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Road Accident Scenario in Kolkata: A Spatio-temporal Study

Amit Ghosh[1] and ***Suman Paul**[2]

[1]*Dept. of Geography, University of Kalyani,*
[2]*P.G. Dept. of Geography, Krishnagar Govt. College, Krishnagar, Nadia*

ABSTRACT

Each year more than 1.2 million people die in road accident around the World. The majority of this death (about 50%) is of pedestrians, cyclist and bikers. The traffic accident situation in Kolkata police station boundary as well as India is really alarming and the loss of lives and property damages are expected to continue if proper corrective measure are not taken accordingly by applying proper engineering measure through extensive research and investigations. This paper presents the various aspects of traffic accidents in Kolkata city in West Bengal, India. Data on accidents were collected from Lal Bazar, Police Head Quarters in the city for three years (i.e. 2007-'09). It was found that a total 7217 accidents occurred during this period. Almost 25 per cent victims were between ages 18 to 30 years. Pedestrians are the worst victims of road accidents and accounted for 17.9 per cent deceased and 82.1 per cent injured. Bus and truck accidents comprise 21 per cent city road accidents. The analysis results also show the nature of contributory factors and hourly distribution of accidents occurred most frequently. Therefore, some safety measures and long term recommendations are made to improve the situation of Kolkata.

Key Words: Pedestrians, alarming, engineering, countermeasures.

INTRODUCTION

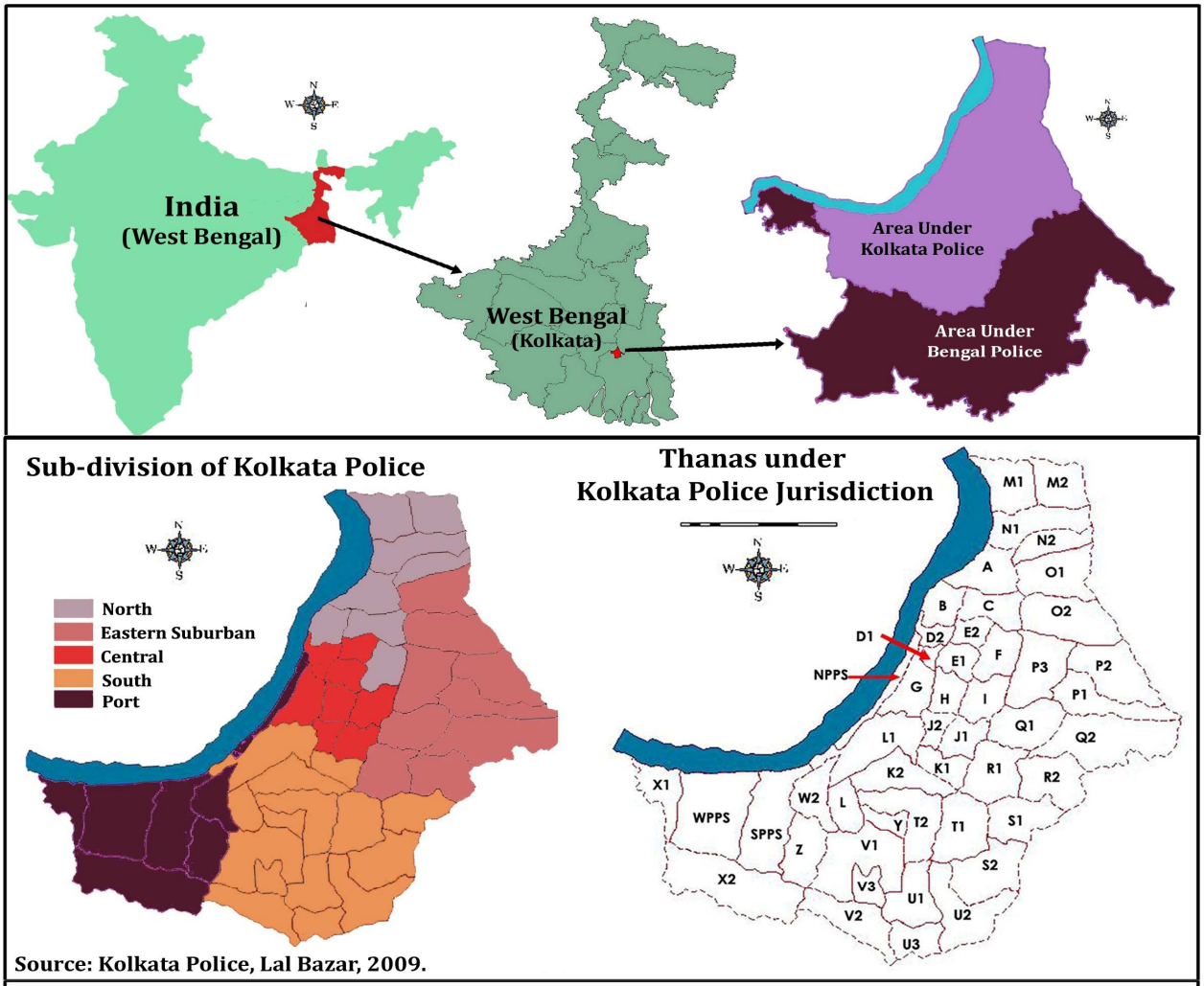
Each year more than 1.2 million people die in road accident around the World (W.H.O. 2004). The majority of this death (about 50%) is of pedestrians, cyclist and bikers. The "Study Global Burden of Disease" undertaken by the World Health Organization (W.H.O.), Harvard University, and World Bank, showed that traffic accident were the world's ninth biggest cause of death during 1990, the study forecast that by the year 2020 road accident would move up to third place in the table of major causes of death and disability (Murray and Loper). According to a report published by W.H.O. more than 3000 people are injured or disable every day. Iran has the highest rate of road accident in the world, leading to 38000 deaths and injure per year (source: IRNA). China is in the second highest position in the world with a number of 89,455 people died in 2006. This problem draws significant attention in India where road accidents are extremely high and still increasing.

