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Ministry of Housing and Urban Affairs
Government of India
सत्यमेव जयते

"UNDERSTANDING THE UTILIZATION PATTERNS OF PEDESTRIAN CROSSING FACILITIES: EVIDENCE FROM BHOPAL CITY"

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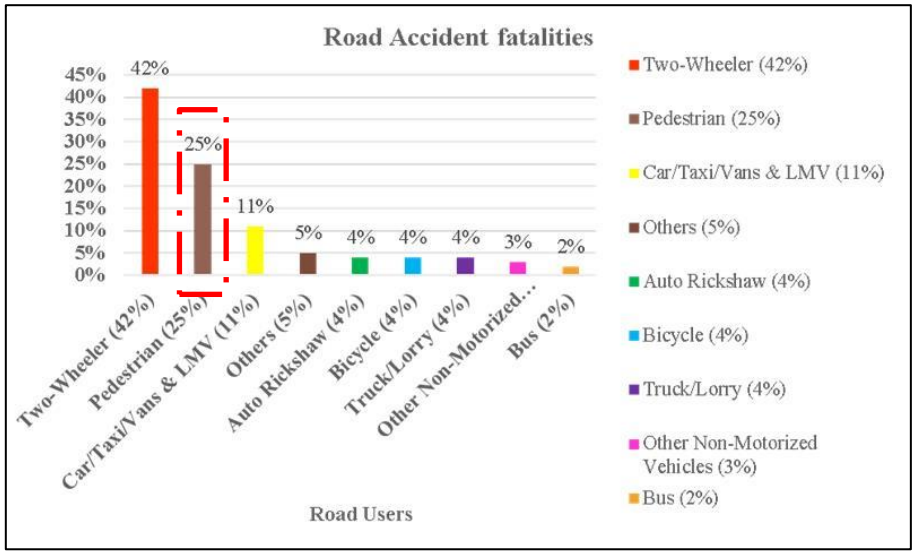
Presentation Outline

- Introduction
- Study Area
- Data Collection
- Road Geometrics of Selected Sites
- Descriptive Analysis
- Results
- Conclusion and Site Specific Recommendation
- References

Introduction

- Pedestrians constitute 22% of global road deaths (WHO, 2013)
- In India, pedestrians are involved in 8.7% of traffic accidents (Ministry of Road Transport and Highways).
- Provision of safe and comfortable facilities for pedestrians is essential.
- The Indian government has allocated substantial funds for constructing Pedestrian Underpasses, Subways, and Foot Over Bridges (MoRTH Research Wing, 2020)



