



The Influence of Road Users' Behaviors on Pedestrian Safety in Urban Built Environment

—The Case of Kinondoni in Dar es Salaam

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Abstract

Road accidents remain a complex challenge in most urban areas. Most roads in urban areas are characterized by mixed traffic conditions which increases the traffic conflicts in urban areas. This paper attempts to explore the influence or relationship of different road users to the occurrence of road accidents in urban built environments. One of the important components for pedestrian safety in urban roads is the existing level of legal enforcement in urban built environments. A case study strategy was employed where different methods of data collection were used. In this study, multiple tools and methods of data collection were used in the collection of different data such as interviews and observation. The interview included closed and open-ended questions to pedestrians in urban areas, and other road users including drivers within the case study. Also, questionnaires and checklists, the questionnaires were used specifically for individuals in households while the checklists were used to collect data from the key informants including the traffic police officer. Physical observation and photo-taking were used to collect data on the behavior of road users on the roads in relation to existing regulations. The majority of road accidents involving pedestrians and other traffic have a relationship with the violation of road traffic regulations. The behaviors of Road users such as careless drivers, wrong overtaking, overspeeding, careless motorcyclists, failure to follow traffic lights, pedestrian crossing in restricted areas, failure to observe traffic signs, and others while using roads increase the risk of pedestrian involvement in road accidents. This paper concludes that most road accidents for pedestrians are the result of conflict or collision with other road users due to unacceptable behaviors of road users which increases the risk of accidents for pedestrians and other road users. The paper also concludes that the violation of regulations by different road users impacted the safety of pedestrians.

Subject Areas

Urban Design and Pedestrian Safety in Urban Built Environment

Keywords

Road Users, Pedestrian Safety, Pedestrian Behaviour, Legal Enforcement and Road Accidents

1. Introduction

Walking remains the widely used mode of travel despite the increase in automobiles. In most cases, walking involves crossing roads from one side to another creating a likelihood of traffic conflicts. High speed creates delays or risks to pedestrians (TRL Limited, 2006) [1]. In Tanzania, around 30 percent of all road traffic deaths comprise pedestrians (Katopola & Mashili, 2022) [2]. Road accidents in urban areas remain the major cause of fatalities in developing countries while literature indicates that the main means of reporting accidents is physical means which may compromise the quality of data and may lack observations of the behaviors of drivers and other road users (Mjema & Dida, 2020) [3]. Road accident is a worldwide problem with an increasing trend and the leading cause of injuries, deaths, and disability worldwide (Deme, 2019) [4].

Road accidents occur when vehicles collide or when there is a collision between vehicles and pedestrians on roads. The occurrence of road accidents may result in deaths, injuries, disabilities, and damage to vehicles (Mohammed, Ambak, Mosa, & Syamsunur, 2019) [5]. Pedestrians' choice of a place to cross the road implies the risk of road accidents. The pedestrian always takes the fastest or the shortest or quickest route and therefore any perceived delay is likely to increase the risk for the pedestrian to cross at a safe place (TRL Limited, 2006) [1]. Pedestrians will less think of safety implications rather they will take a decision to cross when it suits them in terms of time and convenience. Time strongly influences pedestrian behavior when crossing, including crossing against the red signal at single unsignalized intersections or crossing in areas not marked for pedestrian use. The longer pedestrians are required to wait at single-unsignalized intersections, the more likely they are to cross when the signal is red (TRL Limited, 2006) [1]. Pedestrians are often likely to shorten the wait time by crossing without waiting for permission (TRL Limited, 2006) [1].

The risk of high-speed road accidents for pedestrians is high in low- and middle-income countries (Tiwari, 2019) [6]. Literature review indicates that in African countries, human factors, such as speeding, overtaking, reckless driving, phone usage, tiredness or fatigue, alcohol use, non-use of seatbelts, and sleeping, account for more than three-fourths of road accidents. Highly populated countries, such as Egypt, Nigeria, and Ethiopia, experience about 80 percent of road accidents being caused by human factors (Deme, 2019) [4].

High speed of vehicles increases the risk of vulnerable road users due to poor protection and the high risk of crash severity (Constant & Lagarde, 2010) [7]. There is still a lack of acceptance among drivers that their choice of speed may increase accident risk not only for themselves but also for other road users. Safety education programs and campaigns focusing on changing people's instrumental attitudes and enhancing social norms would help to reduce pedestrians' road crossing violations (Yagil, 2000) [8]. In Africa, Human factors resulted in more than eighty percent of road accidents, especially in populated countries such as Nigeria, Egypt, and Ethiopia. Vehicle drivers are responsible for the majority of road accidents in Africa, putting pedestrians and passengers at high risk of fatalities. High speeds, alcohol taking, dangerous overtaking, sleeping, non-use of seat belts, and fatigue have resulted in many accidents (Deme, 2019) [4].

