

PEDESTRIAN BEHAVIOUR & CRITICAL ISSUES ON NH-146 IN FRONT OF SATI VIDISHA (MP)

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Abstract: *Pedestrian, face difficult situations while crossing near intersections and midblock crossings. The risk is more on uncontrolled crossing. Accepting suitable gaps between vehicle in uncontrolled midblock and intersection crossing increase and decrease risk and ensure safety.*

In this study pedestrian crossing behaviour at Sati Uncontrolled Intersection (T) crossing on NH-146 at SATI Vidisha has been investigated considering IRC -103: 2012 recommendation form pedestrian services during 23-07-18 to 28-07-18 (Mon-Sat) in college hour (9:30 am to 5:30 pm). Factors affecting the crossing behaviour of pedestrian at Uncontrolled intersection(T) are Crossing time, speed, stages of crossing, number of interruptions during crossing, age group, walking and running behaviour, group or alone, pattern of movement, the type of vehicle which passes during pedestrian cross, negative safety margin are extracted by manually. Total 18,417 pedestrians were observed during the study and their behaviour while crossing was studied critically.

The tendency of rolling gap behaviour was observed and examined for different age and gender group to analyse the risk involved. Rolling behaviour is predominant behaviour of pedestrian in this study. Young pedestrians take more risks in crossing on present intersection. Young aged pedestrian category poses more chances of interrupted crossing than other old and middle age category of pedestrians. Young aged male pedestrian are more tended to accept the smallest gap between the vehicle and them showing a risky nature of crossing.

In this study, solutions in the form of pedestrian facilities improvement and awareness through education are recommended in pedestrian during crossing the road and improve crossing behaviour.

Index Terms - Uncontrolled Intersection (T), Crossing behaviour.

I. INTRODUCTION

Pedestrian networks and vehicle networks overlap at intersections, posing conflicts between different modes of travel. Effective traffic management can address concerns about traffic speed and volume. A motorist driving more slowly has more time to see, react, and stop for a pedestrian. The number of pedestrians also influences motorists; in general, motorists are more aware of pedestrians when more people walk. Most tools to address crossing challenges are engineering treatments, but tools from the enforcement, education, and planning toolboxes are also important.

Uncontrolled Intersection (T) is the most common Intersection type. Although their capacities may be lower than other Intersections, they do play an important part in the control of traffic in a network. A poorly operating Uncontrolled Intersection may affect a pedestrian crossing or the operation of a Transportation System. The theory of the operation of Uncontrolled Intersection is fundamental to many elements of the theory used for other intersections.

Walking requires two important features in the built environment:- People must walk long road and they must get across road. Crossing a road should be easy, safe, convenient, and comfortable. Pedestrian behaviour and intersection or crossing design affect the road crossing experience, motorist behaviour (whether and how motorists stop for pedestrians) is the most significant factor in pedestrian safety.

II. LOCATION OF STUDY

Here, the location of the study is Uncontrolled Intersection in front of SATI College on NH-146, Vidisha District. This study has been carried out for determining the Pedestrian behaviour & their critical issues at Uncontrolled Intersection in front of SATI Vidisha.

