Pedestrian Charateristics and Behaviour on Surrounding Temple Area Madurai

Bharathy G
PG/Infrastructure Engineering and Management,
Department of Civil,
Thiagarajar College of Engineering,
Madurai, India.

Ms.Karthigaipriya T
Department of Civil,
Thiagarajar College of Engineering,
Madurai, India.

Abstract:

A clear understanding of the pedestrian behaviour under mixed traffic conditions is, need for providing necessary infrastructure and also for enhancing pedestrian safety at congested area. The road is a built environment that should enhance safety and security for pedestrians also, but this ideal is not always the case. Though the pedestrians the heart beat of any development, CBD attracts more customers and one among the world wonders is also located in this area which attracts al lot of foreign and other states and area people towards it. Walking is a basic daily activity, pedestrians during at least a portion of every trip. Major constraint for growth in Madurai, is the limited area available for development and the high population density (56 wards of a total of 72 wards have density above 200 Persons per Ha), within the corporation limits thus making it saturated.

This paper attempts to analyze the various behaviour and characteristics of pedestrians like crossing speed, compliance with signal, and pedestrian-vehicular interaction under mixed traffic conditions and to identify the influencing factors based on statistical tests. 350 pedestrian samples were observed from 7 different in Madurai CBD area for analyzing pedestrian behaviours and the significant factors affecting pedestrians were identified by conducting RII (Relative Importance Index) method. Factors influencing pedestrian crossing speed have been studied and a design crossing speed has been determined for old and adult pedestrians as 0.95 m/s and 1.12 m/s respectively.

By using the concern samples from analysis and suggestion from the people point of view the conclusion have made with adaptable manner.

Index Terms:

CBD (Commercial Business Area), RII (Relative Importance Index), Pedestrian Behavior, Pedestrian-Vehicular Interaction.

INTRODUCTION:

The concern of this report is to discuss as detailed as possible on the pedestrian management in CBD area. Its intention is to describe, explain and comment pedestrian management with respect to road infrastructure. Pedestrians, in particular, are considered as the most vulnerableroad users in less developed countries (LDCs). Madurai being a tourist place attracts large number of tourist throughout the year. The city is mainly depending on the tourism related activity for the economy in addition to other industries. In the coming year tourism will remain key factor and continue to attract tourist.

Considering the above, change in travel pattern in the city will be minimum. Also the city has reached saturation level in the land development. Any change in travel pattern would necessitate huge land acquisition and resettlement issues. The World Health Organization expects traffic injuries to be the fifth leading cause of death across the globe by the year 2030 ifno immediate action is taken (World Health Organization, 2013).

Keeping in view the limitation in the data available, the accuracy level in the future pedestrian travel demand and the nature of city pedestrian travel demand modeling is not considered essential. Discontinuous foot path, encroachment of footpath and poorly designed foot path has forced the pedestrian to walk on the carriageway which leads to safety problems for the pedestrian. Out of 565 accidents, 160 accidents involve pedestrians. Hence in order to enhance the pedestrian safety, it is suggested that on all major roads and roads connecting to temple should be provided with continuous and encroachment free walkway with hand rail for pedestrian.

CHAPTER 1
INTRODUCTION
1.1 GENERAL

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1.1.1 PEDESTRIAN

A pedestrian is a person travelling on foot. Pedestrians are nothing but the walkers, the person one who use pathway or carriage way to walk. Every individual have to walk for certain distance to reach the certain destination respectively.

1.1.2 CENTRAL BUSINESS DISTRICT

The CBD or Central Business District is the focal point of a city. It is the commercial, office, retail, and cultural center of the city and usually is the center point for transportation networks. As being central business area with the presence of various temples located inside it attracts many people both local and other tourist people. As cities grew and developed, CBDs became a fixed location where retail and commerce took place. The CBD is typically at or near the oldest part of the city and is often near a major transportation route that provided the site for the city's location, such as a river, railroad, or highway.

1.2 PROJECT STUDY AREA

The area selected for this project work is Madurai CBD. Madurai is located in the south west part of Tamil Nadu. Being an important tourist destination; it attracts large number of tourist vehicle into the heart of the city. Trip attraction also high in Madurai - CBD. Madurai being a tourist place attracts large number of tourist throughout the year. The city is mainly depending on the tourism related activity for the economy in addition to other industries. In the coming year tourism will remain key factor and continue to attract tourist.