The main aim of this study was to explore the road users' behaviors and the implications on pedestrian safety in Kinondoni Municipality and uncover the challenges of legal enforcement for pedestrian safety in urban areas.

2. Methods of Data Collection

Kinondoni Municipal Council was used as a case study strategy was employed where Different methods of data collection were used. The mixed methods research approach means adopting a research strategy employing more than one type of research method (Brannen, 2005) [9]. The method is both a methodology and a method as it involves collecting, analyzing, and mixing qualitative and quantitative approaches in a single study or a series of studies (Creswell, 2006) [10]. Therefore, this research applied the mixed research approach to collect the required data from the field. In this study, multiple tools and methods of data collection were used in the collection of different data such as a review of road accident records from the police departments, interviews, observation, and photo taking. The interview included closed and open-ended questions to pedestrians in urban areas, and other road users including drivers within the case study. Also, questionnaires and Checklists, the questionnaires were used specifically for individuals in households while the checklists were used to collect data from the key informants. Physical observation and photo taking were used on street layouts, road layouts, and pedestrian movements in relation to existing regulations.

3. Presentation and Discussion of Results

Road transport as a system includes the people, vehicles, and road environment. The interaction of vehicles, road environment, and people has implications for pedestrian safety on roads. This part describes the behaviors of pedestrians on roads and the behaviors of other road users in relation to existing laws and regulations governing road transport operations. An interview with pedestrians, Traffic Police, and car drivers revealed there were some actions by pedestrians that violated regulations for the operation and use of roads. In Kinondoni, viola-

tion of laws and regulations governing operation on roads has been noted. Field observation on pedestrian movement and interviews with different respondents revealed some unwanted pedestrian behaviors which put road users at risk of pedestrian-related accidents on urban roads. These are related to pedestrian movements on roads, pedestrian behaviors at road junctions, pedestrian behaviors at bus stops, and illegal crossing of the road by pedestrians.

3.1. Pedestrian Behaviors at Road Junctions

The analysis of pedestrian movement at the road junctions revealed some pedestrian behaviors that do not adhere to regulations. Road junctions are hot-spot areas for road accidents in urban areas. Kinondoni has several major junctions like Ubungo junction, Mazense junction, Morocco junction, and other junctions where frequent road accidents have been recorded both at signalized and signalized road junctions. While crossing at road junctions, the majority of pedestrians put up some behavior that violates rules and regulations. Intersections are hazardous places (Grembek *et al.*, 2019) [11]. Threats arise from interactions among pedestrians, bicycles, and vehicles, more complicated vehicle trajectories in the absence of lane markings, phases that prevent determining who has the right of way, invisible vehicle approaches, vehicle obstructions, and illegal movements (Grembek *et al.*, 2019) [11]. The findings indicate some of the pedestrian crossing the road junction despite traffic rights not allowing them to pass. Some of the pedestrians cross the road at junctions ignoring the red light. Also, field observation revealed that most of the pedestrians do not cross the road at zebra crossing while some of the road junctions. The provision of the traffic light signals provides a “safer” crossing option to these pedestrians, as compared to uncontrolled crossings and mid-block arterial roads. However, there are still people choosing to cross at the riskier period (Red Man phase) (Koh, and Wong, 2014) [12]. The lack of pedestrian zebra crossing spaces forces pedestrians to move or walk in the motorized carriageways. Similarly, car drivers in some cases do not respect the pedestrian’s right to cross the road. The research findings also indicate the behaviors of pedestrian walking within the carriage. This has increased the traffic conflicts between pedestrians and motorists. Walking in the carriageways increases the risk of pedestrians being involved in road accidents. The occurrence of pedestrian accidents on urban roads in Kinondoni is a result of interaction with other road users. According to the analysis of road accident data from the police department, the statistics indicate that most pedestrian road accidents are the result of involving vehicles. The pedestrian accidents involving cars and pedestrians were 26 percent, pedestrians and motorcycles were 39 percent, pedestrians and buses (Daladala) were 26 percent, pedestrians and bicycles were 4 percent, and pedestrians and tricycles were 5 percent of all pedestrian accidents.

