Pedestrian vehicle conflict analysis for a T-Signalized intersection in Urban Area of Kashmir

Sabha Farooq[1], Sukhdeep Singh[2]

[1]M.Tech Scholar, Dept. of Civil Engineering, CT University, Punjab
[2]Assistant Professor, Dept. of Civil Engineering, CT University, Punjab

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Abstract – For enhancing the pedestrian safety and for providing necessary infrastructure, a reasonable comprehension of passerby crossing conduct under blended traffic conditions is required. This tries to investigate the intersection conduct of people on foot like intersection speed, average time taken by the pedestrian for crossing the road, average time taken by the vehicles and average speed of vehicles for weaving the left turn of intersection, pedestrian-vehicle conflicts under blended traffic conditions and to distinguish the affecting variables dependent on measurable tests, safety level of l-turn of the intersections and pedestrian crossing pattern. In this study, apart from observing the traffic and pedestrian volume from 8:00 am to 7:00 pm , 15 samples of pedestrian of different age groups each and 10 samples of vehicles of different class were observed at left turning legs of Lal chowk byepass intersection and iqbal park byepass intersections. During the assortment, activity that meets at any rate one of the accompanying classifications was characterized as one clash:

Walker decelerates or ends to avoid vehicle, Walker quickens to avoid vehicle, Person ob foot sidesteps to avoid vehicle, Vehicle decelerates or ends to evade person on foot, Vehicle quickens to avoid walker, Vehicle sidesteps to evade person on foot. In deciding the variables of contention, this study centers around person on foot volume, normal passerby speed, volume and speed of left-turn vehicles and width of l-turn of the convergence.Traffic strife method speaks to a proficient methodology for the preventive technique. It was utilized as "substitute proportion of street wellbeing" a contention is characterized as a watched circumstances in which at least two clients are so close in space or time which could prompt a crash if their developments stay unaltered.

Key Words: Pedestrian vehicle conflict, Safety Level of L-Turn, Pedestrian crossing pattern

1. INTRODUCTION

1.1 General

   Traffic research on roadways has predominantly been on vehicles and convenience of pedestrian is often second while designing roadways. One of the major reasons is the complexity involved in modelling pedestrian behaviour. The density of multiple parameters which change the pedestrian crossing behaviour and are very complex to recognize. Left turns at signalized intersections is mostly open for traffic and pedestrian volume is very high with slightest safety ways provided to them. As per Indian Road Congress (IRC) pedestrian crossing speed at crosswalks are estimated as 1.22 m/s. Lars Leden [1] made a comparative study between person on foot security at semi-ensured plans and typical non- channelized signalized approaches and reported that the rate of risk is great at left- turning vehicle rather than right-turning vehicles.

Fig 1.1 shows the iqbal park intersection

This study examines pedestrian-vehicle conflict analysis at l-Turns of signalized intersections. During a journey, the pedestrian needs to perform manoeuvres, detect obstacles, and make decisions. An error in these skills or physical limitations of the pedestrian may prompt genuine wounds or passing as the passerby collabrates with vehicles. This area presents person on foot qualities including crossing time and visual inquiry at intersections. To appropriately plan a traffic lights controlled crossing points, it is required to consider the traffic boundaries everything being equal.

This paper presents the after effects of the passerby conduct tests which were run at the crossing points. To run the examination, field considers were attempted to gather the most trustworthy information from genuine perception. Passerby conduct was recorded with the guide of a wide point camera of TRISTAR System (Integrated Transport Management System)
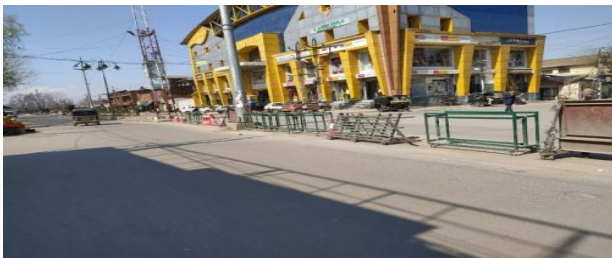
Fig1.2 shows t- intersection

An intersection position dispersion model which takes the crosswalk length, width and separation among crosswalk and goal into account is created. The set up model is approved by contrasting the watched pedestrians crossing positions and the assessed crossing positions. The approval results propose that the set up model is fit foe being embraced to appraise the flood pedestrians intersection positions at far-side cross segment. In light of the model, counter measure for flood infringement can be advanced to keep pedestrians from strolling outside the crosswalk.

