Spot Speed Study

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ABSTRACT

Approximately 48 percent of traffic accidents on urban roads in Bidar, city of India, were endorsed due to speedy. Over 4.8 lakh accidents were recorded, leading to 1.5 lakh average deaths in last five years in India due to speed. In this study, spot speed data were analyzed using data collected at 4 urban roadway sections in bidar. The stretches roadway sections are selected based on the number and fatality of accidents that happened in last 3 years (2016-2019) Bidar Traffic Police Station records. From the study, it is found that the condition of road, spot speed, traffic volume, carriageway conditions and negligence of the people are the main parameters causing the accidents. It was also seen that slow moving traffic were creating hazards for fast moving traffic as it always occupied the innermost lane of the roads.

Keywords: Urban Roadway Sections In Bidar City, Spot Speed, Speed Limit, Design Speed.

1. INTRODUCTION

Urban transport facilities in most of the Indian cities are inadequate and deteriorating over the years. The development of the public transport system has not kept pace with the traffic demand both in terms of quality and quantity. As a result, the use of undesirable modes such as personalized transport, mainly two-wheelers, and intermediate public transport, mainly three-wheelers, is growing at a rapid speed. Roads and footpaths today are heavily encroached by parked vehicles, hawkers, and roadside business forcing pedestrians to walk on the road. This results not only in restricting the traffic flow, but also putting the pedestrians’ life at a great risk. Besides encroachment, it is found that road surface in most of the cities is substandard. Besides, lane markings and traffic signs are usually missing and the intersections often require geometric correction. Wholesale goods centers are usually located in the center of the city, which attracts substantial goods traffic on congested city roads. Congestion results in delays and time losses. An inevitable result of the growth of traffic has been the increase in road accidents, which take a great toll on human life every year. Each year nearly 1.3 lakh people die as a result of a road traffic collision, more than 3000 deaths each day and more than half of these people are not travelling by car. Over 4.8 lakh accidents were recorded, leading to 1.5 lakh deaths in the year 2016 which reduced to 1.46 lakh deaths from 4.5 lakh accidents in the year 2017, which shows the percentage reduction of about 3% in India. Which again in 2018 4.61 lakh road accidents leading to 1.49 lakh deaths. In road safety management, an accident
blackspot or black spot is a place where road traffic accidents have historically been concentrated. It may have occurred for a variety of reasons, such as a sharp drop or corner in a straight road, so oncoming traffic is concealed, a hidden junction on a fast road, poor or concealed warning signs at a crossroads. For some decades treatment of accident black spots (e.g. by signage, speed restrictions, improving sightlines, straightening bends, or speed cameras) was a mainstay of road safety policy, but current thinking has it that the benefits of these interventions are often overstated. Effects such as regression to the mean risk compensation and accident migration combine to reduce the overall benefit. In some cases, it has been claimed that the result is an increase in overall casualties. In one notable experiment, several accident blackspots were "treated" with a null treatment placement of a garden gnome according to some reports. Accident rates at these points were found to have decreased significantly in the following period, a finding which is taken as clear evidence supporting the theory of regression to the mean.

1.1 Scope of Project

The problem of the accident is very acute in highway transportation due to complex flow patterns of vehicular traffic, presence of mixed traffic and pedestrians. Traffic accidents may involve property damages, personal injuries or even casualties. One of the main objectives of traffic engineering is to provide safe traffic movements. Road accidents cannot be prevented, but by suitable traffic engineering and management measures, the accident rate can be decreased considerably. Therefore the traffic engineer has to carry out systematic accident studies to investigate the causes of accidents and to take preventive measures in terms of design and control. It is essential to analyze every individual accident and to maintain zone-wise accident records.

1.2 OBJECTIVE OF THE PRESENT STUDY

From the detailed literature review carried out the following objectives were set.

1. To study the causes (details) of accidents and to suggest corrective treatment at potential locations.
2. Determine vehicle speed percentile.
3. Ease in planning traffic control.
4. To carry out spot speed study using distance-time method.

2. METHODOLOGY

2.1 Key Steps to a Stopwatch Spot speed study

A stopwatch spot speed study includes five key steps:
1. Obtain appropriate study length.
2. Select proper location and layout.
3. Record observations on stopwatch spot speed study data form.
4. Calculate vehicle speeds.
5. Generate frequency distribution table and determine speed percentiles.

1. Obtain Appropriate Study Length

The study length is important because it is used in the calculation of vehicle speeds. Table 4.2 provides
recommended study lengths, which are based on the average speed of the traffic stream. Using these recommended study lengths makes speed calculations straightforward and less confusing. If these lengths are not appropriate, another length can be used assuming it is long enough for reliable observer reaction times.

2. **Select Proper Location and Layout**

   Figure 4.1 illustrates a typical layout for conducting a spot speed study using a stopwatch. When selecting a location and layout, care must be exercised so that the observer can clearly see any vertical reference posts. The observer should be positioned higher than the study area and be looking down. The position could be on a bridge or a roadway back slope. The observer should use reference points to aid in collecting the elapsed time it takes a vehicle to travel through the study area. The reference point to start timing may be a brightly colored vertical post. The reference point to end timing may be a tree or a signpost in the observer’s sight line. An accurate sketch of the site should be documented, including number of lanes, position of observer, and description of reference points (see Figure 4.1 for an example).

