
A Study on Pedestrian Behavior at Tidel Park Signalized Intersection and Remedial Measures to be Implemented

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ABSTRACT

The statistics say that there is one death every four minutes due to a road accident in India and 1214 road crashes occur every day in India. Among these, two wheelers account for 25% of total road crash deaths. Due to road crashes 20 children under the age of 14 die every day and a total of 377 people die every day in India. Report says that Tamil Nadu is the state with the maximum number of road crash injuries. Further, it is found that large number of accidents took place at the signalized intersection due to drastic growth of vehicle population and evolution of high speed vehicles. In that pedestrians are the vulnerable road users and they are mostly involved in the accidents which lead to severe injury and even fatality. Thus there is a need to observe the pedestrian behaviour at signalized intersection. The study area to observe the pedestrian behaviour at Tidel Park Signal junction has been taken into account and detailed report has been prepared. The video cameras are used for tracking the pedestrian behaviour and the quantitative analysis of pedestrians is obtained through video graphic survey. The video graphic survey is done from which the pedestrian volume count based on age, gender, crossing in group/single, with/without luggage, the reason for the illegal crossing at intersection is analyzed. From the video graphic survey it is observed most of the illegal crossing was done by male pedestrians than female pedestrians. Based on the age group, 14-60 contributes the maximum of about 92% in Tidel Park signal. For safety purpose pedestrians cross in group is higher than in single in the study area. Pedestrian crossing without luggage is 91% in Tidel Park signal. Average speed of pedestrians is found to be 0.79 m/s.

KEYWORDS

Pedestrian behaviour, Signalized intersection, Traffic survey

1. INTRODUCTION

Signalized intersections are expected to ensure safety by giving the right of way for traffic movement including pedestrians. Nevertheless, the provision of signalized pedestrian crossing facility may not promise the pedestrian safety due to some reasons such as traffic violation and unsafe signal phasing. Signalized crossing facility located at high speed intersection with turning vehicles may become a hazard to the pedestrian safety. Accident involving vulnerable road user such as pedestrian has become a great concern in traffic safety due to large number of deaths and injuries. The risk of fatality and injury of pedestrian when collided with a vehicle are subjected to the various factors which related to human, engineering and environmental aspects. Identifying and quantifying the impact factors to the risk of severity and fatality in pedestrian crashes have been studied by many researchers around the world, however some factors that are believed to be associated with the risk of pedestrian crash were overlooked. Pedestrian-vehicle conflict at signalized intersection happened due to several factors related to the pedestrian, driver, traffic and environment conditions. Pedestrian behavior such as crossing against the traffic signal or not in a crosswalk is associated with greater risk. There is evidence saying that the crash risk level increased eight times when

pedestrian adopted illegal crossing behaviors at signalized intersection. The probability of pedestrian involved with an accident is high while they cross the road particularly with high number of speeding traffic.²

Walking is under-represented and pedestrian exposure to risk is higher than expected from transportation studies. In India little attention has been given to pedestrian facilities and has been undervalued as a mode and its role is too long ignored. Much importance has not been given for planning and maintenance of pedestrian facilities such as crossing facilities are not at the right place and sidewalks are encroached by hawkers leads pedestrians to walk on the streets. Thus there is a need to study pedestrian behavior at signalized intersection and to assess how to reduce such accidents.

The objectives of the study are:

- To understand pedestrian crossing behavior at signalized intersection with respect to age, gender, crossing in group/single, with/without luggage.
- To determine the speed of pedestrian.
- To investigate the reason for illegal crossing of road and mitigate measures to be taken.

2. INFERENCE FROM LITERATURE REVIEW

Illegal pedestrian crossing is due to low green phase and large waiting time for pedestrians. Most of the accidents occur at the first 5sec and last 5sec of the red phase due to urgency in moving. Male pedestrians are more prone to accidents than female as they took risk while crossing the roads and also due to less patience. Speed of the pedestrians according to their age, male walks faster than female. Most the accidents occur within 50m from the intersection and in that severity is within 10m. Pedestrians who walk alone are more prone to accidents compared to those who walk in group.

3. METHODOLOGY

Review of literature helped to derive a general methodology. For the present study, several locations in Chennai were identified. Data required for the study are collected through the primary surveys by video graphic technique from which the pedestrian volume, speed and crossing in single/group, crossing with luggage/without luggage are analyzed and the difficulties faced by the pedestrians and suggestions of pedestrians can be obtained by Questionnaire survey.

Study location was identified based on the following criteria where

- The pedestrian traffic is quite high
- And the place where there are no pedestrian facilities is provided.

