



e-Traffic Mag

*an e-zine launched by State Traffic Planning Cell (STPC) in the 150th year of
Tamil Nadu Police*

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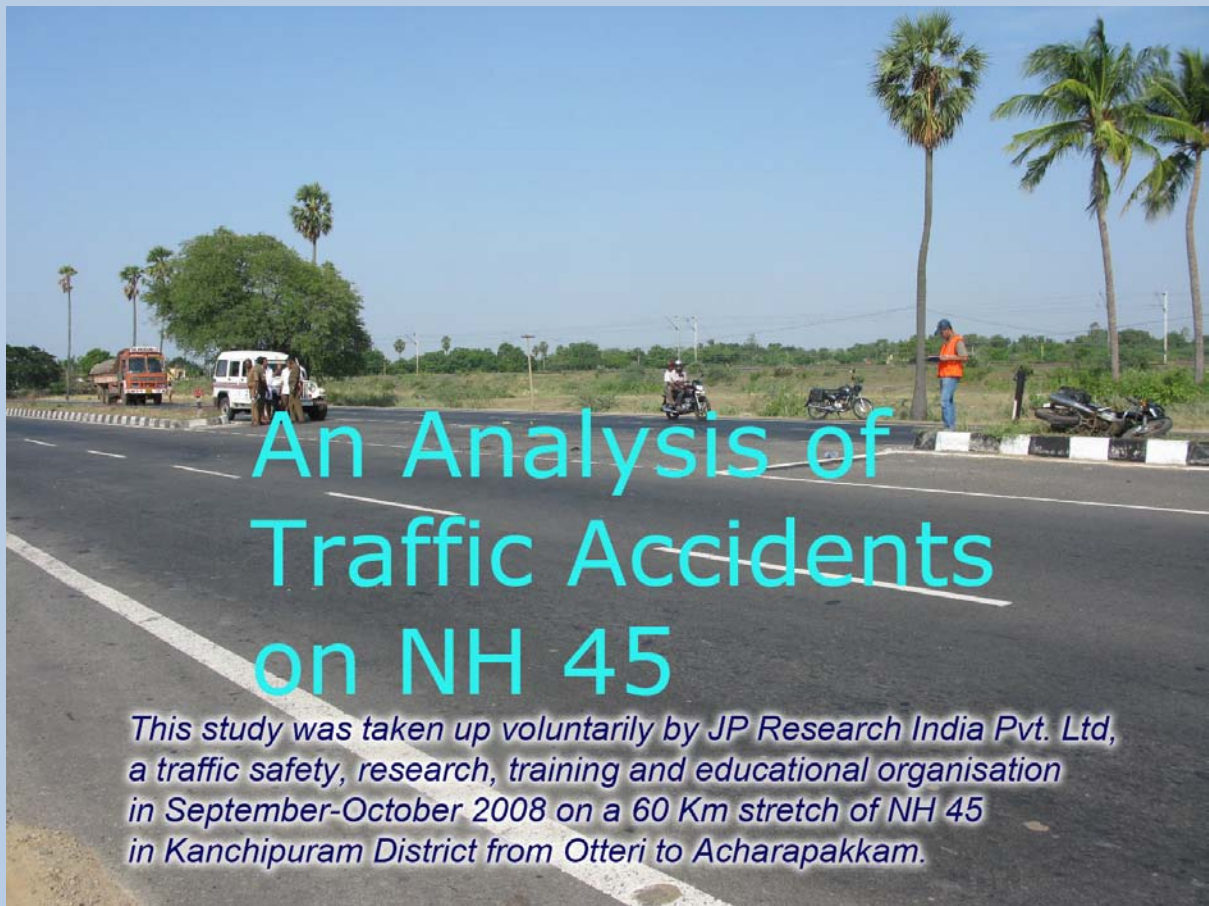
Dear Reader,

Please send us articles, research papers and other material that might interest traffic-management professionals. Also, send us your feedback. Our contact ID is: etrafficmag@gmail.com

It is proposed to bring out this magazine on the first of every month.

Please circulate the magazine to those you think might benefit from it.

The issues of this magazine will also be made available for browsing as well as download on our website www.tnpolice.gov.in/trafficimprove



ABOUT THE AUTHOR



Ms. Jeya Padmanaban is the President and Founder of JP Research ,Inc., (www.jpresearch.com) a statistical and engineering consulting company headquartered in California, USA, with a branch in India. She is the recipient of a number of prestigious awards and has served on many high-level committees in the US, including National Highway Traffic Safety Administration (NHTSA).

Thanks to the efforts by the State and Central Governments, traffic accident investigation in India is emerging from a rule-of-the-thumb impressionistic style to a scientific and technology-based methodology. Our project was a voluntary contribution in this direction inspired by the State Traffic Planning Cell (STPC). Our organisation decided to conduct a study by using modern tools and techniques of accident research and analysis that might provide a model for similar studies by the Police Department in future.

The project involved collecting comprehensive data on vehicle accidents involving injuries or fatalities occurring in the period starting from 1 September 2008 to 15 October 2008. No personal or proprietary information was collected for these accidents. The objectives for this real time accident investigation and data collection project were:

- To develop a framework for an in-depth traffic accident database for road accidents in India.
- To understand the nature of accidents and identify causes/problems along NH45.
- To provide recommendations based on this study for reducing accidents on NH45.

ACCIDENT INVESTIGATION METHODOLOGY:

For the 45-day period of this study, on occurrence of an accident, the police called a dedicated contact number for JPR India that was manned 24 hours by one of our researchers. As soon as a call was received and details of the accident noted down, JPR India researchers travelled immediately to the accident scene from their base camp in Chengalpattu. If no JPR India researcher could attend the accident scene, the contacting police official was so informed and accident details were subsequently collected from the police station in whose jurisdiction the accident took place. The methodology used by JPR India researchers at the accident scene involved the following:

Accident Scene Examination: Scene data is very important for understanding the cause of an accident. Photographs of the accident spot (location where impact occurred), vehicles, and surroundings are taken from all angles, especially covering the direction of vehicle approach and travel. The notion is to document the accident and all available evidence in photographs, which can be used for future references and analyses. Recording the GPS coordinates and the distance of the accident spot from other specific locations help in identifying the exact accident location for future study and identification of black spots. Scene measurements help identify the final resting positions of the crashed vehicles after a collision, the position of any object that may have been struck by a vehicle, and volatile evidence (such as skid marks, broken parts, etc.) with respect to the road infrastructure and surrounding environment. Infrastructure assessment involves recording the road infrastructure and surrounding environment details such as road type, surface condition, road quality, flow of traffic, presence of a divider or median, junction type, road construction material, weather, lighting, etc. On completion of the above activities and after developing an understanding of the accident events, the entire accident scene is diagrammatically represented in order to give a simple and clear picture of the accident for future reference.

Figure 1A shows the diagram of an accident scene from our study. Truck V2, which came out of a petrol bunk after refuelling, tried to cross the gap in the median to pick up its lane. V1, the speeding car, already coming in that lane, applied the brakes too late, skidded for a distance and then hit the rear left wheel of the Truck V2.

