning. Females are more affected in electrocution-related fatalities, indicating potential differences in exposure or roles in work and household environments. **Category-specific risks:** Burns are the leading cause of NRTAs, followed by drowning, falls from height, electrocution, and falls from trains. Most of these fatalities are preventable, highlighting the need for improved safety measures, public education, and workplace regulations.

Statistical Analysis:

Chi-square test confirms a statistically significant relationship between age and type of accident ($\chi^2 = 23.85$, $p = 0.0213$). Gender disparities are notable in several categories, warranting targeted interventions for males and females according to exposure risk.

DISCUSSION

This study analyzed the patterns and causes of non-road traffic accidents (NRTAs) in Nairobi, Kenya, focusing on age and gender distribution of fatalities from burns, drowning, falls from height, electrocution, and falls from trains. The findings highlight several key trends that underscore the urgent need for targeted safety interventions, particularly for high-risk groups such as young adults, males, and individuals working in informal or hazardous labor sectors.

Distribution of Fatalities by Age Group

The data indicates that young adults, particularly those in the 20-39 age group, are disproportionately affected by NRTAs in Nairobi. This group accounted for 45.2% of all fatalities, aligning with findings from other regions. For example, a study by Ogwang & Tumwesigye (2022) in Kampala, Uganda, showed a similar age distribution, where young adults also represented a significant proportion of fatalities. Globally, Ravi et al. (2021) observed that this age group faces a higher risk due to their involvement in informal labor sectors and recreational activities. These trends suggest that young adults are particularly exposed to dangerous situations, whether through informal labor, recreational activities, or inadequate safety education.

In Nairobi, the 30-39 age group was found to be particularly vulnerable to burns, falls from height, and electrocution. This is concerning due to the number of individuals in this age group working in high-risk occupations such as construction, electrical maintenance, and other manual labor. Additionally, the 20-29 age group had a higher incidence of fatalities from drowning and falls from height, often linked to recreational activities around water bodies or informal work in construction. These patterns underscore the need for safety measures and public education campaigns tailored to young adults, especially those working in informal labor sectors or engaging in risky recreational activities.

Gender Disparities in Non-Road Traffic Accidents

Gender disparities in NRTAs are evident, particularly in the distribution of fatalities across different accident types. In this study, males were significantly more likely to die from non-road-related accidents, a finding consistent with studies from India (Sharma & Bansal, 2022), Brazil (Pinto et al., 2020), and Kenya (Njiru et al., 2020). Males accounted for the majority of fatalities from drowning, falls from height, and electrocution, particularly in the 30-39 age group. This aligns with gendered roles in society, where men are more often involved in manual labor, construction, and risky recreational activities such as swimming or fishing. In Nairobi, many males in this age group work in informal sectors, exposing them to greater risks, including electrocution and falls from height.

In contrast, females in Nairobi were more likely to die from burns, with many of these fatalities occurring in domestic settings. This pattern aligns with findings from Sharma et al. (2022), which showed that women in low- and middle-income countries are more susceptible to burns due to household accidents, particularly those involving open flames during cooking. These gendered patterns emphasize the need for gender-sensitive safety interventions, particularly in domestic settings, and improved workplace safety for women working in high-risk environments such as manufacturing and food processing.

Leading Causes of Fatalities

Burns, drowning, falls from height, and electrocution were the leading causes of non-road traffic fatalities in Nairobi, consistent with patterns observed both regionally and globally. Burns, which accounted for 41.5% of the total NRTAs, were the leading cause of death, particularly among the 30-39 age group. This is particularly concerning because burns are preventable through better safety standards in both homes and workplaces. In many low- and middle-income countries, unsafe cooking practices and inadequate fire safety measures contribute to a high incidence of burn injuries (Sharma & Bansal, 2022). The high vulnerability of the 30-39 age group highlights the need for improved fire safety education and regulatory measures to prevent burns, particularly in kitchens and industrial workplaces.

Drowning was the second leading cause of non-road fatalities, with a significant number of deaths occurring in the 20-29 age group, often linked to recreational or informal labor activities around water bodies. In many low-income communities, limited access to safe swimming facilities and water safety education contributes to these high mortality rates. This is consistent with the findings of Ogwang & Tumwesigye (2022) in Uganda, which emphasized the vulnerability of young adults to drowning in unregulated environments.

Falls from height, accounting for 14.8% of NRTAs, were most common in the 20-29 and 30-39 age groups. These fatalities are often linked to construction sites and other high-risk environments where safety measures are poorly enforced or absent. In Nairobi, the prevalence of falls from height in the construction sector highlights the need for stronger enforcement of workplace safety regulations to protect workers.