Based on the above criteria, the study location was selected at **Tidel Park Signal junction.**

- Tidel park intersection is a 6 lane divided Express way with a road width of 22m and is located at a distance of 14.6km from CBD.
- It's a 4-arm junction with large number of pedestrian as-well as vehicle population.
- Educational land use is there in this location and congestion is the major problem in this stretch as OMR is the heart of IT corridor.
- Bus stop is located at 10m from the intersection and Foot Over Bridge is located at a distance of 17m from the intersection.
- Manually controlled signal is operated during peak hours, each phase takes about 3-4mins and time taken to cross the signal is a major task for the drivers.
- Major issue is that there is no separate timing for pedestrians to cross the intersection.
- Fig 3.1 shows the Flow Chart for Methodology and Fig 3.2 shows the google image of Tidel Park signal and Fig 3.3 shows the line diagram of Tidel park.

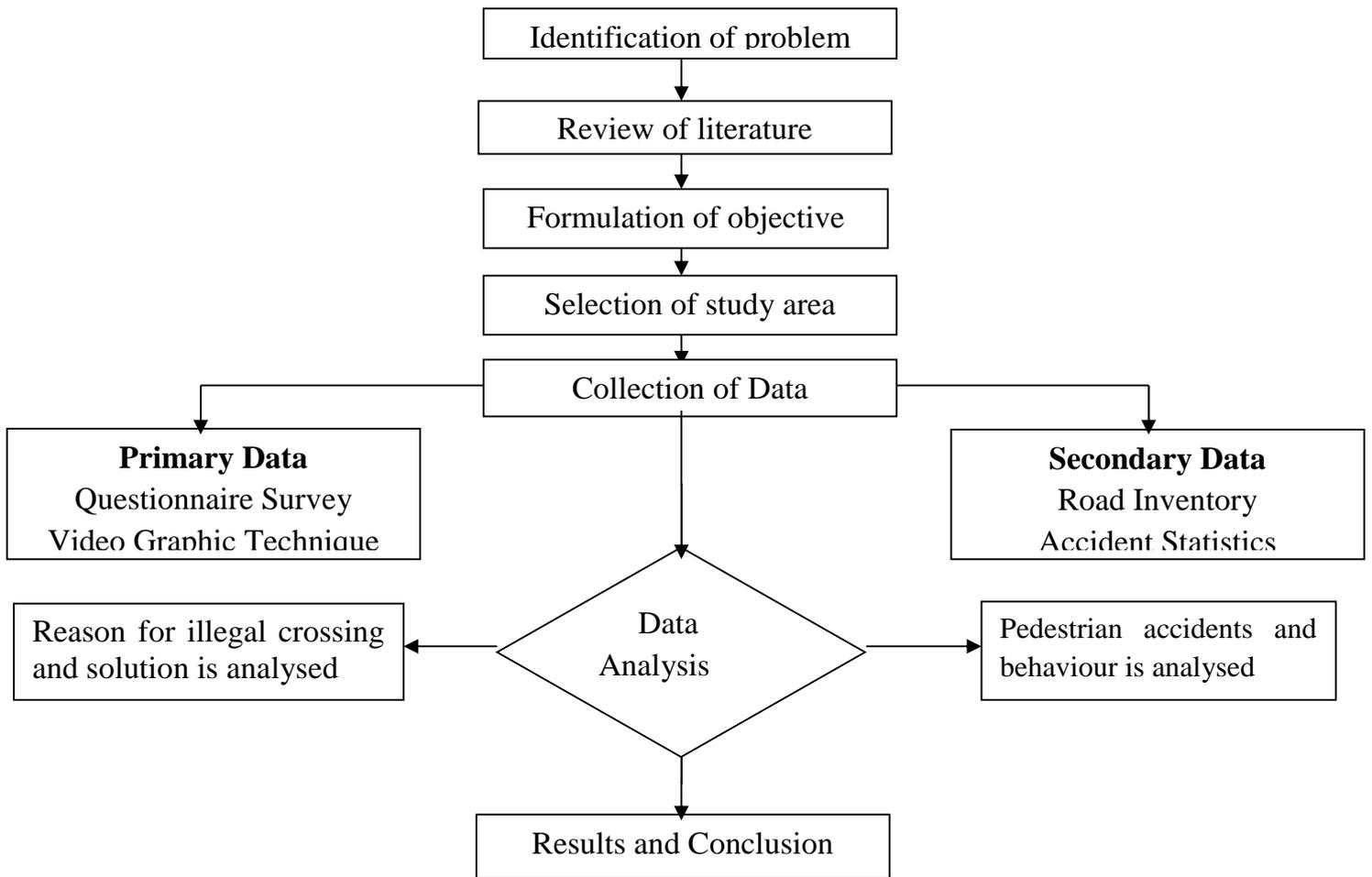


Fig 3.1 Flow Chart for Methodology



Fig 3.2 Tidel Park Junction-Thiruvannmiyur

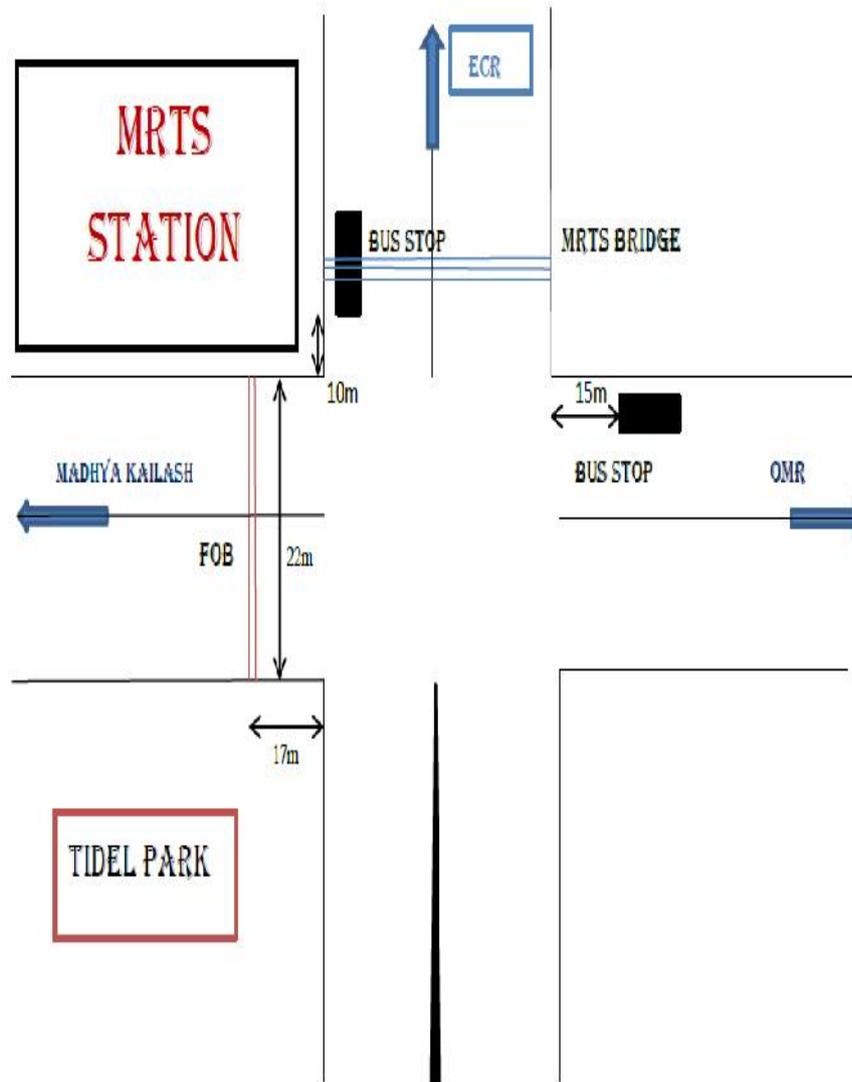


Fig 3.3 Line Diagram for Tidel Park Signal

4. DATA COLLECTION AND ANALYSIS

Pedestrian surveys were done by questionnaire and by video cameras to provide information on pedestrian crossing behaviour, accident risk for pedestrian and difficulties faced by pedestrians. **Questionnaire survey** is one of the most important data collecting techniques in transportation studies. They are relatively cheap and allow the collection and analysis of data taken from comparatively large samples. Questionnaires are commonly used to gather information about the difficulties faced by the pedestrians, reason for the illegal crossing behaviours and safety level. At the site, camera was fitted either at the top of the building/ on the footpath or some distance from the intersection for data collection. It was recorded in such a way that the pedestrians were unaware of it. Pedestrian crossing behaviour according to their age/gender with or without luggage/children everything were assessed, and these are the primary quantitative parameters observed in this survey. The pedestrian count, speed of the pedestrians while crossing the road and number of pedestrians using carriageway