International Journal of Research in Engineering, Science and Management
Volume-3, Issue-12, December-2020
https://www.ijresm.com | ISSN (Online): 2581-5792

Feasibility Study on Pedestrian Facilities at Central Bus Stop

Y. R. Akshay[1], N. Bharath[2*]
[1,2]*M.Tech. Student, School of Civil Engineering, REVA University, Bangalore, India*
*Corresponding author: murthybharath1996@gmail.com

***Abstract*: Bangalore is rated to be one of the fastest growing cities in Asia with a current population of about 8.8 million and the life style of people and their commuting habits have undergone radical changes in case of an urban areas. This tremendous growth is making unsafely for vulnerable road users like pedestrians. In this study 200m stretch of road at Mantri mall, Bangalore is selected to analyse the pedestrian facilities by conducting surveys like pedestrian volume count, questionnaire survey, and accident data. The objective of the study is to obtain the maximum pedestrian volume count at selected stretch for analyzing and to give necessary recommendations. From the study it is concluding that pedestrian volume is high during working days and 72% of peoples from questionnaire survey are suggesting for the construction of underpass hence there is a serious need of pedestrian facilities such as underpass or pedestrian signal.**

***Keywords*: Accident data, Feasibility study, Questionnaire survey, Pedestrian facilities.**

1. Introduction

In Bangalore from the last few decades, the life form of peoples and their travel habits have undergone radical changes due to tremendous development of metropolis city. Vehicular volume is increasing along with population and this making huge traffic congestion, conflicts between vehicles and vulnerable road users like pedestrians. The word "Pedestrian" refers a person travelling on foot. The safety of pedestrians while walking along the road side is very important in this metropolis city especially for growing cities like Bangalore. But there is a lack of safety for pedestrians in Bangalore due to less availability of land, unplanned and improper design of facilities. In some cases of pedestrian facilities is not using by individuals due to the presence of vendors on the footpaths, discontinue of footpaths, improper horizontal and vertical clearance along the footpath, improper ventilation and drainage facility in underpass, absence of escalator and shaded facility in skywalks etc. To save the life of peoples there is a need of good pedestrian facilities for the safety of vulnerable road users.

A. Facilities of pedestrians

Pedestrian facilities have typically been provided as part of response to accident problems, or in road schemes, or for amenity or economic reasons - usually in town metropolis cities. General pedestrian facilities are listed below:

1. Sidewalks
2. Pedestrian Zones
3. Overpasses and Underpasses
4. Shared Pedestrian-Bicycle Paths
5. Queuing Areas
6. Walkways
7. Pedestrian Crosswalks

2. Literature Review

In urban cities are generally overpopulated which faces problems to safety of pedestrians due to improper design or absence of pedestrian facilities. Therefore, a short discussion of the previous literature review has been made.

Hitesh A. Patel, Amandeep Singh Bhalla, Hardik U. Patel (2016) The objective of this paper is to provide the safety for pedestrian at some of the particular intersection, they have considered a case study on some of the areas of Visnagar that is GD circle, MN road, etc. In these areas there are poor pedestrian safety facilities. They have concluded that, there is no proper pedestrian signals at this intersection and guard rails is not installed for safety of pedestrian so they have studied on development of pedestrian facility is taken up to improve pedestrian safety facility at mentioned intersection.

J P Rojas-Suárez, M S Orjuela-Abril, and G C Prada-Botía (2019) As the vehicular traffic increases the accident rate also increases and the primary usage of road should be by pedestrian but pedestrian are most affected by vehicular traffic. In this paper they have studied the characteristics of vehicle road, identifying the critical points and road section of maximum demand of the inhabitants, which are most considered for pedestrian crossing. They have taken vehicle volume count to determine the vehicular flow that circulates through this road corridor by the means of graph, tables which help them to identify the statistical data, they have also taken pedestrian volume count and opinion survey has also conducted and as a result they have concluded that motorcycles are causing more pedestrian accidents.

