Influencing Spatial and Temporal Patterns of Road Accidents: A Study on Nuwara – Eliya District

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ABSTRACT

In the global context, about 1.25 million people die each year as a result of road traffic crashes. Moreover, road traffic injuries are the leading cause of death among young people, aged 15–29 years. Furthermore, 90% of the world's road fatalities occur in low- and middle-income countries (WHO, 2017). In Sri Lanka, the accident rate is increasing rapidly. According to the transport and civil aviation report, 2801 deaths, 2590 fatal accidents, 13,095 minor accidents, and 7719 critical accidents occurred in Sri Lanka in 2015. The trend of the accidents has been increasing due to many factors. Physical features of the roads and roadsides, behaviour of drivers and pedestrians are the main influence on the occurrence of accidents. Central province has many accidents-prone areas due to its spatial and temporal patterns. Landform and climatic factors such as fog, snow and rainfall trigger accident potentials. Therefore, this study, "Spatial and temporal patterns of road accidents and their challenges: a study on Nuwara-Eliya District" investigates reasons for the enhanced rate of traffic mishaps. This is the first such study of this phenomenon. Herein, we used primary and secondary data. The results indicate that physical features are mainly to blame.

Keywords: Traffic, injury, fatality, physical features

1. INTRODUCTION

At present, accidents are frequently occurring disaster in the world. Many lives and properties have been lost due to the occurrence of accidents. Nearly 1.3 million people die in road crashes each year, on average 3,287 deaths a day. Over 37,000 people die in road crashes each year and 400,000 people under 25 die on the world's roads, on average over 1,000 a day. Unless action is taken, road traffic injuries are predicted to become the fifth leading cause of death by 2030 (Association for safe international road travels, 2017).

In Sri Lanka, the accidents have been increasing rapidly. A Motor Traffic Accident occurs on highway collision with vehicles, persons or with property. An accidents may occur as between a vehicle and other vehicle, vehicle colliding with a person, vehicle colliding with movable or unmovable property, when a vehicle goes off the road, a person being knocked down with another person and due to natural or manmade disaster. People aged between 15 and 44-year account for 48% of global road traffic deaths.

Day to day transportation activities seem as threats to the human bein. Medical advancement has been inventing to save the lives of human but the accidents cause challenges for the human life. More than 90% of deaths that result from road traffic injuries occur in low- and middle-income countries. Even within high-income countries, people from lower socioeconomic backgrounds are more likely to be involved in a road traffic crashes.

Hatton-Nuwara eliya main road has accident prone areas due to the landscape and the climatic factors' influences. In this connection, this study has been conducted to identify the physical features which cause accidents in the Hatton-Nuwara eliya Main Road as main objective.

And as secondary objectives, finding the relationship between human behaviour and the accidents as well as to identify the challenges due to the accidents and suggest solutions to overcome the challenges to reduce the accidents' likelihood in the study area.

2. STUDY AREA

The annual rainfall of the study area is 2550 mm and the average temperature is 15.3 °C. There is a lush meadows and rainforests in the study area. Considering the population of the study area, 340,297 men 371,297 women are living in there. Population density is 427 people for 1 km^2.