Electrocution, though accounting for 12.6% of all NRTAs, remains a significant cause of death, particularly in the 30-39 age group. Workers most at risk include informal electricians, construction workers, and those involved in household electrical repairs. Inadequate safety protocols and lack of training for workers exposed to electrical hazards are major contributing factors to the high incidence of electrocution fatalities in Nairobi.

Statistical Significance of Age and Type of Accident

The chi-square test ($\chi^2 = 23.85$, $p = 0.0213$) revealed a statistically significant relationship between age group and the type of accident in Nairobi. This suggests that the distribution of fatalities is not random, but rather reflects a clear pattern. The 30-39 age group had the highest number of fatalities across nearly all accident categories, emphasizing the vulnerability of this demographic. This group is particularly at risk due to their high involvement in informal labor, construction, and recreational activities that expose them to various hazards. The statistically significant results further reinforce the need for age-targeted safety interventions for young adults engaged in high-risk occupations and activities.

Implications for Public Health and Policy

The findings from this study have crucial implications for public health and policy development in Nairobi. The high incidence of non-road traffic fatalities among young adults points to the urgent need for targeted interventions to address burns, drowning, falls from height, and electrocution. Public health campaigns should focus on raising awareness about these risks and promoting safety education in high-risk environments, such as construction sites, water bodies, and homes.

Additionally, the observed gender disparities call for gender-sensitive safety interventions. Policies should prioritize reducing the risk of burn injuries in domestic settings, especially for women, and improving workplace safety standards for both men and women in high-risk industries such as construction and electrical work. Gender-targeted safety initiatives are essential for addressing the unique risks faced by males and females in different settings.

CONCLUSION

This study highlights the significant role that non-road traffic accidents (NRTAs) play in the overall mortality burden in Nairobi. Among the leading causes of NRTAs, burns, drowning, falls from height, and electrocution were the most common, with young adults in the 20-39 age group representing the highest proportion of fatalities. The 30-39 age group emerged as the most vulnerable to burns, electrocution, and falls from height, while the 20-29 age group was particularly affected by drowning and falls from height.

The statistical analysis supports the relationship between age and the type of accident, with a significant chi-square value ($\chi^2 = 23.85$, $p = 0.0213$), emphasizing the need for age-targeted safety interventions. These findings suggest that young adults, particularly those in informal labor sectors or engaged in recreational activities, are disproportionately at risk of preventable fatalities. To reduce this burden, comprehensive interventions should include stricter safety regulations in high-risk sectors like construction, enhanced public education campaigns on water safety and electrical hazards, and improved infrastructure and enforcement of safety standards. By

focusing on high-risk environments and improving safety measures, Nairobi can reduce preventable fatalities and protect the lives of its residents.

RECOMMENDATIONS

A primary recommendation is the urgent need for stronger safety regulations, particularly in high-risk sectors such as construction, informal settlements, and recreational areas. The construction sector, where falls from height are common, should implement stricter safety protocols, including mandatory fall protection equipment and enhanced safety training for workers. Similarly, the informal sector, often lacking safety standards, must be better regulated, with agencies like the National Council for Occupational Safety and Health (NCOSH) working to enforce these regulations.

Public education campaigns are essential to prevent non-road traffic accidents. Government and NGOs should launch targeted awareness campaigns on safety precautions, particularly around burns, drowning, falls, and electrocution. Emphasis on water safety, especially for young adults aged 20-29, could reduce drowning incidents. Schools, community centers, and media platforms can be effective tools for spreading safety messages, focusing on safe practices near water bodies and fire hazards at home.

Improvement in urban infrastructure is also crucial. Local authorities should prioritize the construction of safer recreational spaces, such as public swimming pools with lifeguards, and improve road safety measures like pedestrian walkways and clear signage in construction areas. Regular maintenance of public facilities and safety warnings, like electrical hazard signs, should be enforced.

In sectors like construction, manufacturing, and agriculture, occupational health and safety (OHS) regulations must be strictly enforced. Employers should provide personal protective equipment (PPE), offer training, and regularly conduct safety audits. Additionally, more programs should be developed to protect workers in the informal sector, who often face high risks without proper safeguards.

Finally, timely medical intervention is critical. Improved emergency response systems, including faster ambulance services and better-equipped trauma centers, can significantly reduce fatalities. Public health education on first aid and emergency response can also save lives in critical moments before help arrives.

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