

URBAN ROAD ACCIDENTS IN DHAKA, BANGLADESH

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ABSTRACT

Dhaka, the capital city of Bangladesh, is the most vulnerable city both in terms of total number of accidents and accident rates. A total number of 2,720 accidents occurred during 2007-2011. This has caused a total of 1,481 numbers of pedestrian fatal accidents with 1,562 pedestrian fatal casualties. The primary objective of the paper is to study the characteristics of the road traffic accidents in Dhaka. The study area for this study is Dhaka Metropolitan Area. The paper focused on a few selected parameters a) Trend in overall accident rates b) Monthly variation of accident rates c) Accidents by severity levels d) Collision types e) Accidents in different lighting conditions. The raw data in the form of Accident Report Forms (ARFs) were collected from Dhaka Metropolitan Police (DMP). A GIS database was prepared for accidents showing locations and details for the period of 2007-2011. The analysis showed that on an average, the total number of traffic accidents is reduced by 11% each year. No profound effect of weather/season on road accidents is found. Fatal accidents and motor collisions are decreasing while injury accidents are increasing. Most traffic accidents: cause fatality (69%) and hit a pedestrian (60%). Fifty four percent of the accidents occurred during daytime. The paper recommends improvement measures for the road accident data collection and management system in Dhaka, Bangladesh. That includes the training need for the police staff, need for a geo-referenced database for data storage and management and involvement of multiple agencies in the process.

1 INTRODUCTION

Pedestrians, cyclists, and motorcyclists are vulnerable road users and constitute nearly half the victims of road traffic accidents worldwide. Sixty five percent of these accidents involve pedestrians. Of these pedestrian deaths, thirty five percent are children [1]. This is, in part, a result of rapid increases in motorization without sufficient improvement in road safety strategies and lack of implementation of preventive measures. Table 1 shows the respective shares in the global population, registered vehicles, and road traffic deaths of high, middle, and low income countries. The percentage of deaths in low income countries is high, whereas low income countries have a much lower share of the registered vehicle population [2].

The analyses reveals (Table 2) that Bangladesh has a very high fatality rate in road accidents – more than eighty five deaths per ten thousand registered motor vehicles per year. Moreover, the number of registered vehicles is growing alarmingly as well.

Table 1: Global Road Accidents in Different Income Level Countries

Parameter	High Income	Middle Income	Low Income
Population	15.6%	47.8%	36.7%
Registered Vehicles	52.1%	38.7%	9.2%
Road Traffic Deaths	8.5%	49.6%	41.9%

Table 2: Motor Vehicles and Road Accident Reported Casualties in Bangladesh [3]

Year	Registered Vehicles	Deaths	Injury	Total Casualties
2000	28764	3430	3211	6641
2001	42510	3109	3172	6281
2002	54877	3398	3770	7168
2003	59248	3289	3818	7107
2004	61202	2748	1080	5621
2005	65878	3187	2754	5941
2006	80305	3193	2409	5602
2007	121272	3749	3273	7022
2008	144419	3765	3284	7049
2009	145243	2958	2686	5644
2010	161178	2847	1803	4449
2011	172484	2467	1631	3858

In the Mega-City Dhaka, with a population of 14 million (may rise to 22-25 million by 2020), rapid urban population growth has far outstripped the capacity of urban infrastructure, leading to low level of service delivery. The transport conditions in Dhaka are characterized by chronic traffic congestion and delays, high rate of accidents, low quality of public transport service, lack of comfort and safety for pedestrians and growing air pollution. In Dhaka, nearly fifty percent of the people are walking dependent, both for economic and efficiency reasons. A significant number of trips are made by bicycles and non-motorized three wheeler rickshaws. There is a high level of conflicts between motorized and non-motorized transport. Also, seventy seven percent of traffic accident fatalities were previously found to be pedestrians and fifty percent of these fatalities involved buses [4]. At the current growth rate, the number of vehicles in the country is expected to double in the next ten years. This factor along with the high proportion of two-and three-wheeler motorized and non-motorized vehicles in the city and the relatively young age of the majority of the population, are contribute to the serious road accident casualties [5]. In urban areas, the traffic roadway system is more complex where a mixed road user environment prevails and greater perceptual demands are placed on the road users. The heterogeneity of traffic, plying of modes with varying speed and maneuvering time makes the roads and intersections of cities of Bangladesh even more complex [6]. These specific natures make Dhaka city unique and

different from other developing cities of the world. The objective of the paper is to study the characteristics of the road accidents in a mixed traffic environment where most of the roads are congested during the majority time of the day and night. The study focused on a few selected parameters a) Road accident trend b) Monthly variation of accident rates c) Accidents by severity level d) Type of accidents e) Accidents in different lighting conditions.