Vinayaka, Divya K, Krupashree GM, Arjun P , Mohammed Luqman, Monika G (2020) This paper's intended contribution, in terms of providing pedestrian safety so they have taken pedestrian volume count, questionnaire survey on street vendors and by using VISSIM software. The main strategy proposed is to give a significantly impact on the pedestrian

safety and it can also be used for decision making processes to increase the safety of pedestrian.

3. Study Area

The study area selected of 200m stretch road at Mantri mall, Bangalore is selected to analyse the feasibility study of pedestrian facilities. There is huge population traffic across this road section due to the presence of mall and people are walking on road because of on street parking, vendors on footpath, improper design of footpaths and obstructions along the road stretch.

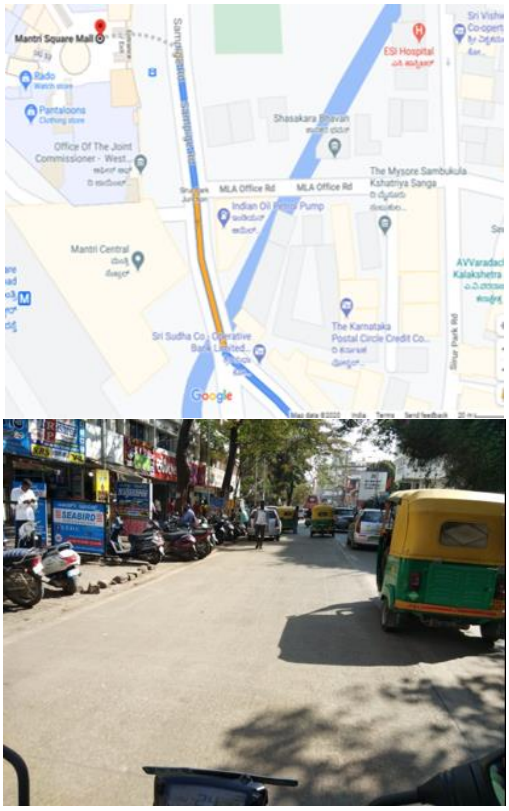


Fig. 1. Location of study area

4. Objectives of Study

1. To carry out the pedestrian volume count survey.
2. To collect opinions of pedestrians through questionnaire survey.
3. Analysis of accidents through previous year accident data.
4. To give out proper conclusion and appropriate measures for pedestrian comfort and safety.

5. Methodology

A. Detailed Methodology

1) Pedestrian survey

Pedestrian survey is conducted during morning, afternoon and evening peak hours for 3 working and 2 non-working days. The pedestrian count is taken from 7 to 9.30am, 1 to 2pm and 4 to 8pm. This pedestrian counting is tabulated with respect to routes and days.

2) Questionnaire survey

Pedestrian's opinions are taken to find out the ease or difficulties level for crossing the road. It gives us the present scenario of the selected road section. The main pedestrians considering for the questionnaire survey are students, adults, professionals and aged people.

3) Accidents data

Due to this rapid urbanization pedestrian and vehicular conflicts are more so to analyse the accident we have collected accident data from 2011 to 2016 from police station near to the selected area.

The following flowchart provides the methodology of framework for study:

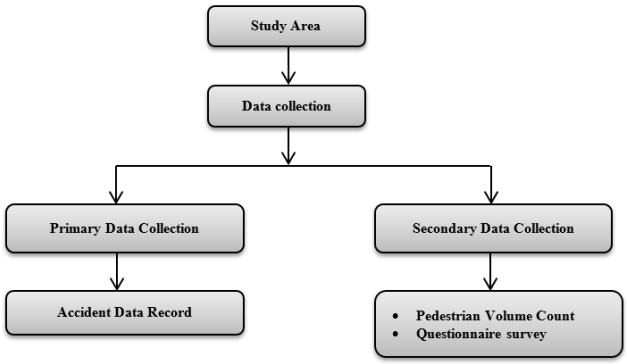


Fig. 2. Methodology of framework for study

6. Data Collection and Analysis

A. Past Accident Data Record

To analyse the accident pattern we have collected accident data from 2011 to 2016 from police station. Number of accident records is shown in following graphs in the selected area for study.