to cross the road were calculated according to their age, gender, single or group, with or without luggage, by using Pedestrian Entry and Exit software and reason for illegal crossing of road are can be obtained from Questionnaire survey. The survey was done among 100 people out of whom 61 were Male and 39 were Female. Questionnaire survey was done to determine the qualitative analysis like the adequacy of

signal timing, availability of pedestrian crossing facilities, suggestions and view of the pedestrians and also difficulties faced by the pedestrians are analysed.

Videography survey was conducted at Tidel park junction for 2 hours 8:00 AM to 10:00AM during peak hours on 15th March 2015 using a video camera installed on tripod and survey was done at MRTS bridge. Width of the road at Tidel Park intersection is about 22m. From the video graphic survey volume count of pedestrians based on age, gender, with/without luggage, crossing in single/group are collected. Data extraction software is also developed and used to obtain pedestrian volume count. Study location for video graphic survey done at Tidel Park was shown in fig 4.1



Fig 4.1 Study Location for Videographic Survey – Tidel Park Signal

Data was extracted from the video collected at 8:00 AM to 10:00 AM and a total of 1127 pedestrian data was obtained. From the data collected it was observed that male pedestrians are about 618 and female pedestrians are about 509. Fig 4.3, 4.4, 4.5, 4.6 shows the pedestrian volume based on age, gender, crossing in single/group, with/without luggage and Fig 4.7 and 4.8 shows average speed and crossing time of pedestrians. About 92% of the individuals crossing the intersection are in the age group of 14 to 60 and men are about 55% and women are about 45%. Pedestrians crossing the intersection without luggage are about 71% and with luggage are about 29%. Pedestrian crossing in group is more, about 91% and crossing in single is about 9%. Speed of the male pedestrians are about 0.85m/sec and female pedestrians are about 0.73m/sec, and speed of pedestrians at the age group <14 are about 0.85m/sec, age group between 14-60 are about 0.78m/sec and pedestrians at the age group >60 are about 0.74m/sec. Table 4.1, 4.2, 4.3 and 4.4 shows the pedestrian volume based on gender and age group respectively.

