An Analysis of Road User Behaviour in Accident Prone Areas of Hyderabad City: based on data from Direct Observation Studies

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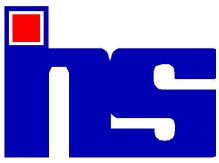

THE INSTITUTE OF HEALTH SYSTEMS

An Analysis of Road User Behaviour in Accident Prone Areas of Hyderabad City: based on data from Direct Observation Studies

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Introduction:

The spectacular increase in the number of motor vehicles on the road has created a major social problem - the loss of lives through road accidents. The appalling human misery and the serious economic loss caused by road accidents demand the attention of the society and call for a solution of the problem. A multidisciplinary approach is needed in understanding the problem and providing solutions. The analysis of the accident statistics provides clues, to the many factors that led to the accidents and to improvements that may be desired. Accident data, supply valuable information to control, regulate and manage the traffic more efficiently. Although accident statistics have an important general monitoring function and may form a basis for detecting specific traffic safety problems, the information as available from accident data is inadequate for the next steps in studying safety problems, viz. analyzing and diagnosing, defining remedial measures, and evaluating effects. Systematic observations of road user behaviour, combined with knowledge of human information processing capabilities offer wider perspectives in understanding the causes of safety problems[1]. For answering the question as to how to prevent accidents, a good understanding of the causation process leading to accidents is needed. Hence, a closed circuit TV (CCTV) based direct observation method was developed to study and analyse the road traffic activity in Hyderabad city.

Methodology:

As part of the direct observation studies, the closed circuit TV (CCTV) monitoring technique is being adopted for recording the traffic activity/accident occurrence at major traffic junctions in Hyderabad. Two CCTV cameras and a digital video recorder (DVR) are being installed at 10 pre-identified accident prone stretches of the busy thoroughfares in the city in consultation with the Hyderabad Traffic Police Department. The CCTV cameras and Digital Video Recorder (DVR) are placed at the pre-identified accident prone sites for a two-week period. Day & night recording of road traffic activity is done on 24-hour basis.

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[1] Horst, A.R., "A Time-based Analysis of Road User Behavior at Intersections", Proc. 3rd Workshop of International Cooperation on Theories and Concepts in Traffic Safety, Cracow, 1990.

Data is recorded and stored in the DVR. Data is retrieved from DVR stationed at respective sites periodically and brought to IHS for analysis purposes.

From the road traffic activity recordings that are available for a two-week period from each site, video recordings of three days are randomly selected. Ten minute footage from each hourly recordings are observed in a detailed manner to analyse the road traffic activity, for capturing violation and accidents. To extrapolate the data for one hour. The data obtained were analysed to calculate various indices that indicate the traffic violation events in the city.

Traffic Violation Events:

Traffic Violation events indicate the events which made the road traffic crash imminent (i.e., something that occurred and caused the crash). These are in other words precursors of road traffic accidents.

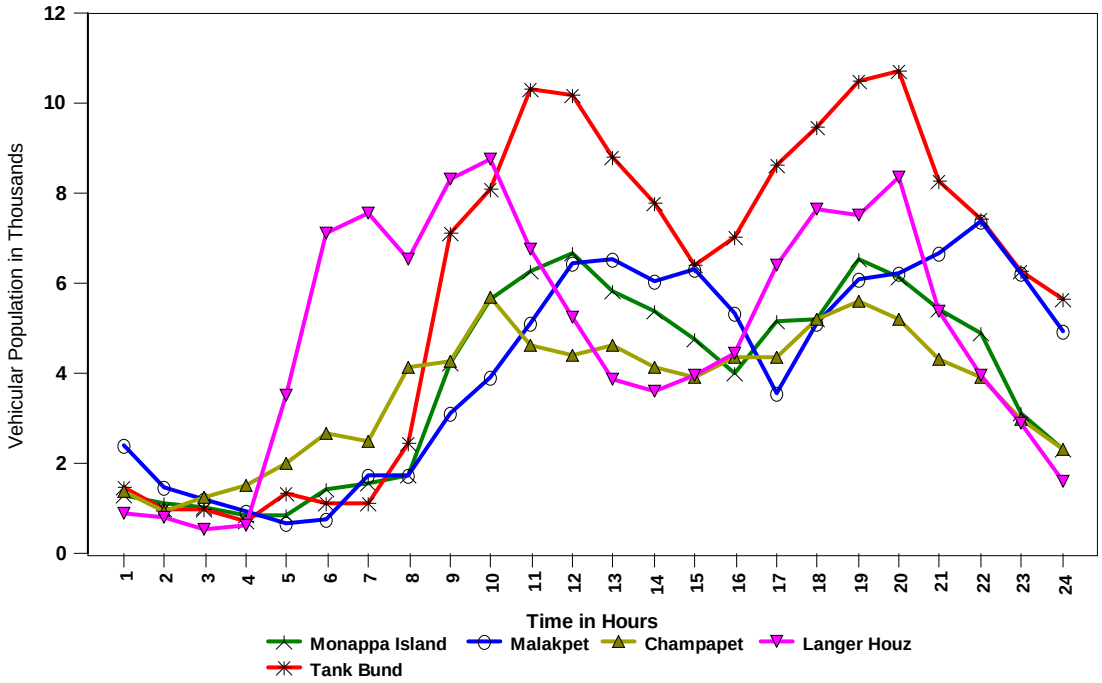
1. Line crossing: Where a road is divided by a yellow or white continuous line, vehicles trying to overtake each other should not cross the continuous line. When a vehicle crosses a yellow or white continuous line it is defined as a line crossing event.
2. Wrong side entry: Entry of vehicles in no entry areas such as vehicles coming from opposite direction on a one-way road.
3. Signal Jump: When a vehicles crosses the white stop line at a traffic junction controlled by signal lights, while the red or amber light is still on, such an event is called as signal jumping.
4. Triple riding: When a two wheeler is used to carry more than the permitted two persons, including the rider, it is called as triple riding.
5. Over crowding in public transport vehicles: An event in which public transport vehicles carry more passengers than the prescribed numbers for e.g., footboard travel or hanging from the buses and hanging or protrusion of body part outside a jeep or auto rickshaw respectively.
6. Overloading: Goods or objects extending or sticking out of carrier vehicles such as rickshaws or Tempo trolleys.
7. Left overtaking: As vehicles are permitted to overtake only from right, any vehicle overtaking from left is a traffic violation event.
8. Prohibited ‘U’ Turn: Vehicles taking a ‘U’ Turn at places where ‘U’ Turn is prohibited.
9. Vehicles with extra projection: Vehicles carrying goods that extend beyond the body of the vehicle.
10. Parking at ‘No Parking’ places: An event in which vehicles are parked at places that would endanger or cause inconvenience to road users.

