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Analysis Of Pedestrian Safety Near By Baiyappanahalli Metro Station

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Abstract

Pedestrians are one of the most Vulnerable Road User in India. Road traffic accidents are a major but neglected global problem, requiring concerted efforts for effective and sustainable prevention. A comprehensive approach is required for improving road safety of pedestrians and reducing the causalities on the roads. Baiyappanahalli, with a maximum daily footfall of 28,300 passengers, emerged as the busiest metro hub in the city, overtaking Kempegowda Majestic station (27500). This study is an attempt to find out the most critical factors responsible for pedestrian safety and to devise methods which would provide solution for the same like design a sky walk in the study area or provide a pedestrian signal.

Keywords – *Pedestrian, Traffic accident, Pedestrian safety, Pedestrian signal, skywalk.*

I. INTRODUCTION

Walking is a universal phenomenon but usually not considered as a transport mode because it does not engage vehicles as modes. The term “Pedestrian” is used to define the actual fact that the procedure to pedestrian pathway development should be as scientific and systematic as the techniques that are applied to highway design and development. At city level, every single person is a pedestrian but treated as neglected road user. Where is my walking space? This is the first thought that comes in the minds of a pedestrian in the city as almost all footpaths are either usurped by shopkeepers or blocked by obstacles like poles, sign boards depriving the pedestrians of the much-needed space. As a result, they are forced to walk on the roads and end up blocking free movement of vehicular traffic and putting their lives at risk.

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Transportation plays a great role in the development of the country, but the safety of the Pedestrians is not considered while designing the road facilities. Pedestrian safety has been raising alarming concerns among the public and transportation professionals alike. Walking is a complete mode in itself and is an additional mode by which any individual can access personal vehicle or public transportation or reaches the final destination after using a mode.

Pedestrian safety has been raising alarming concerns among the general public and transportation professionals alike. According to WHO's "Global Status Report on Road Safety 2013," 1.24 million people die each year as a result of road traffic crashes, half of which are vulnerable road users.

Research and studies show an excessive involvement of pedestrians, cyclists and motorized two-wheelers in road traffic injuries. For example, "the initial Global status report on road safety disclosed that almost half (46%) of those killed in road traffic accidents are pedestrians, cyclists. In recent past, the second Global status report on road safety 2015: supporting a decade of action investigated pedestrians separately from other vulnerable road users, and indicated that 22% of those killed on the world's roads are pedestrians."

A great number of the vehicular population growth in the country has been seen in the towns and cities. Pedestrians are the primary victims of fatal accidents. Traditional planning is greatly biased to the motorized modes of transport, even though every road user is a pedestrian at some stage of journey. The supply of road infrastructure has also fallen short of the requirements. Though the accident rate is decreasing down, the number of fatalities is still high. The basic objective should be to decrease pedestrian conflicts with vehicular traffic to the minimum.

II. OBJECETIVES AND METHODOLOGY

2.1 *Objectives of the study*

1) To find out existing Level of Service for Pedestrians.
2) To find out queue length, delay, speed and travel time by VISSIM simulations for the intersections.
3)To identify problems in selected Intersections and to recommend appropriate facilities or new suggestions for safe pedestrian movement.

2.2 *Methodology*

First of all study area was selected and then it was followed by collection of raw data which was analyzed manually as well as VISSIM software. After analyzing the data thoroughly some improvements were suggested. The process of methodology is shown below.

- Selection of study area
- Collection of raw data
- Data extraction and analysis
- Pedestrian simulation in VISSIM
- Suggesting improvement for easy passage of pedestrian and preventing delay
- Results and conclusion

2.3 *Methodology*: Study Area:

Baiyappanahalli Metro station is the busiest in the city. It has attracted all transport services. The state-run BMTC alone runs at least 1,500 shuttle services from here. With cabs and auto rickshaw numbers growing at what has come to be an important transport hub, the three lanes of the Old Madras Road on the station-side is practically reduced to one. While a little space has been dedicated for auto rickshaws and bike taxis, buses and cabs drop.

