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Assessing the Effect of Road Users' Awareness of Revised Traffic Regulations on the Rate of Road Accidents along Naivasha Highways, Kenya

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Abstract:

The paper investigated the level of the road users' awareness of the Revised traffic regulations of 2012 and its impact on the rate of road accidents along Naivasha Highways in Kenya. The study assessed the frequency of occurrence of traffic road accidents five years before and after the revision of traffic regulation. Descriptive research design was used. The target population was all the motorists (public service, commercial and private vehicle operators who had used Naivasha Highways for 5 years and above) and traffic accident victims having a total combined population of 12,033. From this population, a total of 284 respondents participated. The motorist respondents were drawn through convenience sampling while accident survivors were drawn purposively. A questionnaire was used to gather information from the motorists and accident survivors. The results obtained from the research area indicated that majority of the respondents were aware of the revised traffic regulations of 2012. Consequently, the study was informed that the respondents' awareness of the revised traffic regulations had significantly reduced the frequency of traffic accidents which was high before the introduction of revised traffic regulations and subsequently low after the implementation of revised traffic regulations along Naivasha Highways. The study recommended that both the National government of Kenya and the County government of Nakuru to embark on a rigorous road safety awareness campaigns on the revised traffic regulations so as to reduce the rate of road accidents. It also advocates for the sensitization of the public through visual, audio and print media on the importance of observing the Revised Traffic Regulations, proper road usage and the purpose of road furniture among others in a bid to reduce the rate of road accidents in the country.

Keywords: Revised traffic regulations, road accidents, effects, public service vehicles, highways, road furniture

1. Introduction

1.1. Background to the Study

According to World Health Organization report of 2013, every year nearly 1.3 million people are killed in road traffic accidents worldwide and road crashes are the leading cause of death among people between the ages of fifteen and twenty-nine. The report further observed that more than 90 percent of the world's road fatalities occur in developing countries, and half of these fatal victims are pedestrians, cyclists, and motorcyclists. Only 28 countries of the world's population have adequate laws to address the main risk factors, which are excessive speed, drunk driving, unserviceable vehicles, and failure to use crash helmets, seat belts, and child restraints. If no action is taken to reduce this carnage, the annual number of deaths from road traffic injuries could top 1.9 million by 2020 and become the fifth highest cause of death globally (WHO, 2013).

In 2012, the government of Kenya amended sections of Chapter 403 of Traffic regulations to help curb the ever-increasing road accidents which had become a great concern to many Kenyans. Hardly does a day pass without cases of road accidents being reported in the media. Many people have lost their lives along Kenyan highways while others have been maimed or disabled. According to National Transport and Safety Authority report, Naivasha Highways in Kenya has been listed among the most dangerous and unsafe roads in the country prone to accidents (NTSA, 2016).

1.2. Statement of the Problem

To mitigate on traffic crashes, the government amended the 2003 regulations to Revised Traffic Regulations of 2012. The amended rules brought on board the National Transport and Safety Authority (NTSA) and the Kenya National Highway Authority (KeNHA) as surplus regulation enforcement agencies besides the traffic Police department. In addition, the amended rules embraced technology-based measures such as usage of speed cameras; government recommended digital Speed Governors, Breathalyzers and stiff punishments to curb traffic road crashes (Traffic Amendment Act, 2012). Different authors have researched on the traffic rules awareness in developed countries such as Norway, Russia and India. However, they have not clearly presented the effects of awareness of traffic rules in the developing countries among them Kenya. Evidently, a comprehensive assessment on the level of road users' awareness of the revised traffic regulations and

its impact on the rate of traffic accidents is currently lacking in scholarly literature. The concluded research focused on Naivasha highways to mitigate on this knowledge gap.

1.3. Purpose of the Study

The purpose of the study was to assess the effect of road users' awareness of the revised traffic regulations of 2012 on the rate of road accidents along Naivasha Highways in Kenya. The Study was guided by the following objectives:

- To assess the respondents' level of awareness of the revised traffic regulations
- To establish the frequency of traffic accidents (five years) before and after implementation of revised traffic regulations.
- To assess the effect of road users' awareness of regulations on the rate of traffic accidents

1.4. Research Questions

- What is the level of respondents' awareness of the revised traffic regulations?
- How was the frequency of traffic accidents along Naivasha highways (five years) before and after implementation of the revised Traffic regulations?
- What is the effect of road users' awareness of regulations on the rate of traffic accidents?