So far, the CCTV cameras have been installed at five sites viz., 1. Monappa Island Junction, 2. Tank Bund Road, 3. Moosarambagh - Nalgonda X Roads, 4. Champapet to Dhobighat Road and 5. Langar Houz to Toli Chowki Road. The video

recordings of the first 5 sites corresponding to a two-week observation period at each site have been analysed to understand the traffic activity pattern and a preliminary report of the same is presented below.

Results:

Figure 1: Hour-wise Vehicular Density at Five Observation Sites in Hyderabad City



At the Champapet and Langer Houz Junctions, the highest vehicular density was observed during the peak hours, i.e., between 8 to 10 A.M. in the morning and 6 to 8 P.M. in the evening. Whereas at the Monappa Island Junction and Tank Bund Road monitoring sites the highest vehicular density was observed between 10 to 12 A.M. in the morning and the peak hour period between 6 to 8 P.M. in the evening. However, at the Moosarambagh - Nalgonda 'X' Roads Stretch, the highest number of vehicles were recorded between 8 to 10 P.M. during night time (Figure 1).

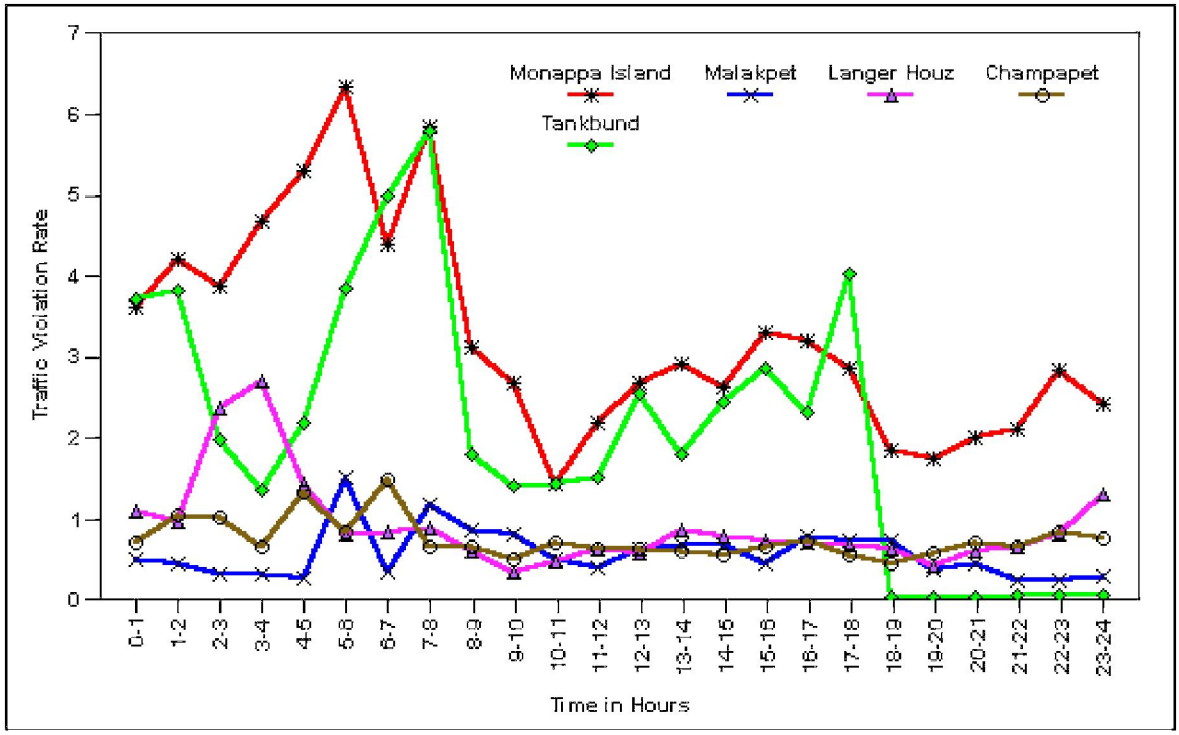
Table 1: Category-wise Vehicles Recorded at Five Observation Sites in Hyderabad City