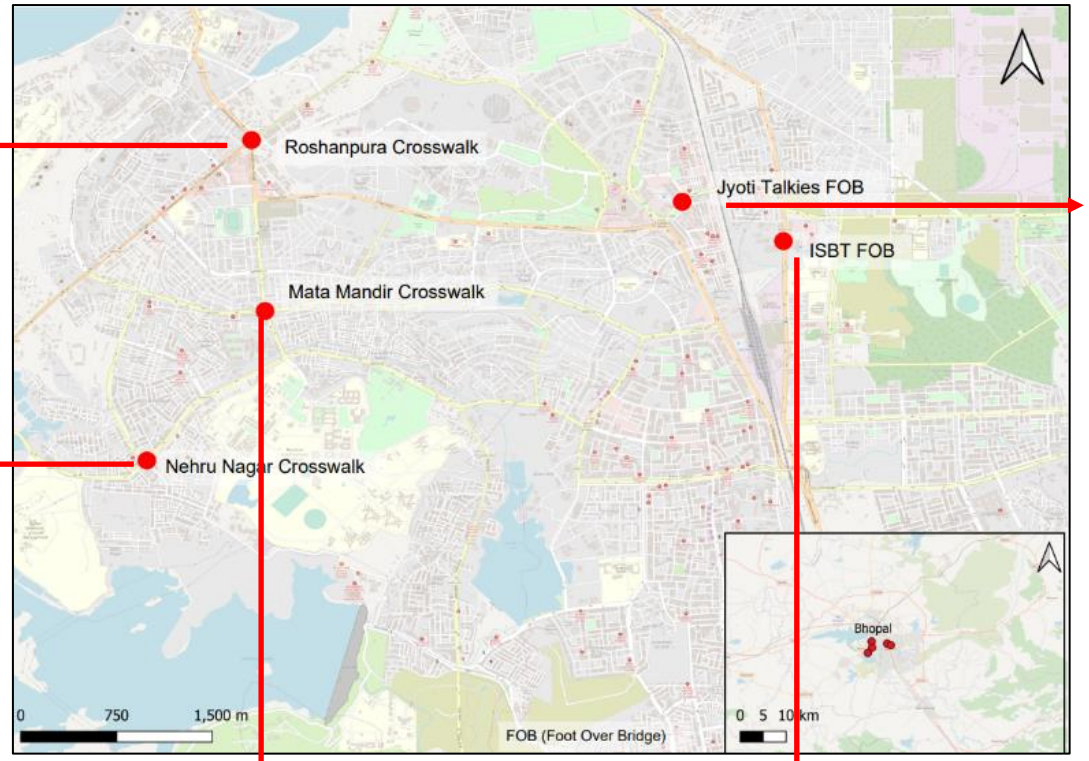
S. No.	Million Plus Cities	2017	2018	2019	2020	2021
1	Chennai	7,257	7,580	6,871	4,389	5,034
		8.74	8.79	8.21	7.31	7.48
2	Delhi	6,673	6,515	5,610	4,178	4,720
		8.04	7.56	6.70	6.96	7.01
3	Jabalpur	3,303	3,419	3,397	3,226	3,855
		3.98	3.97	4.06	5.37	5.73
4	Indore	4,513	3,434	3,383	3,036	3,676
		5.44	3.98	4.04	5.06	5.46
5	Bengaluru	2,297	4,611	4,684	3,233	3,213
		2.77	5.35	5.59	5.38	4.77
6	Bhopal	3,393	3,508	3,287	2,295	2,616
		4.09	4.07	3.93	3.82	3.89
7	Vizaq	1,667	1,838	1,706	1,765	2,339
		2.01	2.13	2.04	2.94	3.48
8	Hyderabad	2,834	2,846	2,900	2,064	2,273
		3.41	3.30	3.46	3.44	3.38
9	Mumbai	3,160	3,162	2,872	1,812	2,230
		3.81	3.67	3.43	3.02	3.31
10	Jaipur	2,983	2,781	4,271	1,940	2,165
		3.59	3.23	5.10	3.23	3.22
Total top 10		**38,080**	**39,694**	**38,981**	**27,938**	**32,121**
% Share in Total		**45.88**	**46.05**	**46.55**	**46.53**	**47.73**
All Cities Total		**82,286**	**85,318**	**82,781**	**58,736**	**67,301**

Road Accident in India 2021 (MoRTH)

Selected Study Area

Roshanpura Crosswalk

Nehru Nagar Crosswalk



Map showing Study Area (Source: Open Source)