2. Literature Review

Advancement in technology to curb accidents particularly those caused by over speeding has continued as speeding remains a common contributing factor in the causation of fatal crashes. According to Schroeder et al (2016), Speed limit enforcement is the action taken by appropriately empowered authorities to check that road vehicles are complying with the speed limit regulations on roads and highways. The authors observe that over 13,000 fatalities occur per year especially in the United States, making speeding one of the most often-cited causes of accidents. Unlike in the United States, the concluded study observed that a manually operated Binar Speed camera model is constantly in use along Naivasha highways therefore there wasn't any automated traffic operations on speed check.

Besides the usage of Speed Camera in traffic enforcement, the Speed Governor or a Speed Limiter is commonly fitted into motor vehicles to maintain the required speed limit. According to Eco gas Impex (2015), Road Speed Limiters were developed to improve safety and the environment by controlling the top speed of vehicles, thus reducing serious accidents and pollution. Bishop (2005) observed that Speed Limiters also reduce; speed variability, lane change, deceleration maneuvers, approach speeds at intersections, curves, and roundabouts hence reducing possibility of crashes significantly. In Kenya, the 2012 Traffic Act was revised and the Minister of Transport and Infrastructure recommend the type of Digital Speed Limiters to be used. This was intended to compel use of tamper proof gadgets fitted on PSVs and commercial vehicles.

In addition to exceeding speed limit, driving under the influence of alcoholic substances has equally been found to be a major contributing cause of traffic crashes. For instance in Europe, a report by The European Transport Safety Council (ETSC) observed that drunk drivers were greatly over-represented in road traffic crashes and at least 20% of all road deaths in Europe were alcohol related whereas about only 1% of all kilometers driven in Europe were driven by drivers with 0.5 g/l alcohol in their blood or more (ETSC, 2015). In Kenya, Breathalyzers were introduced to measure alcohol content on drivers and generally to deter drunk driving related crashes which was a major contributing factor to traffic crashes (NTSA, 2017).

2.1. Effects of Road User's Awareness of Traffic Rules

Public attitude and awareness play a critical role in adoption and application of social control measures including traffic regulatory laws. A cross cultural study conducted by Torbjorn et al., (2014), on the risk constructs and driver attitudes and awareness in Norway, Russia, India, Ghana, Tanzania and Uganda, revealed a variation in drivers' risky behavior in these countries. The differences on road traffic risk perception, risk sensitivity, driver attitudes and behavior were also examined. According to the study, Norwegians reported safer attitudes regarding drunk driving and exceeding the speed limit. On other hand, respondents from Sub Saharan Africa reported higher road traffic risk perceptions and risk sensitivity than respondents from Norway, Russia and India. Respondents from Tanzania reported the highest willingness to take risks both in traffic and in general. Participants from Sub Saharan Africa and India reported safer attitudes in regard to speaking out to an unsafe driver, rule violations and attitudes towards pedestrians using the road. The predictive model of driver behavior explained a satisfactory amount of variance in Norway, Russia and India, but was poorly fitted in the African countries. The results from the study were discussed in line with the general risk environments and the road traffic systems in high- and low-income countries (Torbjorn et al., 2014). The current study sought to explore the respondents' attitude towards the enforcement of the Revised Traffic Regulations within the area of study.

According to NTSA, (2017), speed and alcohol are among the most leading causes of road accidents in Kenya. Public attitude and awareness on Traffic Rules and general behavior of motorists is a major contributing factor on road traffic accidents. The road safety agency associates reasons for speeding to attitudes such as: speeding because other drivers do so; perceiving the speed limit as too low; a belief that they will not be caught by the Police for speeding; not knowing they were speeding; existence of regulations which can easily be contested in court; conviction that speeding is not dangerous; and other views that link speeding to positive connotations. In addition, Asingo (2007) further underscores the negative attitude, ignorance of traffic laws and mistrust between the Police and the general public as an impending factor to enforcement of traffic regulations along Kenyan highways.

In addition, the Kenya Traffic department reiterates that Traffic Rules in Kenya are violated by both private and public service vehicles across the Country. For instance, the department cited provisions of the Kenya Traffic Legal Notice No. 161 which regulates commercial Pick-ups and light trucks not to exceed 80 /Kph. However, drivers are frequently arrested for exceeding the 80/Kph speed limit despite the inscription of speed indication at the rear of their motor vehicles. In addition, the general public has shown less confidence on the capability of the speed cameras, Breathalyzer, and Speed Governors to curb the rate of traffic crashes due to overlapping regulatory agencies. NTSA, (2017) further observed that in Kenya, enforcement of traffic regulations has prompted constant opposition from the public some opting to challenge the enforcement of traffic regulations through legal suits. The study established that the road users lacked knowledge on Revised Traffic Regulations and other road safety measures.