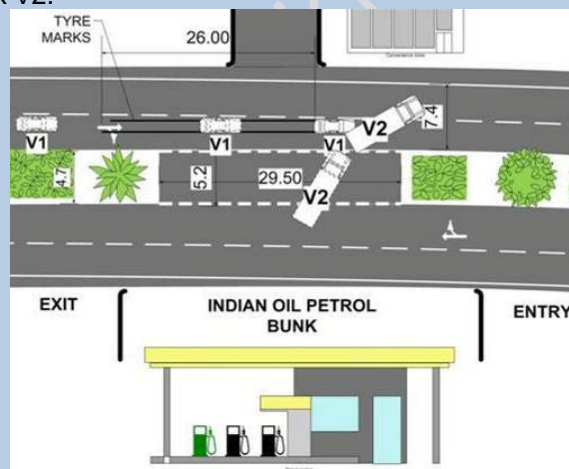


Figure 1A: Accident Scene Diagram

Photographs of the scene, showing the direction of approach and travel are given in figures 1B and 1C.



Figure 1B: Accident Spot and direction of approach



Figure 1C: Direction of Travel

Vehicle Examination: Researchers examined crash vehicles on-scene and/or after it was towed to the side of the road. This examination involved:

- Recording direct and indirect damages.
- Determination of Collision Deformation Classification (CDC).
- Measurement of interior intrusions.
- Occupant contact with vehicle interiors.
- Determination of belt use/airbag deployment.

To scientifically describe impacts on a vehicle, researchers use the seven-character Collision Deformation Classification (CDC) code as per the Society of Automotive Engineers (SAE) standard J224. This internationally accepted standard crosses language barriers and gives a 3-dimensional description and specified magnitude of the impact damage on a vehicle that helps in describing, recording and communicating vehicle impact damage very easily in reports and analyses. CDC retains the damage information for reference, should it be required at a future date, especially in the physical absence of the vehicle.

An example of CDC is described using the damaged car, shown in figure 2, examined in our study.



Figure 2: Frontal impact damage

For the above impact damage, the CDC obtained is:

0 1 F Z E W 3

- 01 = Principal Direction of Force (1 O' clock direction)
- F = Type of Impact (Frontal)
- Z = Location of Damage (Right side of frontal area)
- E = Vertical Location (Below lower end of windshield)
- W = Type of Damage Distribution (Wide)
- 3 = Maximum Extent of Penetration from front bumper to lower windshield on a scale from 1 to 5

Injury Coding and Correlation: A thorough knowledge of injury severities is warranted in order to improve traffic safety and the Abbreviated Injury Scale (AIS) developed by the Association for the Advancement of Automotive Medicine (AAAM) is used by JPR India researchers for injury coding. The system uses a seven digit code to describe the location of the injury, type of injury, the type of anatomical organ injured and the severity of each injury sustained.

The code has seven digits in which the first digit represents the affected region of the body, the second digit the type of anatomical structure, the third and fourth the specific anatomical structure and the fifth and sixth the level of injury. Based on the values given to these six digits, the seventh digit is determined which gives the severity of the injury. The severity is indicated by a number ranging from 1 to 6 as shown in the table below:

Abbreviated Injury Scale		
Scale	Severity	Example
1	Minor	Superficial laceration
2	Moderate	Fractured sternum
3	Serious	Open fracture of the humerus bone
4	Severe	Perforated trachea
5	Critical	Ruptured liver with tissue loss
6	Unsurvivable	Total severance of aorta

Figure 3 shows the interior parts of a car involved in an accident studied by us. The front left occupant sustained injuries in the accident.



Figure 3: Occupant contact.

The medical reports obtained for the front left occupant mention bruising to the face and a Colles fracture to the left wrist. The AIS codes obtained for the injuries were as follows:

Injury	AIS code
Face Skin Abrasion	210202.1
Colles Fracture	752802.2

The occupant contact points in the car interiors were examined and then correlated with the injuries of the occupant to determine the cause of each injury. As can be seen the Colles fracture is the most severe injury sustained in the accident due to contact of the wrist with the glove box.

This type of correlation is important for reconstructing the occupant position and occupant kinematics (the manner in which the occupant is thrown around) during an accident. An occupant not wearing seatbelts, for example, might be thrown around much more violently by an impact than an occupant who is securely belted.

The classification of injuries and determination of their severity helps to identify those specific injuries that cause accidents to be fatal. Based on data collected over a period of time, injuries can be studied and conclusions drawn on types of steps that could be taken to prevent such fatal injuries. Such a code-based study is thus of crucial importance in reducing fatalities on the roads.

RESEARCH FINDINGS:

Over the 45 days of this project, researchers investigated 32 accidents. Figure 4 shows the distribution of accidents by time. 21 of the 32 accidents (65.6%) took place between 00:00 and 09:00 hours. Maximum number of accidents (10) occurred between 03:00 to 06:00 hours.

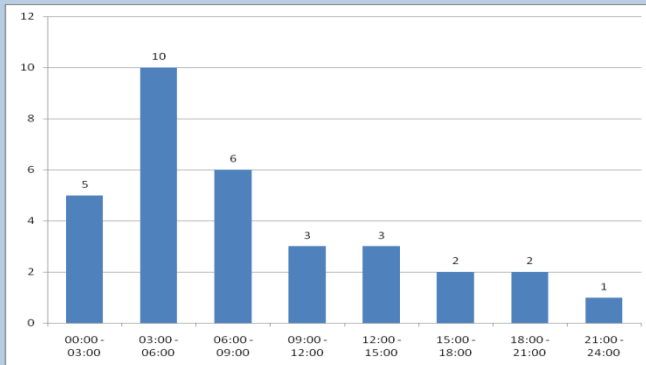


Figure 4: Accident Distribution by Time

Figure 5 shows the type and number of road users involved in the 32 accidents investigated. Trucks form the majority vehicle type (45.61%) followed by passenger cars (15.79%).

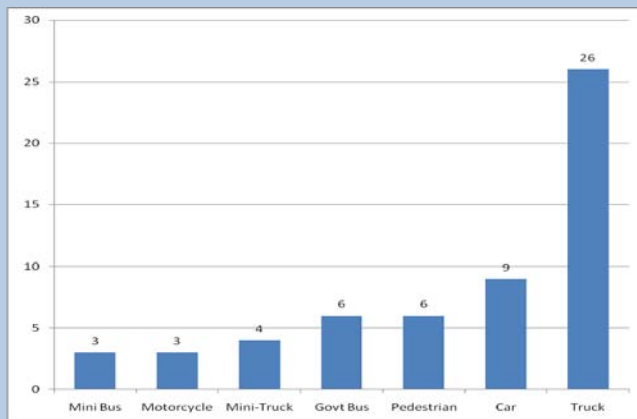


Figure 5: Accident Involvement by Road User Type.

The above graphs broadly indicate that night time accidents involving trucks need to be looked into.

To get a deeper insight into the accidents, the 32 accidents were further categorized for analysis as shown in figure 6. The accidents are first divided into Multiple-Vehicle and Single-Vehicle Accidents. An accident involving collision between a car and a truck would be classified as a Multiple Vehicle accident and a car hitting into a tree would be a Single Vehicle accident.

They are then sub-divided as per the type of accident. In our study, the Front-Rear collisions account for 59% of the accidents investigated. This is the only Multiple-Vehicle type of accident that has been observed by researchers on the NH45.

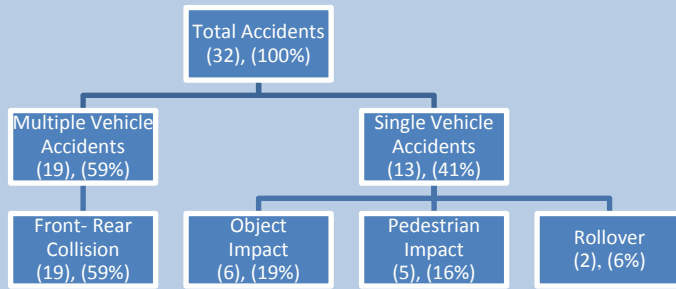


Figure 6: Breakup of accidents for analysis.