2 THE STUDY AREA

Dhaka City is surrounded by rivers that restrict the natural growth of the city in the horizontal direction. Dhaka city area is under jurisdiction of different authorities that are known as Dhaka North and South City Corporations (DCC), Dhaka Metropolitan Area (DMA), Dhaka Statistical Metropolitan Area (DSMA) and Dhaka Metropolitan Development Plan (DMDP) area. The study area for this study is Dhaka Metropolitan Area. The study area covers the whole DCC area, the oldest organic core part of Dhaka city (Old Dhaka), the planned areas and even the unplanned new generation organic areas that are called 'Informal Settlements'. This selected study area almost covers the biggest urban agglomeration and is the central part of Bangladesh in terms of social and economic aspects.

3 DATA COLLECTION

The first step of the study was to collect accident data covering the years 2007 thru 2011 for the study area. After extensive field survey, it was found that the responsibility of collecting traffic accident related data vests on the Police department of Bangladesh. The concerned Police Stations fill-up 'Accident Reporting Form' (ARF) for each accident. This was the official source of accident information or data. Finally the ARFs were collected from the DMP Headquarter, Dhaka. A total of 2,720 ARFs were collected for the period 2007-2011.

4 PLOTTING THE ACCIDENT LOCATIONS IN A GIS PLATFORM

At the beginning, a database was developed using 'Microsoft Access' for the selected variables. Later this database was exported to ArcGIS software for mapping and projecting the accident locations incorporating all the necessary information.

One major problem plotting the accident locations in GIS platform was to match the unknown coordinate system of DMP maps. DMP Headquarter uses quite old maps of Dhaka City with no geographic and projected coordinate system referred. To resolve this problem, the unknown coordinate system has been transformed into Bangladesh Transverse Mercator (BTM) projection system. This helps to identify the accident locations more accurately. The base maps (shape files) including the DCC boundary, water bodies, railway lines and road networks were collected from Rajdhani Unnayan Kartripakkha (RAJUK) i.e. the capital development authority. These maps were produced in 2010. The GPS and other surveying activities were conducted during 2005-2008. Therefore, these are the available latest and up-to-date maps of Dhaka city. At a later stage of the study, the database created in 'Microsoft Access' was exported to ArcGIS that made it possible to plot all the accident locations including the information generated for the selected variables.

5 UNDER REPORTING OF TRAFFIC ACCIDENTS

An important factor in road safety management is the collection and use of accurate and comprehensive data related to road accidents. The interpretation of those data is a pre-requisite for an accurate diagnosis of accident problems, assists in the development of remedial measures and allows evaluating the effectiveness of road safety programs. However, data constraints and widespread under reporting of accidents prevent understanding the real magnitudes of road accident problems. It is observed that the sources of accident data are biased due to under-reporting, particularly in the case of non-fatal

accidents. Only one accident out of 125 occurred is reported to the police. Figure 1 shows that thirty four percent of accident cases have been settled locally, either by paying some treatment cost or begging pardon or making some financial compensation [7].

Accident Research Institute (ARI) of Bangladesh University of Engineering and Technology (BUET) conducted a survey data on Dhaka-Aricha road to investigate the extent of underreporting. It is found that the extent of underreporting is as high as 60% in some Police Stations. Moreover a thorough review of newspaper revealed that underreporting of fatality information is also highly prevalent [8].