Vehicle Type	Monappa Island Junction	Tank Bund Road	MBagh-Ngonda X Roads	Champapet	Langer Houz
	n=91777	n=143375	n=100479	n=86686	n=116806
Cycles	2.13	1.16	3.74	3.37	3.21
Two wheelers	37.37	36.55	55.10	31.95	33.22
Auto rickshaws	17.85	29.64	16.64	18.36	23.19
Seven seaters	0.00	0.06	1.36	9.03	8.23
Buses	1.15	1.87	4.93	2.48	2.96
Lorries	0.28	0.12	2.09	3.46	3.11
Mini vans	1.43	0.48	2.76	16.39	20.06
Cars / Jeeps	38.38	28.88	12.17	10.33	1.44
Others	1.40	1.25	1.22	4.65	4.58
Total	100	100	100	100	100

Table-1 presents the 24-hour average category-wise percent distribution of vehicles at the five CCTV installation sites. It can be seen from this table that at the Monappa Island Junction, a VIP route, the highest number of vehicles observed were four wheelers followed by two-wheelers and auto rickshaws. The reason for the more number of vehicles being four-wheelers may be due to the fact it is a main link between State Secretariat, Raj Bhavan, Hitec City (the IT Hub of Hyderabad city) and the Hyderabad City Airport. At the Tank Bund Road, Moosarambagh-Nalgonda 'X' Roads and Champapet sites, the highest number of vehicles observed were two-wheelers followed by auto rickshaws and four wheelers. However, at the Langer Houz junction, the highest number of vehicles observed were two-wheelers followed by auto rickshaws and mini-vans.

The hour-wise traffic violation rates per 100 vehicles for five sites is shown in Figure 2. The maximum traffic violations were recorded between 5 to 8 A.M. in the morning at the three monitoring sites viz., Monappa Island, Tankbund and Malakpet. At the Langer Houz site, were recorded between 3 to 5 A.M. in the morning. The traffic violations observed during evenings were comparatively less but one spike was noted between 5 to 6 P.M. at the Tank Bund Road site. Interestingly, these observations reveal that the rate of traffic violations were highest during non-peak hours suggesting that risky road user's behavior is more prevalent during the lean hours when the road traffic is relatively low.

Figure 2: Hour-wise Traffic Violation Rates at Five Observation Sites in Hyderabad City



The category-wise traffic violations observed at the five CCTV installation sites are shown in Table-2. The most commonly recorded traffic violations at Monappa Island

Junction were wrong side entry (72.88%) followed by unauthorised parking (14.12%) and left overtaking (8.93%) respectively. At Tank Bund Road, the most common traffic violation types were line crossings (81.03%) followed by wrong side entry (4.71%), extra projection (4.32%), unauthorised parking (3.92%) and prohibited 'u' turn (3.70%). Wrong side entry was the most common traffic violation (44.12%) observed at the Moosarambagh - Nalgonda 'X' Roads Stretch followed by unauthorised parking (32.18%) and left overtaking (12.46%). It can be noted from this table that no line crossings were recorded at Moosarambagh site as there is a continuous road divider of 3 feet height on this stretch of road. The most commonly recorded traffic violations at Langer Houz site were wrong side entry (33.77%) followed by unauthorised parking (27.28%), left overtaking (16.11%) and line crossing (12.62%) respectively.

Table 2: Category-wise Traffic Violations at Five Observation Sites in Hyderabad City

Traffic Violation Type	Monappa Island Junction	Tank Bund Road	MBagh-Ngonda X Roads	Langer Houz	Champapet
	n-2478	n-2272	n-578	n-832	n-598
Line Crossing	1.33	81.03	0	12.62	17.73
Wrong Side Entry	72.88	4.71	44.12	33.77	31.77
Left Overtake	8.93	1.14	12.46	16.11	16.22
Prohibited 'U' Turn	1.49	3.70	2.94	1.56	2.51
Overloading	0.28	0.44	2.25	3.37	0.84
Triple Riding	0.77	0.53	2.08	2.64	1.67
Unauthorized Parking	14.12	3.92	32.18	27.28	27.26
Extra Projection	0.20	4.32	3.11	2.28	2.01
Overcrowding	0	0.22	0.87	0.36	0
Total	100	100	100	100	100

After the CCTV activity is completed at all the accident prone stretches, a detailed report will be prepared based on the analysis of the video recordings to understand the traffic activity pattern and the causative factors behind the high level of road traffic accidents in Hyderabad city.