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Accident Prevention and Road Safety for Hilly Road's at Hairpin Bend

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ABSTRACT: "The increasing number of road accident on National Highways & State Highways in India, which constitute about 4.9% of the total road network accounts of $1/3^{rd}$ of the total fatalities. More than 1,40,000 were killed in India's roads, according to the figures released by the Govt. of India. More than half of the people killed in more than 6,00,000 road accidents in 2019 were age 15 - 43. Road accidents cause death or sever injuries and loss of potential income and hence road safety has becoming an issue of national concern. The main objective of this study is to describe the basic principles of a road traffic injury control that differentiate the current situation of the traffic accidents, and define the specific interventions that can be implemented in different settings to prevent the road traffic injuries and reduce the number of blackspots and to suggest various measures to strengthen the disaster risk governance to manage the risk of the disaster so that new efforts can be implemented to correlate the traffic accidents."

I. INTRODUCTION

"Road traffic injuries are among the ten leading causes of death worldwide, and they are leading cause of death among young adults age 15-43 year. Such accident also lead to 20-50 million non-fatal injuries, and many people incur a disability as a result of their injury. According to WHO, 1.25 million people worldwide died in road traffic accident in 2018, to provide some context, this figure is more than five times the death toll of the 2004 Indian ocean tsunami, one of the deadliest nature disasters ever recorded In hilly regions the road accident scenario is further gloomy due to various obvious reasons. Some of the reasons for accidents in hills are narrow roads, steep slope/gradient, hairpin bends, narrow and sharp curves, presence of valley/ river at one side of the road, poor visibility in winter, monsoon, landslides, width/type of shoulder, pavement surface, maintenance standard etc."



Figure 01- Hairpin Bend Road



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1.1 WHAT IS HAIRPIN BEND ROAD?

A hairpin turn is a bend in a road with a very acute inner angle, making it necessary for an oncoming vehicle to turn about 180° to continue on the road.

A hair pin curve bend is located on the section having minimum cross-slope and maximum stability. It must be safe against land-slide and ground water seepage.

1.2 ACCIDENT IN HILLY ROAD

Driving in hills, especially in adverse and severe whether condition is a difficult task than in plains. Reasons of accidents in hilly roads are serpentine curves, Hairpin bend, steep grades, and blindness in horizontal and vertical curves, steep terrain, and hazards of Rolling stone, Landslides, & Extreme climate conditions. Fig. 01 shows the view of a hill road at hairpin bend on SH 26 (M.P.).

1.3 REASON OF ACCIDENT

- Poor Visibility.
- Over Speeding.
- Atmospheric condition
- Over Loading.
- Drunken Driving.
- Distractions to Driver.
- Avoiding Safety Gears like Seat belts and Helmets.
- Non-adherence to lane driving and overtaking in a wrong manner.



Figure 02 - Road Accident

1.4 EFFECTS

- Death
- Injury
- Vehicular damage
- Road Damage
- Permanente Disability
- Temporary disability



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II. LITERATURE REVIEW

Bellis, W. (1990), worked on 'Capacity of Traffic Signals & Traffic Signal Timing'. The data collection was done at three signalized intersections in New Jersey by using a five - person field crew pressing telegraph keys wired to a 20-pen chart recorder for two types of vehicles such as, passenger car and truck (single unit truck). Bellis identified heavy trucks as having an average length of 12.8 m (42 ft), which suggests that today's heavy trucks may be bigger and heavier, and the trucks he study closer to SU (single unit) vehicles. This data is useful for determining the average travel times were reported for one location at six positions. The data was collected for passenger cars were too incomplete, it is not useful for finding the acceleration of vehicle or for analysis purpose, but the data was collected for the truck is complete and to be useful for analysis purpose, but the truck data had fewer gaps and exhibited a linearly decreasing relationship with α = 1.67 (5.47) and β =0.1229. So regarding to the value the suitable model was proposed was linearly decreasing acceleration model with respect to speed.