Among them, Habib [6] and Fruin [2] analyzed person on foot mishaps at signalized crossing points on a single direction framework in Manhattan, N.Y and found that a left turn development is more hazardous to people on foot than a through development. Quaye reported that T-intersections are generally more dangerous

Traffic lights are one of the most efficient tools of controlling traffic. They are utilized to isolate colliding traffic movements on crossing points. To appropriately plan a traffic lights controlled crossing points, it is required to consider the traffic boundaries everything being equal. The most impressive boundaries are the volumes and speed of pedestrians and vehicles. Walker driving gatherings of individuals, including kids, individuals with no private vehicle get to, and the older.

Over the years, researchers have attempted to inspect the factors which affect walking speed. The most significant components impacting pedestrian speed are age, gender, physical constitution, inspiration and reason for movement, distance to be secured, and climate and terrain conditions (Fruin,1971), (Fruin,1989), (Witkowski,1978). Based on research (Fruin,1989) led with 967 free-stream pedestrians in New York City, 78% of subjects were noted to be moving with the speed of under 1.4 m/sec. The norm speed was 1.2 m/sec. Be that as it may, more established men's speed was 1.1 m/sec and they comprised the 25 percentile of the sharing capacity.

It should be noted that the pedestrian entry time may be determined by the distance from other crosswalks, the presence and proximity of a public transport stop, the surrounding features, and the urban infrastructure and land-use. The analyzed crosswalk is situated in the downtown area in the neighbourhood of essential pedestrian traffic 'generators'. For the situation, despite the intensely vehicle traffic power at crossing point, the signalization should flexibly ideal person on foot conditions

1.2 OBJECTIVES

1. To analyse the pedestrian-vehicle conflicts for L-Turns of the Lal chowk and Iqbal Park ByePass intersection under mixed traffic conditions and to identify the influencing factors based on statistical tests.

2. To analyse the safety level of L-Turns of both the intersections.

3. To analyse the crossing behaviour of pedestrians.

4. To analyse the pedestrian crossing pattern for L-Turns of both the intersections

2. METHODOLOGY

Two number 4 way signalized intersections viz. Lal chowk intersection and iqbal park intersection were adopted for data collection for this particular study. Intersections lal chowk and iqbal park intersections are most preferred by people and receive maximum traffic and pedestrian flow. Further lal chowk intersection and iqbal park intersection are accident prone areas.

Table No. 5.3 Average Speed of Pedestrian						
Width of Motorway (m) =6.63						
	Children	Young Male	Male	Young Female	Female	Senior citizen
Average Speed of each group(m/s)	1.270	1.436	1.320	1.402	1.275	1.161
Average Speed of all pedestrian (m/s)	1.3106					

Based on the study, a multivariate accident prediction model was proposed.

$$\{E^\wedge m\} = b_0 * F1^{b_1} * F2^{b_2}$$

Where

F_1, F_2 = Vehicle and pedestrian flows, respectively

b_0, b_1, b_2 = parameters to be estimated

m   = entity (signalized intersection)

$E\{m\}$ = mean of such m's for different intersections with flows F_1 and F_2; and

$\wedge$ = estimated of $E\{m\}$

Table No. 1.1				
Parameter estimates for left turning vehicles				
Flow period	$\hat{b}_0$	$\hat{b}_1$	$\hat{b}_2$	$\hat{k}$
1. day	2.6210^{-7}	1.19	0.331	2.2
2. a.m/p.m	4.8510^{-8}	1.37	0.346	*
3. hour	1.82×10^{-8}	1.32	0.338	0.4
4.15 minutes	3.61×10^{-8}	1.35	0.368	*

*not enough data for estimating k

The relation between SCI and the number of conflicts is given below:

$SCI = 0.9971^{C_v}$

Where C_v is the number of vehicle-pedestrian conflicts for a period of time.

Table No. 2.2		
Safety level of the intersection		
SCI	Safety Level	Description
>0.8	A	Very few conflicts, very safe
0.5-0.8	B	Relatively severe conflicts, potential danger
0.3-0.5	C	Severe conflicts, intersection redesign required
<0.3	D	Severe conflicts, great danger, design required

Vehicle and pedestrian conflicts were recorded manually for morning peak hour on each left-turn of both the intersection.