Head-on collisions were not observed as this 4 lane highway has a wide centre median separating traffic flowing in opposite directions.

A look at the injury severity distribution in figure 7 gives a clearer indication of the injury contribution of each type of accident event. Front-Rear Collisions and Pedestrian Impacts dominate fatal accidents, followed by Object Impacts, while Rollovers involve no injuries.

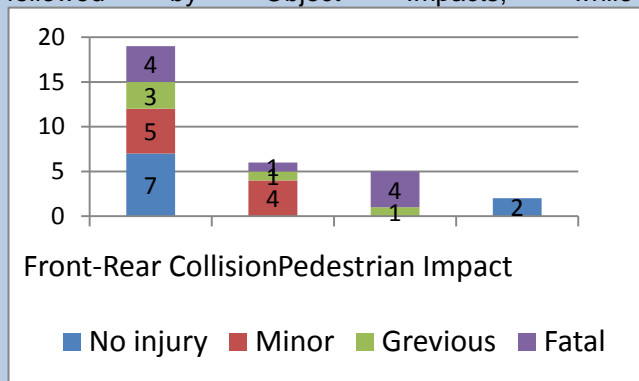


Figure 7: Injury Severity distribution by type of accident

Since the Front-Rear Collisions were found to be the predominant type of accidents in our study, these accidents have been made the focus in the following section of the article to understand accident conditions and determine causes.

FRONT-REAR COLLISIONS:

Based on the study of 19 Front-Rear collisions, the following are some important observations:

1. Of the two vehicles involved, one is a “leading” vehicle while the other is a “following” vehicle.
2. The “leading” vehicle usually suffers a rear impact (13 out of 19) or a side impact (6 out of 19), while the “following” vehicle suffers a frontal impact (19 out of 19).
3. The “leading” vehicle is usually the initiator (but not necessarily the cause) of the accident, while the “following” vehicle is usually the victim of the accident.

Figure 8 and 9 describe the types of leading and following vehicles investigated and their effect on injury severity.

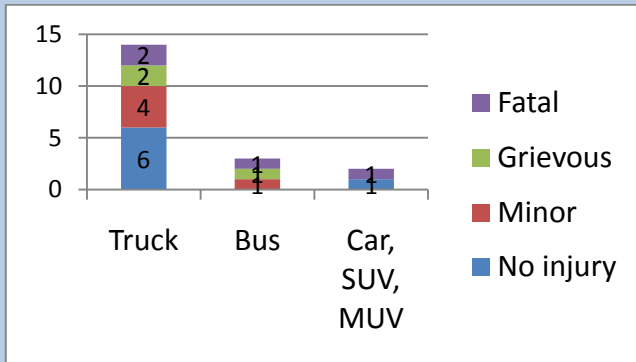


Figure 8: Accident distribution by leading vehicle type and injury severity.

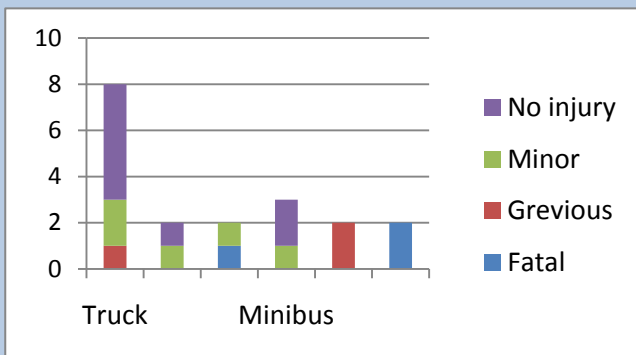


Figure 9: Accident distribution by following vehicle type and injury severity.

It can be noted from the above graphs that:

1. Trucks (14) form the majority of leading vehicles involved in Front-Rear collisions, while Buses (3) come a distant second.
2. The injury severity distribution clearly indicates that larger vehicles (trucks and buses) inflict serious injuries as leading vehicles.
3. Following vehicles have a larger distribution of vehicle types. Again trucks (8) form the majority of following vehicles.
4. The injury severity distribution clearly indicates that smaller vehicles usually suffer fatal or grievous injuries as following vehicles, while larger vehicles usually suffer only minor or no injuries.

Based on the analysis of “leading” and “following” vehicle characteristics, it can be stated that trucks as “leading vehicles” initiate most of the front-rear collisions. To gain a deeper understanding of conditions initiating these accidents, the pre-accident conditions of the leading vehicles were then analyzed. All the 19 accidents could be categorized into the pre-impact conditions of leading vehicles as shown in figure 10 below.

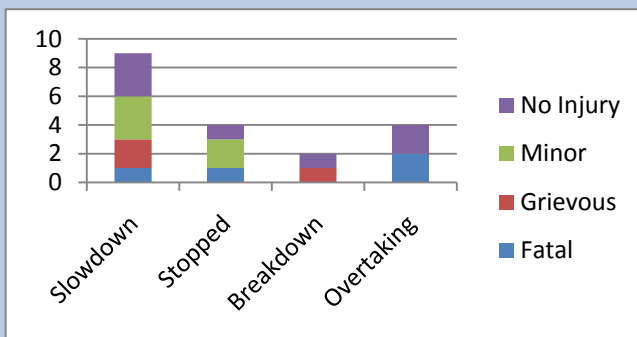


Figure 10: Accident distribution by vehicle leading condition and injury severity.

Slowdown: Leading vehicle slows down and following vehicle crashes into it. Slowing down was observed to occur at or near U-turns, gas stations, restaurants or traffic jams (caused by accidents). In all these cases, there is decision making involved on the part of the driver. Drivers get to know about these locations/situations only when they pass by them, hence they slow down to decide

whether they want to make a stop or not. If information for each of these locations is provided well in advance through proper sign boards/indications, the driver will be aided to make decisions in advance and prevent sudden slowing down.

Stopped: Leading vehicle has stopped/parked for a reason (restaurant, relieving or sleeping) and following vehicle crashes into it. Stopping usually occurs due to the driver/occupants deciding to take a nap or to relieve themselves after a long drive. A facility or area developed to help bus passengers and truck drivers to rest, and information regarding these areas provided well in advance to road users, can help in reducing these accidents.

Breakdown: Leading vehicle is broken down/being repaired when following vehicle crashes into it. Breakdown of trucks (need for repairs) was usually due to tyre punctures. Trucks may stop alongside the road for this, but there were instances when trucks were observed being repaired in the middle of the road without proper indications or warning signals. Such breakdowns are very dangerous, as occupants are standing outside and close to the vehicle. Towing services need to be improved.

Overtaking: Leading vehicle is performing an overtaking maneuver and immediately cuts the following vehicle or slows down in front of it, and the following vehicle crashes into the leading vehicle. The small sample of overtaking accidents does not provide enough information to analyze overtaking conditions in detail. In general it was observed that lack of lane discipline, no signalling by drivers, overtaking from the left side and high speeds caused these accidents.

NIGHT TIME ACCIDENTS:

Of the 19 front-rear collisions investigated, 12 occurred at night. In all 12 cases, the accident scene had no street lights/lighting and the involved vehicles were found to have non-operational tail lamps and also lacked prominent reflective strips and markings.