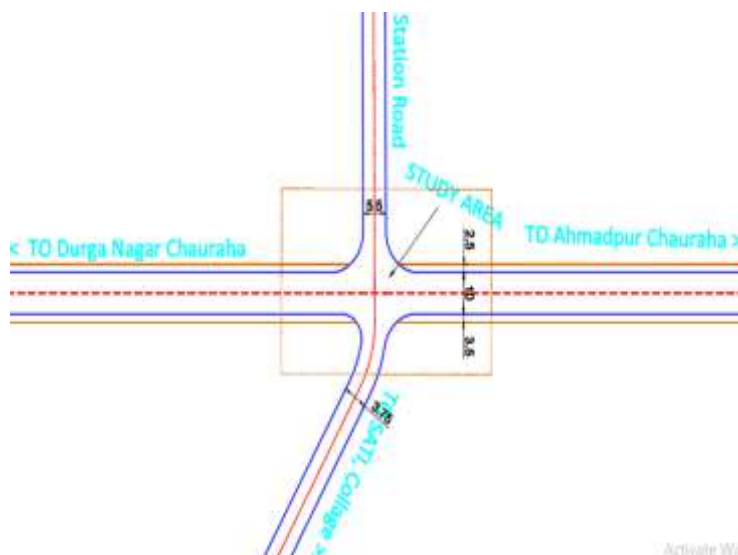


Figure1 : Intersection layout in front of sati college

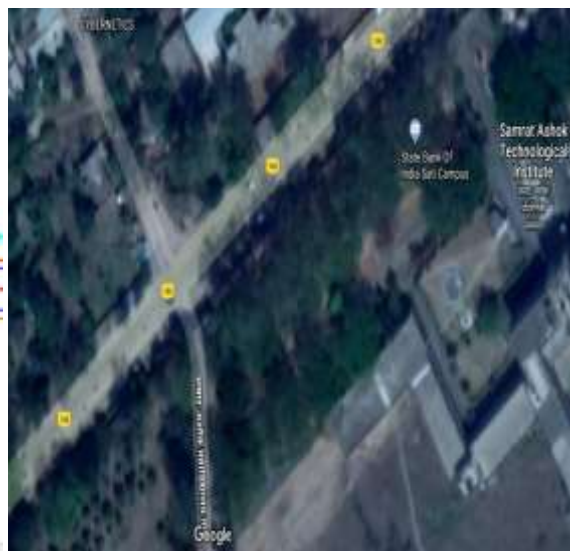


Figure2 : Map of the study Area

III. NEED OF STUDY

- This study describes the pedestrian crossing behaviour at Sati Uncontrolled intersection crossing in Vidisha.
- The investigation is based on the crossing behaviour of pedestrian, changing their behaviour and create awareness .

At this location behaviour of pedestrian is the most important issue, a large number of pedestrians are crossing this location and due to the lack of awareness and safety they do not behave right way.

IV. LITERATURE REVIEW

Baric, (2017): Given the high risk of severe accidents at level crossings (LCs), this study examined legal and illegal crossing by pedestrians and cyclists at a high-traffic LC in Zegreb, Croatia. Survey data and field observations were collected to identify reasons for risky behavior. Behavior was observed under normal conditions and in the presence of various safety measures in order to identify measures that reduce risky behavior. Results show that the presence of a police officer at the LC was most effective at reducing illegal crossings, while the presence of cameras contributes significantly as well, especially after a safety educational campaign when illegal crossing decreases by 59.23%. We can assume that in the future the improvement regarding human behavior on LC could be made with cameras on LC and more frequent educational campaigns. This is the first reported use of field survey and video surveillance methods to analyze user behavior at LCs in Croatia.

Marisamynathan, (2015): In India pedestrian crashes mostly occur when pedestrians cross the road, especially at signalized intersections. This study examines various factors affecting pedestrian crossing behaviors at signalized intersections under mixed traffic conditions. The pedestrian crossing movements were captured through a video graphic survey conducted at selected 8 signalized intersections in Mumbai, India. The captured data consisting of around 2476 pedestrians was observed that the rate of pedestrian compliance with traffic signal was 53%. This study is oriented towards various levels of pedestrian crossing behavior such as pedestrian arrival pattern, crossing speed, compliance behaviors and pedestrian-vehicular interaction at signalized intersections. In the first level, the pedestrian arrival pattern was analyzed to find the best fit. In the second level, the factors affecting pedestrian crossing speed were identified by suitable statistical tests with respect to pedestrian and traffic characteristics. The third level involves the analysis of pedestrian compliance behavior with respect to pedestrian gender, age, platoon, crossing type, crosswalk marking, crossing direction and crossing speed based on various statistical tests. The fourth level comprises of pedestrian-vehicular interactions in detail, based on a conducted statistical test. The pedestrian-vehicular interaction was modeled by using a binary logit model. Study results indicate that approaching vehicle direction and gap size were the highly influencing factors for interactions. Findings from this study will help to understand the pedestrian crossing behavior at signalized intersections where pedestrian non-compliance is predominant and recommends for adequate facilities to be provided to all pedestrians to cross the street with utmost safety, comfort and convenience.