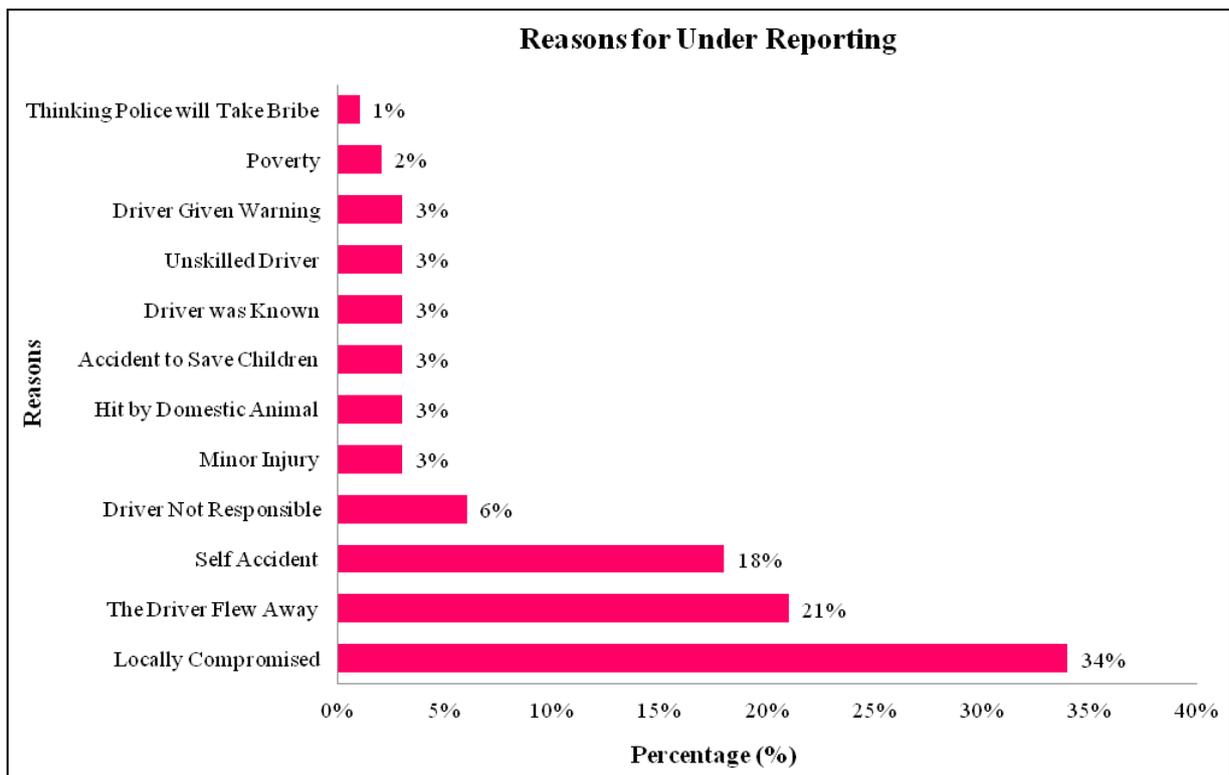


Figure 1: Reasons for Under Reporting of Traffic Accident [7]

6 RESULTS OF THE ANALYSES

Detailed analyses of the GIS based traffic accident maps were performed. This includes analyses of all the maps containing accident details of years 2007-2011 of Dhaka City. The cause and effect scenario of traffic accidents are depicted in Table 3 and Table 4. A total number of 2,720 accidents caused a total of 1,481 numbers of pedestrian fatal accidents with 1,562 pedestrian fatal casualties during 2007-2011. The scenarios for Non-Motorized Vehicle (NMV) and Motorized Vehicle (MV) are also visible in these tables. It is interesting to note that the total number of traffic accidents is decreasing over the years (Figure 2) and between 2007 and 2011; the traffic accidents have decreased by forty eight percent. Each year the total number of traffic accidents is reducing by eleven percent on an average.

Table 3: Traffic Accident Scenario of Dhaka Metropolitan Area (Cause)

Year	* Total Number of Recorded Accidents	Number of Fatal Accidents			Number of Injury Accidents (Grievous and Simple)			Number of Motor Collision
		Pedestrian	**NMV	***MV	Pedestrian	**NMV	***MV	
2007	731	361	46	47	78	32	59	109
2008	655	367	40	56	20	28	56	88
2009	518	307	26	45	14	23	40	65
2010	434	249	31	32	30	17	48	44
2011	382	197	29	42	41	17	50	28

Table 4: Traffic Accident Scenario of Dhaka Metropolitan Area (Effect)

Year	* Total Number of Recorded Accidents	Number of Fatal Casualties (Passengers or Drivers)			Number of Injury Casualties (Passengers or Drivers)			Total Number of Vehicles Involved in Traffic Accidents
		Pedestrian	**NMV	***MV	Pedestrian	**NMV	***MV	
2007	731	395	53	62	84	57	115	997
2008	655	382	45	80	20	47	122	918
2009	518	315	33	59	15	39	73	721
2010	434	262	36	45	44	22	85	587
2011	382	208	29	53	45	22	80	528

Note: One accident may cause fatality and injury at the same time. Moreover, one accident can cause more than one casualties.