Table 4.1 Total Pedestrian Volume Based On Gender at Tidel Park Intersection

Description	Male	Female	Total
Pedestrian coming out from MRTS Exit	534	602	1136
Pedestrian flow from Thiruvanmiyur	1157	811	1968
Pedestrians crossing the intersection	618	509	1127
Pedestrian Using FOB	1372	1092	2464
Pedestrian flow in Tidel park	3681	3014	6695

Table 4.2 Pedestrians Crossing the Intersection Based On Age Group

DESCRIPTION	<14	14-60	>60
Total number of Male pedestrians	10	568	41
Total number of Female pedestrians	12	457	39
Total number of Pedestrians	22	1025	80

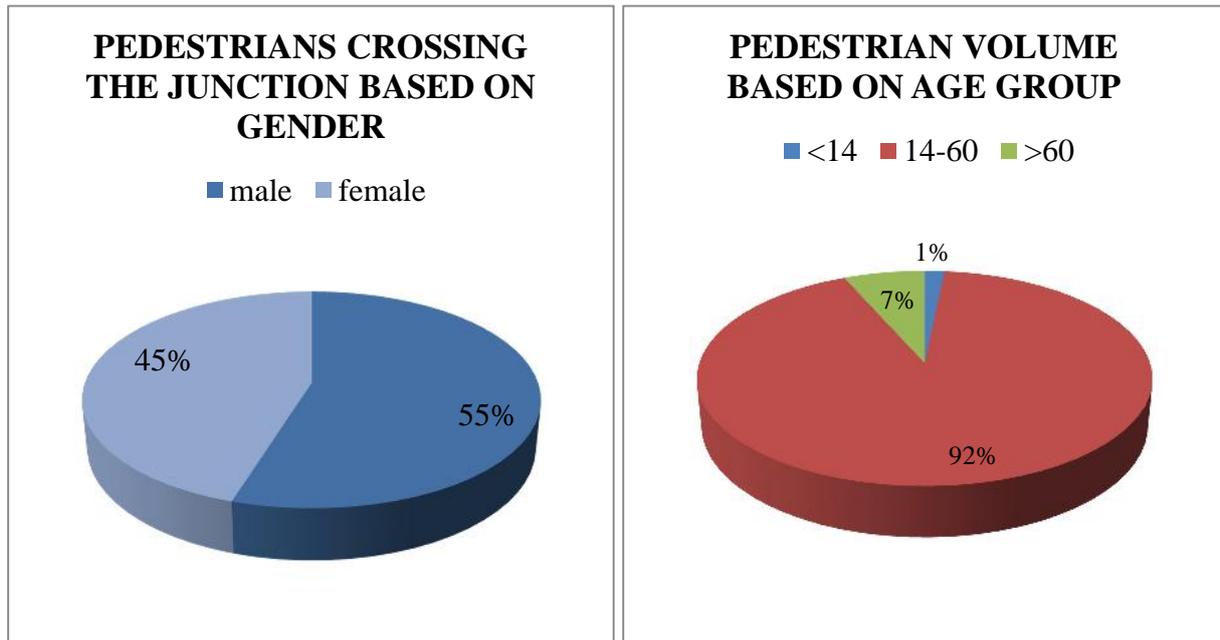


Fig 4.2 Pedestrians Crossing The Junction Based On Gender & Age group