Chang, (2014): Observations conducted by researchers revealed that group interaction within crowds is a common phenomenon and has a great influence on pedestrian behavior. However, most research currently undertaken by various researchers failed to consider the group dynamics developing pedestrian flow models. This research presented a critical review of pedestrian models

that incorporates group behaviour. Models reviewed in this research are mainly created by microscopic modeling approaches such as social force, cellular automata, and agent- based method. The purpose of this literature review is to improve the understanding of group dynamics among pedestrians and highlight the need for considering group dynamics when developing pedestrian simulation models.

V. STUDY AREA AND METHODOLOGY

This study is based on surveying (Manual survey and Questionnaire) methods to identify the general crossing behaviour of pedestrians and find out the pedestrians perception on using road crossing facilities.

The data collection methods used for the study are manual survey and questionnaire survey. The 6 days, 23-07-2018 to 28-07-2018 (Monday to Saturday) data is collected in college hours 9:30am to 5:30pm by manual survey in each direction of Uncontrolled Intersection in front of SATI Collage. The main road in front of SATI College at Vidisha city known as NH 146.



Figure 3: Location of the study area SATI Intersection(T)

Figure 4 : (Straight) behaviour of pedestrian at Intersection

Under due considerations, the two lane road at Intersection, the width of the carriageway 10m and with shoulder the total width of the road 16m were taken for the crossing study. This uncontrolled Intersection taken for the study are on location in SATI college Intersection in Vidisha. These Intersection are two lane roads. To understand the perceptions of pedestrians on safety and crossing behaviour, questionnaire survey was also conducted on location by manually. The factors affecting pedestrians to make decision to accept the suitable gap from vehicle, speed of crossing, vehicle's speed, lack of traffic facilities are included in the questionnaire survey. The main questionnaire consisted of multiple choice questions. The survey was conducted among pedestrians at the study location. A total of fifty above people responded on the field.

The extracted data form by manually includes the various aspects of pedestrians during crossing, such as demographic features of pedestrians, social factors, vehicle factors and other pedestrian flow characteristics. The pedestrian were categorized according to the age, gender, the way of crossing, and the vehicle passes during crossing is done. The age of pedestrians are categorized in general into, youth, middle aged, and old age according to the visual appearance. The group effect of pedestrians considered, for the analysis depicts the pedestrian who cross individually or as a pair, as one category and the pedestrian who cross with more than two pedestrians accompanying them, as other category. The pedestrian who cross as a pair are also considered as 'crossing as a single person only', as it showed hardly any difference in the parameters extracted between the two pedestrian crossing as a pair in all cases. The interruption for pedestrian crossing was conducted when the pedestrian crossing was interfered by a vehicle on road surface either side of the road.

Questionnaire survey was conducted among the related pedestrians to find out the reasons what kind of problems are facing during cross the road. A total of above fifty pedestrians have been randomly carried out to get questionnaire survey.

Pedestrians responded their facing problem at Uncontrolled intersection at vidisha.

These following problems are

- Vehicles are running of very high speed.
- Speed breakers are not provided at intersection

Lack of traffic facilities such as Midblock crossing for pedestrians, speed limit sign board etc.

VI. DATA ANALYSIS AND RESULTS

Total 18,417 pedestrians are followed by manual survey at uncontrolled Intersection at SATI college, for gathering knowledge about their road crossing behaviour, 6 days data was collected at SATI Intersection during college hours 9:30 am-5:30 pm. Data was included Pedestrians and their behaviour are represented at this site.

DAYS	TOTAL PEDESTRIAN IN NEGATIVE SAFETY MARGIN	PERCENTAGE(%)
MONDAY	2218	64.9
TUESDAY	2227	60
WEDNESDAY	2238	64.8
THURSDAY	2148	67.5
FRIDAY	2117	64.7
SATURDAY	968	58.8