Tourism and vegetable cultivations are partaking to the economic development of the inhabitants. Due to the increasing amount of the tourists, the traffic congestion is very high level in the study area.
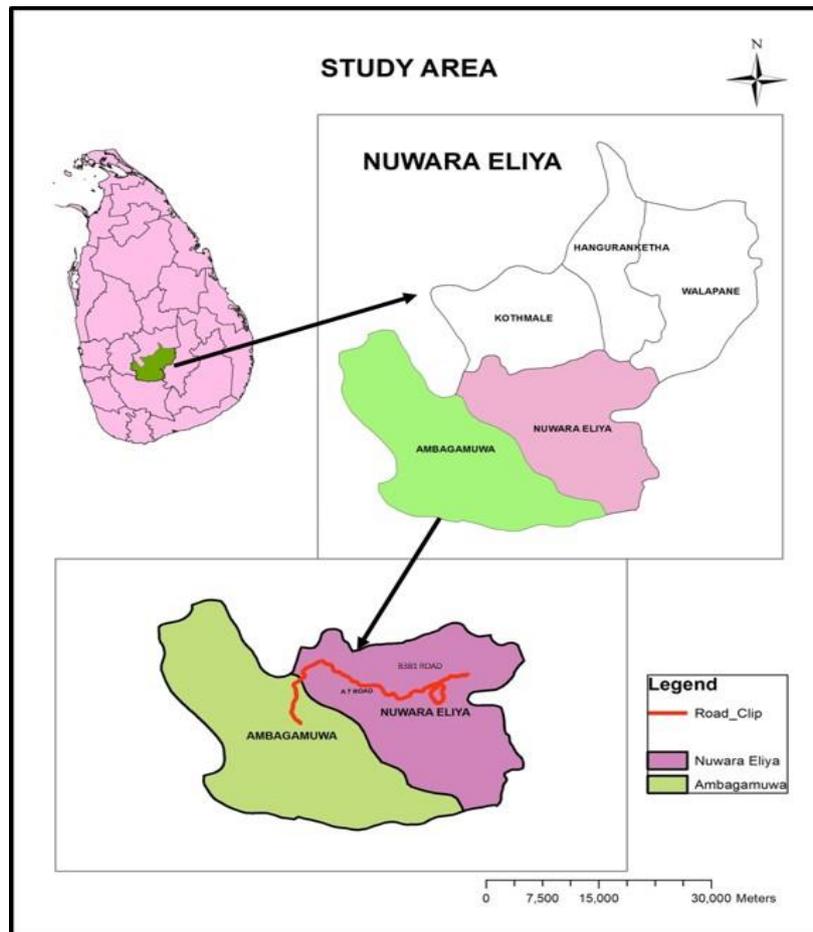
Figure 1. Study Area

3. OBJECTIVES

Primary Objective

- Identifying the physical features which cause accidents in the Hatton-Nuwara-Eliya Main Road

Secondary Objective

- To find the relationship between human behaviour and accidents in the study area.
- Identifying challenges and to suggest solutions to overcome the challenges in the study area.

4. MATERIALS AND METHODS

Both primary and secondary data were used for this study using the qualitative and quantitative data collection methods.

Primary data

Questionnaire, direct observation and interviews were used to collect the primary data.

Questionnaire survey

100 purposive samples were distributed among drivers, pedestrians, street vendors, to collect data for this study.

Direct Observation

Types of vehicles, velocity, quantity, and time were observed in the study area. And physical features of the road network, behaviour of pedestrians and drivers, activities of traffic police, and the impact of the climate on vehicle usages were observed to collect primary data for this study.

Interviews

Traffic police, chief engineers of road development authority, doctors, pedestrians, drivers, street vendors, businessmen and students were interviewed for data collection.

Secondary data

Data from 6 police Divisions in the study area, reports from DS Division, related books, research articles, websites, newspapers, magazines and statistics from respective authorities were used as secondary data.
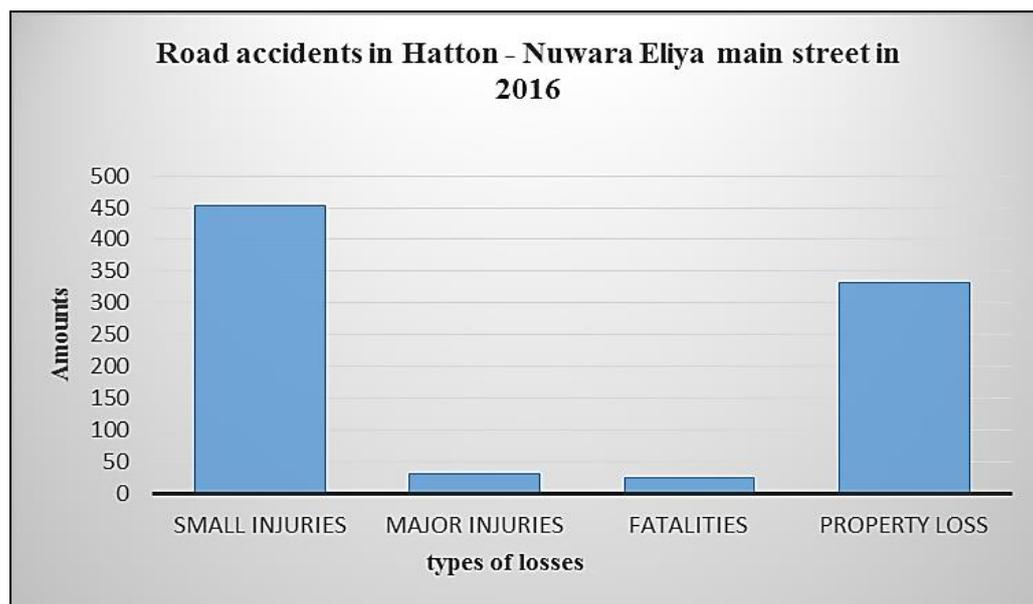
5. RESULT AND DISCUSSION