3.2. Motorcyclists and Car Driver’s Behaviors Risking Pedestrians

Pedestrian safety requires all road users to adhere to existing laws and regula-

tions. According to road accident statistics, most pedestrian road accidents occur as a result of a collision with other road users. The behaviors and attitudes of car drivers and motorcyclists have implications for the safety of pedestrians. Analysis of road traffic statistics indicated that about 39 percent of pedestrian road accidents involve motorcycles and pedestrians, 26 percent of all pedestrian accidents involve cars and pedestrians, 26 percent of pedestrian accidents involve buses (Daladala), 4 percent involve bicycles pedestrians while 5 percent of all pedestrian accidents involve pedestrians and tricycles (three-wheelers). This is also supported by literature whereby; Vehicle drivers are to blame for the majority of road accidents in Africa putting pedestrians and passengers at high risk of fatalities.

3.3. Negligence or Careless Behaviors of Motor Vehicle Drivers on Urban Roads

An interview with traffic police officers at Traffic Police revealed that in most cases, pedestrians are always victims of poor decisions taken by vehicle drivers. Car drivers neglect the regulations governing them on how to treat pedestrians while driving on roads. According to road accident, statistics from 2012 to 2014 about 18 percent of road accidents occurred due to negligence or careless car driver's behaviors on the roads. This includes negligence of existing regulations on the roads as indicated by traffic signs, symbols, and other by-laws. Traffic police accident records indicate that negligence or careless drivers accounted for 6963 road accidents which involved about 11,212 vehicles and killed 125 and injured 2370 road users. Negligence or careless behaviors of motor vehicle drivers on urban roads increases the risk of pedestrian road accidents.

3.4. Dangerous Driving Behaviors by Car Drivers in Urban Areas

According to road accident statistics from 2012 to 2014 about 18 percent of road accidents occurred due to dangerous driving by car drivers, motorcyclists, and other motor vehicles on the roads where in a period from 2010 to 2014, dangerous driving on roads accounted for 4932 accidents which involved about 8348 vehicles, killed 2012 and injured 2091 road users. This was due to poor enforcement of traffic regulations and individual motor vehicle operators who do not respect the existing laws and regulations governing the rights of pedestrians in using the road.

Figure 1 indicates a situation where a car driver violates the right of the pedestrian to cross the road at a zebra crossing. The driver of vehicle number one (1) crosses the zebra crossing while a pedestrian is still crossing the zebra area.

3.5. Drivers Overtaking Carelessly Increase

The possibility of pedestrians being hit while walking. According to road traffic accident statistics about 5% of the road accidents that occurred in Kinondoni from 2012 to 2014 were due to dangerous overtaking on the roads by car drivers. This includes drivers overtaking on left side while the law requires drivers to overtake on the right side.

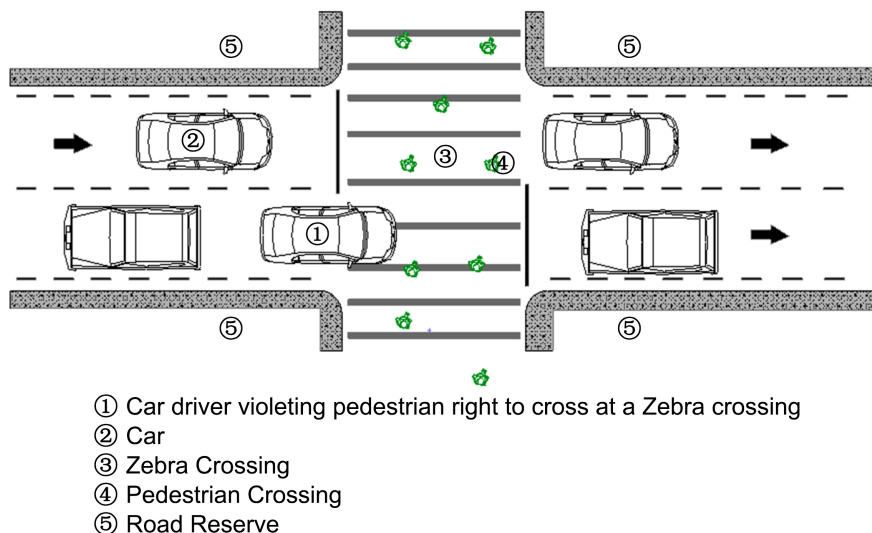


Figure 1. Dangerous driving behaviors by car drivers in zebra crossing area.