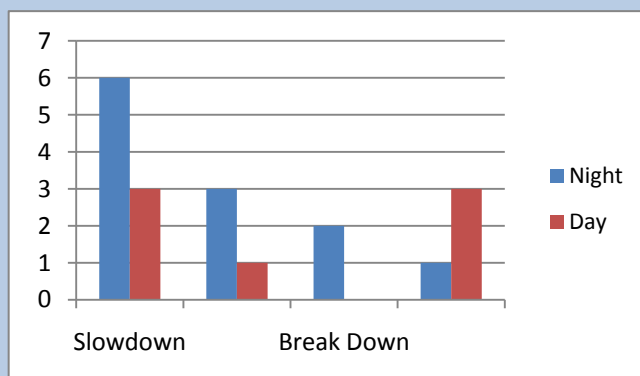


Figure 11: Pre-accident Condition and Lighting conditions.

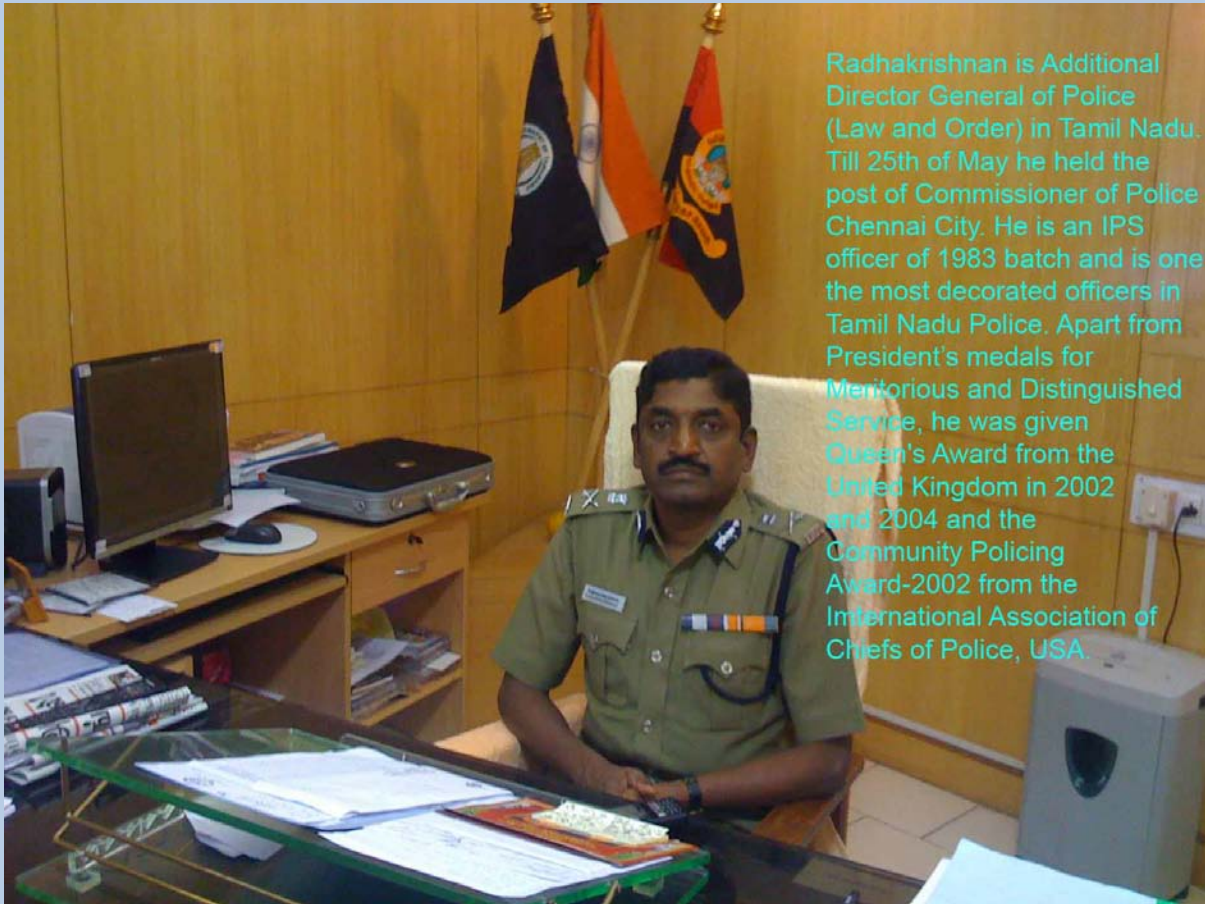
CONCLUSIONS:

Based on the above analysis, the following conclusions can be made:

1. Front-Rear Collisions are the biggest contributors to road accidents and injuries on the NH45 and amount to 59% of the accidents investigated, which occur due to vehicles, especially trucks, slowing down, stopping, breaking down or overtaking.
2. Causes of these accidents are:
 - a. Last minute decision making by the driver due to inadequate information, advance warnings and surprises.
 - b. Parking/standing of vehicles alongside (but intruding into the road) or on road.
 - c. Poor vehicle lighting and visibility due to non-operational tail lamps and lack of reflective markings.
 - d. Poor design of intersections and entry/exit to gas stations.

Creating a Culture of Safety

K. Radhakrishnan IPS



Radhakrishnan is Additional Director General of Police (Law and Order) in Tamil Nadu. Till 25th of May he held the post of Commissioner of Police Chennai City. He is an IPS officer of 1983 batch and is one the most decorated officers in Tamil Nadu Police. Apart from President's medals for Meritorious and Distinguished Service, he was given Queen's Award from the United Kingdom in 2002 and 2004 and the Community Policing Award-2002 from the International Association of Chiefs of Police, USA.

Management of traffic in a metropolis like Chennai City is different from that in rural and suburban areas. Not only is the management of City traffic marked by a greater emphasis on regulation and smooth flow of traffic, the nature of accidents is also different. The population of vehicles per unit area in Chennai City is far greater than in the rest of the State. This results in a much higher chance of vehicle-to-vehicle collision or vehicle-to-human collision in the City than in the other parts of the State. At the same time, the congestion in the City slows down the speed of vehicles and chances of collisions with high momentum decrease. In the city head-on collisions leading to multiple deaths are rare and mostly occur because of causes other than vehicles crossing paths in their natural course of movement. Take for instance the recent case in R4 Traffic Investigation Police Station Cr. No 193/2009 in which a car hit a two-wheeler and then, in order to escape, moved rashly on the wrong side of the road and hit head-on with an auto, causing the death of the auto-driver as well as a passenger. Cases of this nature are not the norm in the City. Prevention strategies have to focus on the innumerable violations by individuals, rather than rashness of a few. Such a strategy must focus on creating a broad-based and pervasive culture of safety.

Awareness is not the main problem:

The level of safety-awareness among Chennai-dwellers is much higher than that among the rural folk. Instances of a pedestrian suddenly changing direction to move towards the other side of the road --- a

common sight on a village road --- are relatively uncommon in Chennai City, although not non-existent. Mostly, traffic violations are not due to lack of knowledge about basic traffic rules, but because of other reasons. Let us try to identify these reasons:

- a) *Wanton and defiant violations:* There is one brand of the urbanite who considers himself beyond the purview of laws. Individuals of this category maintain an "I care two hoots!" attitude towards rules and the authorities entrusted with their implementation. They behave as if the roads are their personal property where the others must make an effort to avoid being knocked down by them.

