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Road Accidents in New Delhi – A Review of Recent Study

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Abstract: Transportation contributes to the economic, industrial, social and cultural growth of any country. Increase in number of vehicles day by day and the use of the roads by dissimilar groups of travel increases the chances of accidents. Accident is a major problem, particularly at the intersection of roads and national highway. The Indian capital Delhi have heterogeneous traffic system that enhances severe congestion and pollution especially in roads intersection because of radical increase in number of vehicles. It was found that apart from human factors, defective and insufficient road designs resulted in the increase in the number of accidents.

Keywords: Road accidents, Intersections, Road users, Factors of road accidents.

I. INTRODUCTION

Currently, increase in growth of urbanization and traffic is causing the congestion in roads and at intersections. The congestion is more during peak hours of the day i.e. during working hours where all the vehicles enters the intersection and leads to congestion and forms the queue. Many Indian cities are facing the crisis of urban transportation. Most of the time due to traffic jam a lot of time and fuel get wasted. Pedestrians face inconveniences in crossing the roads. Due to congestion, pollution increases and it causes harmful effects on human health, living adjacent to that area. Traffic delay and improper management of traffic increasing rapidly in urban cities. . Even though some segments of the society have upgraded their mode of transport to motorized vehicles, many more are dependent on non-motorized modes such as walk or bicycle. The use of the roads by dissimilar groups of travel increases the chances of accidents. Pedestrians are considered as the weakest traffic participants, because they are easily involved in traffic accidents with severe consequences.

According to a report on Roads Accident in Delhi - 2017 published by the DELHI TRAFFIC POLICE, more than 1600 people died in 2017 as a result of roads traffic crashes. While annually the nation loses almost 1.5 per cent of its GDP on account of road accidents, India is not even spending 10 per cent of that amount to make our roads safe. Delhi records an average of five road accident deaths per day – four of these are of pedestrians and two-wheeler riders. Cyclists and pedestrians are the vulnerable users on our roads. The pedestrian's fatality range in roads accident of Delhi varies between 40% to 45% in contrast with other road users. Delhi over the years has perceived enormous growth of population due to continuous movement of people from neighbouring states due to centralized capital, in search of employment and business. The phenomenal growth of roads transport has carried along with it the serious problem of traffic accidents. There has been an accumulative trend in the number of roads accidents as well as casualties from year to year. The main causes of such high rate of accident is mainly attributed to the inadequacy of the roads to meet the traffic demands, roads user behaviour, vehicle defects, poor roads geometrics and visibility, poor designing of intersections, lack of pedestrian facilities, poorly maintained footpath, encroachment of roads by hawkers, improper visibility of roads obstruction due to lack of street lighting, lack of signage's useful for pedestrian safety, ignorance of roads safety rules, lack of efficient control measures, unregulated urban expansion etc.. Roads accidents cause heavy economic loss to the country. Roads Safety is enforced to reduce accident involving both human and vehicles there by making the roads safer and user friendly to traffic.

II. LITERATURE REVIEW

A road traffic injury is a fatal or non-fatal injury in-cured as a result of a collision or incident involving at least one road vehicle in motion on a public road or private road to which the public has right of access resulting in at least one injured or a killed person. [1] Socially these accidents are

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considered as inevitable and a part of life which occur randomly. But in reality, these are results of a complex set of interaction among the public with their vehicles and the prevalent environmental conditions along with the existing legal pro-visions. Many a times road traffic accidents are preventable. Road traffic injury take the lives of nearly 1.3 million people every year and at the same time injure 20-50 million people. According to World Health Organization (WHO), it is the leading cause of death for people aged15-29 years. It is projected that road traffic injuries will be among the top five leading cause of death by the year 2030. [2–4]. The leading cause of road traffic accidents in India is mainly due to fault of the driver (77.1%). Other causes include weather condition, defective motor vehicles, poor condition of the roads etc. [5]

The period of survival for fatalities from injuries was also explored. It was evident that the majority (43.6%) of the deaths either occurred on the spot or within the first 6 hours, with almost 80% of those dying in the first 3 hours from injury. Head injury victims have a higher early mortality, with 55% dying immediately and another 25% within 6 hours. [9] The vast majority of those injured on the road in India are pedestrians and cyclists since these are the most common modes of transport, especially for the poor. Lack of adequate pedestrian walking spaces, lack of speed control, and poor recognition of their right to safety are contributing factors, as in other developing nations. [10]

Data Source: The data is taken from Roads Accident in Delhi - 2017 published by the DELHI TRAFFIC POLICE and Road Accident in India -2016 by MORTH.