3.6. Excessive Speeding by Car Drivers

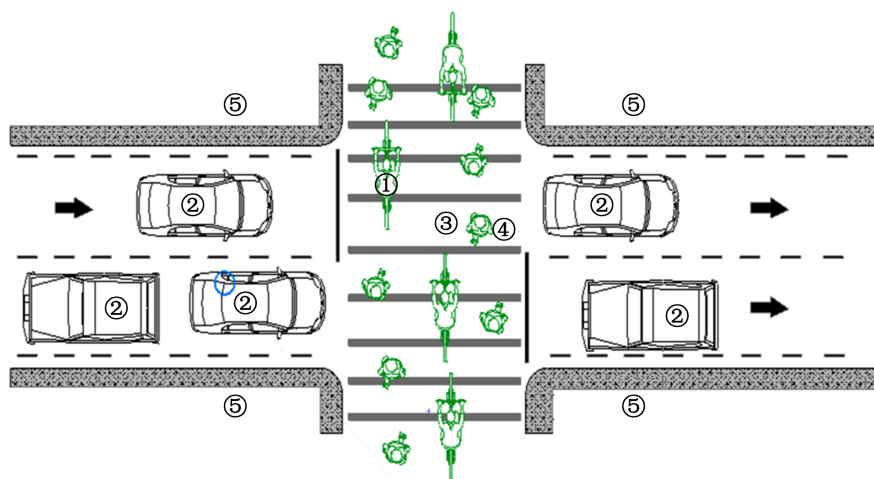
Speeding motor vehicles increase the risk of road accidents. Children and the elderly are often the victims, since they are vulnerable to the fast-moving vehicles. Excessive speeding is also due to the negligence of car drivers and failure of car drivers to follow prescribed speed limits on the roads. According to road traffic accident statistics from 2010 to 2014, excessive speeding of car drivers in urban roads resulted in 1309 accidents, involving 1752 vehicles which killed 54 persons and injured 593. This indicates that there is little effort being made by the responsible authorities to limit the speed of vehicles on roads.

3.7. Careless Motorcyclist Behaviors on Roads

Motorcyclists are among road users violating safety laws and regulations on urban roads. According to road accident statistics, another reason for the occurrence of road accidents in Kinondoni is the careless behavior of motorcyclists who ignore traffic regulations on the roads. About 4 percent of all road accidents are caused by careless motorcyclists on roads. Motorcyclists have a tendency of disrespecting pedestrians' right to cross on zebra crossing; also, some of the motorcyclists ride on pedestrian walkways especially during peak hours, when the roads are congested, in the morning and evening.

3.8. Illegal On-Street Parking

Road regulations do not allow for on-street parking, but most of the areas in Kinondoni lack parking spaces and facilities; this tempts people to park on the road (street parking). The on-street parking sometimes occupies areas that are reserved for pedestrians, making their movement difficult. On-street parking increases the risk of pedestrian involvement in road accidents, as visibility between pedestrians and car drivers is obstructed. Some vehicles actually park on the pedestrian walkways.



- ① A motorcycle driver violating pedestrian right to cross at a Zebra crossing
- ② Car
- ③ Zebra Crossing
- ④ Pedestrian Crossing
- ⑤ Road Reserve

Figure 2. Motorcyclists crossing on zebra while pedestrians are crossing the road.

3.9. Motorcyclist Violation to Pedestrian Rights on Zebra Crossings

Zebra crossings are safe places where pedestrians have the right to cross the road. An interview with the traffic police department indicates that motorcyclist drivers in most cases do not respect the rights of the pedestrian to cross the road; in some cases, pedestrians were killed or injured at the zebra crossing.

Figure 2 indicates a situation where a motorcycle driver violated the right of the pedestrian to cross the road at a zebra crossing. The driver of the motorcycle labeled by number one (1) crosses the zebra crossing while driving a motorcycle and pedestrians are still crossing the zebra area. The traffic regulation prohibits motorcyclists from crossing a zebra while driving the motorcycles. This pattern of behavior increases the risk for pedestrians including children's going to schools. The use of pedestrian walkways by motorcyclists violates laws forbidding motorists to use pedestrians' space. This results in collisions of motorcyclists and pedestrians legally crossing pedestrian areas.

4. Conclusion

The research findings conclude that the existing laws and regulations governing the safe operation and use of roads are not fully enforced, nor are they observed by road users to ensure pedestrian safety. The behaviors of Road users such as careless drivers, wrong overtaking, overspeeding, careless motorcyclists, failure to follow traffic lights, pedestrian crossing in restricted areas, failure to observe traffic signs, and others while using roads increase the risk of pedestrian involvement in road accidents. Low understanding of regulations and laws go-

verning road operations, which threatens the safety of pedestrians. Failure to observe and enforce regulations could result in serious accidents for pedestrians, making walking environments in urban areas very precarious.

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Conflicts of Interest

The author declares no conflicts of interest.

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