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Figure 1. Map of Study area

Collection of data:

Accident Data: The data regarding the pedestrian accidents in Swami Vivekananda Road have been collected for a period of four years, i.e. from 2015-2018 from Traffic Police Station. The date, time, approximate place, types of vehicles involved etc. are entered in the F.I.R and details are recorded in case files. The pedestrians are most affected by accidents in road. The pedestrian safety is very low. Accidents which occurred during the study period, i.e. 2015-2018, are arranged Year-wise. It is observed that a greater number of accidents occurred in year 2018. Year-wise distribution is presented in Figure 2.

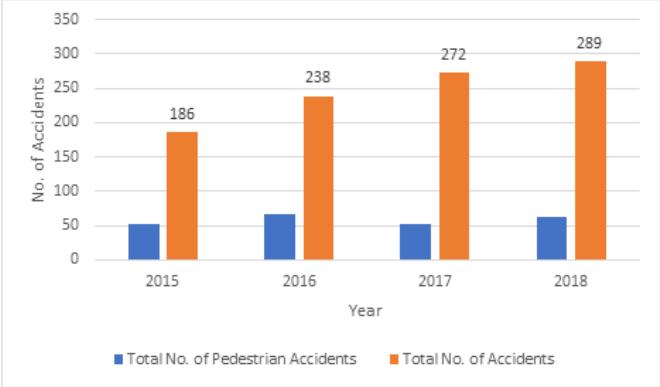

Figure 2. Graphical representation of Accident data

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2.4. Traffic Data: The traffic volume count survey was conducted at the junction and classified volume count survey is conducted for morning, afternoon and evening hours. The survey was carried out by manual vehicle counting and classifying the vehicles passing the survey station in both directions, in 15 minutes intervals.

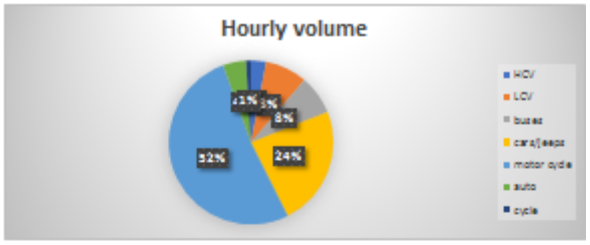

Figure 3: Graphical representation between 8:30am to 9:30 am

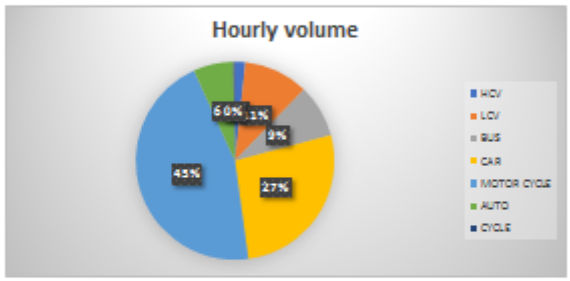

Figure 4: Graphical representation between 2:30pm to 3:30 pm

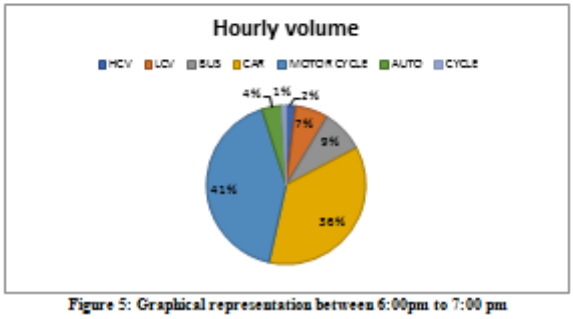

Figure 5: Graphical representation between 6:00pm to 7:00 pm

Figure 3. Watermark Extraction algorithm Block Diagram

Pedestrian Volume Count: For any solution to a problem of pedestrian safety at intersections, it is necessary to know the pedestrian volume at the intersections. A survey was conducted at 5 intervals in a day.