3. **Record Observations on Stopwatch Spot Speed Data Form**

   On the stopwatch spot speed data form the observer records the date, location, posted speed limit, weather conditions, start time, end time, and down time. As the front wheels of a vehicle (or only the lead vehicle in a group) cross a mark or pavement crack at the beginning of the predetermined study length, the observer starts the stopwatch. The watch is stopped when the vehicle’s front wheels pass a reference line in front of the observer. A slash is recorded on the data form corresponding to the elapsed time observed.

4. **Calculate Vehicle Speeds**

   To calculate vehicle speed, use the predetermined study length and the elapsed time it took the vehicle to move through the course (as recorded on the stopwatch data form) in the following formula (Robertson 1994):

   \[
   V = \frac{D}{1.47T}, \quad (2.2)
   \]

   where \( V \) = spot speed (mph), \( D \) = length (feet), and \( T \) = elapsed time (seconds). In the equation, 1.47 is a constant that converts units of feet per second into miles per hour. For example, if the spot speed study length is 100 feet and the motorist’s elapsed time is 2.5 seconds, the motorist is traveling at

   \[
   \frac{100 \text{ feet}}{1.47(2.5 \text{ seconds})} = 27 \text{ mph}.
   \]

5. **Generate Frequency Distribution Table and Determine Speed Percentiles**

   Determine the 50th and 85th speed percentiles using a frequency distribution table and calculations as described earlier.

   **Example Stopwatch Spot Speed Study**

   The city of Cottonwood Glen received a complaint of afternoon traffic speeding in a residential area. The city suspected this was related to students leaving a nearby high school. The first action taken by the city...
was to quantify the facts by conducting a spot speed study. The city decided to use the stopwatch method because of their limited resources. A location was selected near the intersection of 4th Street and University Avenue, approximately two blocks from the high school and where the city had received multiple speeding complaints from residents. The posted speed limit is 30 mph. The study was conducted on a Wednesday and started at 3:00 p.m. The time was selected to correspond to the period when most high school students leave the school. The study continued until a sample size of 100 vehicles was measured. The study length of 176 feet was used because the posted speed limit is between 25 and 40 mph, as shown in Table 4.3. The study layout is illustrated in Figure 4.2.

Equation 2.1 is used to find the exact speeds for the 50th and 85th percentiles of speed. For the 50th percentile of speed, $PD = 50\%$, $P_{max} = 54\%$, $P_{min} = 41\%$, $S_{max} = 28.9$ mph, and $S_{min} = 27.2$ mph, so $SD = ((50\% − 41\%)/(54\% − 41\%))(28.9\ mph − 27.2\ mph)+ 27.2\ mph = 28.4\ mph$.

2.2 DATA COLLECTION AND ANALYSIS
We have selected the stretches in Bidar city under the guidance of Bidar Traffic Police Station. The stretches are selected based on the number and fatality of accidents that happened in last 3 years (2016-2019).
1. Near Railway track, Naubad road, Bidar.
3. Near Allamaprabhu petrol pump, Gumpa ring road, Bidar.

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Spot Speed Study Details (Distance-Time Method)
Time taken by the different vehicles at corresponding spots

Day 1
Cumulative frequency calculation
1. No proper maintenance of roads (accumulation of wastes near the edges of roads, accumulation of dust on the surface of roads).
2. Accumulation of waste near the edges of roads
3. Sign boards are not properly visible (accumulation of dust/smoke on sign boards).
4. Poor highway lightings.
5. Pavement undulations

2. Near Jhira conventional hall, Chikpet, Bidar.

Spot Speed Study Details (Distance-Time Method)

Time taken by the different vehicles at corresponding spots

Day 1
Cumulative frequency calculation
Problems Observed By Visual Inspection
1. No proper maintenance of roads (accumulation of wastes near the edges of roads, accumulation of dust on the surface of roads).
2. Accumulation of waste near the edges of roads
3. Sign boards are not properly visible (accumulation of dust/smoke on sign boards).
4. Poor highway lightings.

3. Near Allamaprabhu petrol pump, Gumpa ring road, Bidar.

Spot Speed Study Details (Distance-Time Method)
Time taken by the different vehicles at corresponding spots

Cumulative frequency calculation

Problems Observed By Visual Inspection
1. No proper maintenance of roads (accumulation of wastes near the edges of roads, accumulation of dust on the surface of roads).
2. Sign boards are not properly visible (accumulation of dust/smoke on sign boards).
3. Poor highway lightings.
4. Pot holes.
5. Rise of chambers above the ground

3. CONCLUSION

Road accidents cannot be totally prevented, but the accident rates can be decreased considerably. There is a scope for prevention of accidents. From the study, it
is found that the condition of road, spot speed, traffic volume, carriageway conditions and negligence of the people are the main parameters causing the accidents. It was also seen that slow moving traffic were creating hazards for fast moving traffic as it always occupied the innermost lane of the roads.

The main goal of accident study is to determine what corrective measures and actions needs to be taken to prevent any further occurrences. To prevent accidents, 4 E’s of road safety should be followed which are formed by The Ministry of Road Transport and Highways. 4 E’s of road safety are Education, Enforcement, Engineering and Emergency care as per New Motor Vehicles Act 2018.

From the present study these are the following outcomes

1. Since Vehicles move greater than the speed limit, hence it is necessary to construct speed breaker to ensure the vehicles are moving within speed limit.
2. Identify possible locations of black spots and traffic control for everyday changing traffic trends.
3. Calculated percentile speeds on selected road.

4. REFERENCES

[1]. Bhargav Naidu , Spot speed survey and analysis,A case study on jalandhar-ludhiana road NH-1, feb-2018