Figure 2. Road accidents in Hatton – Nuwara-Eliya Main Street in 2016

According to the above chart, the accidents in the Hatton – Nuwara-Eliya main street has caused many losses namely, small injuries, major injuries, fatalities, and property losses. The accidents mostly caused 453 small injuries to the victims. And 31 major injuries have been caused to the victims. Due to the accidents 24 fatalities 332 property losses have been caused in the Hatton-Nuwara Eliya Main Street in 2016. Accordingly, the small injuries and property losses have occurred in this study area.
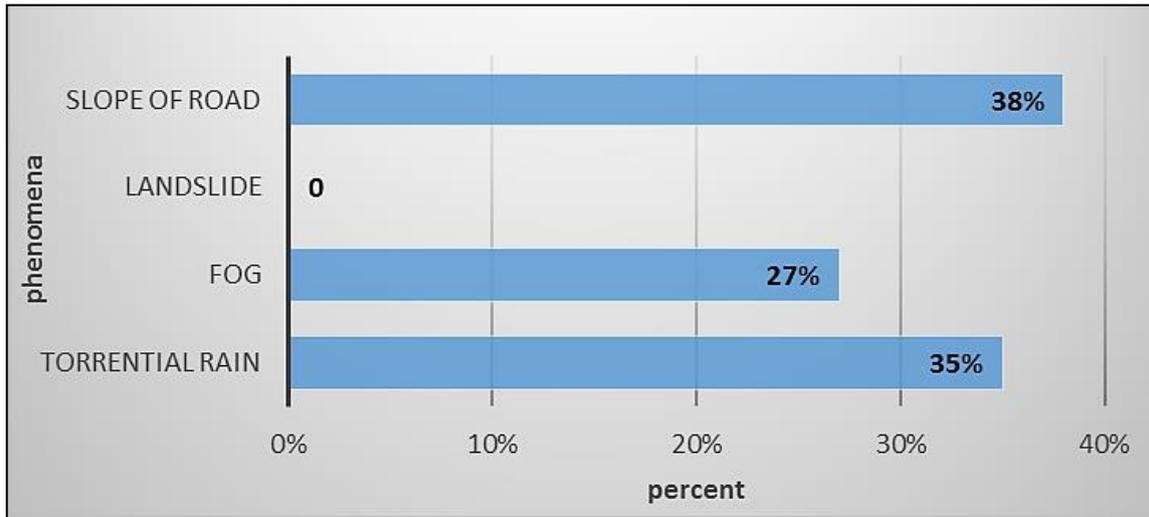