It can be said about India that it is the heart of south Asia. It is one of the highly populated countries of the world having population density of 324 persons / sq k.m. In India one person dies in every 6 minute and 10 are injured in the same time frame (source: BBC Sep 2005). In the year 2006-07 and 2007-08 India experiencing the highest number of road accident in the world, almost 15 cases every hour on an average. There are a number of metropolitan areas in India like Mumbai, Delhi, Chennai and Kolkata. The situation is very dangerous particularly in metropolitan areas. In Mumbai metropolitan area 35 cases of accident occurs per day and 15th death (source: BBC Sep 2005). The total number of road accident in Delhi metropolitan area in last year is nearly 12,000 (Delhi traffic police report). The situation in Kolkata is very similar like the other.

The Kolkata metropolitan area is situated on the land of the state West Bengal and it is in the eastern part of India and along with the holy river Ganga with a very high population density. The most central part of this metropolitan

area is under the administration of Kolkata Police (K.P.), the land size of this part is 104.5 sq. k.m. As the economy of this area is totally depending on industrial and service sector (this particular area is also known as the Central Business District of the whole metropolitan area) and it is well known that this type of economy largely depend on quicker transport the vehicle pressure on the road is huge and consequently the occurrence of accident is generally very frequent. The total flow of this area is nearly 1,062,047 vehicles and 85 to 90% of them is motorized .The road network is very much congested with a total road length of 1416.4 k.m. where the land size under this area is only 104.5 sq k.m. There are a number of entry point (like Dunlop, Howrah Bridge, port area and Ultadanga etc.) can be identified easily through which a large number of flow come in and go out every day. In last year nearly 2789 accident occurred in this area and the number of vehicle and accident is increasing simultaneously day by day. Looking at the present scenario of accident around the world this sudden occurrence can appropriately be termed as 'Social hazard"

Figure 1 showing the administrative set up of the study area.



Source: Kolkata Police, Lal Bazar, 2009.

Name of the Thanas under Kolkata Police Jurisdiction

A: Shyampukur	G: Hare St.	L2: Maidan	P2: Phoolbagan	T1:Bowanipur	W: Watgunge
B: Jorabagan	H: Bau Bazar	M1: Kossipur	P3: Narkeldanga	T2:Kalighat	X1: Gardenreach
C: Buratalla	I: Muchipara	M2: Sinthi	Q1: Entally	U1:Tollygunge	X2: Taratala
D1: Burrabazar	J1: Taltala	N1: Chitpur	Q2: Tangra	U2: Lake	Y: Kareya
D2: Posta	J2: New Market	N2: Taratala	R1: Beniapukur	U3: Charu Market	Z: Ekbalpur
E1: Jorashanko	K1: Park St.	O1: Maniktala	R2: Topsia	V1: Alipore	NPPS: North Port
E2: Girish Park	K2: S P Sarani	O2: Ultadanga	S1: Bullygunj	V2: New Alipore	SPPS: South Port
F: Amharst St.	L1: Hastings	P1: Beliaghata	S2: Gariahat	V3: Chetla	WPPS: West Port

The traffic accident situation in Kolkata police station boundary as well as India is really alarming and the loss of lives and property damages are expected to continue if proper corrective measure are not taken accordingly by applying proper engineering measure through extensive research and investigations. Therefore, it is important that

accident studies should be carried out for this area on a priority basis. The major objectives of this study are to provide information on the characteristics of accident (types, distribution and location of accident), the location of most hazardous intersections and mid-block, and provide recommendation to improve traffic safety in Kolkata police station boundary.

Study Area

From the present scenario of road accident around the world one can easily realized that, how much, this sudden occurrence is crucial to mankind and how much it is necessary to study on this dangerous occurrence to save the mankind. Here in this paper Kolkata police station boundary area, situated under Kolkata metropolitan area, have been taken as the study area because it is evident that the metropolitan area is highly vulnerable to road accident all over the world due to the high population density and huge pressure of vehicle on her road. The Kolkata police station is the main industrial division under Kolkata metropolitan area and it is known as the Central Business District (C.B.D) and generally the busiest, it is easily approachable to author, that's why Particularly the Kolkata police station boundary area have been taken as the study area. The geographical location of this in brief - Kolkata police station is within the Kolkata Municipal Corporation and capital of West Bengal state. It is situated on the left bank of the river Hooghly having extension of $22^0$31'- $22^0$40' North latitude and $88^0$16' – 88^0 24' East Longitude. Historian has given various explanations as to the origin of the name Kolkata. The area under Kolkata police station is 104.5 sq. k.m. having 48 police stations under 5 divisions in total.