Considering the above, change in travel pattern in the city will be minimum. Also the city has reached saturation level in the land development. Any change in travel pattern would necessitate huge land acquisition and resettlement issues

Fig 1.1 Project study area

Table 1.1 Streets of Madurai CBD

Madurai CBD	Veli street	
	Masi street	
	Avanimoola street	
	Chithirai street	

The Area which shown in the map below have been suggested by experts and people inside the CBD area where the improvement have to be enhanced.
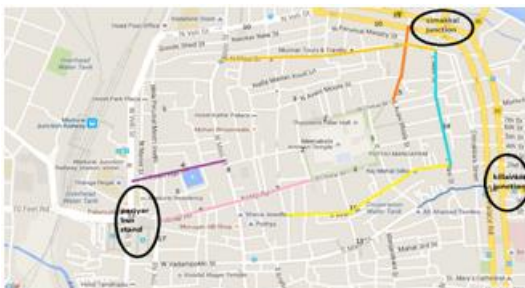

Fig 1.2 Selected locations

- NETHAJI STREET
- TOWNHALL ROAD
- EAST AVANI MOOLA STREET
- NORTH MASI STREET
- SOUTH AVANI MOOLA STREET
- SOUTH MASI STREET
- EAST MASI STREET

1.3.1 IDENTIFIED PROBLEMS

- Presence of temple and wholesale market within the CBD area attracts large volume of pedestrian volume on the streets. Lack of basic facilities for the pedestrian as they are the backbone of development
- Excessive delays, lack of facilities for pedestrians are the key problems at intersection.
- Lack of waste management: Presence of whole sale market, grocery market and private transport offices in the Central Business District (CBD) creates huge waste disposal.
- The road side vendors plays a major role in disturbing the pedestrian flow as they fully occupied the sidewalks
- On street parking in the CBD, creates a lot of chaos for the pedestrians as due to over congestion and lack of parking area

1.4 AIM

To assess the pedestrian traffic in Madurai CBD and formulate strategy plan for pedestrian management by considering future scenario (2030)

1.5 OBJECTIVES

The objective of the study is to develop a pedestrian management system for an identified study area. Following are the identified objectives for this research work:

- To identify the existing condition of the roads and pedestrian facilities
- To analyse the social economic and democratic profile on pedestrians and their travel characteristics
- To suggest best strategy plan for pedestrian management

CHAPTER 2
METHODOLOGY
2.1 GENERAL

Based on a detailed literature review the following methodology was formulated, and being adapted project I study methodology was highlighted in the research methodology. The methodology help to split the concern study into step by step art or procedure. While proceeding the flow of work it will be reliable

Approach to the study

In this area, the concept for the project was derived based on the related work to the city, from various thesis works with respect to Madurai CBD.

Literature review

For any project review of the literatures play a major role, for this study, literatures related to Pedestrian management, and pedestrian flow with respect to their behaviour and characteristics was collected and studied, And also pedestrian strategy and management techniques related literatures were also studied, and reviewed

Study area description

The study area was the central business district area of the city, In this section all the details about the identified areas was collected and reported. The chosen for the data collections are also mentioned and justified.

2.2 RESEARCH METHODOLOGY
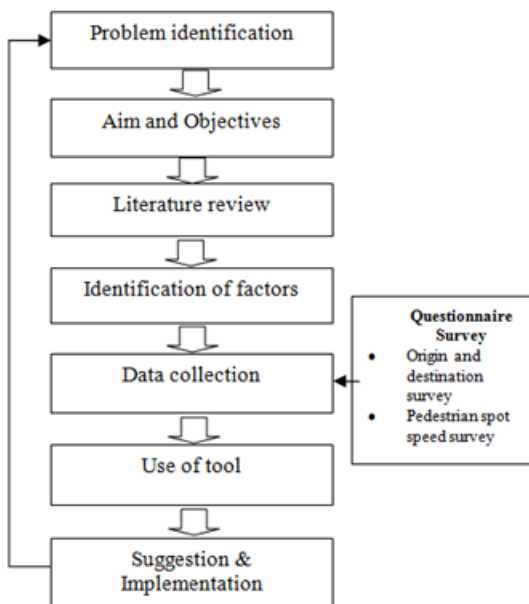
2.2.1 IDENTIFICATION OF FACTORS
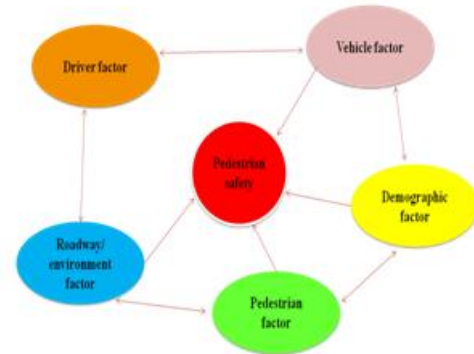
2.2.1.1 VEHICLE & DRIVER FACTORS