The worst example of these defiant violators is the group of young motor-cycle riders who are often seen conducting motor cycle races on Chennai roads. The police, in spite of their efforts, are at best only able to control but not root out the menace. The legal framework does not provide a severer remedy than charging these young adventurers for rash and negligent driving, but the youngsters mostly belong to well-off families and do not seem to bother about the thousand odd rupees they must pay as fine. Also, the police find it difficult to segregate these racers on a crowded road and often the racers speed off before they can be caught.

Another category of the wanton violators are those who consider it the duty of the potential victim to look after his or her safety. They don't feel responsible for the possibility of accidents to which their rashness and negligence exposes others.

The traffic violators of this category cannot be controlled by mere enforcement. They must be taught to share the road with others. Apart from this, the public at large must condemn activities that expose the common road-user to risks. Once a culture of looking down upon violators of laws develops in our society, the violators will desist from breaking the laws. Our attitude towards violations of laws should change so as to make the violator feel ashamed of committing the violation.

- b) *Violations due to negligence:* The persons who violate traffic rules due to negligence fail to appreciate the dangers to which they are exposing themselves and others. They live by the faith that since nothing has gone wrong in the past, nothing will go wrong in the future. The pedestrian who moves across the road without bothering to look around belongs to this category.

It is easier to resolve this problem, because there is no wanton and defiant attempt on the part of the violator to violate the laws. All that is required is a change of attitude. This can be achieved by constantly and repeatedly drumming into his or her mind the need for following rules.

- c) *Violations due to 'compulsion':*

Part of the problem in Chennai City is the dense movement of vehicles and the public and the resultant congestion. Someone returning from office or rushing to the cinema hall does not show the patience to wait for his turn for a smooth way to his destination. The road-users are seen constantly competing for the scarce road-surface by squeezing into the gaps between vehicles to cut short their journey. The car wriggles into the space between lorries and the motorcycle into the space between cars. In their desperation to maintain forward movement in the midst of congestion, the drivers throw road-safety to the winds.

Negligence of this type may be called negligence due to 'compulsion' because the road-user is under pressure to compete for the space available for travel. The office-goer who must reach in time, the student who must not miss the first period and the youngster who has a commitment to honour are all in a hurry to reach. These road-users feel irritated and frustrated when they have to wind their way through thick crowds of humans and vehicles.

The irritation generated by the frustration finds expression in their driving styles. A short vacant space is seen as the chance to make up for the delay and the scooterist presses the accelerator, only to hit against a cyclist emerging from a side-lane! It becomes a sequence that is often repeated on the City roads: congestion → delay → frustration → exasperation → rashness.

This category of violations can be resolved by creating a culture of starting in time for one's destination. Also, the awareness campaigns must focus on how proper scheduling of one's travel on the road can reduce the need for such desperation.

- d) *Flouting the safety norms:* Every potential danger does not end up in an accident. For every accident that takes place, there are innumerable others that don't occur. This creates a false confidence that one might come to a hair's breadth proximity to an accident, and yet never become a victim. Such erroneous notion is very frequently the cause of accidents. One day a slight slip on caution results in an accident.

Safety Campaigns rather than Awareness Campaigns:

The above categorization of the causes for violation of traffic rules would make clear why in a city like Chennai, safety level is low in spite of a high level of awareness. The road-users are well aware of the Stop-line and yet they sometimes violate it. They know the meaning of the traffic lights and the significance of the lane system and yet many of them do not follow these. This is because traffic violations are not caused by lack of awareness but because of the other factors mentioned above.

Hence, awareness campaigns alone are not an answer to the traffic problem in Chennai City. There is need for safety campaigns that would gradually cultivate in the minds of the City-dwellers a culture of safety. The need for caution should become a part of thinking. Just as a staunch Hindu would not go into the temple with shoes on and just as a Muslim would not eat pork, so also a member of our society should feel uncomfortable at the thought of violating traffic rules.

We need to fill the minds of the people with the dictum "Danger begins where caution ends". The fact that one slip in caution may prove fatal either for us or for someone else needs to be drummed into the minds of the people.

Internalising the Laws:

The culture of safety is based on internalization of traffic rules. The rules should become a part of our personality. A person does not have to be told to use the razor for shaving instead of the kitchen knife. A school student never gets confused whether to go and sit in his chair or in the chair for the teacher. A youngster from a good family does not need instruction on whether to touch his father's feet or give him a slap. All the expected forms of behavior in these situations are strongly printed on the mind. The traffic rules should get similarly printed on the minds of the road-users. If such internalization of rules is possible in the western countries, why can it not be achieved in our country?

Appeal to Emotions:

Safety campaigns should appeal not only to the logic of the target groups, but also to their emotions. Appeal to the emotions goes much deeper and touches the heart. A safety campaign that shows the negative impact of the death of a bread-earner on the future of his children will have a greater impact than a campaign that only repeats clichés.

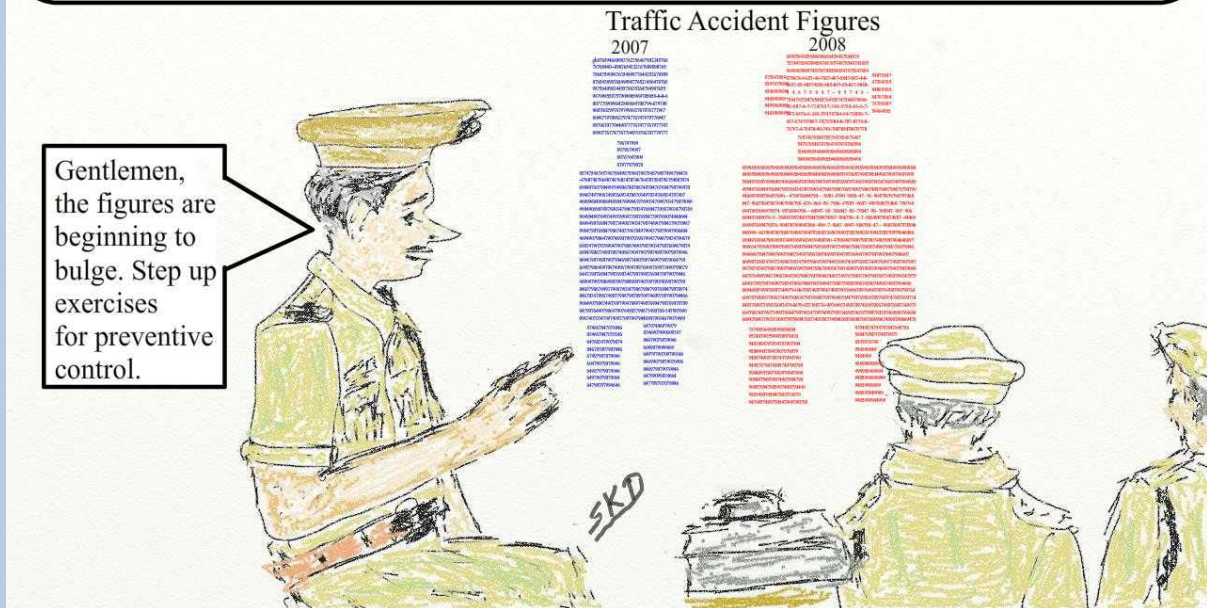
Building a Safety Culture:

The characteristic of a culture is that it does not require conscious teaching. It is passed on from generation to generation through a process of socialisation. Violators of cultural norms are rare and

can be dealt with more easily. At present the person who hoodwinks the traffic cop and passes the red light is considered a smart guy and the one who waits for the light to change although there is no vehicle from the other side is considered impractical and a stickler to rules. This situation must reverse by a change of our value system. He who stands and waits for the change of light although there is no vehicle from the other side must be respected and he who violates the red light must be derided. Such change in values will bring the dawn of a Culture of Safety.

e-TrafficMag

Troubleshooting Figures *by S. K. Dogra*



S.K. Dogra, 1982 batch IPS officer of Tamil Nadu cadre, is currently Additional Director General of Police in charge of the State Traffic Planning Cell. He is the recipient of President's Medals for Meritorious and Distinguished Service.