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Table -1 Survey data

SL No.	Intersection	Timing	Volume
1	Biayappanhalli	8AM-10AM	3515
2		10AM-12PM	1220
3		12PM-2PM	1525
4		4PM-6PM	1670
5		6PM-8PM	3208

Table -2 Peak hour pedestrian volume count

SL No.	Intersection	Peak Hour	Peak Hourly Volume ped/hr	Off Peak Hour	Off Peak Volume ped/hr
1	Baiyappanhalli	8AM-10AM	3515	10PM-12PM	1220

Table -3 Calculation of LOS

SL No	Intersection	Space	Walkway Width	15-min Peak Flow	Flow Rate V_p	LoS	Remarks
1	Baiyappanhalli	>1.9-3.3m^2/p	3	960	21.3	E	Movement is possible only by shuffling

Table -4 Queue counters:

QUEUECOUNTER	QLEN	QLENMAX
Towards tin factory	49.15	60.49
Towards Baiyappanahalli	57.81	76.15

Table -5 Queue counter in present condition

QUEUECOUNTER	QLEN	QLENMAX
Towards tin factory	45.51	57.50
Towards Baiyappanahalli	42.82	69.21

Table -6 Delay results in present condition

DELAYMEASUREMENT	STOPDELAY	VEHDELAY
OMR towards factory	74.13	84.02

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OMR towards Baiyappanahalli	24.24	39.7

Table -7 Delay results with suggested skywalk

DELAYMEASUREMENT	STOPDELAY	VEHDELAY
OMR towards factory	41.17	51.33
OMR towards Baiyappanahalli	11.83	21.58

Table 6 shows the delay results in present condition while as table 7 shows delay results with suggested skywalk. By comparing the two graphs we can conclude that delay gets greatly reduced thereby improving the flow in the particular area.

Table -8 Density and speed in present condition

Performance measurement	Time	Density	Speed
AVG	0-600	0.05	0.75
MAX	0-600	0.06	1

Table -9 Density and speed with suggested skywalk

Performance measurement	Density	Speed
AVG	0.08	1.65
MAX	0.13	2.48

By comparing results of density and speed in present condition with results of suggested skywalk, we can conclude that speed and density was improved after suggesting skywalk.

Table 9 and table 10 shows speed and density in present condition and with suggested skywalk. By comparing results of density and speed in present condition with results of suggested skywalk, we can conclude that speed and density was improved after suggesting skywalk.

III. RESULT AND DISCUSSIONS

Pedestrian feedback form:

- In this intersection the difficulty of crossing at intersections on scale of 1 to 5 was rated 4.
- 75% of pedestrians agreed in majority that road is not safe enough to cross.
- Majority of pedestrians frequently walk 3-4 days a week or above.

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- 47% of the pedestrians think that they do not have enough sidewalks.
- Almost all pedestrians agreed that there was no space to walk.

All pedestrians did not feel safe to cross at intersections, as vehicles do not stop while pedestrians are crossing.

IRC specification checklist:

- Footpath is present and width is 3m.
- Krebs are present and height is 0.2m.
- Zebra crossing is present and width is 3m.
- Refuges islands, steps, crossing time, mid-block crossing and resting place are not available.
- Street lights present at an interval of 30m.

Guard rails are present and the height is 1.3m.

IV.CONCLUSION

Pedestrian safety is of paramount importance in modern times. Following are some of conclusions drawn after the analyzing the study area in every aspect.

- In comparison to 2017 there has been increase of 19% pedestrian accidents in 2018 which shows study area is accident prone.
- Sky walk is the need of the hour for the selected intersection. It vastly improves the selected area in following aspect:

1) We can safely infer that queue length gets greatly reduced from 57.81m to 42.82m by constructing a skywalk in the particular area.
2) We can conclude that delay gets greatly reduced from 84.02 sec to 51.33 sec thereby improving the flow in the particular area.
3) Level of service greatly improves from E to B thereby improving the traffic condition in many aspects such as improving the speed, reducing delay, reducing queue length, improving travel time and improving the flow rate.
4) The average speed of pedestrian was increased from 0.75 m/sec to 1.65 m/ sec with the suggested skywalk.

- After analyzing the pedestrian feedback forms we can safely conclude that the selected intersection is not safe for pedestrian movement.

A new traffic light system detects when people wants to cross the streets, this is a new development with camera equipped traffic lights that automatically detects when want to cross the streets. This system can also be used in the selected area.

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