- Precepation of risk (eg. Alcohol Consumption, mobile use, etc)
- Speed of vehicle
- Volume of traffic
- Types of vehicle

2.2.1.2 PHYSICAL CHARACTERISTICS

- Lack of crossing devices
- Lack of midblock crossing
- Width of road
- Poor side walk
- Absence of side walks
- Capacity of sidewalks
- Poorly timed signals

2.2.1.3 SPECIAL CONDITIONS

- Weather
- One way street
- Children & teers
- Unlawful street vending
- Shopping centres
- Construction
- People with limited mobility

2.2.1.4 PEDESTRIAN BEHAVIOUR

- Pedestrian walking
- Perception of risk
- Alcohol consumption
- Sped and pace of life
- Unawareness of laws

- Lack of sign board
- Hard mentality

2.2.2 DATA COLLECTION

From the investigation of the literature review, the total number of required samples are fixed as 350 samples from different locations. The questionnaire survey have made for different types of people varies from their gender, age, location, purpose, etc. The data have collected in simulations duration. The questionnaire have prepared with respect to the factors that are affecting the flow or behaviour of pedestrian.

- Nethaji street (50 samples)
- Townhall road (50 samples)
- east avani (50 samples)
- north masi (50 samples)
- south avani (50 samples)
- south masi (50 samples)
- East masi (50 samples)

2.2.3 DATA ANALYSIS
Relative Importance Index

The relative importance index (RII) used to indicate the relative importance of each variable contributing to the poor quality performance of small scale contractors was calculated with the formula below:

$$RII = \Sigma W / (A * N)$$

W - scale for rating a factor (ranges from 1 to 5);
A – the highest weight in the scale;
N - total number of respondents.

Using this method the prioritising of the factors are done for ranking it and identifying the major issues and the improvement have to be done respectively. The various samples collected from 7 different areas and the major issues in the different areas are identified and the solutions are made respectively.

CHAPTER 3
RESULTS AND DISCUSSION
3.1 GENERAL

The major outcome of the RII method have been discussed in this section.

The data analysis results are taken for identification of major factors affecting the behaviour of the flow of pedestrian and the purpose of the trip and the frequency of the trip have been identified. This details are taken from the origin and destination survey done for pedestrian respectively.

3.2 RESULTS

The samples of about 350 for 7 different locations have been taken for the concern. The areas chosen are the major congestion area through which the inlet and outlet of the trip was made inside the Madurai CBD. With the help of the analysis, the prioritization have been done for the factors affecting the pedestrian behaviours and the improvement have to be made from the questionnaire collected from the people in Madurai CBD for all the 7 locations.

3.2.1 NETHAJI ROAD

The most congested area in Madurai CBD because of various show rooms, road side shops, market, whole sale market, restaurants, etc, present in it. The most viable reason was it origin from the Periyar bus-stand and ends near Meenakshi Amman temple, which will help the tourist and other people from various zones to easy access.

Table 3.1 Factors affecting Pedestrian flow

FACTORS	RANKING					TOTAL (N)	Σ W	MEAN (ΣW/N)	RII	RANK
	5	4	3	2	1					
No sidewalk	32	10	6	1	1	50	221	4.42	0.884	1
Sidewalks in poor condition	24	6	14	4	2	50	196	3.92	0.784	6
Unsafe intersection	24	14	6	4	2	50	204	4.08	0.816	4
Bad driver behaviours	22	14	9	3	2	50	201	4.02	0.804	5
Too much to carry	4	11	15	13	7	50	142	2.84	0.568	7
Unsure of route	7	9	10	9	15	50	132	2.64	0.528	8
I dont like to walk	8	4	9	13	16	50	125	2.5	0.5	9
Solid waste and garbage	24	21	3	1	1	50	216	4.32	0.864	2
Pollution on road	30	8	9	1	2	50	213	4.26	0.852	3

From the above table 3.1, we come to know no proper sidewalk are there for pedestrians which make them to walk on the carriage way which leads to allot of chaos for both motorized and non-motorized vehicles respectively. Due the presence of whole sale market and the showrooms present here leads to generate many solid waste and the lack of drainage system leads to stagnant of water on the sidewalk and the carriage way respectively. Road side vendor plays a vital role in the lack of sidewalk space because they occupy plenty of space for their work.