Last year, in STPC we created a database using Visual FoxPro. I myself wrote the programs and the programs were sent to the districts as email attachments. The zipped folder contained a word document with detailed instructions on how to install the software. In each district a set of constables were trained to fill data and the work in each district was supervised by a Sub-Inspector. It took a few weeks before the work could pick up speed, but once the constables became comfortable with the program, data began to flow into a PC-converted-into-a-Server in the STPC.

The entire effort became a good precursor for a much more powerful database system called Road Accident Database Management System (RADMS) that has now been procured by the Government of Tamil Nadu and entrusted to STPC. The database system also helped to throw up a number of issues related to traffic accident statistics and I wish to highlight some of these for discussion by other officers. I shall be glad to get your opinion on these issues either on the email ID etrafficmag@gmail.com or through the Discussion Board in our website at www.tnpolice.gov.in/trafficimprove

The Modal Value of daily fatal accidents:

The number of fatal accidents that occurred each day in 2008 were counted with the help of a program. The number of times a certain figure was reached during the year was then tabulated and studied. It was found that the minimum number of fatal accidents to occur on a single day was 13 and this figure was achieved only once in the year. Similarly, 15 and 16 fatal accidents on a single day occurred only once in the year. As we moved up from 17 fatal accidents per day onwards, the number of days on which this figure of fatal accidents occurred went up till a figure of 29 fatal accidents per day was reached. It was found that 29 fatal accidents on a single day occurred 24 times in the year. This is the highest number of times a figure of fatal accidents on a single day is achieved during the year 2008. The figure of 29 can thus be taken as the modal value of fatal accidents for Tamil Nadu. As we move up from the modal value, the number of times a certain figure of fatal accidents is achieved on a single day begins to decrease till we reach the maximum figure of 56 fatal accidents on a single day. This figure was reached 2 times during the year.

What is the significance of the Modal Value?

Since modal value is the peak of the tendency of the accident figures to cluster around a point, this value has great significance for preparing the accident profile of the State. The fact that 29 is modal value of fatal accidents in 2008 shows that the aggregate of factors, such as the road condition, the level of road-safety awareness, the volume of vehicle movement on the roads etc. tend to contribute an average of 29 fatal accidents in a day. Whenever the number of fatal accidents is higher than this figure, some other factors play a role in increasing the figure and whenever the number comes down, it is due to those factors which favour road-safety. On daily analysis it was found that rise in accidents above the modal value coincided with a higher-than-normal movement of vehicles due to such factors as a rally in Chennai or a temple festival across parts of Tamil Nadu. This observation was also supported by the fact that there was a spurt in accidents in certain areas and this spurt was found to coincide with greater movement of vehicles due to the above mentioned reasons.

This type of analysis based on a modal value helps to develop a strategy for reducing accidents by close monitoring. Once the modal value is taken as the expected figure of fatal accidents for the State under the existing conditions of road, safety-awareness and other factors, the following steps can be planned:

- Efforts should be made to bring down the modal value by improving road condition, awareness level and enforcement of laws.
- Deviations from the modal value should be analysed for post-analysis and learning lessons.
- Such events as rallies, temple festivals and other events that increase vehicle movement should be anticipated and preventive bandobast provided for better road-discipline.

STPC tried all this in Tamil Nadu by close monitoring of traffic in the State by establishing a State Traffic Control (STC) with good results. It was found that the accidents in the second half of the year were significantly less than those in the first half. The State-level monitoring is further being strengthened.

Studying the Modal Value approach across states:

I wish to suggest that other states should undertake a similar modal value based approach. It would be interesting and useful to pool the results from across many states and see if the type of pattern suggested by me emerges. I shall be glad to interact with those interested in such analysis.

Accident-count by occurrence:

Based on our indigenously-created database program last year, we arrived at the figures by taking the *date of occurrence* rather than the *date of reporting* as the criterion. The normal practice is to say so-and-so number of cases was reported during so-and-so-year. This, however, distorts the situation, especially in accident cases where cases of injury are altered to 304(A) after several days. Thus, many cases that occurred in 2007 go into 2008 account and many cases that occurred in 2008 go into 2009 account. Logically, we should be interested in knowing how many cases *occurred* in 2008 and not how many cases were *reported* in 2008.

In my opinion, the issue of whether the statistics should be based on date of occurrence or date of reporting should be debated and standardized at the national level. Perhaps we could benefit from the practice in other parts of the world.

Should only charged cases be taken into account?

In India an FIR is registered as soon as a traffic accident is reported. The FIR has to necessarily contain one of the IPC sections. The section for the fatal accident is 304(A) IPC. During investigation in many cases registered under section 304(A) IPC, it turns out that there was no negligence or rashness on the part of the driver. The case is not charged in such situations. Now, the question is: what would be the status of such cases in our final tally at the end of the year. Strictly speaking, if fatal cases are taken to be cases under section 304(A), then cases in which our investigation reveals that there is no rashness or negligence cannot be called fatal cases. A debate among police officers with some feedback from the practice in other countries might help rationalize the practice.

The cut-off date:

The tally of accident cases taken on a certain date is liable to change, as some of the persons injured in accidents succumb later. This becomes a tricky affair when you take the end-of-the-year figure. Many of those who were undergoing treatment on the 31st December succumb during the next few days and weeks. At times, the doctor who gives the cause of death connects the death to an accident even after months. Therefore, as days go by, a number of cases of injury change into fatal accidents. How to handle this change in figures is one issue that needs to be debated.

Mind your figures:

I have raised just a few issues. But those who deal with figures know how tricky the subject of statistics can become. It is high time we as professionals began discussing these issues and rationalizing our system of figures.

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The Cost of Accidents

Sanjeev Kumar IPS



Mr. Sanjeev Kumar is an IPS officer of 1986 batch. He is Inspector General of Police in charge of South Zone with headquarters at Madurai. Among the many sensitive postings held by him was a 9-year long tenure as an officer with the Research and Analysis Wing of the Government of India. In the current article he analyses the material and human cost of accidents.

The Road Accident have been a major cause of loss of life in south Zone. To get an idea about the extent of the problem and areas where better enforcement or planning is required, an analysis was conducted about accident cases in South Zone.