Figure 3. The relationship between natural phenomena and accidents

Figure 3 shows the natural phenomena for the accidents in the study area. 38 percent of the accidents have occurred due to the slop of the road. 27 percent accidents have occurred due to the fog during the morning and evening. And torrential rain has caused the 35 percent of the accidents in the study area.
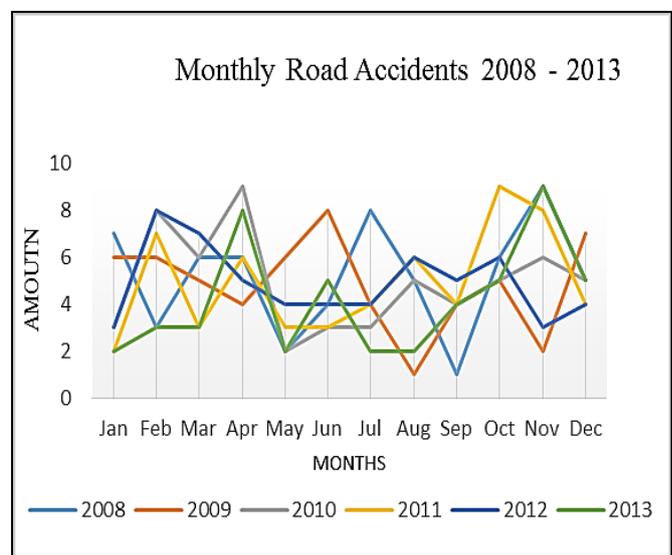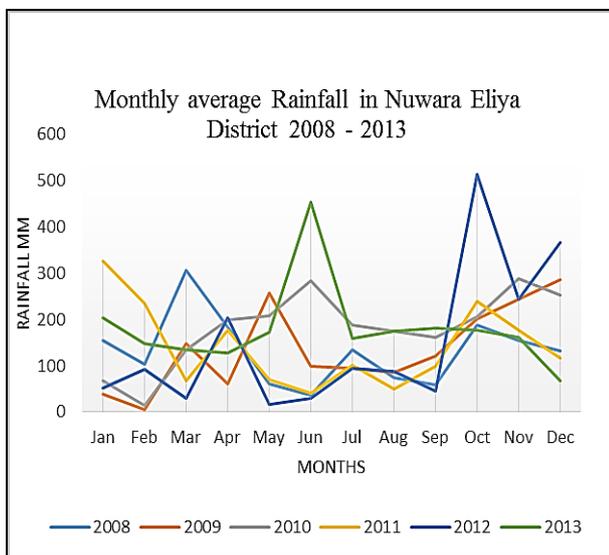

Figure 4. Relationship between rainfall and accidents in the study area

According to these charts, the rainfall has influence on the road accidents in the Hatton – Nuwara Eliya Main Street. The more rainfall the greater incident of accidents in the study area. During the rainy season, it is difficult to travel in Hatton – Nuwar Eliya main road due to the invisibility. The invisibility causes the collision of vehicles one another. Especially, during night times, the occurrence of accidents is likely increasing due to the dark and invisibility. Many accidents have been registered during the rainy season in the study area.
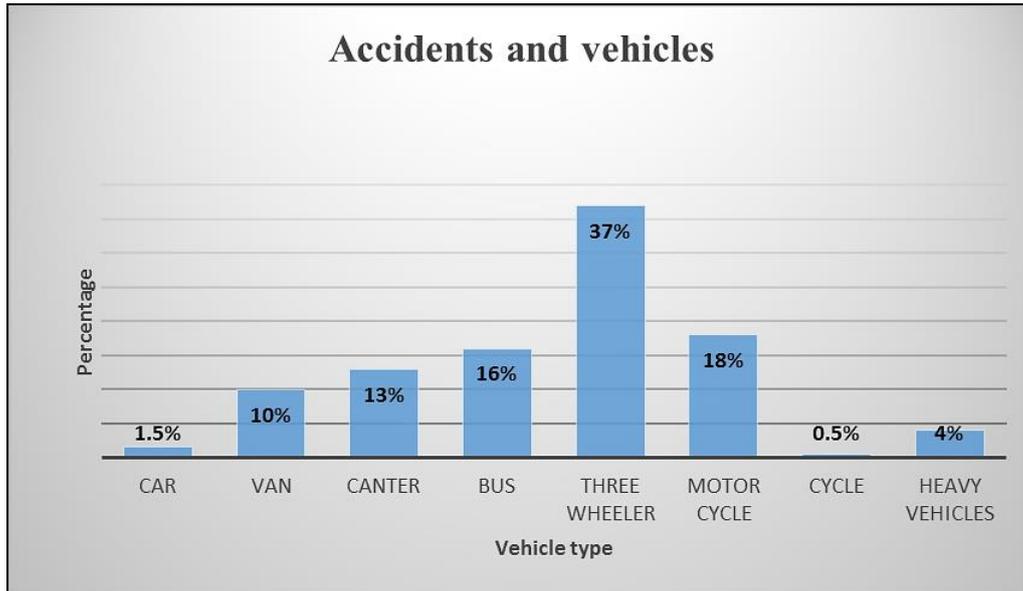