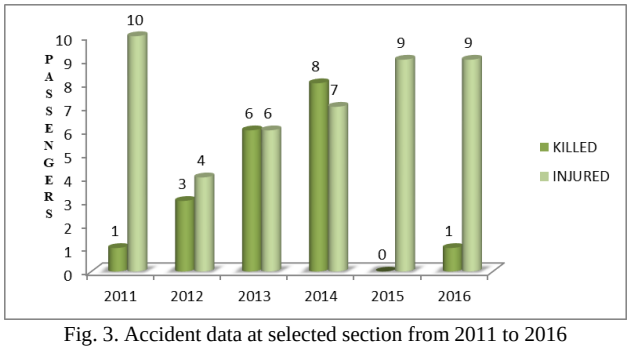


Fig. 3. Accident data at selected section from 2011 to 2016

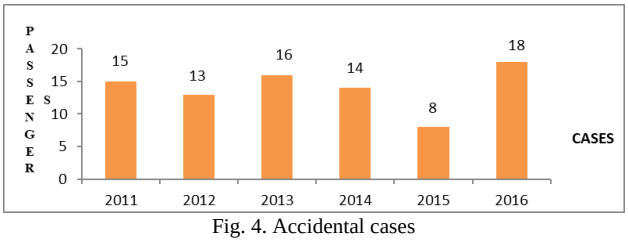


Fig. 4. Accidental cases

B. Pedestrian Volume Count

Pedestrian volume count is done by using video graphic method; Cameras was placed at elevated place to capture the entire section during peak hours from morning 7 to 9.30am, afternoon 1 to2pm and evening 4 to8pm. From this data we have analyzed the pedestrian volume count. Below are the graphs representing pedestrian volume count of 3 working and 2 non-working days during peak hour.

Pedestrian Volume Count on Monday:

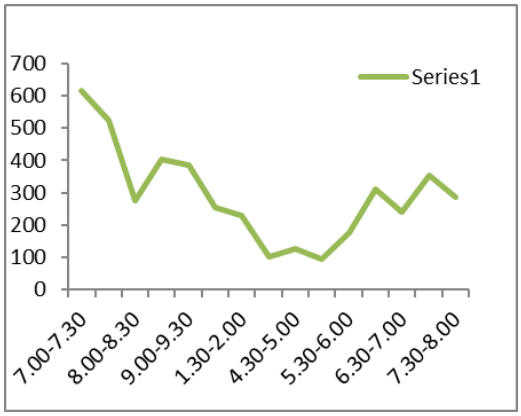


Fig. 5. PVC from Central Bus Stop to Mall

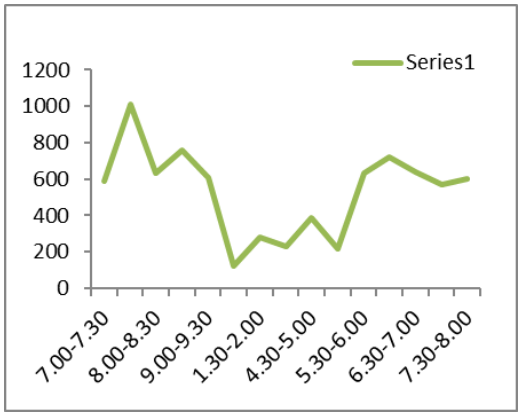


Fig. 6. PVC from Mall to Central Bus Stop

Pedestrian Volume Count on Wednesday:

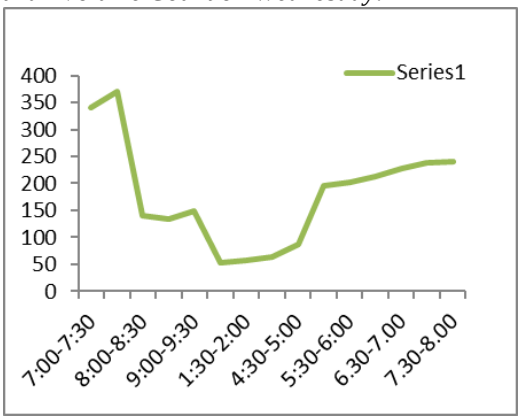


Fig. 7. PVC from Central Bus Stop to Mall

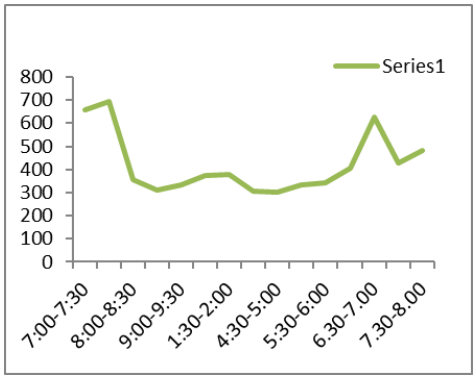


Fig. 8. PVC from Mall to Central Bus Stop

Pedestrian Volume Count on Friday:

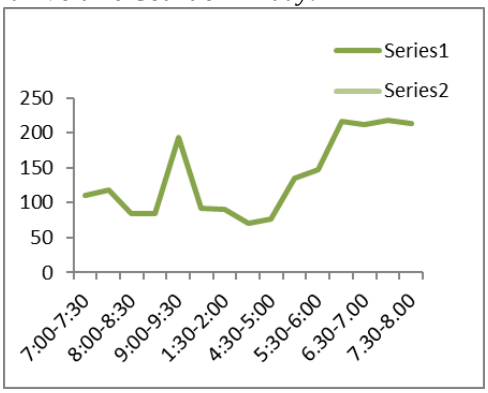


Fig. 9. PVC from Central Bus Stop to Mall

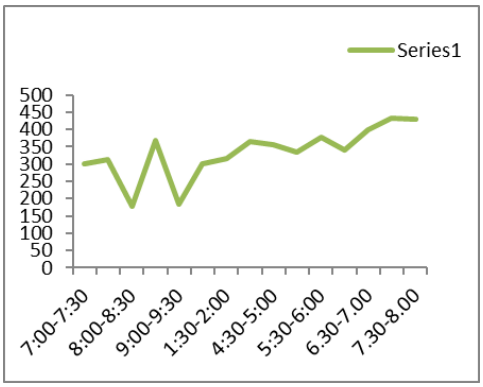


Fig. 10. PVC from Mall to Central Bus Stop

Pedestrian Volume Count on Saturday:

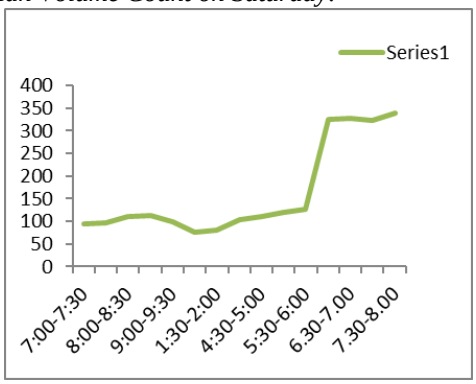


Fig. 11. PVC from Central Bus Stop to Mall

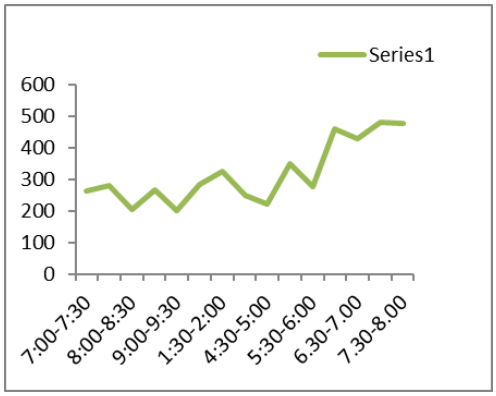


Fig. 12. PVC from Mall to Central Bus Stop

Pedestrian Volume Count on Sunday:

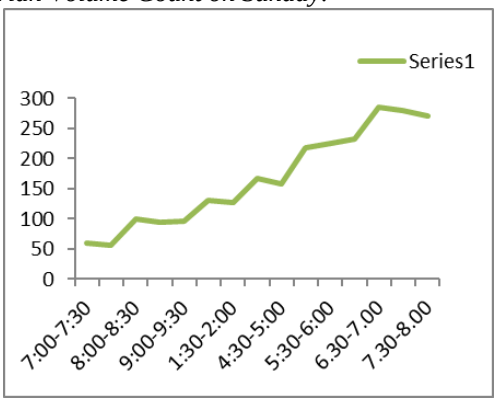


Fig. 13. PVC from Central Bus Stop to Mall

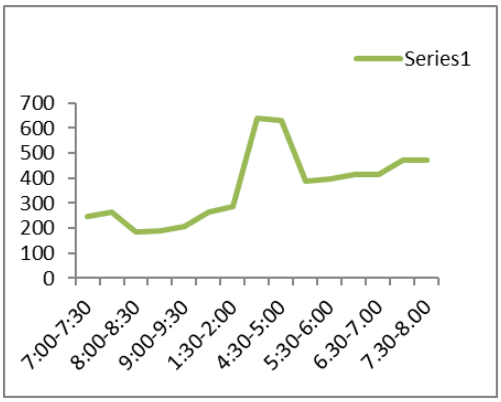
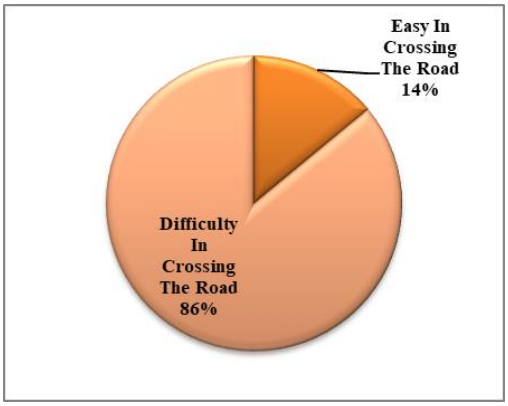


Fig. 14. PVC from Mall to Central Bus Stop

C. Questionnaire Survey

The opinions of pedestrian were taken through questionnaire survey. Total 200 questionnaires were taken and the details of which are tabulated. The opinions are presented in graphical manner.



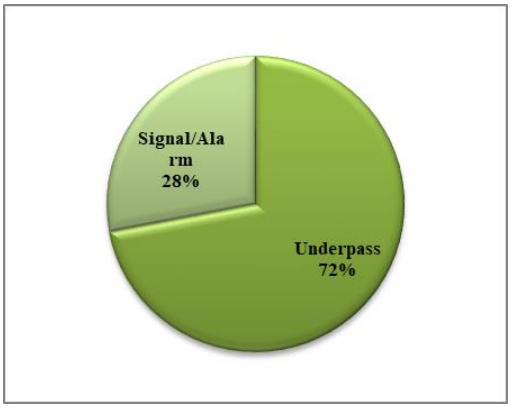


Fig. 15. Responds of Pedestrians ease or difficulty level for crossing the road and type of facility

7. Results and Discussions

Flow of Pedestrians from Central Bus Stop to Mantri Mall and Mall to Central Bus Stop:

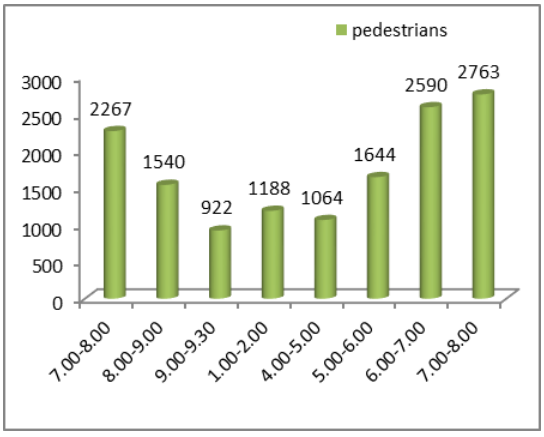


Fig. 16. Central Bus Stop to Mantri Mall

Table 1
Questionnaire survey respond

Type of Pedestrian	Total	Easy in crossing the road	Difficulty in crossing the road	Underpass	Signal/Alarm
1.Professional					
Men	50	8	42	38	12
Women	30	2	28	20	10
2.Student	20	3	17	11	9
3.Local	100	15	85	75	25
Total	200	28	172	144	56

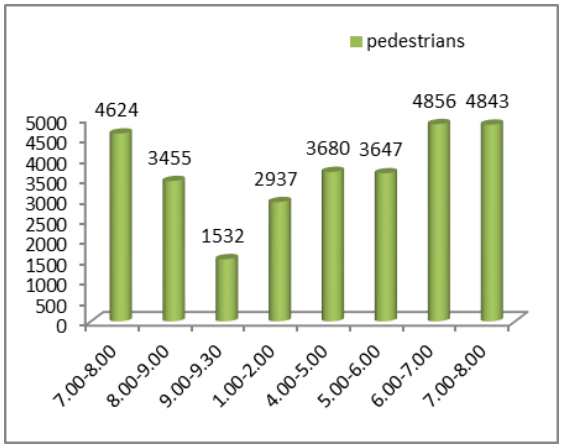


Fig. 17. Mantri Mall to Central Bus Stop

Pedestrian Flow on Working Days:

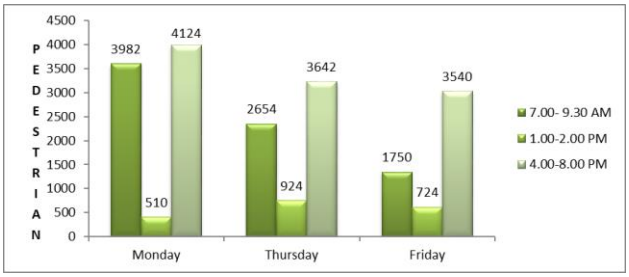


Fig. 18. Total pedestrians flow on working days

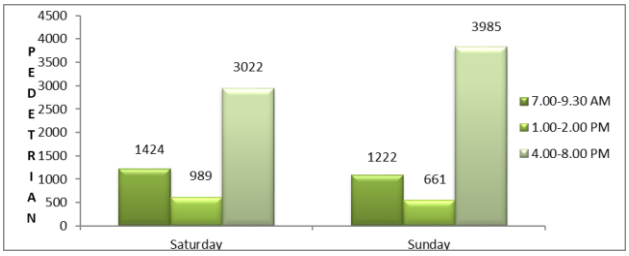


Fig. 19. Total pedestrians flow on non-working days

8. Discussions

- From the result obtained, the maximum morning peak hour of pedestrian flow is from Central Bus Stop towards Mantri mall at 7:00 to 8:00 am which is 5406, considering all the working and non-working days.
- During afternoon hour, the maximum peak hour of pedestrian flow is from Central Bus Stop towards Mantri mall at 1:00 to2:00pm which is 3254.
- In evening the maximum peak hour of pedestrian flow is from Central Bus Stop towards Mantri mall at 6:00 to 7:00pm which is 5525.
- Questionnaire Survey was conducted to collect detail information of possible public needs. The survey indeed helped in bringing up public's important views. From the data collected, it was noticed that the number of people having difficulty crossing the road were more in number. The percentage of people suggesting for Underpass were 72% and people suggesting for pedestrian signals were 28%.
- From the accident data collected (2011-2016), it was clear that the accidents occurred more during the year between 2012 &2013 and we observed that accidents were increasing till 2013.Later due to safety awareness and traffic monitoring the pedestrian accident were decreased.