Objectives

The major objectives of this study are –

- To study the distribution of fatal and non-fatal accidents took place during 2007-2009
- To analyse the nature of fatalities and injuries among different age-sex during 2007-2009
- To apprise the hourly incidents of fatalities and injuries during 2008-2009.

Review of Literature

Literature abounds on accident analysis, traffic records, and statistical methods used to perform accident analysis. Statistical methods articles covered a variety of techniques to analyze accident records and road safety. One article described the use of the Classification and Regression Tree (CART) method of nonparametric regression-type statistical procedure applied as a classifier and a regression model to highway safety analyses [(12)]. Another evaluates the use of R2 to evaluate goodness of fit of accident prediction models [(8)]. One article focuses on statistical hypotheses testing and its use to analyze whether the expected accident frequency is beyond what might be explained by changes in traffic and similar influences [(7)]. Another article used logistic regression analysis to determine whether age and gender were factors that influenced severity of injuries suffered in head-on automobile crashes on rural highways [(10)]. Yet another analyzed the reliability of statistical road accident injury severity models [(12)], while others focused on statistical methods to identify hazardous sites [(17)]. Another paper describes about the development of the rate-quality control method and use of this method in hazardous roadway location identification. The third uses regression models to estimate expected number of crashes [(17)] and the last covers the historical and conceptual development of procedures for identification of hazardous locations for safety improvement [(8)]. Additional articles focus on causal factors, one considering the relationship between volume-to-capacity ratios and accident rates [(18)] and the other examines the relationship between prior incidents and additional incidents on urban arterial roadways [(15)]. Other articles focused on roadside object effects on accident severity with one focusing on guardrail end-types, vehicle weights, and accident severities [(5)], a second on median treatments on urban arterial safety [(1)], a third on the effects of air bags on severity of roadside object crashes while a fourth studying the feasibility of utilizing accident data to derive unintentional roadside encroachment rates (U.S.D.T., 1997) and a fifth source, containing 7 articles, which concerns the finite element modelling of vehicle impact with a variety of safety structures (U.S.D.T., 1997). Most researchers found that GIS brings efficiency in data handling and effectiveness in data analysis [(9)]. The development of GIS application on road accident analysis has become a trend [(10)]. A GIS enables a new method in organizing geographical data through its database management system that facilitates the storage, organization and retrieval of digital records [(2)].

With all the literature existing related to accident analysis, traffic records, statistical methods and related fields, it is clear there is a strong interest in these topics. However, of all the literature collected, only a small fraction of the literature mentioned the use of GIS. This reflects not only the relative infancy of GIS, especially for use by transportation researchers, but also the fact that GIS is not used frequently for accident location and analysis. However, clearly interest is growing, both in GIS for accident location and analysis and in other non-GIS methods of accounting for the importance of traffic safety throughout the transportation community.

MATERIALS AND METHODS

Data Base

The data base which is used to analyses this study are as follows –

- Division-wise Fatal and Non-fatal (IPC) traffic accident cases for the year 2007, 2008, 2009.
- Age-sex wise distribution of fatalities and injuries in Kolkata police station boundary for the year 2007, 208, 2009.
- Victims wise distribution of fatalities and injuries in Kolkata police station boundary for the year 2007, 2008, and 2009.
- Time wise distribution of fatalities and injuries in Kolkata police station boundary for the year 2007, 2008 and 2009.

Methodology

The methodology that has been use to prepare this paper from its start to end are as follows:

Data Collection:

All the required data which have been used to give a structure to this paper are being collected from the Head office of Kolkata traffic police, Lal Bazar, Kolkata it is the only source of data related to road traffic accident in this area.

Collection of Maps:

The Kolkata police station boundary map and road network map of this particular area are also being collected from the Head office of Kolkata traffic police, Lal Bazar, Kolkata.

Perception Study:

A perception study being done in those areas which are identified as the accident black spot to get the perception about the causes of frequent occurrence of accident based on the view of the dwellers of that particular area as well as the daily commuter.

Data Analysis and Presentation:

To analyze the data in this paper some general software and GIS software have been used. Particularly all the maps presenting different nature of accident are being prepared by the help of the Geomatica 9.1. Software (GIS software) and all other calculation have been done by the help of Microsoft Excel software. There are some simple and general statistics have been applied to analyze the data throughout the entire paper.