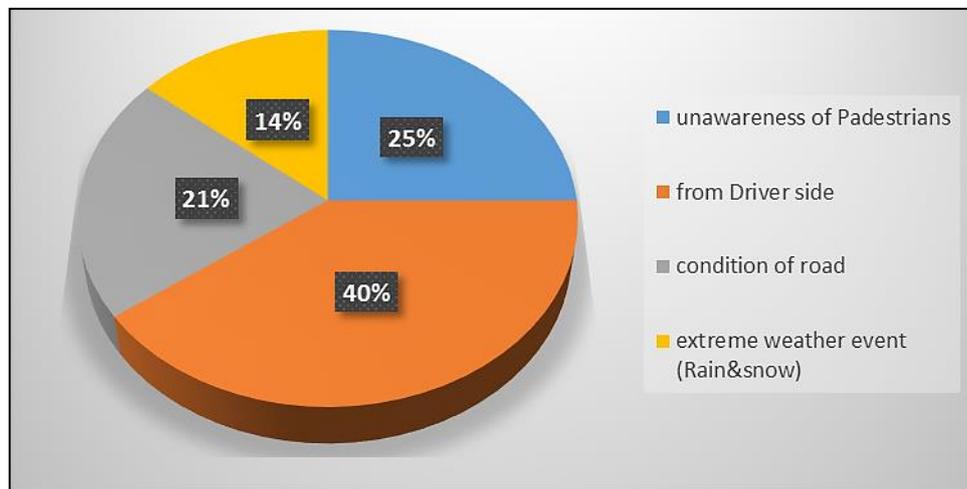**Figure 5.** Vehicle types influencing on accidents.

Figure 6. Public opinion about accidents in the study area.

According to the above chart, 37 percent of accidents have been occurred due to three wheelers. Because, in the study area, the usage of three wheelers are high levels than other vehicles. 18 percent of the accidents have been occurred due to the usage of motor cycle. 16 percent of accidents have occurred due to the bus transportation. Physical features and behaviours of pedestrians and drivers have influenced in the accidents.

Figure 6 shows the analysis of questionnaire survey for the accidents occurred in Hatton – Nuwara Eliya Main road. According to this graph, 40 percent of accidents account for the drivers behaviours. Drivers do not follow the instructions and speed controls according to the road and climatic conditions. 25 percent of accidents have occurred due to the unawareness of pedestrians. Pedestrians violate the rule and regulations of the usage of roads. They do not follow the instructions erected in the road sides. 21 percent of accidents have occurred due to the dilapidated and slipping condition of the roads. Rain and snow have caused 14 percent of accidents in the study area.
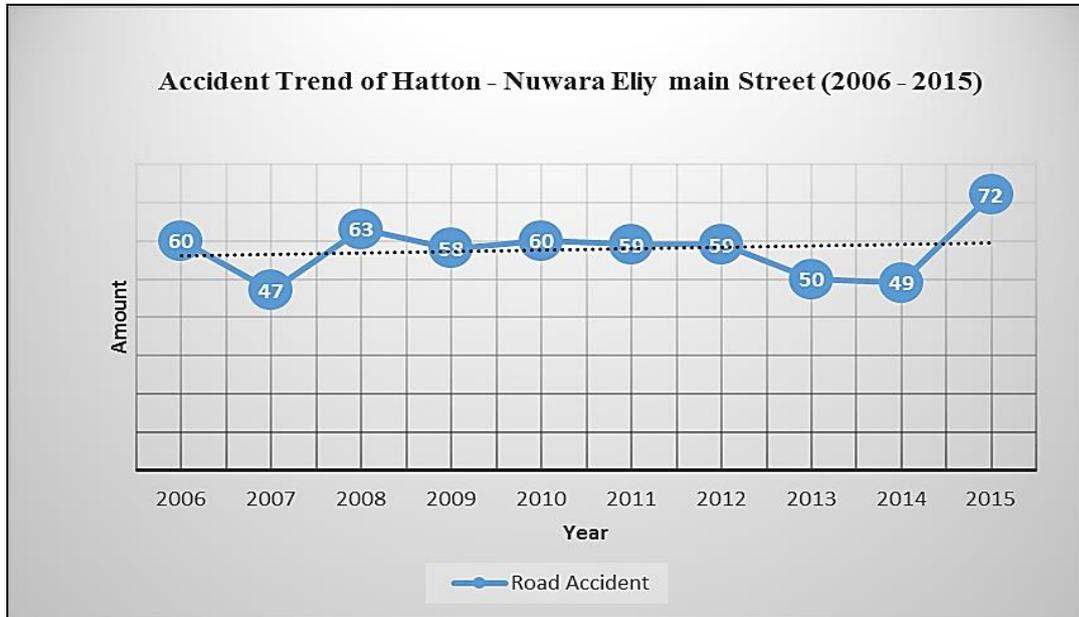