Table 1: Average percentage of pedestrian in negative safety Margin

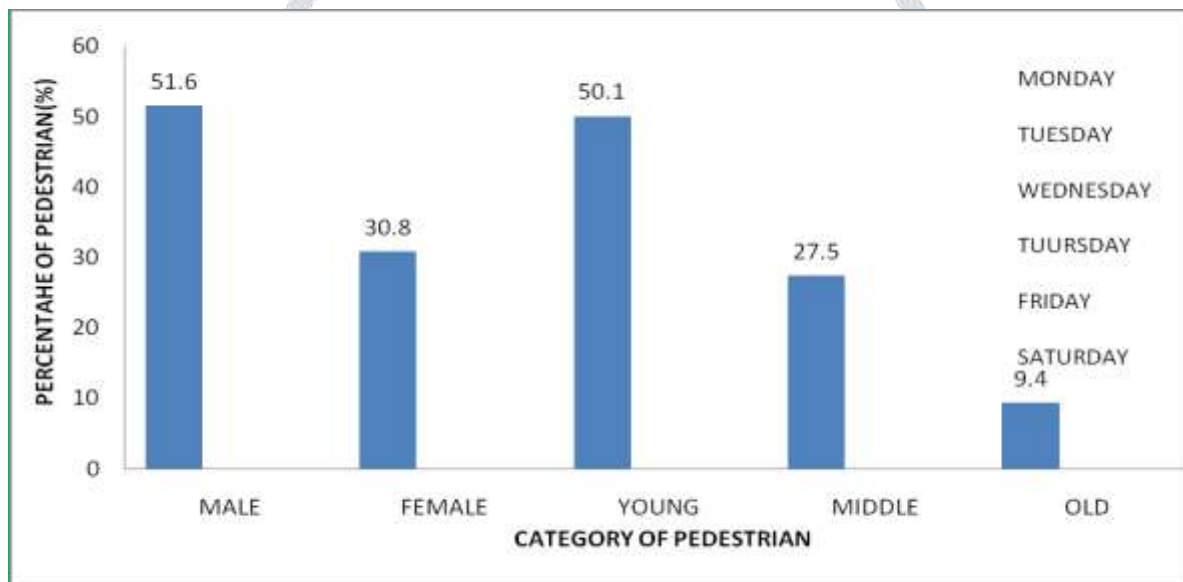


Figure 5: Average percentage of negative safety margin



Figure6: that image show in negative safety margin



Figure7: Female in negative safety margin (use mobile phone)

due to rolling behaviour

Table : Average Hourly Variation of Pedestrian Volume

Sr. No.	Date	23.07.18	24.07.18	25.07.18	26.07.18	27.07.18	28.07.18	Total	Average
	Time	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday		
1	9:30-10:30	396	510	591	531	543	170	2741	457
2	10:30-11:30	615	437	562	401	410	447	2872	479
3	11:30-12:30	220	348	253	285	297	154	1557	260
4	12:30-13:30	332	510	352	312	321	227	2054	342
5	13:30-14:30	539	628	551	677	684	224	3303	551
6	14:30-15:30	557	522	267	258	256	105	1965	328
7	15:30-16:30	409	357	378	365	373	187	2069	345
8	16:30-17:30	318	355	347	349	356	131	1856	309

Table2: Total average pedestrian crossing at intersection

FACTORS IMPARTING RISK IN CROSSING

- **Gender**

From the analysis of whether male or female present significance in crossing behaviour, it was found that the negative safety margin of male pedestrian 51.6% and female pedestrian 30.8%. On the other hand male pedestrians are 58.1% more likely to show rolling gap behaviour, 57.5% more likely to show negative safety margin, 51.2% more likely to observe running behaviour and female pedestrian are 61.5% in Running behaviour, 59.3% in rolling behaviour, 61% are interrupted and 63.3% are in negative safety margin. The occurrence of female rolling gap behaviour might be the reason for more negative safety margin compared to male pedestrians. This suggested that female pedestrian tend to show rolling behaviour between the vehicles accepting smallest vehicular gap. They are faster in crossing than the male pedestrians and the interruptions are found to occur less.

- **Age**

In the factor of age group young age group pedestrian are 50.1% in negative safety margin, middle age group pedestrian are 27.5% in negative margin and old age group pedestrian are 9.4% in negative safety margin. The value of crossing speed of pedestrians are observed from 1.45m/s to 1.6 m/s and crossing time of pedestrian are about 5 seconds.

- **Group or pair**

Pedestrians are moving on road, in Group, Alone or in pair. At SATI Uncontrolled Intersection(T) 48.7% total pedestrian observed in group and 51.7% are observed in alone or in pair. In which 59.2% males and 62.7% females are observed in alone or in pair and 40.5% Males and 38.3% females are observed in group.