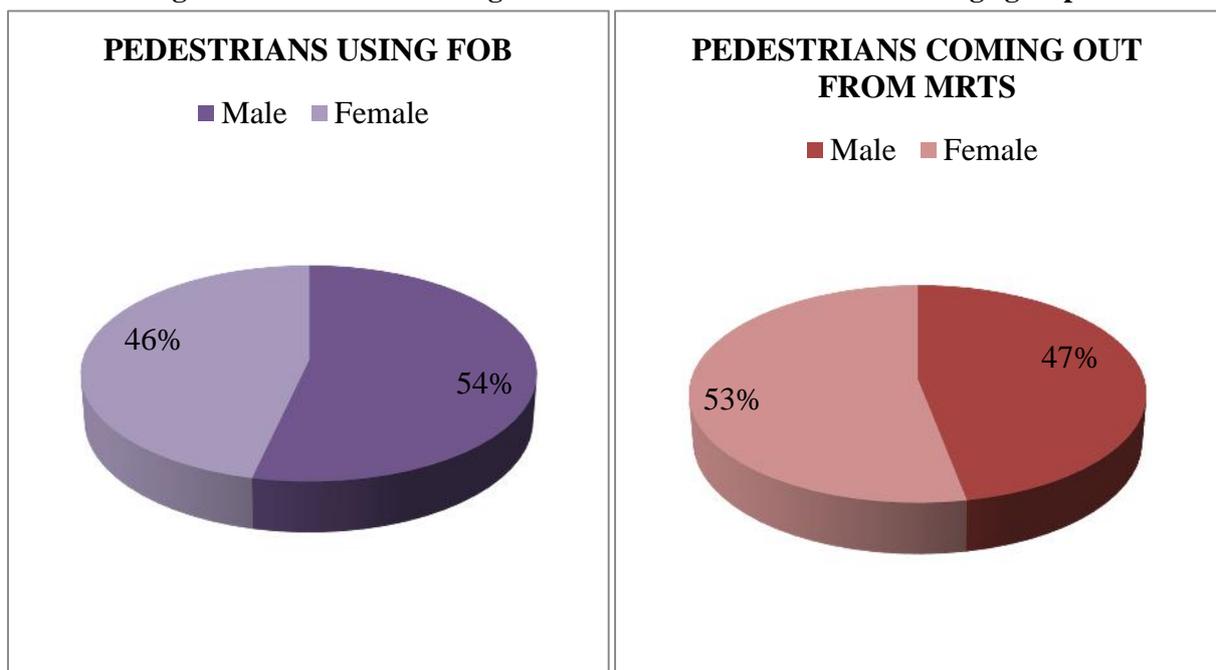


Fig 4.3 Pedestrian Using Foot Over Bridge & Pedestrian Coming out From MRTS

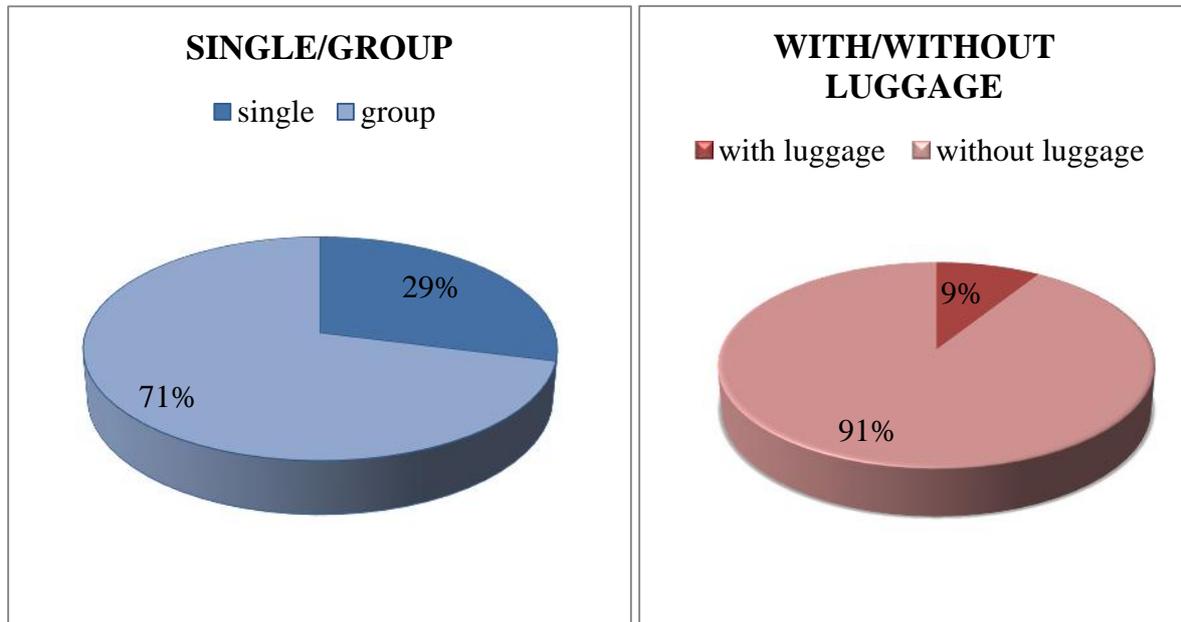


Fig4.4 Pedestrian Crossing the Road in Single/Group &With/Without Luggage

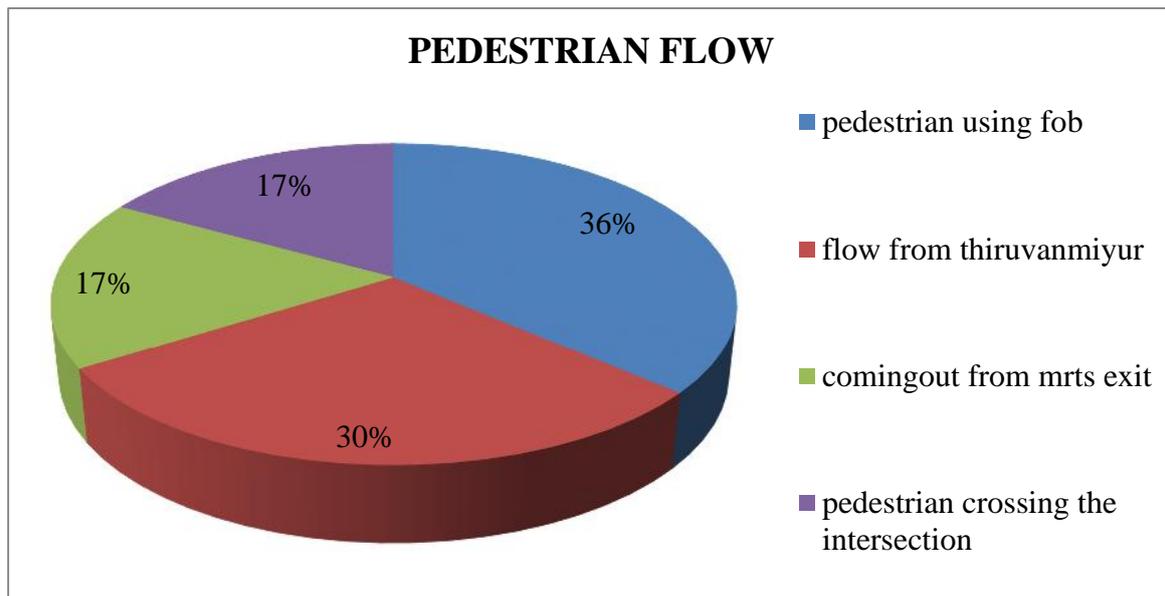


Fig 4.5 Pedestrian Flow In Tidel Park Signal

Table 4.3 Average Speed of Pedestrians Based on Gender

Description	Speed in m/sec
Male	0.85
Female	0.73
Average Speed	0.79

Table 4.4 Average Pedestrian Crossing Time And Pedestrian Speed

Age Group	Crossing Time in Seconds	Speed in m/Sec
<14	27.32	0.85
14-60	29.37	0.78
>60	31.2	0.74