9. Conclusion

- Experimental analysis gives, the average pedestrian observed per hour during working days are 1012 and on non-working days are 980.
- The peak flow is observed during 7am to 8am in the morning hours and 6pm to 7pm in the evening hours.
- Analysis shows that there is a serious need of pedestrian facilities such as pedestrian signal or underpass.

References

[1] Hitesh A. Patel, Amandeepsingh Bhalla, Hardik U. Patel, "Feasibility study on development of pedestrian facility: Journal of Scientific Review and Research in Engineering and Technology, vol. 1 (6), Sep.-Oct., 2016.
[2] J P Rojas-Suárez, M S Orjuela-Abril, and G C Prada-Botía, "Technical feasibility study for the implementation of pedestrian safety mechanisms", 5th International Week of Science, Technology & Innovation Journal of Physics: Conference Series, 2019.
[3] Vinayaka, Divya K, Krupashree GM, Arjun P, Mohammed Luqman , Monika G, "Pedestrian Feasibility Study in Selected Areas of Bangalore", International Journal of Advanced Science and Technology, vol. 29, no.4, pp. 4080 – 4092, 2020
[4] Sudhir and Sameera Kumar, "Pedestrians at cross road" Bangalore Traffic, World Transport Policy and Practice, vol. 2, 2013.
[5] Ashish Verma and Marry Anthony (2014) "Integration of street vendor's n footpath design guidelines for an Indian city" Transportation Research Record Journal of the Transportation Research Board, vol. 1 (1934), 1-14 January 2005.
[6] Aishwarya Fadnavis, "Success and Failures of crossing facilities for pedestrians" International Journal of Research in Engineering and Technology, 2015.
[7] T. Subramani, "Study on existing pedestrian traffic and facility study on major roads in Salem and suggestions for its improvement" International Journal of Modern Engineering Research, vol. 2, 2012.
[8] Hemant Mittal, Ashutosh Sharma, Ajay Gairola, "A review on the study of urban wind at the pedestrian level around buildings", Journal of Building Engineering, vol. 18, pp. 154-163, 2018.
[9] Weichen Liao, Armin Seyfried, Jun Zhang, Maik Boltes, Xiaoping Zheng, Ying Zhao, "Experimental study on pedestrian flow through wide bottleneck", Transport Research Procedia, vol. 2, pp. 26-33, 2014.
[10] Tie fang Zou, Zhiyu, Ming Cai, Jike Liu, "Analysis and Application of Relationship between Post-Breaking-Distance and throw Distance in Vehicle-Pedestrian Accident Reconstruction", Forensic Science International, vol. 207, pp. 135-144, 2011.
[11] S. K. Singh, "Review of urban transportation in India," J. Public Transp., vol. 8, no. 1, pp. 79–97, 2005.
[12] Rajat Rastogi, Ilango Thaniarasu and Satish Chandra, "Design implications of walking speed for pedestrian facilities, Journal of Transportation Engineering, vol. 137, no. 10, pp. 687-696, October 2011.
[13] Published by National institute of mental health & Neuro science by Indian council of medical research, "World Health Organization", India Office, and New Delhi, 2011.
[14] Noorain Mohd Isa, Ahmad Zaharin Aris, Zakiah Ponrahono and Rosta Harun, "Vehicle- pedestrian conflict: A case study in university putra Malaysia", Journal of the Malaysian Institute of Planners, vol. 17, pp. 92-100, 2019.
[15] IRC: 103-2012 "Guidelines for pedestrian facilities".