Jyoti Talkies Foot Over Bridge

Mata Mandir Crosswalk

ISBT Foot Over Bridge

Study Area Characteristics

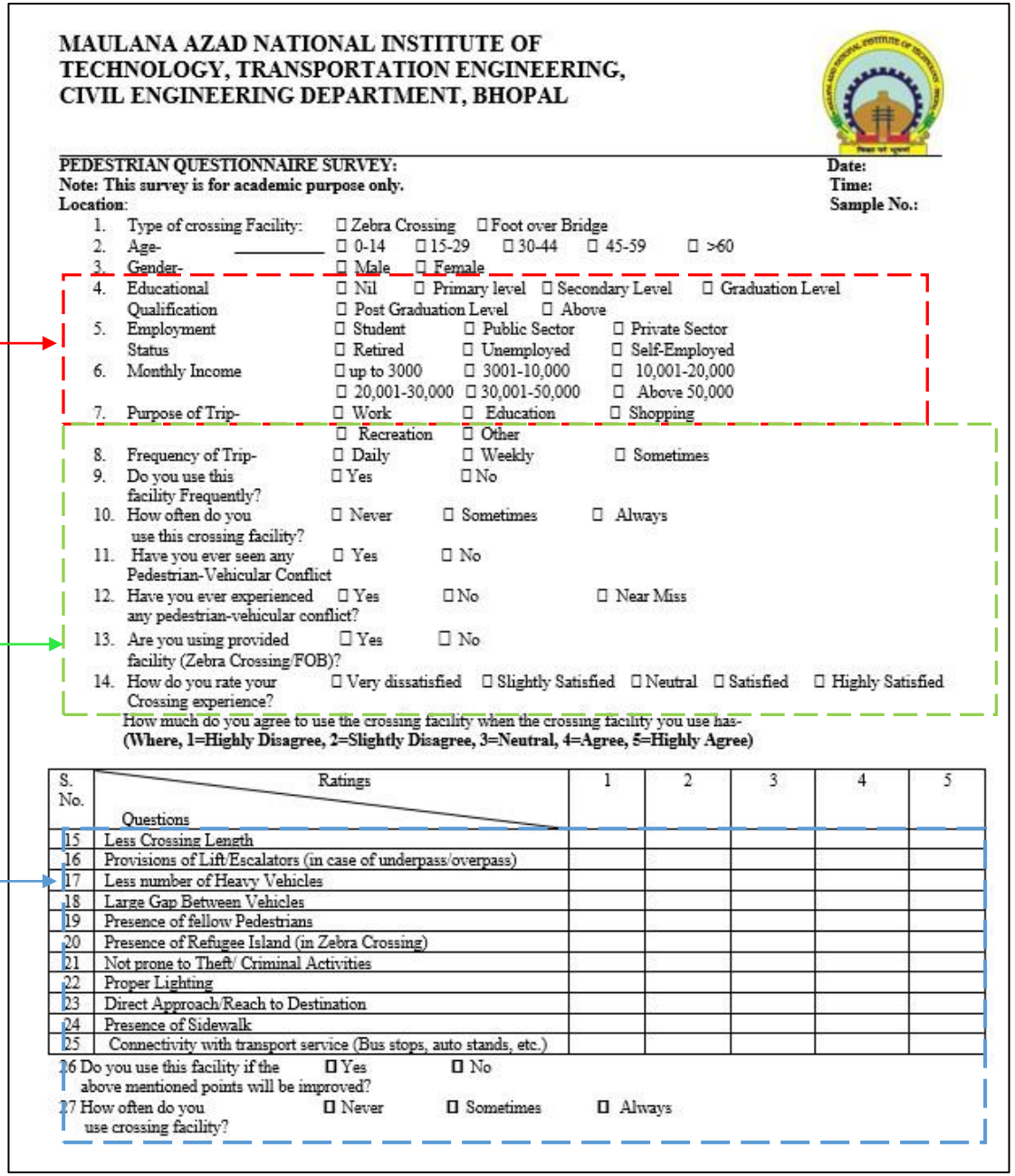
Sl. No	Type of Facility	Location Name	Characteristics	Sample Collected	Peak/Non peak hour
1	Zebra Crossing	Nehru Nagar Zebra Crossing	This crossing is provided near round about where traffic volume is around 3294 Vehicle /hr, pedestrian volume 858 persons/hr and average speed of vehicles was 25 km/hr. and pedestrian 4.24 Km/hr. Pedestrian signal or traffic signal are absent. Most of pedestrians cross ahead or beyond the designated zebra crossing provided under utilizing the provided one.	76	Peak hour
2	Zebra Crossing	Mata Mandir Zebra Crossing	This crossing is provided near round about where traffic volume is around 4200 Vehicle /hr, pedestrian volume 564 persons/hr and average speed of vehicles was 45.67 km/hr. and pedestrian was 4.71 Km/hr Pedestrian signal or traffic signal are absent. Most of pedestrians cross ahead or beyond the designated zebra crossing provided under utilizing the provided one.	80	Peak hour
3	Foot Over Bridge	Jyoti Talkies Foot over Bridge	This facility present near shopping and commercial zone of Bhopal city. The crossing length of the over pass is 35 m. Traffic volume and speed of vehicles is 3144 Vehicle/hr and 25 Km/hr Pedestrian movement was noted to be 642 persons/ hour total pedestrians flow around and a pedestrian speed of 5.6 Km/hr	80	Peak hour
4	Foot Over Bridge	ISBT Foot over Bridge	This facility present near Inter State Bus transport of Bhopal city (ISBT). The crossing length of the over pass is 30 m. Pedestrian movement was noted to be 23 persons/ hour which is very low in number considering the total pedestrians flow around and pedestrian speed of 3.45 Km/hr The traffic volume was 5856 Vehicle/hr and a traffic speed of 35 Km/hr.	80	Peak hour
5	Zebra Crossing	Roshanpura Roundabout Zebra Crossing	This facility present near shopping and commercial zone of Bhopal city. The pedestrian volume and pedestrian speed were 520 Pedestrian/hr and 4.78 Km/hr respectively. The traffic volume and speed were 5244 vehicle/hr and 8.63 Km/hr	80	Peak hour