III. ENGINEERING CAUSES OF ROAD ACCIDENTS

"Roads accidents do not just happen but are caused" is a common cliché in the area of traffic safety. Thus, if accidents are caused by some agents, surely, they could be identified and appropriate remedial measures developed and implemented for their prevention to the extent feasible and for the reduction of the ill effects and trauma of the accidents still happening.

Some of the factors which contribute directly or indirectly to the accidents are:

a) Geometry of the Roads

Geometric design of roads deals with the dimension and layout of visible features of the roads such as horizontal and vertical alignments, sight distance and intersection. It is possible to design and construct the pavement of a roads in stages but it is very expensive and rather difficult to improve the geometric elements of a roads in stages a later date. Therefore, it is important to plan and design the geometric features of the roads during initial alignment itself taking into consideration the future growth of traffic flow and possibility of the roads being upgraded to a higher category or to a higher design speed standard at a later stage.

b) Motorized Vehicle on roads

As regards the vehicle, its fitness or roads worthiness is most important from traffic safety angle. Control over its fitness and its conformity with the legal provisions is exercised by transport officials and the police.

a) Non-motorised vehicles and pedestrians

The roads user group can be broadly classified into three categories, namely, the pedestrians, the drivers of nonmotorized vehicles and the drivers of motorised vehicles. The first two categories are not governed by any specific traffic regulations and generally drivers of slow vehicles do not feel obliged to acquire any formal knowledge of the traffic rules and regulations. For these groups of people, concerted effort is warranted in educating them of the correct behaviour on the roads, and on this educationists and mass media have a vital role to play. As regards the drivers of motor vehicles, it is a question of observance to the strict licensing procedures as prescribed by law and enforcement authorities responsible for the driving rules and regulations. Pedestrians can be classified on the basis of their age, walking speed and their capabilities to crossing the roads:

- **Children** use pedestrian crossing to travel to school and to access recreational facilities either with the adults or by themselves. They are more impulsive in making decision about the roads crossing.
- **Adults** are the major group of pedestrians. They make their trips as a pedestrian for work, for catching transit, for leisure etc. According to IRC-93:1985 pedestrian have an average walking speed of 1.2 m/s. Adults are predictable to make safe judgment when crossing the roads.
- **Elders** are travels as a pedestrian in higher proportions than the other groups. They are generally slow to react towards traffic condition, walk at a slower rate compared to other groups. Some elder peoples need support for walking such as walk stick.
- **Differently abled person** is the person with different restricted abilities such as visually impaired, walking disabilities such as people on wheel chairs or crutches etc. For planning of any

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pedestrian facilities, it is important to consider that the walking speed of differently abled persons are more than normal person. And their reaction time and decision making are also differing from normal person.

b) Traffic signage and signalling Aspects

It includes planning and geometric design on one hand and regulation and control on the other hand. Application of scientific principles, tools, technique and finding for safe, rapid, economical and efficient movement of people and goods. There are few other criteria too such as pavement marking, signal control, roads signs, street lighting which are required for minimising the roads accident.