Table No.5.9			
Lal Chowk Intersection			
S No.	Particulars of L-Turn	Peak Hour	NO. of conflicts between vehicles and Pedestrians C_v
1	RAM BAGH TO NATIPORA	9:10 to 10:10 am	52

S No.	Particulars	Peak Hour	Conflicts
2	NATIPORA To RAM BAGH	9:00 to 10:00 am	32
3	RAM BAGH To IQBAL PARK	9:30 to 10:30 am	73
4	IQBAL PARK TO RAM BAGH	10:40 to 11:40 am	36
IQBAL PARK Intersection			
1	MAJHOOR NAGAR TO RAM BAGH	8:50 to 9:50 am	49
2	RAM BAGH TO LAL CHOWK	8:30 to 9:30 am	2
3	LAL CHOWK TO RAJ BAGH	9:10 to 10:10 am	119
4	RAJ BAGH To MAJHOOR NAGAR	8:40 to 9:40 am	107

Geometric data of left-turns of lal chowk intersection and iqbal park intersection was recorded

Table No. 5.11							
Lal Chowk Byepass Intersection							
S No.	Particulars of L-Turn	Peak Hour	No. of Pedestrians Q_P	No. of Vehicles Q_V	No. of conflicts between vehicles and Pedestrians C_v	speed of pedestrian V_P	speed of vehicle V_v	width of leg WI
1	RAM BAGH TO NATIPORA	9:10 to 10:10 am	284	345	52	1.3106	10.57	10.25
2	NATIPORA To RAM BAGH	9:00 to 10:00 am	239	319	32	1.3106	10.4	8
3	RAM BAGH To IQBAL PARK	9:30 to 10:30 am	260	395	73	1.3106	10.54	9
4	IQBAL PARK TO RAM BAGH	10:40 to 11:40 am	333	249	36	1.3106	8.35	8
IQBAL PARK ByePass Intersection							
1	MAJHOOR NAGAR TO RAM BAGH	8:50 to 9:50 am	329	388	49	1.3106	7.83	6.5
2	RAM BAGH TO LAL CHOWK	8:30 to 9:30 am	24	51	2	1.3106	7.42	7
3	LAL CHOWK TO	9:10 to 10:10	48	39	119	1.3	9.	9.

	RAJ BAGH	am	2	9		106	64	65
4	RAJ BAGH TO MAJHOOR NAGAR	8:40 to 9:40 am	481	536	107	1.3106	5.5	12.63

. Vehicle and pedestrian flow were recorded manually from 8:00 am to 7:00 pm. Vehicles were classified into: 2 wheelers, lmv and hmv and 10 samples of 2 wheelers & lmv and 05 samples of hmv were taken to find the average vehicle speed under red and green signal conditions at each left-turn of the intersections. Pedestrian crossing behaviour was also observed and the pedestrians crossing in straight and inclined pattern at entry, centre and exit of each l-turn was recorded for one hour (9:00 am to 10:00 am).

The regression equation developed from the data is as under:

$$C_V = -66.573 + 0.167Q_P + 0.036Q_V + 1.797V_V + 5.272Wl$$

Where

C_V = No of conflicts between vehicles and pedestrian

Q_P = No of pedestrians per hour

Q_V = No of vehicles per hour

V_V = Speed of vehicle in m/s

Wl = width of L-turn of the intersection in meters

3. CONCLUSIONS

Struggle between left-turn vehicles and people on foot at signalized crossing points has progressively become a wellbeing danger to street traffic activity. This research , in view of the investigation of person on foot and vehicle volume at l-turn of signalized crossing points and adequate review information, presented the regression model which shows that the number of conflicts between left turning vehicles and pedestrians is determined by four main parameters: number of pedestrians, number of left turning vehicles, and speed of left turning vehicles and width of l-turn of the intersection and it was found that the width of the l-turn of the intersection(wl) and speed of the left turning vehicles(vv) has the most critical effect on the conflicts between left turning vehicles and the pedestrians.

Pedestrian wellbeing strife list (sci) was determined dependent on struggle investigation of left-turn vehicles and people on foot at signalized crossing points. The reason for sci is to give a arrangement of guidelines for assessing the wellbeing of signalized convergence, the higher the file number is, the more secure the people on foot are, when crossing the streets

Pedestrian crossing behaviour was also observed .two major types of crossing patterns were found at entry, centre and exit of each l-turn of the intersection such as straight (perpendicular) and inclined (oblique).

Future studies should examine the visual search of pedestrians by using cameras which record head movements, and if possible eye movements, as pedestrians walk towards the curb and as they reach the curb (before the crossing manoeuvre). The visual search of Pedestrians should also be examined as a function of age and sex

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