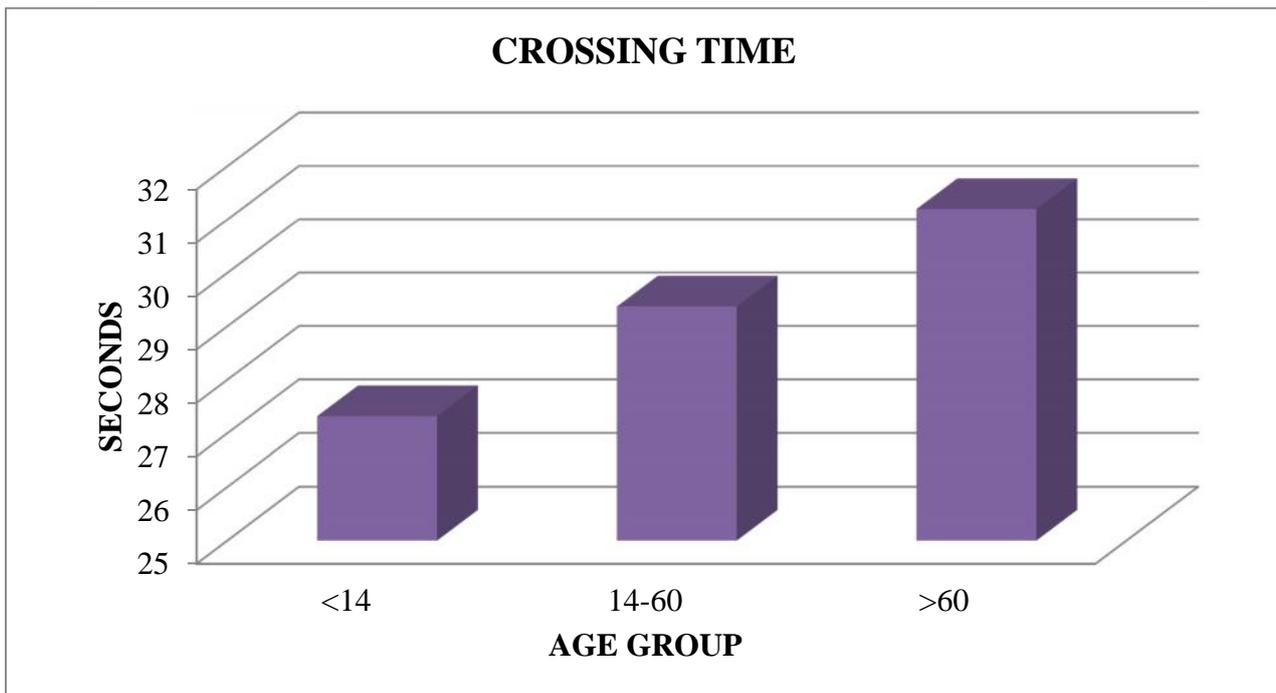


Fig 4.6 Crossing Time for Pedestrians

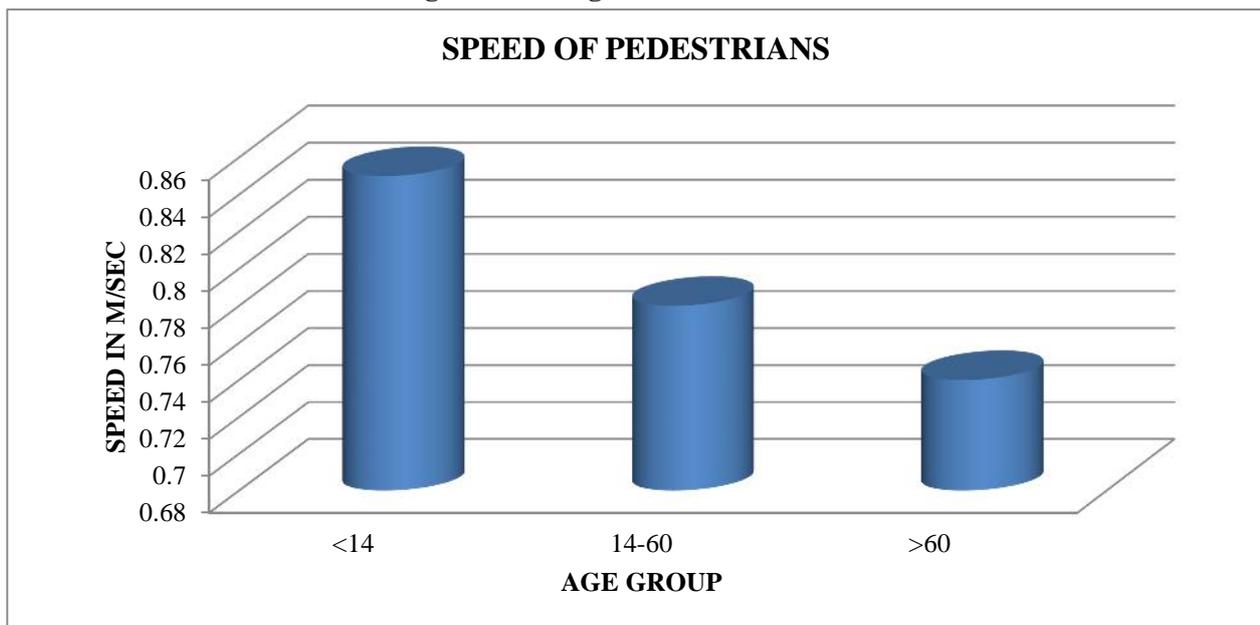


Fig 4.7 Speed of Pedestrians Based on Age Group

Data was analysed from the questionnaire survey done at Tidel Park on 1st April 2015 from 6:30PM to 9:30PM. The survey was done to 100 people out of whom 61 were male and 39 were female. From the analysis we conclude that about 59% of pedestrians suggest for separate timing for pedestrians, 22% of pedestrians suggest for escalator to climb the FOB and 19% of pedestrians suggests for subway for their safe crossing.