* Number of Filled-Up Official Accident Reporting Forms during a Year

** NMV = Non-Motorized Vehicle

*** MV = Motorized Vehicle

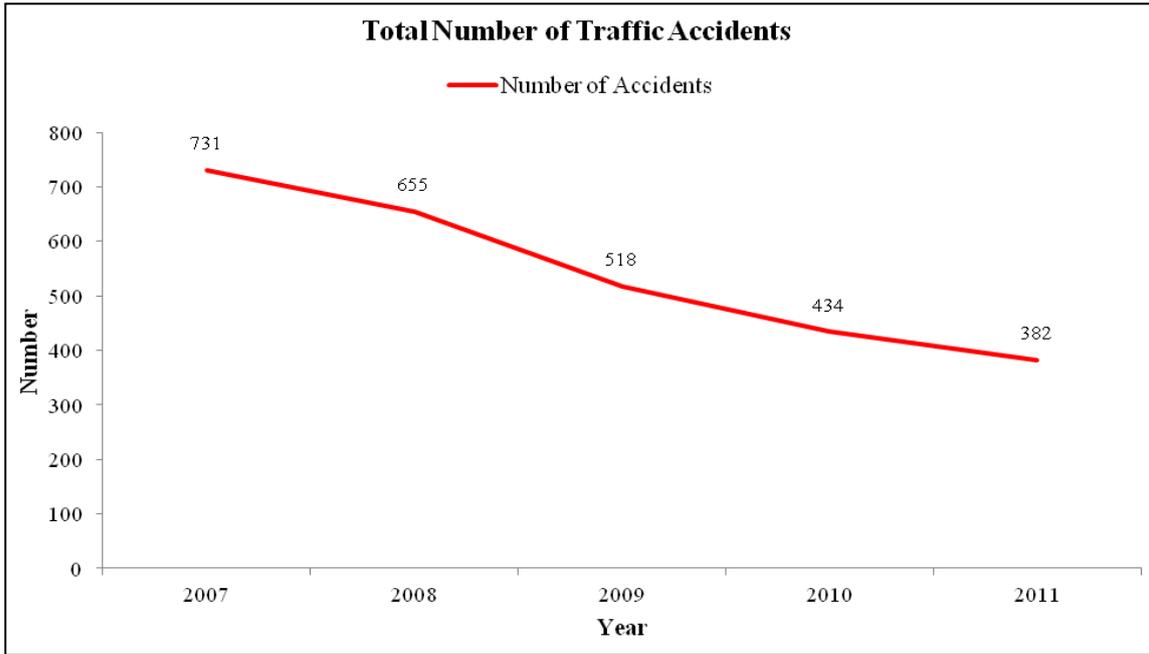


Figure 2: Total Number of Accidents in Dhaka City (2007-2011)

7 TRAFFIC ACCIDENT SEVERITY

Out of the 2,720 traffic accidents 1,875 were fatal accidents, 553 were injury accidents and 334 were only motor collisions. The effects were 2,057 deaths of passengers/ pedestrians/drivers and 870 other people were injured. A total of 3,751 numbers of vehicles were involved in all those 2,720 accidents from 2007-2011 (Table 3 and 4).