Questionnaire proforma

Personal characteristics

Walk Trip Characteristics

Pedestrian Perception



MAULANA AZAD NATIONAL INSTITUTE OF TECHNOLOGY, TRANSPORTATION ENGINEERING, CIVIL ENGINEERING DEPARTMENT, BHOPAL

PEDESTRIAN QUESTIONNAIRE SURVEY: **Date:**
Note: This survey is for academic purpose only. **Time:**
Location: **Sample No.:**

1. Type of crossing Facility: ☐ Zebra Crossing ☐ Foot over Bridge
2. Age- _____ ☐ 0-14 ☐ 15-29 ☐ 30-44 ☐ 45-59 ☐ >60
3. Gender- ☐ Male ☐ Female
4. Educational Qualification ☐ Nil ☐ Primary level ☐ Secondary Level ☐ Graduation Level ☐ Post Graduation Level ☐ Above
5. Employment Status ☐ Student ☐ Public Sector ☐ Private Sector ☐ Retired ☐ Unemployed ☐ Self-Employed
6. Monthly Income ☐ up to 3000 ☐ 3001-10,000 ☐ 10,001-20,000 ☐ 20,001-30,000 ☐ 30,001-50,000 ☐ Above 50,000
7. Purpose of Trip- ☐ Work ☐ Education ☐ Shopping ☐ Recreation ☐ Other
8. Frequency of Trip- ☐ Daily ☐ Weekly ☐ Sometimes
9. Do you use this facility Frequently? ☐ Yes ☐ No
10. How often do you use this crossing facility? ☐ Never ☐ Sometimes ☐ Always
11. Have you ever seen any Pedestrian-Vehicular Conflict ☐ Yes ☐ No
12. Have you ever experienced any pedestrian-vehicular conflict? ☐ Yes ☐ No ☐ Near Miss
13. Are you using provided facility (Zebra Crossing/FOB)? ☐ Yes ☐ No
14. How do you rate your Crossing experience? ☐ Very dissatisfied ☐ Slightly Satisfied ☐ Neutral ☐ Satisfied ☐ Highly Satisfied

How much do you agree to use the crossing facility when the crossing facility you use has-
(Where, 1=Highly Disagree, 2=Slightly Disagree, 3=Neutral, 4=Agree, 5=Highly Agree)

S. No.	Ratings / Questions	1	2	3	4	5
15	Less Crossing Length					
16	Provisions of Lift/Escalators (in case of underpass/overpass)					
17	Less number of Heavy Vehicles					
18	Large Gap Between Vehicles					
19	Presence of fellow Pedestrians					
20	Presence of Refugee Island (in Zebra Crossing)					
21	Not prone to Theft/ Criminal Activities					
22	Proper Lighting					
23	Direct Approach/Reach to Destination					
24	Presence of Sidewalk					
25	Connectivity with transport service (Bus stops, auto stands, etc.)					