Table 3.2 Improvement need for Pedestrian

SOLU TIONS	RANKING					TOTAL (N)	ΣW	MEAN (ΣW/N)	RII	RANK
	5	4	3	2	1					
More sidewalk	30	12	8	0	0	50	222	4.44	0.89	2
Maintenance of sidewalks	31	14	5	0	0	50	226	4.52	0.9	1
Better street lighting	23	15	8	3	1	50	206	4.12	0.82	8
Improved connection between sidewalks, bikeways	21	19	7	3	0	50	208	4.16	0.83	7
Proper drainage	27	16	6	0	1	50	218	4.36	0.87	4
Better intersections (pedestrian signals & crossways)	28	15	6	1	0	50	220	4.4	0.88	3
Separation from vehicular traffic	28	14	7	0	1	50	218	4.36	0.87	4
ITS for pedestrians	30	11	5	4	0	50	217	4.34	0.87	6

From the table 4.2, the immediate solution have to be done should be maintaining the existing sideways periodically and providing the continuous sidewalk wherever possible which make the safe, convenient and comfort for the pedestrians. The signals have to be provided so that the collision between the pedestrians and vehicles will be reduced, at present there is no proper signal and traffic police for guiding the flow of vehicles and pedestrians respectively.

Early peak hour   Morning peak hour   Evening peak hour

Fig.3.1 Field observation for various duration

3.2.2 TOWNHALL ROAD

The area in which all the electronic shops are present and the restaurants are located in huge. It origin from the railways junction and ends with Meenakshi Amman temple respectively. The presence of bazaar attracts allot of other zone people for their job concern purchases. As there is no proper facilities for parking the people have to walk from the Marret street. The one way street always not safe for pedestrians as the drivers can drive in their own way. From table 3.3, Many pedestrians, especially in large congested areas, violate pedestrian traffic controls and place themselves at risk for collisions with motor vehicles. About one-third of fatal crashes involving pedestrians are the result of pedestrians disobeying intersection traffic control or making mis-judgments while attempting to cross a street in unsafe intersection. There is proper zebra crossing or signal for pedestrian opposite to Thangaregal theatre where the flow of vehicle is always more and have more chance of getting accident

Table 3.3 Factors affecting Pedestrian flow

5	RANKING					TOTAL (N)	ΣW	MEAN (ΣW/N)	RII	RANK
	5	4	3	2	1					
No sidewalk	21	16	10	2	1	50	204	4.08	0.816	5
Sidewalks in poor condition	22	10	16	1	1	50	201	4.02	0.804	6
Unsafe intersection	27	13	3	3	4	50	206	4.12	0.824	4
Bad driver behaviours	24	22	1	3	0	50	217	4.34	0.868	1
Too much to carry	3	15	12	15	5	50	146	2.92	0.584	8
Unsure of route	8	10	12	12	8	50	148	2.96	0.592	7
I dont like to walk	6	7	11	4	22	50	121	2.42	0.484	9
Solid waste and garbage	25	16	6	2	1	50	212	4.24	0.848	2
Pollution on road	23	17	9	1	0	50	212	4.24	0.848	2

Early peak hour   Morning peak hour   Evening peak hour

Fig.3.2 Field observation for various duration

Table 3.4 Improvement need for Pedestrian

SOLUTIONS	RANKING					TOTAL (N)	ΣW	MEAN (ΣW/N)	RII	RANK
	5	4	3	2	1					
More sidewalk	30	9	10	1	0	50	218	4.36	0.87	1
Maintenance of sidewalks	28	11	11	0	0	50	218	4.36	0.87	1
Better street lighting	22	17	11	0	0	50	211	4.22	0.84	4
Improved connection between sidewalks, bikeways & transit	18	21	10	1	0	50	206	4.12	0.82	6
Proper drainage	22	13	14	1	0	50	206	4.12	0.82	6
Better intersections (pedestrian signals & crossways)	20	20	8	2	0	50	212	4.24	0.85	3
More separation from vehicular traffic	18	19	11	2	0	50	203	4.06	0.81	8
ITS for pedestrians	24	13	11	1	1	50	208	4.16	0.83	5

From table 3.4, The parking facilities have to made properly so that the path for pedestrians can be used by them rather than the vehicle occupancy. The loading and unloading have to be done in early morning or late night respectively. The shop keepers have to be take responsible for intimating the concern authority periodical inspection .