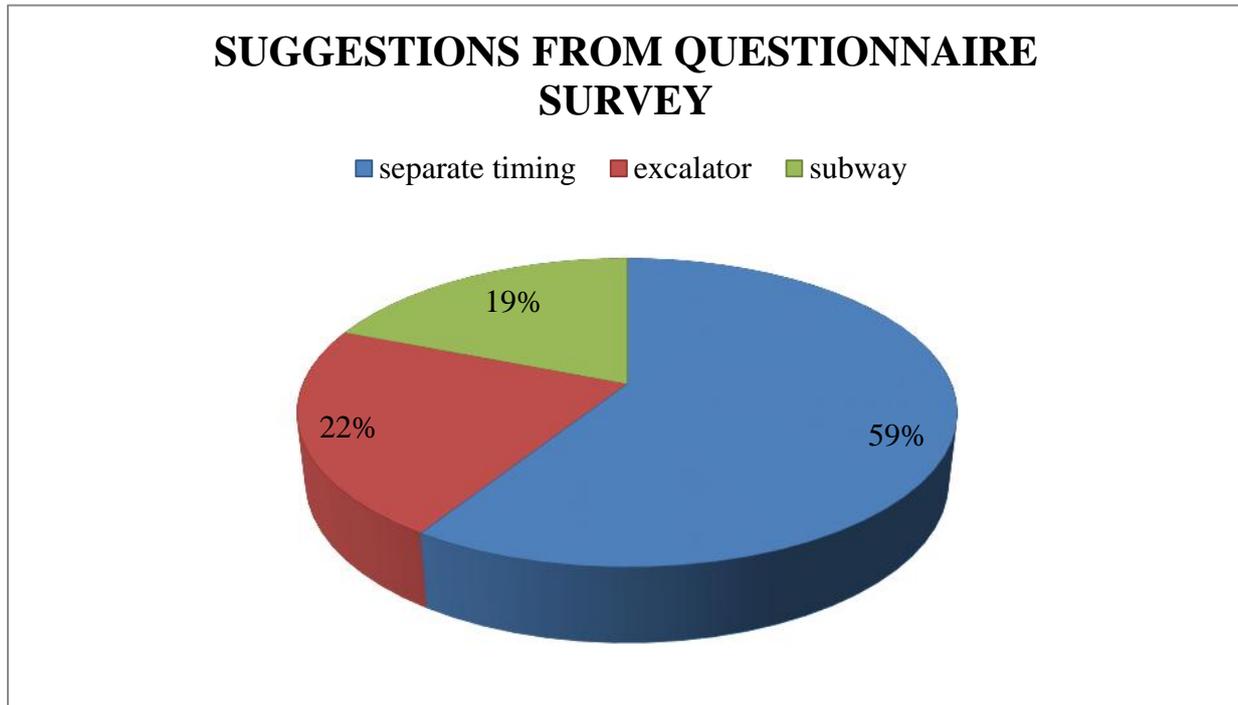


Fig 4.8 Suggestion From The Questionnaire Survey

4.1 Data Extraction Software:

Speed of the pedestrian, volume count of pedestrians based on age, gender, crossing in single/group, crossing with/without luggage can be obtained by video extracting software, Pedestrian entry exit software.

4.2 Data Extraction Procedure:

- Open the collected video in data extraction software and set the video starting time, select the gender of the pedestrian and age limit of the pedestrian after observing the video.
- Click entry while the pedestrian enters the intersection and click the exit button while the pedestrian left the intersection.
- Extracted data are stored in the database in a sequence manner in an excel sheet.
- From these data, pedestrian count are be calculated based on the age, gender and speed of the pedestrians are calculated from the observed pedestrian crossing time and width of the intersection
- From the video, pedestrian count based on whether crossing in single/group, crossing with/without luggage are also can be calculated. Fig 4.1, 4.2, 4.3 and 4.4 shows the snapshot of data extraction software to obtain pedestrian count and snapshot of database in data extraction software.



Fig 4.9 Snapshot of Data Extraction Software-Tidel Park

Test No	Lane No	StartTime	EndTime	Gender	Age	Direction
0	0	0:0:9.8150	0:1:24.6653	Female		Upward
0	0	0:0:9.8150	0:1:25.5632	Female		Upward
0	0	0:37:15.7776	0:37:35.1939	Male	< 14	Downward
0	0	0:57:21.8415	0:57:29.0940	Male	< 14	Downward
0	0	1:10:6.1495	1:11:16.6435	Male	< 14	Upward
0	0	0:0:57.5218	0:1:25.5543	Male	> 30	Upward
0	0	0:7:17.2392	0:7:36.4073	Male	> 30	Upward
0	0	0:16:22.3609	0:16:40.6155	Male	> 30	Upward
0	0	0:16:24.2898	0:16:38.5197	Male	> 30	Upward