Table of Accident cases Reported in South Zone during last 5 years

Years	Unit	Total No of accidents	Total Persons of Killed	Total persons injured	Total No of non fatal accidents	Total No of non fatal accidents with grievous injury	Total No of non fatal accidents with simple injury	Total No of accidents without injury
2004 To 2008	MDU	8316	1734	9580	1564	218	5650	884
	VNR	5166	1224	6804	1073	945	5859	521
	DGL	8937	1936	11502	1742	570	5922	703
	Theni	4328	798	6991	739	761	6190	332
	RMD	3234	755	4015	656	240	2126	212
	SVG	3330	749	4535	674	133	2388	135
	TIN-C	2042	332	1962	318	199	1361	164

	TIN	6612	1537	9415	1380	2587	6830	467
	TUT	6250	1290	7706	1160	534	3912	644
	KKI	5388	1001	5540	959	1023	3103	303
Total		53603	11356	68050	10265	7210	43341	4365

The important aspects coming out

- (i) Total 53603 accidents were reported in the 9 districts and Tirunelveli city Commissioner ate during last 5 years. On an average 29.37 accidents are reported every day in the Zone.
- (ii) 11356 people have died in accidents during the last 5 years. This means 6.22 deaths every day due to accidents.
- (iii) The deaths due to accidents are quite high when compared with loss of life due to murders. We had 1956 deaths due to murders during the period 2004-2008. The average was 1.07 murders per day in the Zone. We are losing 6 times more number of persons in accidents as compared to murders.
- (iv) 68050 persons were injured in last 5 years in accidents. This means 37.28 persons are injured every day.
- (v) Dindigul District followed by Madurai District has the highest number of accidents and casualties due to accidents. One important reason is that many important National / State Highways Pass through the area.
- (vi) In 49238 accidents, the drivers, passengers or other road users sustained some injuries or suffered death. On an average each of these accidents would have involved an average expenditure of Rs. 5,000/- for treatment of victim or damage to vehicles. Total cost comes to Rs.24.6 crores.
- (vii) In 4365 accidents there was only damage to vehicles, if we again take Rs. 5,000/- as average cost of repair it comes to 2.18 crores. Total expenditure would be 26.80 crores.

Important Reasons for the High figures of Accidents

(a) There has been a substantial addition of vehicles on road during last 5 years.

Years	Unit	Total No. of new vehicles registered in the District.
2004 To 2008	MDU	187897
	VNR	27381
	DGL	64497
	Theni	27004
	RMD	38301
	SVG	63558
	TIN-C	145592
	TIN	
	TUT	43131
	KKI	92863
	Total	

(b) An addition of 6.9 lakh vehicles over the last 5 years means an average of 370.20 additional vehicles coming on road every day.

(c) Although the road space has increased on highways due to multilane projects of NHA, yet the same space has not increased on other roads or state highway where speed is equally high.

(d) The police strength to enforce traffic laws almost remained stagnant during the last 5 years. With 6.9 lakh vehicles getting added the traffic component needs additional manpower for regulation and enforcement.

MOTOR PETTY CASES DETAILS FOR THE YEAR 2006,2007,2008 UPTO FEBRUARY 2009

Unit	2006		2007		2008		Total			Percentage Of Conviction
	Booked	Con.	Booked	Con. Pen.	Booked	Con. Pen.	Booked	Con.	Pen.	%
MDU	34498	2070	46510	3761	26483	2631	107491	8462	99029	7.9
VNR	41447	22305	46326	17476	38604	21853	126377	61634	64743	48.8
DGL	23448	6717	35602	14507	38970	18046	98020	39270	58750	40.1
TNI	31242	9138	23489	10388	20786	11335	75517	30861	44656	40.9
RMD	15332	6310	12951	9424	12813	7438	41096	23172	17924	56.4
SVG	10543	6552	13239	7215	11240	6732	35022	20499	14523	58.5
TIN-C	17335	10848	13498	11032	18800	17955	49633	39835	9798	80.25
TIN	19329	15428	35457	29776	37713	29053	92499	74257	18242	80.27
TUT	29424	14453	33417	18551	29531	16629	92372	49633	42739	53.7
KKI	19505	10404	27948	21936	27652	22007	75105	54347	20758	72.7
Total	242103	104225	288437	144066	262592	153679	793132	401970	391162	50.7

(f) Despite the limited manpower we have booked about 2.5 lakhs motors petty cases every year. During last 3 years 7.93 lakh cases have been booked for various violations.

(g) The problem lies in rate of conviction of motor petty cases. Except for Tirunelveli City where 80.25% were convicted and Tirunelveli District where 80.27% were convicted and kanniyakumari

District where 72.4% were convicted all others have very poor rate of conviction. The evening courts functioning in these districts have improved convictions.

(h) Maximum Accidents and deaths are in Dindigul and Madurai districts and these district have a conviction rate of 40.1% and 7.9% respectively. Efforts are being taken to improve conviction rate by liaison with court officers.

(i) Dindigul District & Madurai District are prone to accidents, as a number of highways (Both State & National) pass through their limits.

(j) When we see the figures in the table given below about the year-wise increase in accidents it does show an encouraging trend. Rate of increase of accidents has come down as also the rate of fatalities.

Year	Accidents	Difference from previous year	Death	Difference from previous year
2004	9751	-	1995	-
2005	9963	212	1997	2
2006	10787	824	2224	227
2007	11452	665	2492	268
2008	11650	198	2648	156

(k) The number of accidents increased by 824, 665 and 198 respectively during last 3 years while number or deaths increased by 227, 268 and 156 respectively during last 3 years despite an average 1.4 lakhs vehicles getting added on the roads.

(l) The main reason was that during 2005, 2006 & 2007 a number of major highways started multilane projects, as a result of which a single road had to be used for traffic while the other half of the road was undergoing expansion. 2008 saw most of these projects getting completed. Hence the rate of increase of accidents and rate of increase of deaths has shown a reduction.

(M) The number of highway patrols also increased in 2006 & 2007 and are one reason for the improvement.

(N) In fact Madurai district and Dindigul district have 4 Highway patrol vehicles while all other districts have Two or Three. The above analysis shows we require more highway patrols for Madurai & Dindigul

(j) All the district SPs have now been told to step up efforts to reduce accidents.

(o) With improvement in road the speed of vehicles on highways will increase. Hence, all the side roads that are joining on the Highways should have speed breakers.

(p) Driving on multi-lane highways requires additional training on how to change lanes after giving proper indications. Most of the drivers are not aware of this. Refresher courses will have to be organized in collaboration with Transport Corporations, Lorry Associations, Taxi Driver Associations and Auto rickshaw Associations since these are major stake holders.

(q) A major drive is required to encourage people to wear helmets. The use of helmets is still very low.

The Seamy Side of Accidents



Doctor V. B. Narayan Murthy is a senior consultant plastic surgeon. A gold medallist during his academic studies, Dr. Murthy is known for his professional competence. He has handled a number of accident cases on the East Coast Road, the Old Mahabalipuram Road and the GST Road. He is an FRCS.

In this article he shares his experience from treating accident victims.

Global hospitals and health city is a new superspeciality hospital located in the south of the city of Chennai. It is strategically located close to the OMR (the old Mahabalipuram road) ECR or the East coast road and the GST road, one of the main arterial trunk roads linking the south of the country with the city of Chennai. An initial analysis of the pattern of presentation of RTA victims may provide an insight into the type of accident victims we have seen over the past six months. This initial or the first information report is vital for planning not only for the hospital but sharing this with all the other important groups like the traffic police, NGOs. Road traffic users, and the government. Such cooperation will help maximize efforts to provide the best medical care to the unfortunate victims of road traffic accidents. The data may also be used for raising the profile of preventability of road traffic accident injuries and look at the well-known good practices of driving like helmet and seat belt wearing, avoiding drunken driving, concern for pedestrians and the old. Sensible driving and avoiding over-speeding and most of all obeying traffic rules and when applicable enforcement of the same by the police.

