International Journal of Science and Research (IJSR)
ISSN: 2319-7064
ResearchGate Impact Factor (2018): 0.28 | SJIF (2018): 7.426

An Evaluation of Road Safety Performance for Selected Road Stretches in Kolhapur City

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Abstract: ***Kolhapur is the one of the major cities in Maharashtra state. As per the report of 2011 census of Kolhapur city population is 5, 49,236.(Approx.) The number of accidents in Kolhapur city increasing day by day is due to increase in population, increase in vehicle registration, increase in road network, and rapid urbanization. The number of accidents due to improper lane changing, prohibited and dangerous passing and merging, sudden and erratic speeding, failure to obey traffic control device and signs, driving too fast and/or racing, making improper turns, road conditions etc. The major accident places (black spots) in Kolhapur city are at Cyber chowk, Tarabai chowk, Venus Corner, Kawala Naka etc. Therefor it is necessary to study the road safety performance in Kolhapur city.***

Keywords: Road Safety Index, Road Stretches in Kolhapur city, Road Safety Performance, city traffic solution, accidents in Kolhapur city

1. Introduction

India has the second largest road network in the world with over 3 million km of roads of which 60% are paved. These roads make a vital contribution to India's economy. Road safety is emerging as a major social concern in the country. The statistics with an average mortality rate of 1, 00,000 persons dying in road accidents. India having more than 33 lakh kilometer of well-spread road network. At the same time, India has one of the highest accident rates in the world with more than 14 accidents per thousand vehicles every year, compared to only 6 to 8 accidents per thousand vehicles in developed countries. India accounts for about 10 percent of road accident fatalities worldwide. An estimated 12, 75,000 persons are seriously injured on the road every year. Studies on accidents, the world over, have shown that the human factor is responsible for a majority of accidents. Road Safety is a multi-dimensional issue in order to improve the safety of road; it incorporates the development and management of road infrastructure, rules and regulations, law enforcement to the road users etc. [02]

2. Earlier studies in Road Safety Index

Similar projects were carried out in past and research papers also available on the topic but the model developed for metro cities is not suitable for small cities like Kolhapur as the conditions are different. If we compared the safety measure in metro cities with the small city like Kolhapur. It is found that, in metro cities, the carriageway width is of 2 lane or sometimes it is of 4 lanes also but in Kolhapur, it is only of 2 lane or 1 lane which leads to accidents. Similarly, there are no signs of speed limit indicators and suppose if they are there, they are not followed strictly this is also cause of accidents. Moreover at many places there is on-street parking due to which accidents rate is higher, somewhere there is faint road marking there for lane discipline is not maintained so accidents is increased, as well as there are neither speed breaker nor the proper pavements. And they are not properly marked this are the reasons of greater accidents. More, there are potholes also and increases the accidents, and that is the main reasons, point of road safety has become the crucial point in Kolhapur. If we find the safety measures for Kolhapur, then it will beneficial to rapid growing for similar city. This will help to reduce the accidents rates and help to control traffic problems.

3. Materials and Methods

3.1. Primary survey

As this study of road safety index first it was essential to go for selection of roads for this study and primary survey of the selected roads for the better understanding of problems it was must to know the actual existing scenario of the selected roads, so visited these roads many times. There are many problems are associated with those peoples so it was decided to know their problems by an actual survey with a questionnaire prepared. This survey was conducted in the month of August and September. Which involve the detail information of five roads in Kolhapur city the selected roads. Personal interviews and road survey gives very important basic information at micro level. Collection of data through literature survey, observations, documents, and interview with key persons to identify the problems affecting on safety of existing roads. We have collected the recorded accident data from all the city police stations of Kolhapur for last five years.

Small interviews of the traffic polices at the different time during the visits. And asked them to share the issues about road and traffic conditions. The impartial responses from the field experts were collected since the questionnaire is a very simple approach in answering without complementing numerous probes, it helps in obtaining an impartial and sincere response from the experts.

Detailed survey is conducted along the stretches selected for the study with the preparation of data sheet having different factors considered during the response collection and depending on the actual conditions observed and readings taken from the survey.

3.1.1 Selection of road stretches for the present study

The black spot in Kolhapur city mentioned by traffic police station. There were 17 blackspot are recently announced by traffic police. Based on the number of accidents, traffic review from interviews of experts, finally choose said stretches which covers the all major blackspots of the city these road stretches also has highest number of accidents so they are selected for the study.

1) Stretch No.01: Siber Chowk to Sambhaji Nagar
2) Stretch No.02: Dasara Chowk to Hockey Stadium
3) Stretch No.03: Siber Chowk to Shahu Mill Chowk
4) Stretch No.04: Kawala Naka to Dasara Chowk
5) Stretch No.05: Kawala Naka to Tawade Hotel

As road safety index depends on different parameters related to the different types of characteristics it may changes according to the different aspects as researcher, scope of study, location and classification of road so for our study data we have consider following parameters under the different heads of characteristics.