0	0	0:21:25.2900	0:22:17.9710	Female	> 30	Upward
0	0	0:21:46.3847	0:22:27.8166	Male	> 30	Upward
0	0	0:4:40.2438	0:5:2.3652	Male	> 30	Downward
0	0	0:30:27.0003	0:31:31.5463	Male	> 30	Upward
0	0	0:49:57.1983	0:50:11.5405	Male	> 30	Upward
0	0	0:50:2.4137	0:50:27.3169	Female	> 30	Upward
0	0	0:50:53.0031	0:51:4.6008	Male	> 30	Upward
0	0	0:50:49.0130	0:51:1.1039	Female	> 30	Upward
0	0	0:51:5.8282	0:51:23.3891	Female	> 30	Upward

Fig 4.10 Snapshot of Data Base -Tidel Park

5. CONCLUSIONS AND DISCUSSIONS

Qualitative

From the Questionnaire survey, it is concluded that Tidel park signal has pedestrian crossing facilities like Foot Over Bridge; but due to the urgency, inconveniency and large distance from the intersection, pedestrians used to cross on the carriage way. It is suggested that a separate timing for pedestrians is required to cross the junction, escalator to climb the Foot Over Bridge or provision of Subway for their safe crossing of junction.

Quantitative

From the Video graphic survey at Tidel Park signal, it can be understood that male pedestrians are more in number than female pedestrians, about 55% are male and 45% are female. Based on the age group 14-

60 will contribute the maximum of about 92% and age group >60 is about 7% and age group <14 is only 1%. Pedestrians cross in group are more than that of crossing in single as they move in a group for their safe crossing, and it was about 71% and crossing single are about 29%. And crossing without luggage are more about 91% and crossing with luggage are very minimum, and about 9%. And the speed of pedestrians below 14 is about 0.85m/sec and age group 14-60 is 0.78m/sec and age group above 60 are about 0.74m/sec.

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