RESULTS AND ANALYSIS

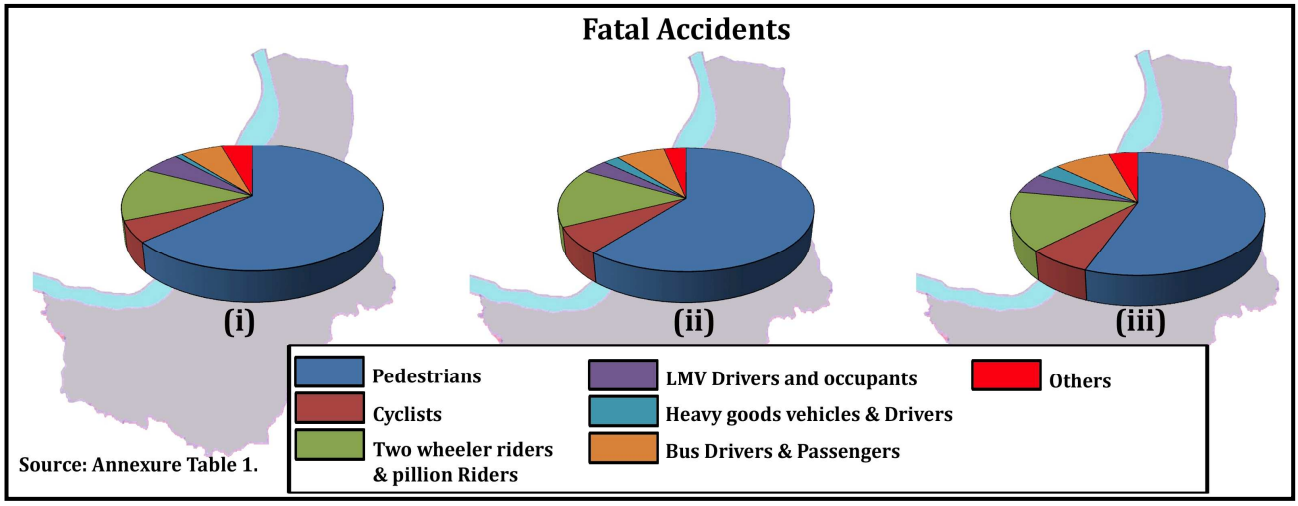


Figure 2a showing victim-wise fatal accidents in 2007 (i), 2008 (ii) and for 2009 (iii).

Victim-Wise Distribution of Fatal and Non-Fatal Accident

Victim-wise distribution of fatal and non-fatal accidents is focuses on the road user groups and their vulnerability to both fatal and non-fatal type of accidents. It is to determine or to find out the highly vulnerable road user group or groups, so that some special care for those road user groups can be taken. In this purpose the different type of road

users are being divided into seven different road user groups, these are pedestrian, cyclist, two wheeler rider and pillion rider, LMV drivers and occupant, heavy good vehicles and drivers, bus drivers and passengers and others. Data are being analyzed during 2007-09 to find out the temporal characteristics of the accidents.

The pedestrian are the most vulnerable group among the road users. They hold a large share of all fatal and non-fatal cases. It is not only for a particular year but can be said as a continuous or constant scenario, without any significant change for the three years, 2007-09. From the 2a (i) and 2b (i), it can be clearly evident that in the year 2007 this particular road user group holds a number of 293 of fatal cases and 1373 of non-fatal cases, which is nearly 63.42 per cent of all fatal cases and 73.78 per cent of non-fatal cases. In the year 2008 the share was nearly 60.81 per cent of all fatal cases (Fig-2a (ii)) and 77.59 per cent of all non-fatal cases (Fig- 2b (ii)). In 2009 a very little decries was found in the share of this group to fatal cases (Fig-2a (ii)) but share to non-fatal cases was remain as high as in the previous year i.e. 74.65 per cent (Fig-2b (iii)). So it can be conclude that though the share of this particular road user group to fatal cases are decreasing very slowly year after year but it is still very high and terrific, on the other hand its share to non-fatal cases is not experiencing any significant decrease and the situation is still going worse.

So it can be conclude that, road user groups are highly vulnerable to both fatal and non-fatal cases and there is no significant up& down in their share for last three years, they are under continuous threat. The other three road user groups those have been taken under consideration are cyclist, LMV drivers and occupant and others, about them it can be said that their share in both fatal and non-fatal cases have not followed any particular trend of increase or decrease for the last three years. For one year, it was gone high when in other year its share goes down and goes up in next year.

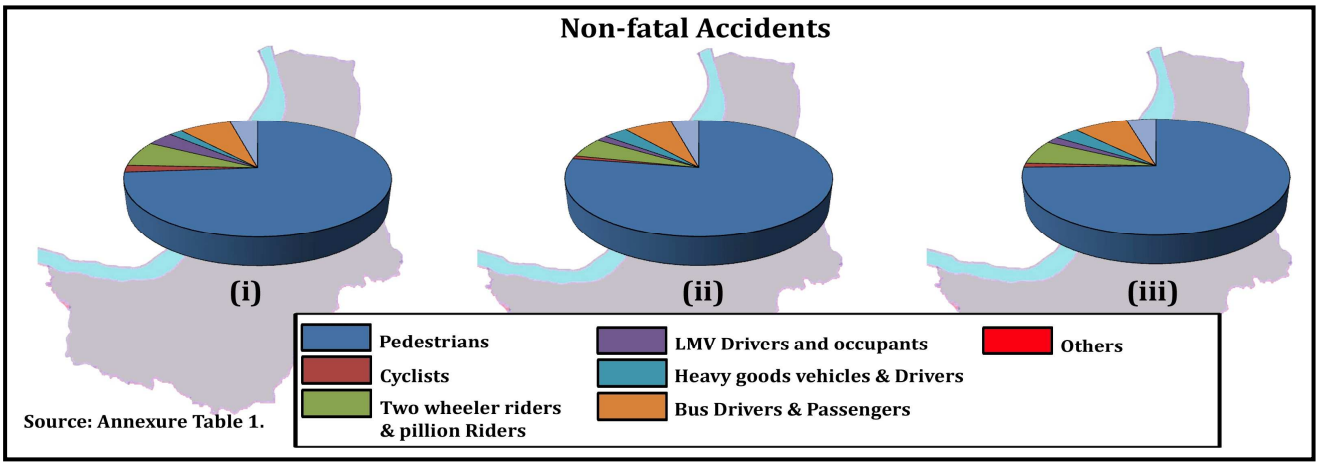


Figure 2b showing victim-wise non-fatal accidents in 2007 (i), 2008 (ii) and for 2009 (iii).