Guensler R. & Hallmark S. (1998), worked on '**Stop Line Distribution of Speed & Acceleration for Signalized Intersection**' he determines the feasibility of using simulation models to predict on-road speed acceleration profile and to identify potential problems in their use as such, a study intersection was modeled in NETSIM, and the simulation output was compared with data collected from field studies of signalized intersections. A modal approach to emissions modeling offers promising benefits, actual implementation is limited by the ability to realistically model on-road modal vehicle activity. A major advantage to simulation modeling is the ability to make multiple runs and compare different scenarios, such as comparing the effect of different traffic timing plans on individual vehicle delay.

Mehmood Arif (2009), work done on '**Determinants of speeding Behavior of Drivers'** on roads of Al Ain (United Arab Emirates). The data was collected based on the questionnaire designed for the research. Data was collected for three years from 2005 to 2007 in two main sections, one having demographic data like gender, age, nationality, education level, driving experience, location of driving, and type of vehicle and the other having data regarding attitudes on a 5-point liker type scale from 'strongly agree' to 'strongly disagree'. About 650 drivers were selected to respond out of which 67% were male and 33% were female. Authors concluded that as drivers mature through age and develop sense of responsibility and lower the speed of vehicle. However, what is the effect of lowering the speed on acceleration and deceleration is not reported in the study.

G. A. Hindle et al. (2011) reported the rate of personal injury collision (PIC) over the past decade on the road on English local authority areas. A significant difference in improvement rate was very much depended on prior PIC risk levels. The study featured the accident scenario of site under the continual surveillance of camera and its impact on accident.

III. METHODOLOGY

The use of sensors, LED light and speed breaker; this system make alert to the driver. It also not makes any destruction to drivers while driving, Drive easily sees the Red or Green Signal on the display and listen buzzer of any vehicle comes from the opposite side of road. The driver can easily keep an eye can the movement of the vehicle coming toward them and can make proper used of breaker acceleration and timing avoiding any accidents.

Using mirror rather than LED light signal and sensors, has many sides effect such as reflection of some rays which can destruct the driver attention. At night due to insufficient light, it does not break.

on image in the mirror of the opposite road. It also becomes more complicated to set the mirror of a given angle so that vehicles at opposite side of the road will be reflected and the image can a given in the mirror. setting the mirror at a given angle also has a demerit, such as the headlight of the vehicle at opposite side of the road will on the mirror and will be reflected toward the raining season due to presence of water and moist in the mirror it deposit allows the observer to see the reflected image of the vehicle in that mirror.

3.1. WORKING

As shown in fig. 03

- 'A' vehicle come from left side of hill can pass from sensor then the buzzer/alarm ON on the right side and red light show on the signal at right side
- If any vehicle not passed from the left side, then on the Right Side, Green LED Signal Display and buzzer not sound



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- 'B' vehicle come from the right side of hill can pass from sensor then, the buzzer/alarm ON on the left side and red light show on the signal at left side
- If ant vehicle not passed from the Right Side then the left side, Green LED Signal displayed and buzzer not sound.

By the above technique driver get prior idea about upcoming vehicle from other side of hill of hairpin bend and avoid collision with vehicle comes from other side of hill.



Figure 03 - Sensor Detect the Vehicle



Fig 04. Accident at Hairpin Bend in Hilly Road

3.2. ADVANTAGES

- Avoid Accident in Curve Road, Mountain Road, and Hill Road.
- Saves Thousands of Lives.
- ➢ Easily Implementable.
- Fully automated (No person is required to operate).
- Installation Cost is very less.

IV. CONCLUSION

- In this system, we get to know about the accident which occurs on the roads at Ghats section, Hilly region bend roads, we understand the causes and effect of accident and then founded out a solution introducing a new technique to avoid such accident.
- This new technique consists of two LED signals on the either side of road and sensor in the road. This help in reducing the accident and to enjoy the safe ride



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Life is important than any other things, once can gone can't be regained. So, to save this valuable life, this method has important role. It can help road users in hilly region roads from being killed in a serious injury.

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