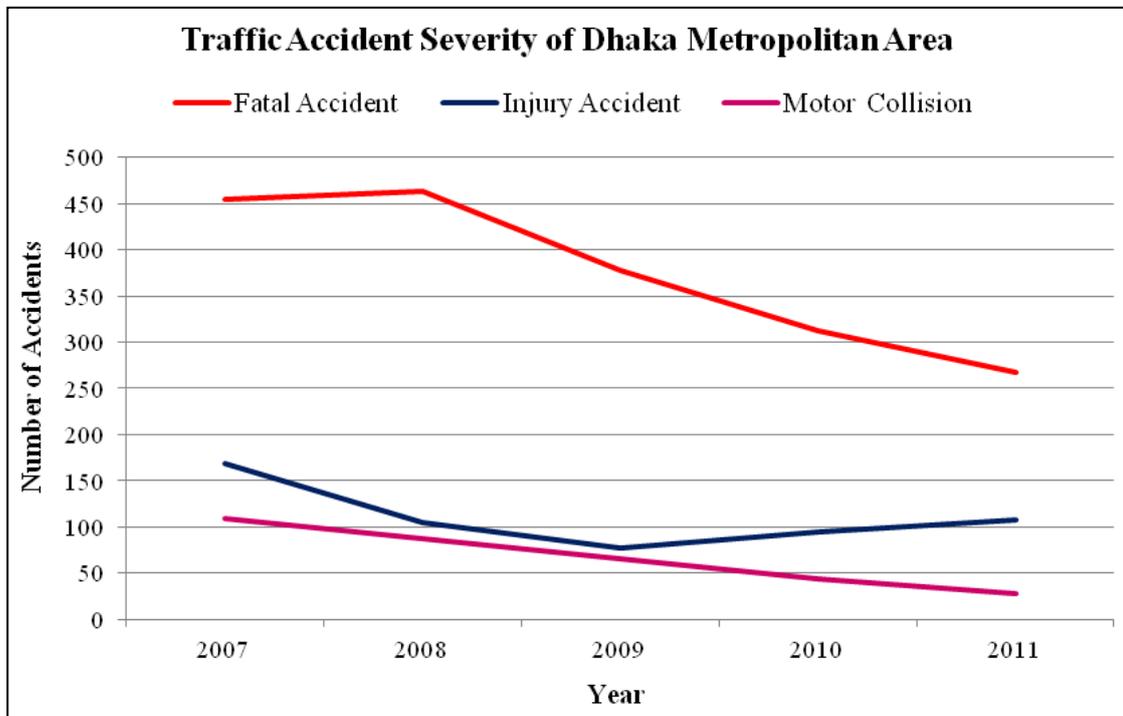


Figure 3: Traffic Accident Severity of Dhaka City (2007-2011)

From Figure 3, it is clear that numbers of motor collision accidents are decreasing gradually over the years. Moreover, though there was a slight increase in fatal accidents during 2007-2008, then it decreased in a noticeable way. For the case of injury accidents, in the beginning there was a decreasing trend but from 2009 the trend changed to an increasing one.

8 TRAFFIC ACCIDENTS BY MONTH

Traffic accidents occur more in the months of April and May in the DMP area (Figure 4). But no distinct peak could be identified for monthly variation of accidents. Accidents are randomly distributed over the years indicating no profound effect of weather on road accidents.