2.2. Theoretical Frame Work

This research was conducted within the framework of Traffic Flow Theory. In the mathematics of civil engineering, traffic flow is the study of interactions between the immobile component (including highways, signage, and traffic control devices), and the mobile component (including pedestrians, cyclists, drivers and their vehicles) with the aim of understanding and developing an optimal transport network with efficient movement of traffic and minimal traffic congestion problems. Attempts to produce a mathematical theory of traffic flow date back to the 1920s, when Frank Knight first produced an analysis of traffic equilibrium, which was refined into Wardrop's first and second principles of equilibrium in 1952 (Committee on Traffic Flow Theory, 2011). In addition, Kerner, (2009) observed that in a free-flowing network, Traffic flow theory refers to the traffic stream variables of speed, flow, and concentration. These relationships are mainly concerned with uninterrupted traffic flow, primarily found on freeways or express ways. Flow conditions are considered "free" when less than 12 vehicles per mile are on a road. "Stable" is sometimes described as 12–30 vehicles per mile per lane. As the density reaches the maximum flow rate (or flux) and exceeds the optimum density (above 30 vehicles per mile), traffic flow becomes unstable, and even a minor incident can result in persistent stop-and-go driving conditions. "Breakdown" condition occurs when traffic becomes unstable and exceeds 67 vehicles per mile. "Jam density" refers to extreme traffic density associated with completely stopped traffic flow, usually in the range of 185–250 vehicles per mile per lane (Kerner, 2009).

Despite the popularity of the Traffic Flow theory, Dagazo (1993) asserts that several decades of intensive effort to improve and validate network optimization based on traffic flow theory models have not succeeded in reduction of traffic congestion and road accidents in real life. This is the major weaknesses of this theory. However, this theory was chosen because it adequately analyzes the enforcement procedures of traffic regulations, behavior of road users, traffic stream variables such as speed, flow and concentration normally found along Kenyan Highways. The study on Naivasha Highways also established that such traffic stream variables were among the main causes of road accidents within the area of study.

3. Research Methodology

The descriptive survey research design was employed in this study. The study was conducted along Naivasha-Highways in Kenya. The target population was all the motorists (public service, commercial and private vehicle operators who had used Naivasha Highways for 5 years and above) and accident survivors having a total combined population of 12,033 from which a total of 284 respondents who participated was drawn. The sample was selected conveniently and purposively. First, various motorists were identified then the accident survivors. The questionnaires used were researcher-administered. A semi-structured questionnaire was used to obtain information on the level of the road users' awareness of the Revised Traffic regulations and its effect on traffic road accidents along Naivasha Highways.

4. Findings and Discussions

The following three research questions were answered:

- What is the level of respondents' awareness of the revised traffic regulations?
- How was the frequency of traffic accidents along Naivasha highways (five years) before and after implementation of the revised Traffic regulations?
- What are the effects of Respondent's awareness of RTR on the rate of accidents?

4.1. Motorists' Awareness of Revised Traffic Regulations

In this section the study inquired from the motorists and accident victims on their awareness of the Revised Traffic Regulations in order to establish the respondents' knowledge on traffic rules.

In relation to awareness of Revised Traffic Regulations, 87% (247 motorist respondents) were found to be familiar with the revised rules while 13% (37 motorist respondents) expressed lack of awareness of the regulations. The information is as shown in the Figure1



Figure 1: Motorists Awareness of the Revised Traffic Regulations

4.1.1. Accident Survivors' Awareness of Revised Traffic Regulations

Only 34.5% (10 accident survivor respondents) agreed that they were indeed aware of the rules while 65.5% (19 respondents) had no knowledge of traffic regulations. It can therefore be deduced that more motorists were aware of the Revised Traffic Regulations as opposed to the accident victims where majority were not aware of the Revised Traffic Regulations. The information is as shown in Figure 2.