WHO reports about 3000 deaths per day in the world. In India, 12.75 lac people sustain serious injuries in RTAs and 1.2 lac die every year. Of these, 60-70% are between 14 and 45 years. A vehicular accident occurs every three minutes causing a death every ten minutes. Trauma related death occurs every 1.9 minutes. India has 1% of the world's vehicles, but 6% of the total global RTA deaths. Economic loss amounts to Rs 550 crores (12.5 billion dollars), an amount that equals our defense budget.

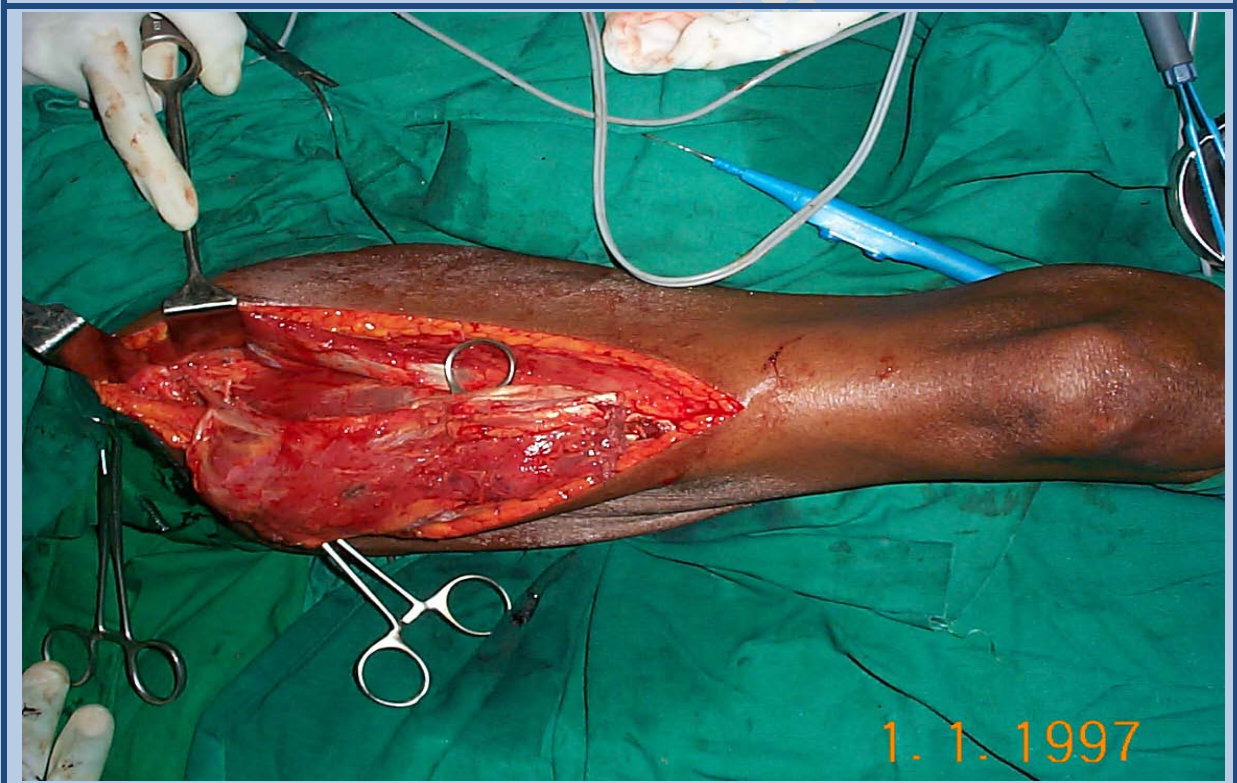
The hospital saw a slow increase in the number of accidents initially but the figures rose exponentially after a private public partnership to post ambulances at important intersections was agreed upon and fully equipped ambulances were provided by the hospital. The age of the victims ranged from as young as 7 years who was involved in a two wheeler injury with his other sibling to an old woman who was aged 75 and had sustained head injury who finally succumbed to the injuries. The mode of bringing the victims ranged from own transport, autorickshaw or our own ambulances. There was no significant delay in the arrival to the emergency department and adherence to golden hour could be possible if our ambulances were involved in the pick up of the victims. Ensuring UABCC (*Urgent Airway Breathing Circulation Cervical Spine*) care and cardiopulmonary resuscitation (CPR) if required or AMPLE (*Allergy Medication Past medical history – diabetes, cardiac, epilepsy Last meal Events leading to accident*) documentation must be completed as it might help doctors in the ERs to decide the therapeutic approach. This was neither followed nor was there any awareness of the same.

80 to 90 % of the accident victims got admitted for further treatment initially but that figure dropped to only 20 to 30 % getting admitted. This we suspect is because initially only the more serious patients were coming to the hospital necessitating admission and treatment. However as the awareness of the hospital grew, more and more people have started coming and also the number of not so serious injuries had also increased. The percentage of number of more serious injuries also increased with reporting of patients dying after coming to the hospital or being brought dead on arrival. Head injuries with the victim not wearing the helmets was the common cause of more serious injuries. Limb injuries were the next common types of injuries seen. Over-speeding in two wheelers was the reason for one of the worst limb injuries that can be imagined. We have had severe cases of severely contaminated right upper extremity injury and fracture of the bones and complete brachial plexus injury. There were numerous simple fractures injuries of limbs but also more severe limb injuries necessitating plastic surgical reconstructions to restore the upper or lower extremity form and function.

A look at the number of people who did not undergo treatment at our center on recommending further treatment throws an interesting aspect to the treatment of these unfortunate victims. This ranged from 15 to 20 % month on month. Cost was an important aspect of further management. In most cases there was some form of insurance for the road traffic accidents. For people who did not have this meant transport to another less equipped hospital or to the public hospital which was far away from this hospital.

Analysis of the cause of accidents revealed carelessness on the part of the driver, over speeding, rash driving by truck drivers and non wearing of helmets by the victims. Awareness on Pre- hospital management needs to be taken up in a big way. Transportation by non ambulance transport is less than ideal and can be harmful. Education of auto-rickshaw drivers may help proper transport of these seriously injured victims. The answer to provide treatment to the accident victims who do not have financial means is an important aspect in the management of the accident victims.







Some consequences of road-accidents

The successful management of the accident victims involves pre - hospital, hospital and post - hospital care. Effective pre - hospital care involves good driving practices by individuals which can be improved by educating the public and also strict law enforcement on the roads. Good ambulances, well equipped with people and machines will help take care of the injured during the transportation. Global hospital has full time doctors this helps deal with the injured victims as soon as they are in the hospital.

The most important aspect of funding for these unfortunate victims who don't have to suffer for lack of funds at the most important time of their life could be done by two means. The Delhi experience showed that challaning 4 million unruly trucks could raise a total revenue of 430 million rupees. Global hospital and other hospitals which are located in the midst of three major roads in the vicinity and who can provide quality emergency care in the golden hour could see a similar plan to raise money and a part of this revenue earmarked for this purpose. The OMR and ECR also

collects toll and a small part of this could be set aside for the care of the unfortunate victims who use and provide revenue that sustains the very road.

This retrospective analysis has all the drawbacks of such an analysis. We need to look at a lot of other factors like the site of injuries, types of vehicles involved, time of the incident to name a few and may be a lot more of aspects. All these and more data should be collected prospectively with the help of the traffic police and transport agencies, NGOs and active participation of the interested hospitals and a database created so that a meaningful analysis could be done.

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