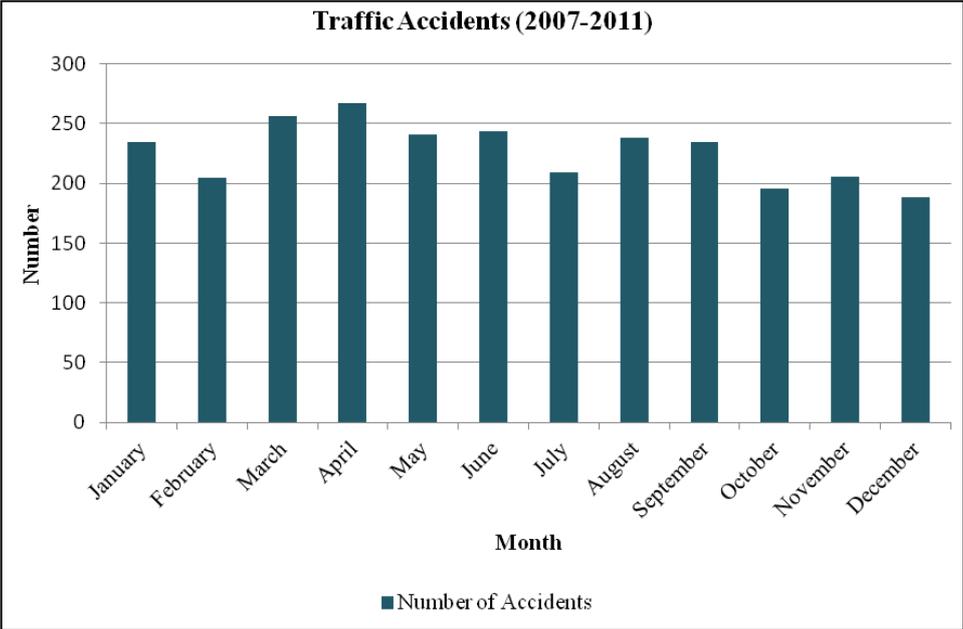


Figure 4: Traffic Accidents by Month

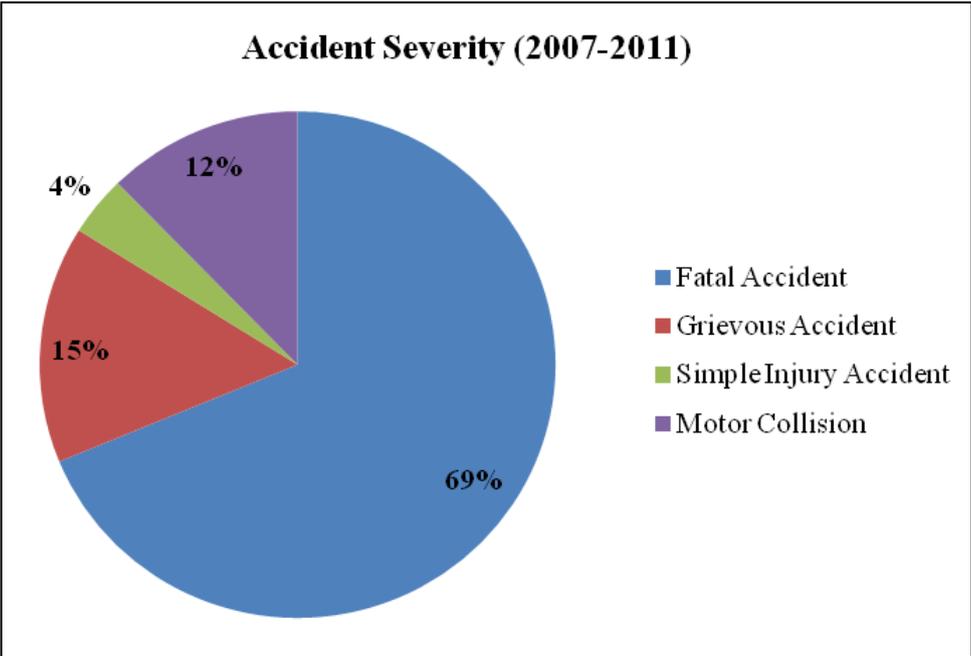


Figure 5: Traffic Accidents by Severity

9 TRAFFIC ACCIDENTS BY SEVERITY

From the analyses it was evident that fatal accidents are dominant in DMP area (Figure 5). About sixty nine percent accidents caused fatality, while nineteen percent accidents caused injury. Motor collision accidents occur in small numbers in Dhaka City.

10 TRAFFIC ACCIDENTS BY COLLISION TYPE

In terms of collision type, a “Hit Pedestrian” type accident is dominant (60%). “Rear End” accident type is in second position (25%). “Head on Collision” (4%) is the third highest cause for traffic accidents (Figure 6).