3.2.3 NORTH MASI STREET

This area is known for the whole sale market for fruits which attracts allot of shopkeepers in various zone for purchasing. The market is accessible from the walk able distance from Simmakal bus stop. The street is one way street which have allot of spacing but due the loading and unloading of the fruits for various area leads to congestion

Table 3.5 Factors affecting Pedestrian flow.

FACTORS	RANKING					TOTAL (N)	ΣW	MEAN (ΣW/N)	RII	RANK
	5	4	3	2	1					
No sidewalk	32	10	6	1	1	50	221	4.42	0.884	2
Sidewalks in poor condition	25	6	13	4	2	50	200	4	0.8	6
Unsafe intersection	25	13	6	4	2	50	287	5.74	1.148	1
Bad driver behaviours	23	13	9	3	2	50	202	4.04	0.808	5
Too much to carry	4	12	15	12	7	50	144	2.88	0.576	7
Unsure of route	7	10	10	8	15	50	136	2.72	0.544	8
I dont like to walk	8	5	9	12	16	50	127	2.54	0.508	9
Solid waste and garbage	25	20	3	1	1	50	217	4.34	0.868	3
Pollution on road	31	8	8	1	2	50	215	4.3	0.86	4

From table 3.5, Though Its the one ways street drivers use to drive in rush manner and no entry restrictions are not followed properly due to consumption of fuel they are not following the rules and regulations which create more issues for the pedestrians. Presence of fruit wholesale market the solid wastes are thrown just like that in the road which make the pedestrians to feel awkward respectively. No proper bins are placed for waste disposals. During rainy season it will emit allot of bad odour in huge amount. Unsafe intersection is always a major issue for the collision between pedestrian and vehicle particularly in the free left turn zones.

Table 3.6 improvement need for Pedestrian

SOLUTIONS	RANKING					TOTAL (N)	ΣW	MEAN (ΣW/N)	RII	RANK
	5	4	3	2	1					
More sidewalk	28	14	8	0	0	50	220	4.4	0.88	4
Maintenance of sidewalks	28	16	6	0	0	50	222	4.44	0.89	2
Better street lighting	18	15	13	4	0	50	197	3.94	0.79	8
Improved connection between sidewalks, bikeways & transit	21	16	9	4	0	50	204	4.08	0.82	7
Proper drainage	30	18	2	0	0	50	228	4.56	0.91	1
Better intersections (pedestrian signals &crossways)	27	11	11	1	0	50	214	4.28	0.86	5
More separation from vehicular traffic	26	14	7	2	1	50	212	4.24	0.85	6
ITS for pedestrians	32	9	7	2	0	50	221	4.42	0.88	3

From table 3.6, The proper drainage system have to provided properly by means of periodical maintenance for both drainage and sideways. The bins have to be provided in large in count because the waste from the market will be large in amount. The sidewalks have to be utilized by the pedestrians not by the shopkeepers. The standard height for the sidewalks have to be maintain throughout the area.

3.2.4 SOUTH AVANI MOOLA STREET

It is known as "Jewellery Bazaar", presence of jewellery shops in this area attracts huge people for both working and purchasing purposes. The well known silk palace named Rajmahal is also present here.

The city and village people used to plan for a trip for any festival or function purpose in this area.

Early peak hour Morning peak hour Evening peak hour

Table 3.3 Factors affecting Pedestrian flow.

From table 3.7 , More congestion in this area due to improper parking facilities leads to more pollution from the vehicles is the major issue in this area and the unsafe intersections because of one way street vehicle enter in no entry will create more chaos. The sidewalks have to be enhanced properly in both the sides of carriage ways. Sidewalks are mean only for the pedestrians that have to be expressed to all respectively.

Table 3.7 Factors affecting Pedestrian flow

FACTORS	RANKING					TOTAL (N)	ΣW	MEAN (ΣW/N)	RII	RANK
	5	4	3	2	1					
No sidewalk	24	12	9	2	3	50	202	4.04	0.808	3
Sidewalks in poor condition	14	8	12	12	4	50	166	3.32	0.664	6
Unsafe intersection	21	19	6	1	3	50	204	4.08	0.816	2
Bad driver behaviours	15	15	11	1	8	50	178	3.56	0.712	4
Too much to carry	3	5	23	17	2	50	140	2.8	0.56	7
Unsure of route	2	6	7	23	12	50	113	2.26	0.452	9
I dont like to walk	4	6	13	15	12	50	125	2.5	0.5	8
Solid waste and garbage	16	16	3	2	13	50	170	3.4	0.68	5
Pollution on road	29	10	4	2	5	50	206	4.12	0.824	1