26 Do you use this facility if the above mentioned points will be improved? ☐ Yes ☐ No

27 How often do you use crossing facility? ☐ Never ☐ Sometimes ☐ Always

Data Collection

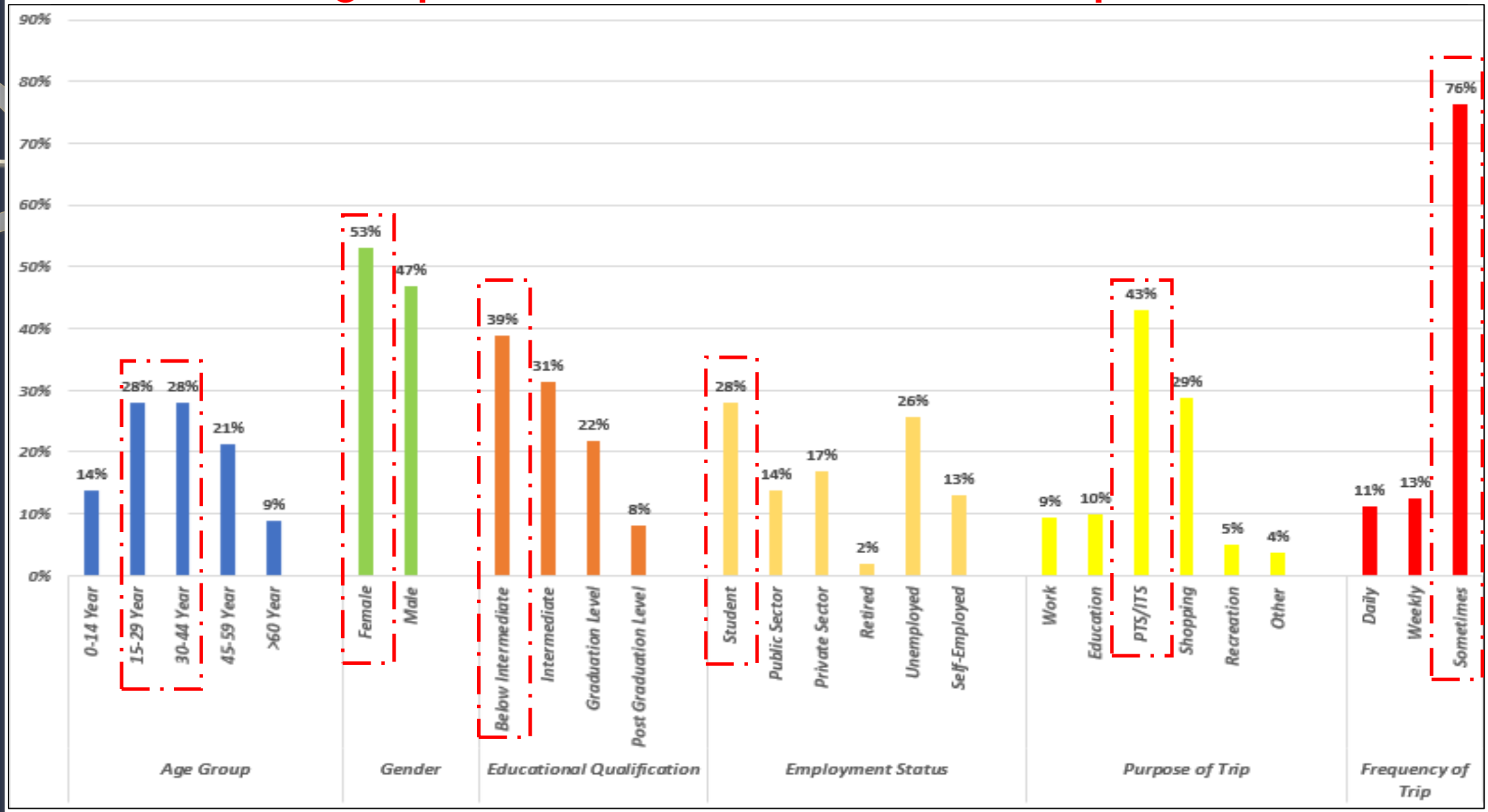
- Road inventory survey was conducted.
- Face to Face Survey was conducted.
- Simple Random Sampling.
- Survey was done in the month of December and January in the evening peak hour.
- Questionnaire was also translated to Hindi for better understanding of the pedestrians.