Fatalities and Injuries among Different Age-Sex

Under this analysis an attempt has been made to find out vulnerability of different aged people to road accident of both Male and Female group. Here to avoid complexity of the road user, populations are being divided into four road user group. These age groups are below 18 years, 18 years to 30 years, 31 years to 50 years and Above 50 years. Here a study have been done for the last three years, i,e. 2007, 2008 and 2009, mainly to find out the temporal variation. For the study three types of accident are being taken into consideration and these are Fatal, Serious injury, Simple injury or Minor injury.

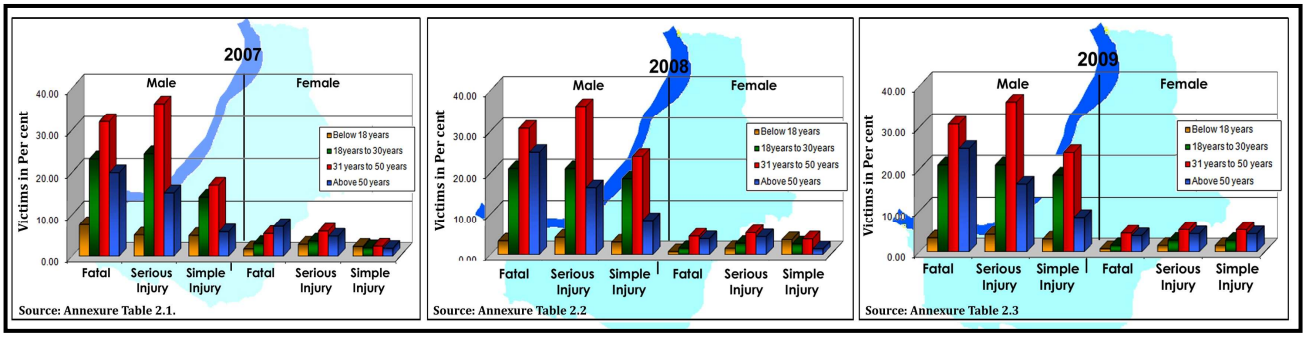


Figure 3 showing fatalities and injuries among different age-sex during 2007-2009.

The male share in all type of accident is very high than female. Male group are holding a share in an average of about 70-80 per cent of all type of accident for the last three years. If it has to be talked about a particular age group then it must have to say that the age group taken as 31 years to 50 years is at the pick of the vulnerability hierarchy for both the male and female group for all three types of accident cases (Fig 3). It account for 30-32 per cent (Male) and 5-6 per cent (Female) of all three type of accident in an average for the last three years (Annexure Table: 2.1, 2.2 and 2.3). Thus it is evident that they are under continuous threat.

The picture is quite same for the last three years and there is no significant change. Male of 31 years to 50 years age group is also highly vulnerable and it can be said that, the vulnerability of this particular age group is very much close to the age group of 18 years to 31 years. From the analysed data it can be clearly to say that the least vulnerable age group is, for both male and female below 18 years. Male of this particular age group accounts for only 3-4% of all type of accident in an average for the last three years whereas the female of this age group accounts for only 2-3% of all type of accident in an average in an average. From the general perception it can be said that the number of this particular age group on road is not so high like others.

The cause behind it may be that, among the other road user age group, the number of this particular age group on road is higher, as they are the working aged people. The age group of 18 years to 31 years is also a highly vulnerable group mainly the Male category for all three type of accident for last three years. They account for 18-20 per cent (Male) in an average for all type of accident for the last three years. Female of this particular age group are not very much vulnerable and holding of share is not very high. If it is said about Female then the next highly vulnerable age group which comes just after the age group of 31 years to 50 years is above 50 years. Female of this particular age group hold a share of 6-7 per cent in an average (Annexure Table: 2.1, 2.2 and 2.3).

Major Factors Contributing Accidents

In case of car accidents, major contributing factors are speeding (46.6 per cent) and careless driving (48.7 per cent). All contributing factors are given below in *Annexure Table 3*. Analyzing some others aspects of accidents, we have the following outcomes: Car accidents occur mainly at highways and cities due to speed (around 46.5 per cent) and careless driving (48.8 per cent). Higher portion of car accidents occur due to rickshaw, truck, bus, tempo etc. The distribution of accidents by days of week and months of year does not show any significant variation. Around 97 per cent of drivers do not wear seatbelts and 5 per cent found alcoholic. Accident factors considered were road surface condition (dry 97.4 per cent), surface type (sealed 99.6 per cent), surface quality (good 98.8 per cent), road geometry (straight 95.1 per cent), weather condition (fair 97.1 per cent), manoeuvring characteristic (ahead 83 per cent) etc.