Table 3.8 improvement need for Pedestrian

SOLUTIONS	RANKING					TOTAL (N)	ΣW	MEAN (ΣW/N)	RII	RANK
	5	4	3	2	1					
More sidewalk	22	13	11	0	4	50	199	3.98	0.8	1
Maintenance of sidewalks	9	21	17	2	1	50	185	3.7	0.74	7
Better street lighting	23	9	10	6	2	50	195	3.9	0.78	3
Improved connection between sidewalks, bikeways & transit	14	18	14	2	2	50	190	3.8	0.76	4
Proper drainage	17	16	9	3	5	50	187	3.74	0.75	5
Better intersections (pedestrian signals &crosssways)	18	10	13	4	5	50	182	3.64	0.73	8
More separation from vehicular traffic	16	11	17	5	1	50	186	3.72	0.74	6
Its for pedestrians	24	14	5	1	6	50	199	3.98	0.8	1

From the table 3.8, the immediate improvement that have to be implemented is providing more sidewalks with standard height and continuity the parking area have to be separated from the area so that the congestion will be reduced and the vehicular and pedestrian separation will be enhanced

4.2.5 SOUTH MASI STREET

The tourist people will be more in this area because the well known Thirumalai nayar palace is located. The people used to go to palace and then to one of the world famous "Meenakshi Amman Temple". And the famous textile shop "Ak Ahmed co" is located which attracts allot of village and low income people respectively. The volume will not be same as that other areas because the customers will be from different districts, areas, etc. The width of the carriage way is less with that the parking of the vehicle also made on the ethier side of the carriage way. There is only one bin in the area so the solid waste collection process is very lack in this area.

Table 3.9 Factors affecting Pedestrian flow

FACTORS	RANKING					TOTAL (N)	ΣW	MEAN (ΣW/N)	RII	RANK
	5	4	3	2	1					
No sidewalk	22	15	9	2	2	50	203	4.06	0.812	4
Sidewalks in poor condition	20	10	17	2	1	50	196	3.92	0.784	6
Unsafe intersection	25	13	4	4	4	50	201	4.02	0.804	5
Bad driver behaviours	23	21	1	3	2	50	210	4.2	0.84	1
Too much to carry	3	13	13	16	5	50	143	2.86	0.572	8
Unsure of route	8	8	13	13	8	50	145	2.9	0.58	7
I dont like to walk	6	7	9	4	24	50	117	2.34	0.468	9
Solid waste and garbage	23	16	7	3	1	50	207	4.14	0.828	3
Pollution on road	23	16	9	2	0	50	210	4.2	0.84	1

Table 3.10 improvement need for Pedestrian

SOLUTIONS	RANKING					TOTAL (N)	ΣW	MEAN (ΣW/N)	RII	RANK
	5	4	3	2	1					
More sidewalk	27	15	8	0	0	50	219	4.38	0.88	3
Maintenance of sidewalks	28	16	6	0	0	50	222	4.44	0.89	2
Better street lighting	16	16	14	3	1	50	193	3.86	0.77	8
Improved connection between sidewalks, bikeways & transit	20	16	10	4	0	50	202	4.04	0.81	7
Proper drainage	28	19	2	1	0	50	224	4.48	0.9	1
Better intersections (pedestrian signals &crosssways)	24	12	13	1	0	50	209	4.18	0.84	6
More separation from vehicular traffic	27	13	7	2	1	50	213	4.26	0.85	5
ITS for pedestrians	30	9	9	2	0	50	217	4.34	0.87	4

From table 3.9, It is also one way street where there is no proper parking facilities for customers and the workers respectively. Instead of using the masi street for return the will use the same road to reduce the fuel and time consumption. As it is one way street the driver automatically drive lethargically. The roadside shopkeepers have to be give separate place not in the sidewalk so that the pedestrians have comfort and convenient place for walk without any fear.

From table 3.10, the drainage facilities have to be provided properly so that the rain water will drain properly. The regular maintenance have to be done so that the breaks in the sidewalks will be repaired in the initial stage ITSelf to avoid major issues. The shopkeeper have to be instructed not to store in the sidewalks which is only mean for pedestrians. The mini hotels in the sidewalk have to be avoided. The proper sign boards for the turnaround have to be provided respectively to avoid rush driving.