IV. ACCIDENT TRENDS IN DELHI

India is a fast-growing country in terms of industrialization and urbanisation, for this transport system plays an important role. Roads traffic accidents in India are developing as the major cause of death and injury with subsequent disability and burden on economy and strength of the nation. Delhi have the highest number of roads accident among all the States and UT's of India. In 2017-6673 roads accidents occurred in Delhi in which 6604 people were injured and 1584 peoples lost their lives. Pedestrians were the most vulnerable victims in roads accidents. In 2017, 45% of the total people were killed in roads accidents. The roads accident trend of last 10 years is shown below: -

Table 1: Roads Accident Trends in Delhi

Year	Fatal Accidents	Total Accident (All Types)	Roads Death (Per Year)	Accident Severity in %
2007	2081	8620	2140	24.82
2008	2015	8435	2093	24.81
2009	2272	7516	2325	30.93
2010	2104	7260	2153	29.65
2011	2047	7280	2110	28.98
2012	1822	6937	1866	26.89
2013	1778	7566	1820	24.05
2014	1629	8623	1671	19.37
2015	1582	8085	1622	20.06
2016	1548	7375	1591	21.57
2017	1565	6673	1584	23.73

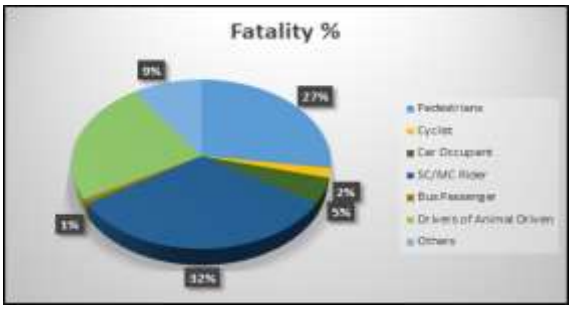

Figure 1: Fatality Percentage (2007-2017)

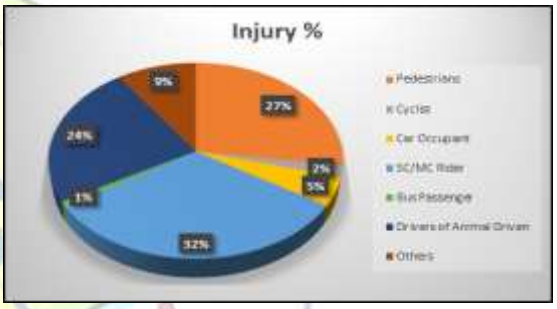

Figure 2: Injury Percentage (2007-2017)

- **Roads accident statistics according to different groups of pedestrians**

It is found that male pedestrians violate traffic rules more than female pedestrians. This is due gap acceptance criteria by the pedestrian. Age also plays important role in decision making of roads crossing. As per the Roads Accident Report – 2017 it has been seen that peoples aged between 19-30 years meet with the casualty more than other age.

According to Roads Accident Report – 2017, 6604 total persons were reported to meet with accident from that 1409 male, 175 females were killed and 5618 male, 986 females were injured.

Table 2: Age wise accident report.

Age Group	Persons Killed		Person Injured	
	Male	Female	Male	Female
< 10 Years	39	25	166	77
11-18 Years	52	13	348	64
19-30 Years	369	32	1593	218
31-40 Years	238	25	830	136
>40 Years	333	55	1222	251

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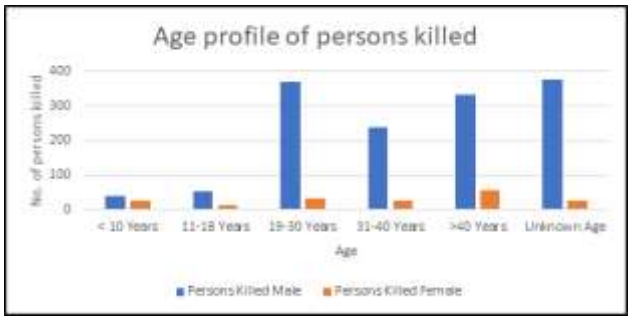

Figure 3: Age profile of persons killed in roads accident – (2007-2017)

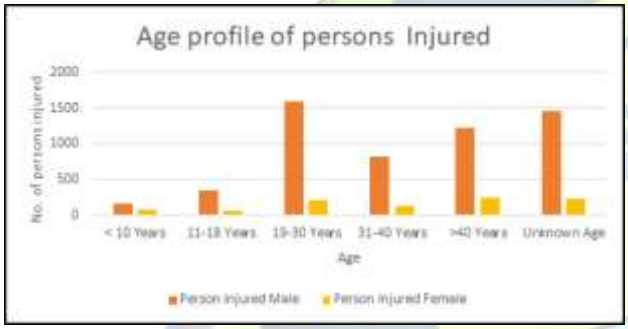

Figure 4: Age profile of persons injured in roads accident – (2007-2017)