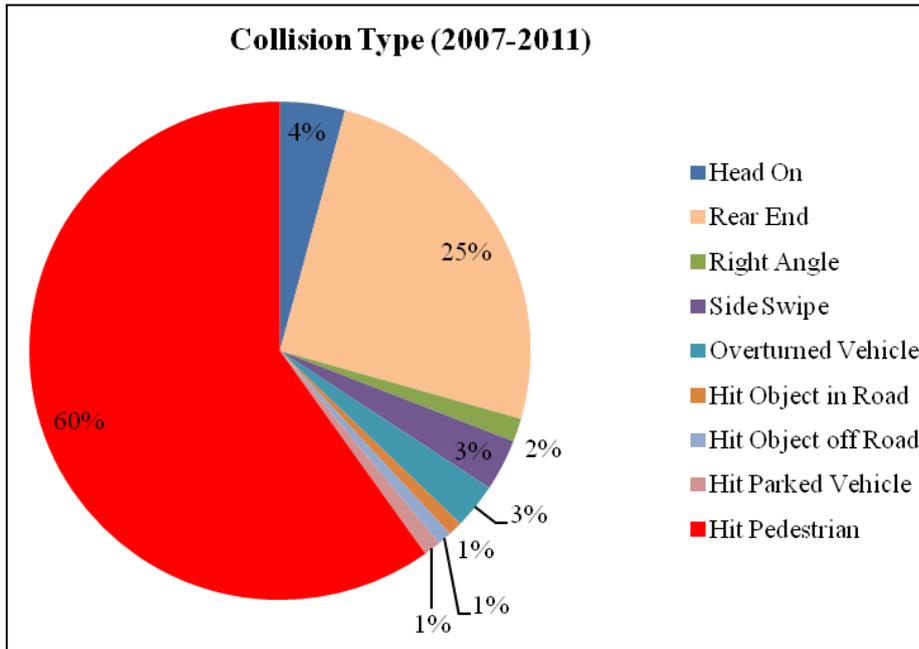


Figure 6: Accidents by Collision Type

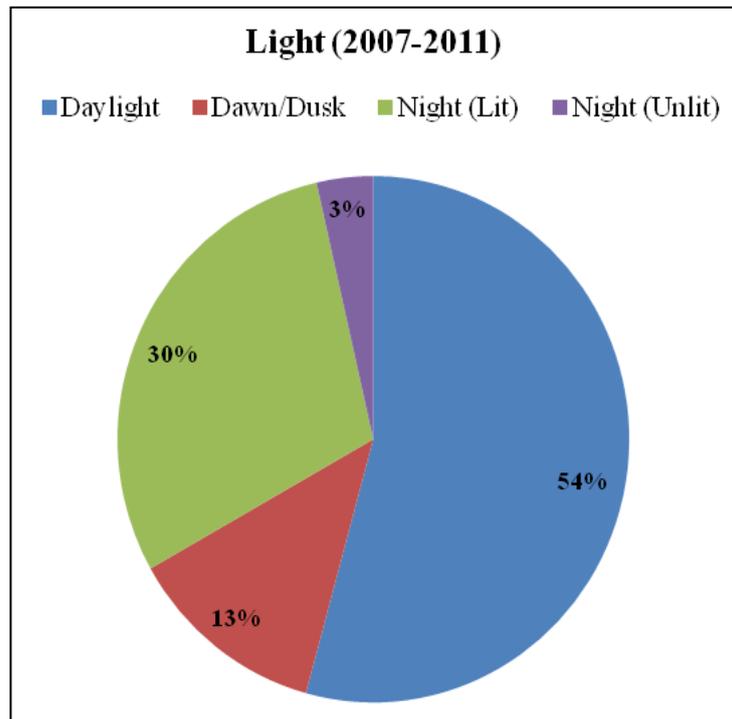


Figure 7: Road Accident in Different Lighting Conditions

11 TRAFFIC ACCIDENTS IN DIFFERENT LIGHTING CONDITIONS

Most accidents (54%) occurred in Daylight in Dhaka city (Figure 7). Accidents at night (with street lights) were in the second position (30%).

12 FINDINGS OF THE STUDY

The findings of the study are as follows:

1. Dhaka Metropolitan Police (DMP) is the only Government authorized legal source for collecting accident information.
2. Under-reporting, under-recording and improper transcription of accident reporting forms are some of the major drawbacks for accident data collection.
3. On an average, the total number of traffic accidents is reducing by 11% each year.
4. Fatal accidents and motor collisions are decreasing while injury accidents are increasing.
5. No profound effect of weather/season on road accidents is found.
6. Majority of the recorded traffic accidents cause fatalities (69%) and “hit a pedestrian” (60%) is the most common type of accidents.

13 RECOMMENDATIONS OF THE STUDY

Based on the experience gathered during the data collection and analysis of this study the following recommendations are made:

1. Training of the police officers and concerned staff regarding accident data collection and filling the ARFs are most important.
2. Incorporating modern technologies (e.g. using GIS techniques instead of MAAP5 software) in analyzing and upgrading traffic accidents related issues is necessary.
3. To strengthen and co-ordinate accident and casualty data collection system involving different agencies and research organizations should be given emphasis.

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