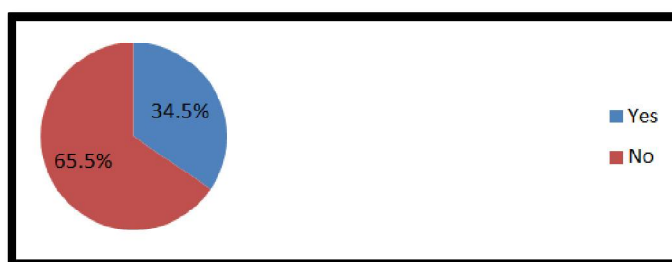


Figure 2: Accident Survivors' Awareness of the Revised Traffic Regulations

4.2. Effects of Respondent's Awareness of RTR on the Rate of Accidents

4.2.1. The Effect of Motorists Awareness of RTR on the Rate of Road Accidents

When the motorist respondents were asked about the effects of their awareness of Revised Traffic Regulations on road accidents, 89.1% said that their awareness of Revised Traffic Regulations had reduced the rate of road accidents, 8.1% said that their awareness had no effect on the rate of road accident while only 2.8% said that their awareness had increased the rate of road accidents. It can therefore be logically concluded that the majority of respondents were in unison that their awareness of Revised Traffic Regulations had significantly reduced the rate of road accidents along Naivasha Highways. The information is as shown in Figure 3.

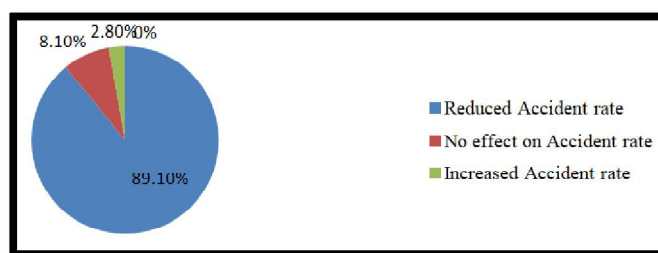


Figure 3: Effect of Motorists Awareness of RTR on the Rate of Road Accidents

4.2.2. Effect of Accident Survivors' Awareness of RTR on the Rate of Road Accidents

The responses from the accident victims established that 93.1% said that their awareness of Revised Traffic Regulations had reduced the rate of road accidents while only 6% said that their awareness had no effect on the rate of road accident. There was no respondent who said that their awareness had increased the rate of road accidents along Naivasha Highways. It can therefore be logically concluded that the majority of the respondents were in agreement that their awareness of Revised Traffic Regulations had significantly reduced the rate of road accidents within the study area. The information is as shown in Figure 4.

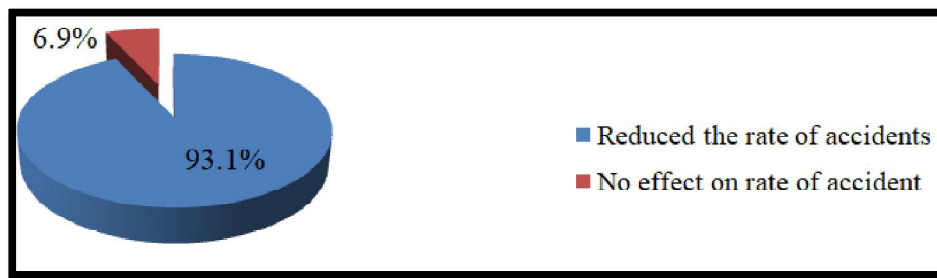


Figure 4: Effect of accident survivors' Awareness of RTR on the rate of road accidents

4.3. Objective 2: Frequency of Road Accidents Before and After the Introduction of RTR

Tables 4.1, 4.2, 4.3 and 4.4 show the results of the second specific objective (To determine the frequency of occurrence of road accidents, five years before (2007-2011) and 5 years after (2012-2016) the revision of 2012 Traffic rules). After analysis, the results were as follows:

4.3.1. Motorists Rating of Frequencies of Accidents Before Introduction of RTR

When asked to rate the frequencies of accidents before introduction of Revised Traffic Regulations, 10.9% of the motorist respondents said that the frequency was low, 5.6% said that it was just the same while 83.5% said that the frequency was higher. It can therefore be concluded that majority of the respondents said that the frequency of accidents was high before the introduction of Revised Traffic Regulations within the study area. The information is as seen in Table 1.

Rating	Frequency	Percentage
Low	31	10.9
Same	16	5.6
Higher	237	83.5
Total	284	100.0

Table 1: Motorists Rating of the Frequencies of Accidents before Introduction of RTR

4.3.2. Accident Survivors Rating of Accidents before the Introduction of RTR

It was established that 10.3% of the accident survivors said that the frequency of accidents before the introduction of Revised Traffic Regulations was low, 6.9% said that it was just the same while 82.8% said it was higher. It can therefore be deduced that majority said that the frequency of accidents was high before the introduction of Revised Traffic Regulations. The information is as shown in Table 2.