- **Time factor on roads accidents**

It is observed from the study that the time has great influence on roads accident. The morning peak hours for vehicular flow is found to be from 08:00 am – 10: 00 am and evening peak hour for vehicular flow is found to be from 06:00 pm – 08:00 pm. At this time pedestrians flow is also on high rate. During peak hour duration the speed of vehicular traffic are more comparatively to off peak hours. Accident rates are high in week days when the traffic flow is heavy. It is also observed that special rush days such as festivals have large no. of accidents. A graph representing accidents in day and night (As per Roads Accident in Delhi - 2017 published by the DELHI TRAFFIC POLICE) is given below-

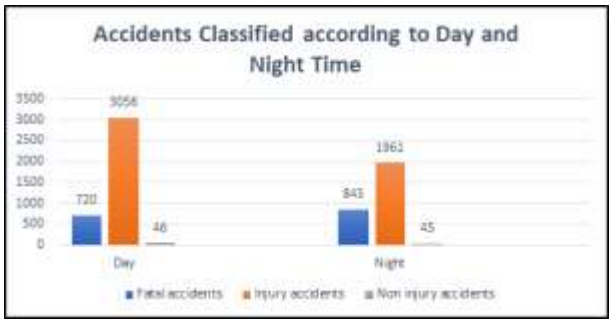

Figure 5: Accidents classified according to day and night time

- **Collision types and their corresponding fatalities and injuries in 2017**

A road accident may cause loss of life/lives or grievous injury or minor injury or non-injury to road-users. An accident which resulted in death of one or more person is a fatal accident. Grievous injury accident is one in which one or more victims suffer serious injury requiring hospitalization (not necessarily in terms of IPC definition of grievous injury). Minor injury accident is when victim(s) does not require hospitalization.

Road accident statistics for 2017 reveals that the percentage share of individual collision types in the total accident are broadly similar to the respective percentage share in fatalities and injuries. Fatality on account of accidents involving hit and run, head on collision, hit from back, hit pedestrian have higher share in total fatality than their respective share in total accidents. Hit and run collision proves to be most fatal.

In case of injury, head on collision, hit from back, hit and run and pedestrian hit have higher share in total injuries than their respective share in total accident. Table 2.4 below gives the number and percentage share of collision types for 2017.

Nature of accident or collision types at aggregated national level data shows that 'head on collision' accounted for 18.7 per cent of total road accidents in 2017. The other major types of collision are 'hit from back' (16.7%), 'hit & run' (14%) and 'hit pedestrian' (13.4%).

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Table 3: Collision and accidents.

Collision type	No of accidents	Persons killed	Persons injured
Head on Collision	87060	24160	98442
Hit from Back	77530	22436	83277
Hit & Run	65176	25856	59554
Pedestrian	62334	18876	54010
Hit from side	42665	12071	44237
Vehicle Overturn	30027	9423	32410
Run Off Road	13219	5181	14966
Fixed Object	12075	4273	12146
With Parked Vehicle	7194	2327	7422

V. CONCLUSION

Road traffic injury take the lives of nearly 1.3 million people every year and at the same time injured 20-50 million people worldwide. India, being a rapidly emerging country has one of the highest motorization growth rates which is accompanied by rapid expansion in road networks and development. Subsequently, the country is faced with various issues and impacts on road traffic accidents and road safety level. It takes a heavy monetary toll on the economy over and above the mortality and injury associated with road traffic accidents. Road traffic accidents are predictable and preventable. For it understanding the different factors leading to Road Traffic Accident is a must. Strict implementation of traffic rules and strict punishments alone will not solve the persisting problem. Hence, it is necessary to invest in road safety to better define the specific characteristics of the problem in a manner so that corrective measures could be tested and implemented accordingly to improve road safety for prevention of road accidents.

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