- **Vehicle factor**

Different types of vehicles are moving on roads such as Cars, Two-wheelers, Three Wheelers and Heavy Vehicles. At Uncontrolled Intersection (T) Pedestrians interrupted of different types of vehicles. 28.5% pedestrians interrupted in cars, 49.5% Interrupted in Two wheelers, 22.5 interrupted in Three-wheelers and 2.4% interrupted in Heavy vehicles.

- **Analysis of questionnaire**

Above 50 pedestrians responded to the questionnaire survey. Male constituted a more portion of the total gender. The age of respondents is 20-80 years in the questionnaire were asked. From the questionnaire analysis, the attitude of people in terms of unauthorized crossing at Intersection where proper facilities are not provided for crossing are analyzed.

SR. NO.	ANALYSIS	RESULT	Comments
1.	Pedestrian crossing in peak hours	3,667 pedestrians	The maximum pedestrian crossing was observed between 13:30 to 14:30 hours
2.	Category wise pedestrian	Younger Aged - 69%, Middle Aged - 24% Older Aged - 7%.	The occupancy of younger aged pedestrian is on a very higher side whereas occupancy of middle aged & older aged is comparatively very low
3.	Alertness of Pedestrian	Young Aged - 51%, Middle Aged - 71% Old Aged - 95%.	Older aged pedestrians are very alert compare to younger & middle aged pedestrian
4.	Walk and run avg. Of pedestrian in (%)	Walk-46.9% Run-59.2%	Running behaviour are in negative safety margin
5.	Rolling and straight behaviour	Straight-48.1% Rolling-51%	Rolling behaviour are the cause of lack of traffic facility
6.	Interruption and uninterruption behaviour	Interruption-66.3 Uninterruption-33	Interruption are more through vehicles during crossing time.
7.	Safety margin	Youngers-50.1% Middle age-27.5% Old-9.4%	Youngers are more in negative safety margin

VII. CONCLUSION AND RECOMMENDATION

In this study young aged pedestrian poses more chances of interrupted crossing than the other two age categories of pedestrians. It is also observed that young aged pedestrians show least tendency to wait for suitable gap throughout the study period. Male pedestrian are 57.5% in negative safety margin, female pedestrians are 63.3% in negative safety margin, young pedestrians are 50.1% in negative safety margin, middle age pedestrians are 27.5% are in negative margin and old age pedestrians are 9.4% are in negative safety margin. In uncontrolled intersection, walking behaviour of pedestrians 46.9%, Running behaviour 52.9%. 48.7% pedestrians in Alone or in pair and 51.2% in group. Pattern of movement of pedestrian observed straight 48.1% and rolling 51.7%. 66.3% pedestrian are interrupted during crossing and 33% are uninterrupted. From this study we have found some valuable opinions of pedestrians due to road crossing and it will be easy to manage the transportation system by using the pedestrian's opinions. The majors conclusions are:-

Recommendation

Based on the previous discussion and pedestrians crossing data analysis some recommendation have been given here as:-

- ❖ Midblock crossing should be designed for pedestrian crossing.
- ❖ People's awareness about the road crossing has to be increased.
- ❖ We can inculcated to pedestrian following Traffic Education Measure:-

1) On spot:-

- Posters
- Leaflets
- Newspapers/magazine
- Road based training.

2) Off spot:-

- Class room based training:-

In class room based training we can organize a workshop for pedestrian awareness

Road based training following these tips.

- **RAISE A HAND WHILE CROSSING** to alert motorists.
- **ALWAYS USE PEDESTRIAN CROSSING** like Midblock crossing, Zebra crossing.
- **USE FOOTPATH** and other walkways whenever possible.

- **WALK IN A SINGLE FILE** if you are walking in a group, always facing oncoming traffic
- **DON'T CROSS IN FRONT OF A STATIONARY VEHICLE AND IN BETWEEN STATIONARY VEHICLES.**
- **BE SEEN, BE SAFE.** Use light coloured clothing when you are walking at night, or carry some reflective materials so that drivers can see you from a distance

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