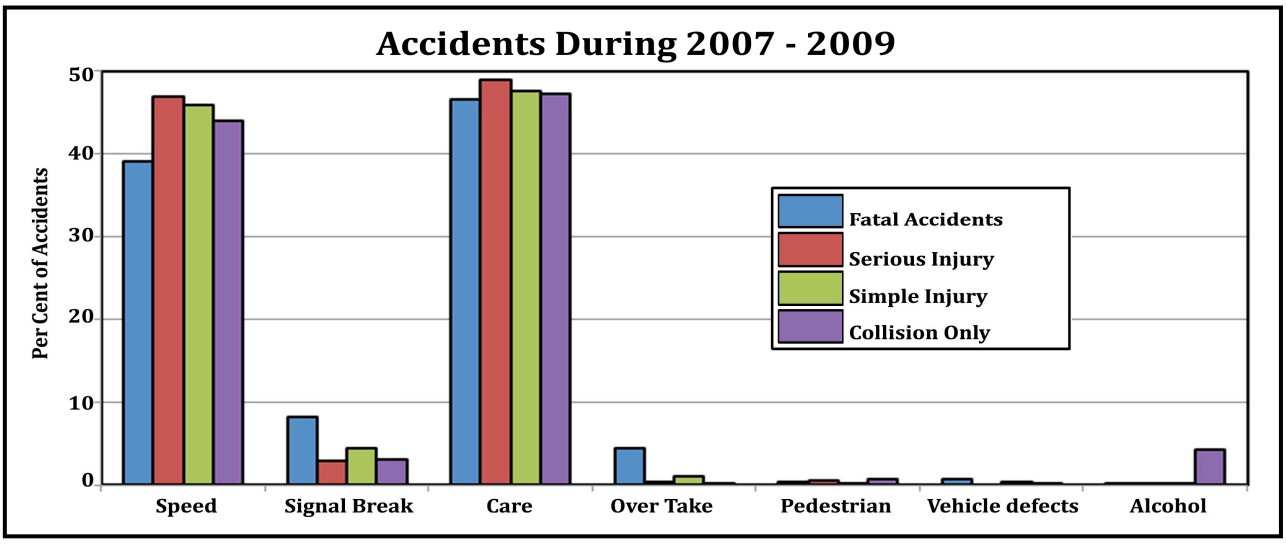


Figure 4 showing major factors contributing accidents.

Hourly Distribution of Fatalities and Injuries

Here it is being tried to find out the dangerous time during a day that are very highly vulnerable to different type of accident. There are mainly three type of accident being taken under consideration, these are Fatal, Serious injury, Simple injury or minor injury. The study covers the analysis of last two years (2008-09) to observe the temporal variation due to lack of data for the year 2007. In this purpose a full day has been divided into two parts, i.e., During Day Time (From 6 A.M. to 6 P.M.) and during Evening and Night (From 6 P.M. to 6 A.M.). It is being done, so that

some special care can be taken for this particular time slot during a day which is very much vulnerable to road accident.

About the fatal cases it can be said that, in 2008, during day time, it is evident that there are two very important or dangerous time zones for accident and these are from 8 A.M. to 10 A.M. and from 1 P.M. to 5 P.M. (Fig 5.i.a and 5.ii.a). As within this time slot the working populations and students are generally remain very high on road because the time slot from 8 A.M. to 10 A.M. is the time when they go to their working places and institutions and within the time slot from 1pm to 5pm, they use to back to home. For the year of 2009 the picture is quite same as for the year 2008. If we see the other part of the day, i.e. during evening and night time, the vulnerable time zone is from 6 P.M. to 10 P.M. for the fatal cases in 2008 and also in 2009.the picture for serious injury cases in 2008 is something like that, during day time there is a very vulnerable time zone, that is from 10 A.M. to 5 P.M., it can be said that it cover more or less half of an entire day time (Fig 5.i.b and 5.ii.b). There is quite change is evident in this picture for the year 2009 and the vulnerable time zone here is lies between 7 A.M. to 1 A.M. So it can be concluding that the time zones lies between 10 A.M. to 11 A.M. is common to both the year 2008 & 2009 is under constant threat.

If we go for the other part of the day that is from 6pm to 6am it can be broadly evident that the time period, from 6pm to 11pm is very much vulnerable, in 2008 and specifically the time period of 8pm to 10 pm is severely vulnerable, this time period experiencing nearly 80-90% of all accident cases occurred during this part of the day. The picture for the year 2009 is quite different, the dangerous time zone lies between 6 P.M to 9 P.M. So it can be conclude that the time zone from 6 P.M to 9 P.M is common to both the year 2008 and 2009, and thus this time period is also under constant threat. If it is said about simple injury nor minor injury cases than the vulnerable time area lies between 12 noon to 5 P.M., specifically the time period from 3 P.M to 5 P.M is very much vulnerable for the year 2008, its account for 50-55 per cent of simple injury cases occurred during the day pert (Annexure Table: 4.1 and 4.2). In 2009, results showing quite different pictures, here two different time zones can be identified as vulnerable time area, this are from 8am to 11am and from 2 P.M to 5 P.M. If we go for the other part of the day that is the evening and night time, the vulnerable time area lies between 6 P.M. to 10 P.M. in 2008 whereas in 2009 it was between 2 A.M. to 4 A.M.

Thus from the above discussion it can be fairly to say that , generally for all three type of accident, the vulnerable time zones are lies between 12 noon to 6 P.M., over the last two years during day time while during Evening and Night time it is between 6 to 12 over the last two years.