Rating	Frequency	Percentage
Low	3	10.3
Same	2	6.9
Higher	24	82.8
Total	29	100.0

Table 2: Survivors rating of the frequencies of Accidents before Introduction of RTR

4.3.3. Motorists' Rating of Accidents after the Introduction of RTR

The response from the motorists' established that 77.1% of the respondents said that the frequency has been low after the introduction of Revised Traffic Regulations along Naivasha Highways, 9.2% said that it was just the same whilst 13.7% said that the frequency was high. It can therefore be deduced that the majority said that the frequency of accidents was low after the introduction of Revised Traffic Regulations. The information is as shown in Table 3.

Rating	Frequency	Percentage
Low	219	77.1
Same	26	9.2
Higher	39	13.7
Total	284	100.0

Table 3: Motorists rating of the Frequencies of accidents after Introduction of RTR

4.3.4. Accident Survivors Rating of Accidents after the Introduction of RTR

After the study, it was found that 72.4% of the accident survivors said that the frequency of accident after the introduction of Revised Traffic Regulations has been low, 13.8% said that it was just the same while 13.8% said it was higher. It can therefore be concluded that majority said that the frequency of accidents was low after the introduction of Revised Traffic Regulations. The information is as shown in Table 4.

Rating	Frequency	Percentage
Low	21	72.4
Same	4	13.8
Higher	4	13.8
Total	29	100.0

Table 4: Survivors rating on the Frequencies of Accidents after Introduction of RTR

4.3.5. Comparison of Traffic Road Accidents before and After Implementation of RTR

In this section, the frequency of Road Accident before introduction of the Revised Traffic Regulation (FoRABIoRTR) and the frequency of road accidents after introduction of the Revised Traffic Regulation (FoRAAIoRTR) were compared using Paired Sample t-test. A P-values of .000 was produced which is less than .05. The results can also be confirmed by the value of $t=24.112$ obtained in the analysis which doesn't fall between the upper (1.24820) and the lower limit (1.47011). It can therefore be construed that the awareness of Revised traffic Regulations of 2012 had significantly reduced the occurrence rate of road accidents along Naivasha Highways. The results are given in Table 5.

		Paired Sample t-test					T	df	Sig. (2-tailed)
		Paired Differences							
		Mean	Std Deviation	Std Error Mean	95% Confidence Interval of the Difference				
					Lower	Upper			
Pair 1	FoRABIoRTR- FoRAAIoRTR	1.35915	.94992	.05637	1.24820	1.47011	24.112	283	.000

Table 5: Accidents Occurrence Before and After Implementation of RTR

5. Discussion

This study established that other causes of road accidents along Naivasha Highways were overloading, corruption, lack of traffic regulation awareness by the road users and use of un-road worthy vehicles among others. The motorists and the accidents survivors attributed the main cause of accident (s) to over speeding followed by overloading. Over speeding means driving at a speed above the set or required speed limit. This simply means driving at a speed that is not safe for the driver and other road users. Within certain roads, speed limits are set with specific regards to the nature of roads, situations or circumstances of such roads. For example, the prescribed speed limit within Kenyan towns and other built-up sections of roads is 50km/h. This is because of the high concentration of both vehicular and human traffic in such places thus driving at the set speed is of significance.

In a similar observation, Cairns (2009) found that more than 80% of accidents were as a result of carelessness, mistakes, negligence and errors made by the drivers. The errors ranged from exceeding the set speed limit, drunken driving, and failure to fasten seat belts for passengers. Cairns observed that non-required speed means driving at a speed not safe due to prevailing road circumstances and thicker traffic. Cairns proposed that drivers must be; taken for refresher courses, checked for alcohol consumption while driving and immediately punished. In Kenya, after completing driving lessons majority of drivers rarely go back for refresher courses hence a likelihood of forgetting important traffic rules and essential features of the road furniture, emerging regulations and new models of the road networks.

6. Conclusion

- The study established that 87% of the motorist respondents were conversant with the revised traffic regulations as opposed to 65% of accidents victims who lacked awareness of the regulations.
- Both the motorist and accidents victims' responses affirmed that the accident rate was high along Naivasha highways five years before the revision of traffic regulation of 2012 but subsequently reduced five years after the commencement of enforcement of the revised regulations.
- Evidently, 93% of the accident's victims and 89% of the motorist respondents were in agreement that their awareness of the revised traffic regulations of 2012 had drastically reduced traffic road accidents within the study area.

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