1) Roadway characteristics
   a) Carriageway width
   b) Number of curves
   c) Gradient
   d) Number of intersections/km
   e) Type of intersection
2) Traffic characteristics
   a) Speed
   b) On-street parking
   c) Road markings
   d) Speed breakers/km
   e) Number of fatalities/km
   f) Signs
   g) Pavement
   h) Signals
3) Roadside characteristics
   a) Presence of obstacles
   b) Footpath
   c) Shoulder
   d) Street lighting interval
4) Pavement characteristics
   a) Pavement status
   b) Potholes/km
5) Miscellaneous characteristics
   a) Bus-stop distance from intersection
   b) Intersection visibility
   c) Presence of median

3.2 Secondary work

After the thorough analysis of the data obtained from the primary survey data was interpreted by the numerical static analysis.

3.2.1Average characteristic Score:

From the analysis of responses collected following are the values obtained by summation of values scored by each characteristics and finding the average of each in percentage. Total of all will be 1%.

Table 1: Key Features Average Score Values

Type of Characteristics	*Average Score*
Roadway Characteristics	0.3856 ≈ 0.39
Traffic Characteristics	0.2673 ≈ 0.27
Roadside Characteristics	0.1259 ≈ 0.13
Pavement Characteristics	0.1350 ≈ 0.14
Miscellaneous Characteristics	0.0855 ≈ 0.09

From above values are the average values of the each characteristics are cumulative but each of the characteristic has different sub head factors which are also get scored in the same sampling method mentioned above as per the data obtained from this ready reckoner charts are prepared as Valued score V/S factor parameter. (i.e. factor parameter on X- Axis and valued score on Y- Axis).

3.2.2 Standard grade roads depending on RSI value:

According to the evaluation tool & the level of service the road is providing following grades are set:

Table 2: Standard Grades Ranges

Range of RSI	**Grade**
0.80 to 1.00	Excellent
0.60 to 0.80	Very Good
0.40 to 0.60	Good/Average
0.20 to 0.40	Poor
0.00 to 0.20	Very poor

By actual survey of all five stretches and recording readings and with reference to the charts prepared of all the sub factors which are to be used in the calculation of RSI following values of key features were obtained as follows;

Table 3: Average Score of key feature for stretch no.01

Strech No. 01 Siber Chowk To Sambhaji Nagar	
Type of Characteristics	Average Scored Value
Roadway Characteristics	61.2
Traffic Characteristics	60.91
Roadside Characteristics	50
Pavement Characteristics	67.5
Miscellaneous Characteristics	65
RSI Value	0.621

Table 4: Average Score of key feature for stretch no.02

Strech No. 02 Dasara Chowk To Hockey Stadium	
Type Of Characteristics	Average Scored Value
Roadway Characteristics	49
Traffic Characteristics	57.08
Roadside Characteristics	50
Pavement Characteristics	65
Miscellaneous Characteristics	78.33
RSI Value	0.571

Table 5: Average Score of key feature for stretch no.03

Strech No. 03 Siber Chowk To Shahu Mill Chowk	
Type of Characteristics	Average Scored Value
Roadway Characteristics	46.2
Traffic Characteristics	59.16
Roadside Characteristics	51.25
Pavement Characteristics	75
Miscellaneous Characteristics	78.33
RSI Value	0.582

Table 6: Average Score of key feature for stretch no.04

Strech No. 04 Kawala Naka To Dasara Chowk	
Type Of Characteristics	**Average Scored Value**
Roadway Characteristics	57.2
Traffic Characteristics	65.33
Roadside Characteristics	51.25
Pavement Characteristics	75
Miscellaneous Characteristics	58.33
RSI Value	**0.623**

Table 7: Average Score of key feature for stretch no.05

Strech No. 05 Kawala Naka To Tawade Hotel	
Type Of Characteristics	**Average Scored Value**
Roadway Characteristics	68.2
Traffic Characteristics	65.5
Roadside Characteristics	51.25
Pavement Characteristics	75
Miscellaneous Characteristics	78.33
RSI Value	**0.684**

3.2.3 Calculations of RSI

For the ideal conditions of road the value of ∑ (Wi x V si) is taken as 100. The numerator is computed based on observations made for each factor in the field for a given road. The value scores for each factor are assessed after measuring each sub-heads and referring the chart for Vei. The corresponding Wi as obtained from interviewing the experts.

$$RSI = \frac{\sum_{i=1}^{i=n}(W_i \times V_{ei})}{\sum_{i=1}^{i=n}(W_i \times V_{si})}$$

4. Result and Recommendations

4.1 Result of Road Safety Index:

After the analysis of road safety index by considering all the parameters, key features affecting road safety index and present condition of Road stretches. Analysis gives road safety index for each separate road Stretch and comparing these with the standard grades following results were obtained;

Table 8: RSI Values for selected stretches

Stretch No.	Name of Road Stretches	Actual RSI	Grade
1	Siber Chowk to Sambhaji Nagar	0.621	Very Good
2	Dasara Chowk to Hockey Stadium	0.571	Good/Avg.
3	Siber Chowk to Shahu Mill Chowk	0.582	Good/Avg.
4	Kawala Naka to Dasara Chowk	0.623	Very Good
5	Kawala Naka to Tawade Hotel	0.684	Very Good

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