4.2.6 EAST MASI STREET

The presence of wholesale onion shop and coconut shop are located in this area. The people from the Mattuthavani, Goripalayam ,etc will prefer this route to reach the Meenakshi Amman Temple.

The presence of rice, dry fruit, nuts , garlic, etc wholesale shops it attracts many people and the well known textile Om Murga saree is also located and it also act as the sub track for palace road.

Table 3.11 Factors affecting Pedestrian flow

FACTORS	5	4	3	2	1	TOTAL (N)	ΣW	MEAN (ΣW/N)	RII	RANK
No sidewalk	22	17	8	2	1	50	207	4.14	0.828	4
Sidewalks in poor condition	23	8	16	1	2	50	199	3.98	0.796	6
Unsafe intersection	27	13	3	3	4	50	206	4.12	0.824	5
Bad driver behaviours	24	21	2	3	0	50	216	4.32	0.864	1
Too much to carry	3	16	11	14	6	50	146	2.92	0.584	8
Unsure of route	7	12	13	11	7	50	151	3.02	0.604	7
I dont like to walk	6	8	12	3	21	50	125	2.5	0.5	9
Solid waste and garbage	25	15	6	2	2	50	209	4.18	0.836	3
Pollution on road	26	15	8	1	0	50	216	4.32	0.864	1

From table 3.11, the rush driving is the major issue in this area, due to parking area for tricycles, goods vehicles and other vehicles using the large space of carriage way the pedestrians feel unsafe. The vehicles used to enter no entry to go Mattuthavi other areas instead of using the proper way because of travel distance, cost and travel time respectively, which leads to congestion. The loading and unloading of the materials taken place without separate they usually use the carriage way. The pedestrians use the carriage way to walk instead of sidewalks because the sideways are used by the parking vehicles or else by the materials stored in front of the shop.

Early peak hour Morning peak hour Evening peak hour

Fig.3.4 Field observation for various duration

Table 3.12 improvement need for Pedestrian

SOLUTIONS	RANKING					TOTAL (N)	ΣW	MEAN (ΣW/N)	RII	RANK
	5	4	3	2	1					
More sidewalk	26	15	9	0	0	50	217	4.34	0.87	4
Maintenance of sidewalks	30	14	6	0	0	50	224	4.48	0.9	2
Better street lighting	18	18	9	3	2	50	197	3.94	0.79	8
Improved connection between sidewalks, bikeways & transit	19	17	9	5	0	50	200	4	0.8	7
Proper drainage	30	18	2	0	0	50	228	4.56	0.91	1
Better intersections (pedestrian signals &crosssways)	28	11	9	2	0	50	215	4.3	0.86	5
More separation from vehicular traffic	28	12	6	2	2	50	212	4.24	0.85	6
ITS for pedestrians	33	8	7	2	0	50	222	4.44	0.89	3

From table 3.12, the presence of whole sale market leads to large amount of waste and during the rainy season the water stagnant leads to bad odour and the water without drain will be staged in the parking area which leads to parking the vehicle in the carriage way. The pedestrian have to use the sidewalks rather than the carriage way to avoid chaos and for safe, comfort and convenient journey. The shopkeepers have to be fined incase of storing their materials in the sidewalks. The separate stands have to be provided for the auto rickshaws, good vehicles and other parking facilities.

3.2.7 EAST AVANI MOOLA STREET

The presence of wholesale markets for stationary shops, book shops and cosmetics shops the large number of people will use this way to reach Meenakshi Amman Temple. The lifting parking located in this area will leads to allot of vehicle congestion respectively. The whole sale shops for textile attracts many key sellers.

Table 3.13 Factors affecting Pedestrian flow

FACTORS	RANKING					TOTAL (N)	ΣW	MEAN (ΣW/N)	RII	RANK
	5	4	3	2	1					
No sidewalk	39	7	2	2	0	50	233	4.66	0.932	1
Sidewalks in poor condition	12	23	11	3	1	50	192	3.84	0.768	4
Unsafe intersection	20	21	8	0	1	50	205	4.1	0.82	3
Bad driver behaviours	15	15	14	3	3	50	186	3.72	0.744	6
Too much to carry	2	2	11	21	14	50	107	2.14	0.428	7
Unsure of route	0	2	7	23	18	50	93	1.86	0.372	9
I dont like to walk	2	0	8	23	17	50	97	1.94	0.388	8
Solid waste and garbage	25	18	7	0	0	50	218	4.36	0.872	2
Pollution on road	18	13	14	2	3	50	191	3.82	0.764	5