Road Geometrics of Selected Crossing Facilities

Characteristics	Roshanpura Intersection	Mata Mandir Intersection	Nehru Nagar Intersection	Jyoti FOB	ISBT FOB
Presence of Traffic Signal	Yes	No	No	-	-
Pedestrian Signal Head	No	No	No	-	-
Road Marking and Signage	Yes	Yes	Yes	Yes	Yes
Presence of Footpath	Yes	Yes	Yes	Yes	Yes
Pavement Condition	Good	Good	Good	-	-
FOB Infrastructure Condition	-	-	-	Good	Good
Encroachment	Absent	Absent	Present	No	No
Presence of Lift	-	-	-	Yes (Not working)	Yes (Not working)
Entry Width	12	15	10	-	-
Exit Width	12	15	10		
Circulatory Roadway	20	44	28	-	-
Weaving Width	12	12	15	-	-
Weaving Length	40	40	27	-	-
Non-weaving width	12	12	15	-	-
Width of Crosswalk/FOB	3	3	3	5	5
Length of Crosswalk/FOB	36	32	22	35	30
Median Width	5	10	5	-	-
Width of Refugee Island	3	-	-	-	-

Note: All measurements are in meters

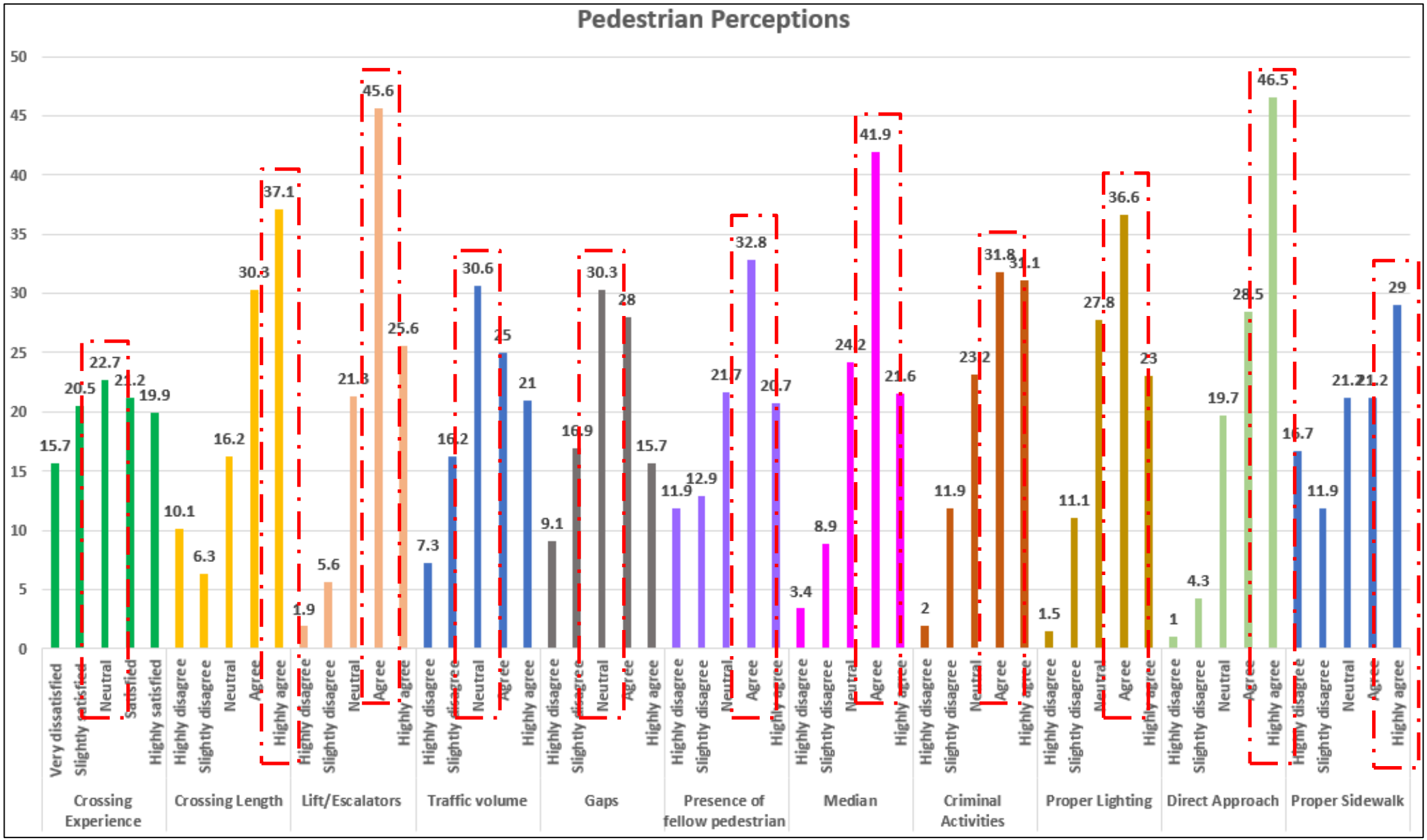
Socio-Demographic Characteristics of Respondents