Figure 7. Accident trend of Hatton – Nuwara Eliya Main Street 2006 – 2015

Figure 8. Seasonal Accidents trend

Figure 7 shows the accident trend of Hatton – Nuwara Eliya Main Street. In 2006, 60 accidents have been occurred. But in 2007, the trend has been reduced due to the decreased accidents rate. This condition has been increased suddenly in 2008. From 2009 to 2012, there is a normalcy in the trend. In 2015, the accidents have been triggered as 72 due to the increased amount of the tourists and vehicles.

During the seasons time in the Nuwara-eliya District, many tourists from inland and foreign countries are coming to spend their time in entertainment. Due to the fact that, this triggers the traffic congestion in the study area. According to the questionnaire survey, 42 percent opinion has been derived as high level. Likewise, 30 percent - marginal level, 10 percent – low level and finally, 18 percent of opinion were expressed as 'accidents did not happen due to the seasonal increasing of vehicles in the study area'.

6. CONCLUSION AND RECOMMENDATIONS

Conclusion

According to this study, the physical features influence to cause accidents in Hatton – Nuwara-Eliya Main Street. Main objective has been satisfied and the relationships between human behaviour and accidents have been identified using in this study. Many recommendations have been suggested to overcome the challenges in the study area. This study will definitely be an informative one to the researchers and students to conduct this study. And for the public and other, it will be fruitful to get knowledge.

Recommendations

- Erecting road side lamps like other urban areas.
- Portraying the slipping areas using proper graphics to alert the drivers.
- Forming speed humps to control the speed of the vehicles.
- Erecting the convex mirrors in the curve road to make easiness to the drivers.
- Making regulation together with respective agencies.
- Frequently check the wiper of the vehicles to reduce the accidents in the rainy and snowy seasons.
- Increasing the training period of the drivers when getting license.
- Educating the street norms to the drivers.
- Avoiding the usage of the head light in any time.
- Controlling traffic congestion during the festive seasons by managing the makeshift shops in collaboration with the respective municipalities.
- Increasing the traffic police to the vigilance activities to control the misbehaviour of the pedestrians and the drivers
- Increasing the fines for the violation of rules and regulations.
- Importing the safety vehicles for the domestic transportation instead of three-wheelers.
- Expanding the public transportation network to reduce the traffic congestions.
- Fixing the CCTV cameras to snoop the misbehaviours and to alert the road users.
- Taking stern activities to the police who are connected with bribery and corruption.
- Providing awareness programs for public.

- Conducting sage driving programs to drivers.
- Renewal of driving license every 3 years having rechecked the knowledge on rules and regulations health.
- To include a subject in to the school curriculum to impart the knowledge about safe driving.
- Black spots to be identified and remedial action should be taken to the violators.

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