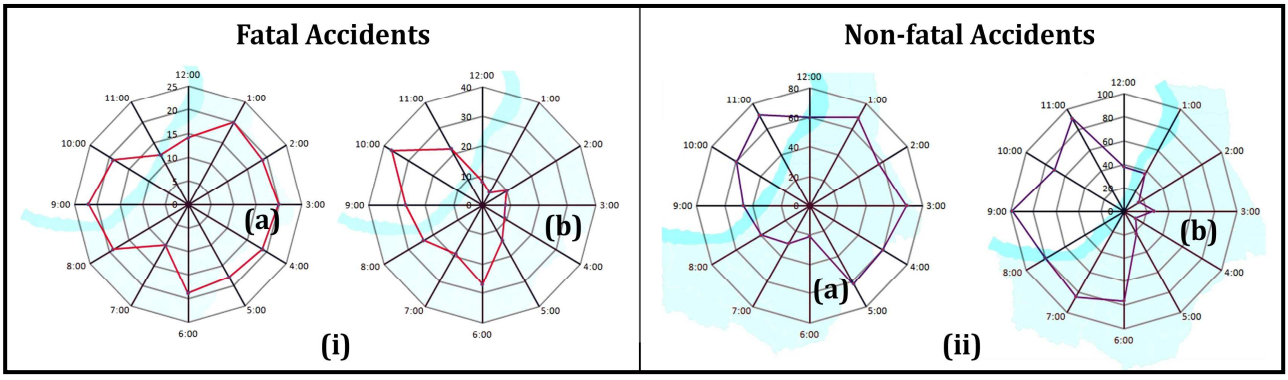


Figure 5 showing fatal (i) and non-fatal (ii) accidents during day (a) and night (b) time.

Some General Road Safety Countermeasures

The data and analysis presented the severity of car accidents and to reduce the number and severity of accidents some countermeasures is required. Some road environmental and regulatory countermeasures are given below:

- ***Installation of median:*** The placement of road medians with flaring openings, provision of pedestrian refuge islands will ensure pedestrian safety as well as reduce will reduce the accident frequency.
- ***Improvement of shoulder:*** Running off road and head on collisions can be significantly reduced.
- ***Inadequate traffic control devices (signs, marking etc):*** Traffic control devices should be installed properly where needed thus reduces accidents due to various road geometry problems.
- ***Better intersection design:*** High accident intersection treatments through adequate visibility, channelization, traffic islands and redesigning cross road intersection into staggered T-junctions may reduce accidents rate.

- ***Controlling speed and errant behaviours of drivers:*** The behaviours of car driver are completely unpredictable due to their overtaking tendency and over speed at free road. So controlling speed and behavioural chance may help to reduce accidents fatalities.
- ***Provision of NMV facilities:*** In addition to the installation of road signs, markings etc. construction of parallel service roads on both side of highway, protective rose walking and crossing facilities as well as installation of street lighting facilities should be provided in the locations where pedestrian and NMV activities are high. NMV should be given roadside facilities as it differentiates speed variable with motorized vehicle.
- ***Maintenance of road surface:*** Damage road surface should be immediately maintain for reducing body damage of car and damage road disturbed free flow of car. As a result driver are got angry and lost the control.
- ***Treatment of roadside objects:*** Adequate safe place at road side may reduce head on collisions with Bus, Truck in Bangladesh because of the tendency of Bus, Truck driver by occupying most of the roadway.
- ***Increase safety awareness of road users and driver training:*** Safety awareness is important criteria for road users when they used roads. Driver training is the key factor to increase awareness about safety

CONCLUSION

Data on road traffic accidents in Kolkata city are very poor. Police records are the only source of information on road accidents although there is substantial under-reporting as many accidents are settled privately. However, the fewer data on accident reports at police station are an indicative of lack of awareness of accident reporting. Based on police data it is not possible to make routine analysis and impossible to implement safety measure. This is primarily because police have no incentive to collect data accurately, and there is no standard accident-reporting format.
The analysis revealed that pedestrians are the largest victim group of fatalities and injuries. They are even in danger at zebra crossings particularly from motorists. The increasing vulnerability of pedestrians to road traffic accidents is largely due to the conflicts between pedestrian and vehicles, excess speed, careless driving and poor road visibility. The key to solving pedestrian safety in Kolkata city is to remove the conflicts, enforce the limiting speed and improve the road visibility. From the analysis it is concluded that many contributing factors are associated with different type of accidents at hazardous intersections and mid-blocks. These accident problems can be minimized to a greater extent by providing round hump to slow down the fast moving vehicle, installing good signal system, preventing the U-turn, eliminating the irregular stopping of auto-rickshaw at intersections and installing road divider to prevent lane changing activities, introducing raised hump with vertical post, sidewalk for pedestrians and control of road side parking.

Accident data from different police station suggests that there is a lack of proper enforcement and education to roadway safety. These weaknesses can be minimized through comprehensive corrective measures. Local community initiatives to improve the conditions are very sparse and it is also concluded that much greater effort, desirably with the support from international agencies and specialized institutes is needed in combating the problem. Importantly, such efforts would require considerable resources particularly trained local personnel, safety specialists and researchers so as to build up indigenous capacity and attain sustainable safety program.

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Annexure

Table 1: Victim-wise distribution of fatalities & injuries in Kolkata Police Station (2007-09)

Victim Types	2007		2008		2009	
	Fatal	Non-fatal	Fatal	Non-fatal	Fatal	Non-fatal
Pedestrians	293	1373	256	1648	227	1449
Cyclists	25	36	29	18	28	22
Two wheeler riders & pillion Riders	63	131	65	118	63	130
LMV Drivers and occupants	26	71	16	33	22	36
Heavy goods vehicles & Drivers	5	36	10	74	15	69
Bus Drivers & Passengers	29	140	31	148	35	152
Others	21	74	14	85	18	83

Source: Computed by the Authors based on Annual Review of Kolkata Police, Head Quarters, Lal Bazar; 2007 – 2009.