Table 3.14 improvement need for Pedestrian

IMPROVE MENT	RANKING					TOTAL (N)	ΣW	MEAN (ΣW/N)	RII	RANK
	5	4	3	2	1					
More sidewalk	34	8	6	1	1	50	223	4.46	0.89	2
Maintenance of sidewalks	9	29	8	4	0	50	193	3.86	0.77	6
Better street lighting	17	19	14	0	0	50	203	4.06	0.81	3
Improved connection between sidewalks, bikeways & transit	20	11	12	5	2	50	192	3.84	0.77	7
Proper drainage	21	10	14	3	2	50	195	3.9	0.78	5
Better intersections (pedestrian signals &crosssways)	16	11	17	5	1	50	186	3.72	0.74	8
More separation from vehicular traffic	16	21	9	2	2	50	197	3.94	0.79	4
ITS for pedestrians	12	20	11	3	4	50	283	5.66	1.13	1

From the above table 3.14, the lack of sidewalk is the major issue in this area so the sidewalks have to be provided wherever possible which will help the pedestrian to walk without any fear. The proper lights have to be provided because of lack of sidewalk the pedestrians have to walk in carriage way in night the visibility will be less if there is no proper street lights and chance of accidents are high. As the modern technologies plays a vital role at present people looking for the new changes as that of developed countries.

Table 3.15 classification of pedestrians

OBSERVED PARAMETERS			NO. OF OBSERVED PEDESTRIANS	PERCENT (%)
CHARACTERISTIC	GENDER	MALE	252	72
		FEMALE	98	28
	AGE GROUP	CHILD	12	3
		ADULT	322	92
		OLD	16	5
BEHAVIOR	CROSSING TYPE	WALK	264	75
		RUN	86	25
	CROSSING SPEED	<1	54	15
		1-1.2	152	43
		1.2-1.4	58	17
		1.4-1.6	70	20
		>1.6	16	5
	NO OF PEDESTRIAN	SINGLE	94	27
		GROUP	256	73

3.3 DICUSSION

As the study concern, the pedestrian management is the major task have to be enhanced in the Madurai CBD. The road is not only for the motorized vehicle it is also for the non-motorized users also (pedestrians). The users of the road are not equal the characteristics and the behaviour of them differs. From the data analysis and the result obtained we come to know that Lack of sidewalk and Bad Driver Behaviour are the major issues in CBD area which reduces pedestrian safety in all the location taken for the study of the project. More Sidewalk, Sidewalk maintenance & Proper Drainage have to be enhanced properly and periodically so that the pedestrian will prefer sidewalk for their safety and welfare. Work, Temple & Shopping are the major Purpose of pedestrian in CBD area which are not properly managed to meet aligned movement. Nowadays the people preferring walking than any other mode of transport which gives them the satisfaction of the trip by admiring the side-by shops.

CHAPTER 4
SUMMARY AND CONCLUSIONS
4.1 GENERAL

The pedestrians are the heart beat of any development, everyone have to walk in any part of their activity. Managing the pedestrian plays a vital role in minimizing maximum chaos between the motorized and non-motorized vehicles**.**

4.2 SUMMARY AND CONCLUSION

The study area was selected and issues involved were identified.

The aim and objective of the project were properly defined to overcome the issues identified. An extensive literature survey revealed several important aspects in identifying the methodology. In this investigation, research methodology has been framed with the help of literature review. The system created would prove the effectiveness of managing pedestrian in the road infrastructure and allow changes to be implemented at the planning phase.The qualitative part of the study reveals that they also feature a number of factors and combinations of factors that increase the potential for serious injury or death, traffic patterns involving heavy vehicles and varying subgroups of pedestrians, patterns of traffic violations involving the range of street users, absence of accessible and safe pedestrian infrastructure, and other characteristics of the built environment.

This reinforces the importance of addressing pedestrian safety in locations with a high frequency of collisions involving severe injury or death to pedestrians, and of considering the features of the places in which they occur as well as the people involved. Pedestrian management policies particularly in encouraging the separation of conflict areas (between motorized vehicles and pedestrians)and establishing roadway hierarchy, as well as careful planning of pedestrian infrastructure that connects with transit stations and existing privately-funded covered walkways should be considered. In adequate capacity of approach arms, lack of proper control and pedestrian vehicular conflict are the key issues at the intersection.

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