Cross Section Demographic characteristics

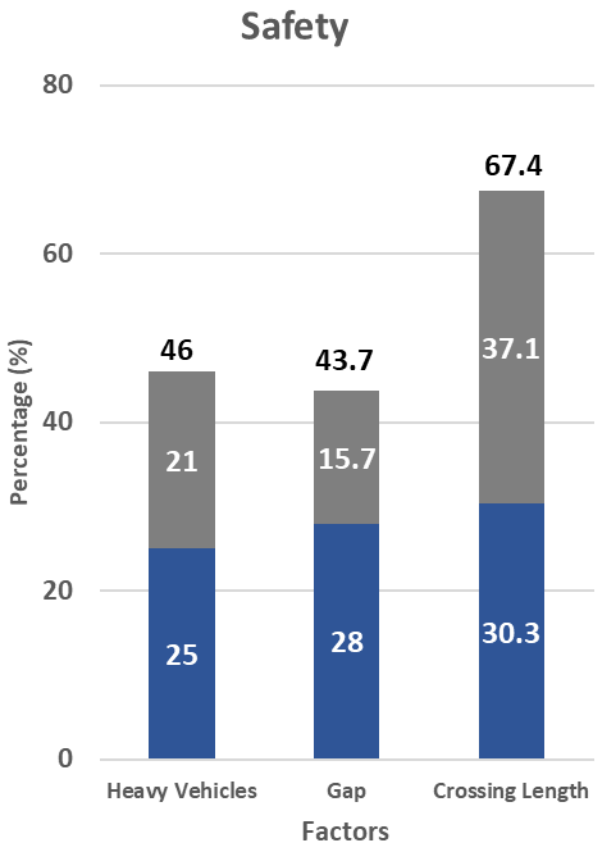
FSB Socio-Demographic characteristics

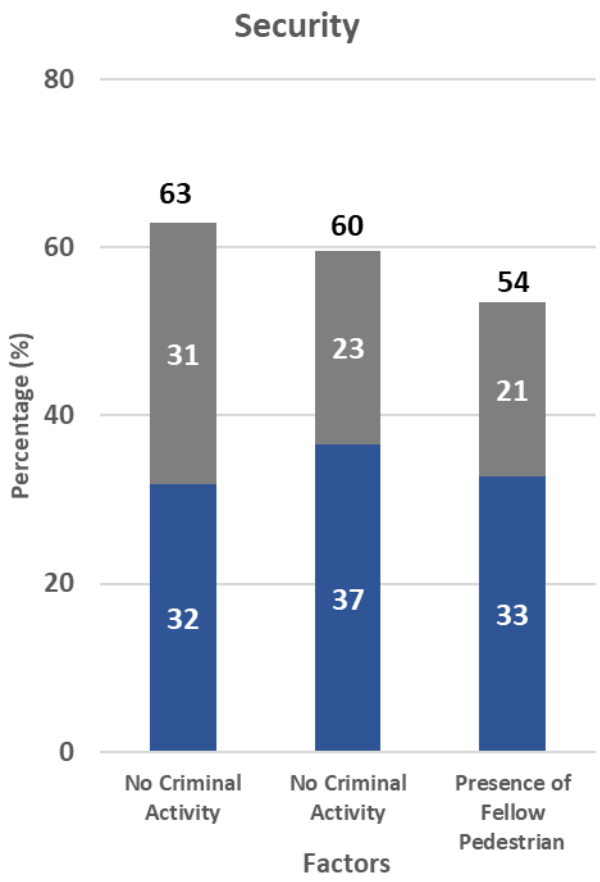
Factors Considered

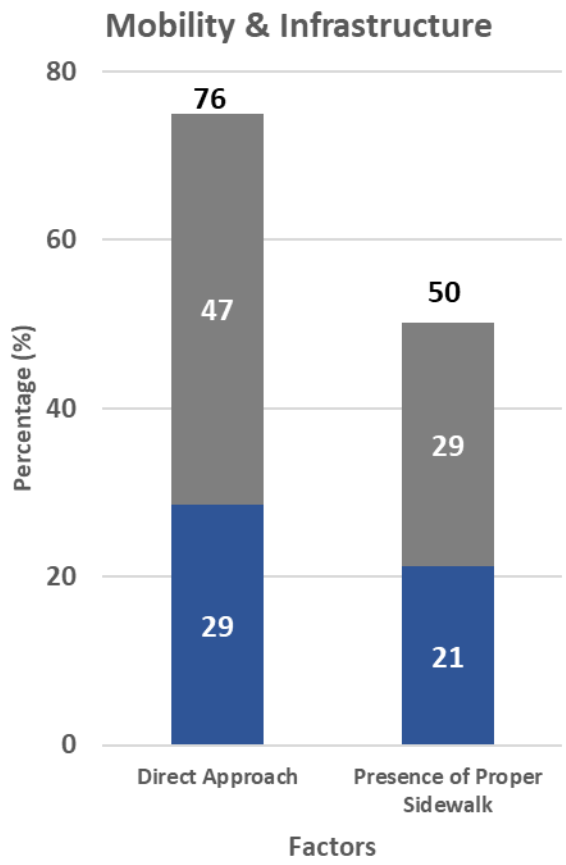


Results

The descriptive analysis results for Safety, Security, Mobility and Infrastructure







Conclusion and Site Specific Recommendations

- Conduct public awareness campaigns to educate pedestrians about the importance of using designated crossing facilities.
- Promote the benefits of using zebra crossings and foot over bridges for safety and convenience.
- Make pedestrian crossing facilities more accessible, especially for individuals with disabilities or reduced mobility.
- Ensure ramps, elevators, and other accessible features are in place to cater to the needs of all pedestrians.
- Improving direct approach by means of ramps may lead to increased utilization of FOB (Anciaes and Jones, 2019).
- Speed limits, no overtaking signs and speed cameras can be installed to reduce the high speed of approaching vehicles on the zebra crossing (Mukherjee and Mitra, 2019).
- Providing CCTV cameras and security can improve the choice of using FOB (Banerjee et al., 2020).
- At ISBT FoB, the pedestrians were of the opinion that the location of FoB was far from the ISBT exit gate. So, providing some connectivity like proper sidewalks or stairs from the ISBT exit gate to FoB may improve the chances of utilization if the same by the pedestrians.
- At Jyoti Talkies, the FoB is constructed near the intersection. Hence people were found to usre the crosswalks more often than FoB. Hence, FoB seem to be inappropriate at that location.
- At Mata Mandir and Nehru Nagar, the crosswalks were faded. Providing properly marked crosswalks can enhance the feeling of safety among pedestrians and enable them to use the same.

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Thank You

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