Table 2.1: Age-sex distribution of fatalities, Serious Injury and Minor Injury (in %) in Kolkata Police Station, 2007

Age-Sex Distribution of Victims	Fatalities		Serious Injury		Minor Injury	
	Male	Female	Male	Female	Male	Female
Below 18 years	5.11	2.83	5.11	2.83	4.95	2.31
18years to 30years	24.38	3.62	24.90	3.69	14.15	2.00
31 years to 50 years	36.23	6.00	37.00	6.13	17.00	2.38
Above 50 years	15.15	4.77	15.48	4.87	5.85	1.85

Source: Computed by the Authors based on Annual Review of Kolkata Police, Head Quarters, Lal Bazar; 2007.

Table 2.2: Age-sex distribution of fatalities, Serious Injury and Minor Injury (in %) in Kolkata Police Station, 2008

Age-Sex Distribution of Victims	Fatalities		Serious Injury		Minor Injury	
	Male	Female	Male	Female	Male	Female
Below 18 years	5.00	2.15	6.45	2.83	3.76	2.31
18years to 30years	23.23	2.92	21.33	4.03	17.85	3.15
31 years to 50 years	39.46	6.77	43.46	6.48	23.46	3.77
Above 50 years	15.85	4.62	17.55	4.57	9.08	2.23

Source: Computed by the Authors based on Annual Review of Kolkata Police, Head Quarters, Lal Bazar; 2008.

Table 2.3: Age-sex distribution of fatalities, Serious Injury and Minor Injury (in %) in Kolkata Police Station, 2009

Age-Sex Distribution of Victims	Fatalities		Serious Injury		Minor Injury	
	Male	Female	Male	Female	Male	Female
Below 18 years	4.22	1.52	4.22	1.52	3.06	3.67
18years to 30years	21.00	2.77	23.02	3.04	18.54	2.62
31 years to 50 years	36.08	5.38	39.54	5.90	23.92	3.85
Above 50 years	16.38	4.38	17.96	4.81	8.38	1.38

Source: Computed by the Authors based on Annual Review of Kolkata Police, Head Quarters, Lal Bazar; 2009.

Table: 3 showing the Contributory Factors for the Road Accidents in Kolkata Police Stations during 2007 – '09

Contributory Factors	Figures in Per Cent			
	Fatal	Serious Injury	Simple Injury	Collision Only
Speed	39.1	46.9	45.9	43.9
Signal Break	8.2	2.9	4.5	3.1
Care	46.7	48.9	47.7	47.3
Over Take	4.5	0.4	1.0	0.3
Pedestrian	0.4	0.6	0.2	0.8
Vehicle Defects	0.8	0	0.4	0.3
Alcohol	0.3	0.3	0.3	4.3
Total	**100.0**	**100.0**	**100.0**	**100.0**

Source: Computed by the Authors.

Table: 4.1 Hourly distributions of fatalities & injuries (in %) in Kolkata Police Station, 2008-09

During Day Hour	2008			2009		
	Fatal	Serious Injury	Simple Injury	Fatal	Serious Injury	Simple Injury
6:00	1.9	2.92	2.55	5.46	4.85	2.79
7:00	1.19	2.85	3.28	5.23	4.23	3.4
8:00	2.38	1.15	2.06	3.33	5.92	2.18
9:00	1.9	2.08	2.06	7.13	6.08	1.46
10:00	2.14	0.92	3.16	5.23	4.92	1.46
11:00	3.33	1.69	1.33	4.51	3.69	3.03
12:00	6.41	5.92	4.73	2.85	3.23	4.0
1:00	4.51	6.54	4.37	2.14	1.77	3.88
2:00	5.7	6.15	4.73	0.95	2.62	6.31
3:00	6.41	7.62	6.55	1.43	2	7.16
4:00	8.79	5.46	6.07	1.9	1.77	5.7
5:00	5.23	7.0	3.76	3.09	1.08	4.49

Source: Computed by the Authors.

Table: 4.2 Hourly distributions of fatalities & injuries (in %) in Kolkata Police Station, 2008-09

During Evening and Night	2008			2009		
	Fatal	Serious Injury	Simple Injury	Fatal	Serious Injury	Simple Injury
6:00	4.51	1.62	2.91	3.33	2.31	1.33
7:00	2.38	2.31	1.82	3.56	3.54	2.43
8:00	4.51	3.08	3.28	4.51	2.92	4.00
9:00	5.23	3.62	2.91	4.04	3.15	5.10
10:00	4.51	4.62	4.13	5.46	5.92	4.85
11:00	2.85	5.46	5.10	2.85	4.08	4.98
12:00	3.33	4.62	5.95	6.89	5.08	6.07
1:00	4.75	5.31	5.58	4.51	4.23	3.88
2:00	4.51	4.38	5.10	3.80	4.85	4.25
3:00	4.75	5.31	6.92	5.23	4.77	6.31
4:00	4.51	4.62	5.83	4.75	4.08	5.58
5:00	4.28	4.77	5.83	3.09	4.15	4.61

Source: Computed by the Authors.