

**Paper ID: CE 0197**

# **A Study on Traffic Management and Engineering Approaches to Reduce Road Accidents in Dhaka City**

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## **Abstract**

Road accidents have become the biggest concern in Dhaka City for the last few decades. Even though the causes of accidents are more or less identified, formulation of immediate short-term, long-term implementable plans to get rid of it and its proper legal-awareness for public implementation has become inevitable. This research main objective was presenting to public how to reduce the alarming accident rate as much as possible through proper management planning, taking appropriate decisions and assuring implementation of it. The investigation area for this study covers the whole Dhaka Metropolitan. The data was collected by field investigation and Accident Research Institute (ARI). Major findings of this paper are identifying the black spots, road geometric conditions, types of accident in the city, causes of accidents, and characteristics of road accidents. In this study, most of the recommendations came from traffic management perspectives and engineering approaches recommendations come later. It is precisely true that traffic accident in Dhaka can be reduce by following effective and planned traffic management system across the city. Proper rules and regulation, law enforcement, methodical public transport system, the development of road infrastructure and public awareness are the five key remedies to minimize accidents rate which was observed during field investigation.

*Keywords: accident; traffic management; black spots; engineering approaches.*

## **1 Introduction**

Dhaka is one of the most densely populated cities in the world with over 18 million people, (UN, 2015). Rapid growth of Dhaka has created many problems in the city. Traffic accident is count as a major problem amongst them. Among Asian city, Dhaka is one of the least motorized capitals. Road transport plays a vital role in country's economy and social welfare. But this road transportation system needs to be improved with due consideration for safety, minimizing accidents and risks. (Boni et al., 2018) In addition to motorized vehicles, many non-motorized vehicles ply in Dhaka. Its traffic system is the worst and these heterogeneous traffic systems alongside with mismanagement in roads are mainly responsible for road accidents. In the past five years (2011-15) over 4.2 lakh motor vehicles have been registered in Dhaka (Satu et al., 2017), but the city is acutely facing short of road-space. a prediction to rise over 26 million peoples by 2035 is really shocking and alarming for road management. (RSTP,2015). Numerous urban problems have led to Dhaka being described as one of the least livable cities in the world (EIU, 2015). Although some accidents occur by chance or to unforeseen circumstances, there are good numbers of other predictable reasons which can be avoided to prevent possible accidents in many cases. Such unsafe conditions as prevailing in roads dictate urgent need for research and investigations for alleviating road distresses and improving overall road safety. So, the objectives of the study are-to find the hazardous road spot, identify the type of accident, identifying traffic management problems in Dhaka, analyzing impact of accident, taking necessary countermeasures based engineering perspectives.

## **2 Literature Review**

The severity of accidents was connected to environmental and temporal parameters, such as the day of the week (weekend vs. weekday), time of day, lighting quality, season, and weather. Accidents that occurred on weekends were more likely to result in fatalities and serious injuries than those that occurred during the week (Blackman &

Haworth, 2013; Cunto & Ferreira, 2017). Furthermore, nighttime and early morning crashes were more likely to be deadly and serious than daytime incidents (De Lapparent, 2006; Manan et al., 2017). Furthermore, the absence of street lights, as well as a dark environment, was linked to a higher risk of fatal motorcycle crashes than when the environment was daytime (De Lapparent, 2006). The impact of seasonal conditions has been reported to have mixed results. In comparison to other seasons, the severity of motorcycle crashes is higher in the winter (Rifaat et al.). Motorcycle crashes that happened during the summer season, on the other hand, were shown to have a higher risk of fatalities and severe injuries (Lin & Kraus, 2009). Lack of awareness and consciousness about road safety among road users, planners and engineers, exacerbates the problem. This problem can be mitigated with public awareness campaigns, improved driver training and better trained enforcement personnel and engineers. (Farzana and Tahmina, 2018)

### 3 Methodology

The psychological characteristics of the drivers is a major parameter in case of road accident. For this a mixed-method approach is adopted, including review of available literature and both qualitative and quantitative surveys. As part of the qualitative method, Key Informant Interviews were conducted with stakeholders. For the quantitative research, a questionnaire survey was conducted with driver respondents from various establishments alongside survey is also conducted in online also. The findings show the current scenario of accidents, including factors and practices which affect accidents and recommendations stated by the respondents. And also to find out the black spot of Dhaka City the newspaper investigation report was counted to select the vulnerable location. The required information was collected through face to face interview of driver. Geometric parameters of the study area were encountered. Based on that, some management and engineering approaches were suggested.

#### 3.1 Site Selection

Traffic accident locations or accident prone area indicating more than death rate of average death rate normally identified as black spots level in major cities in the world, due to long periods of probability of accidents. Based on previous accident records of ARI and suitability of study Airport road and Bijoy Sarani to Banglamotor roads were selected.

### 4. Data Analysis

The survey data related to the demographic and personal information of drivers. These data also include information about road accident types, causes, accident severities, casualties of road users etc. Road geometry related data also encountered to identify the black spots and potential hazards in these locations.

#### 4.1 Questionnaire of drivers

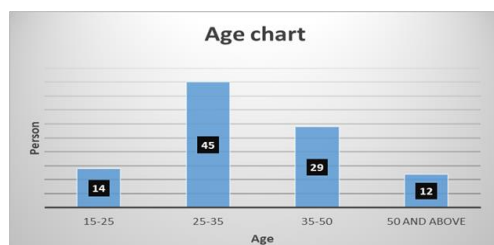


Fig. 1 Age of Driver

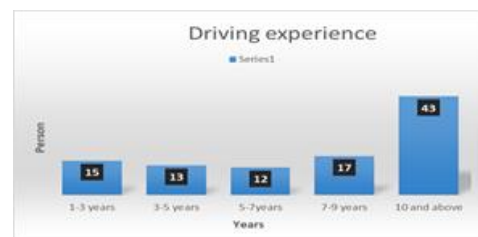


Fig. 2 Driving Experience

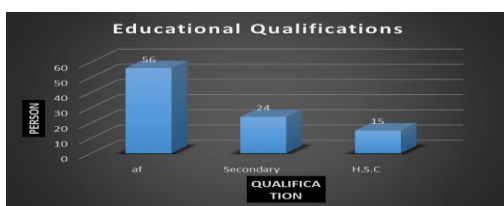


Fig. 3 Educational Qualification



Fig.4 Driving Hours

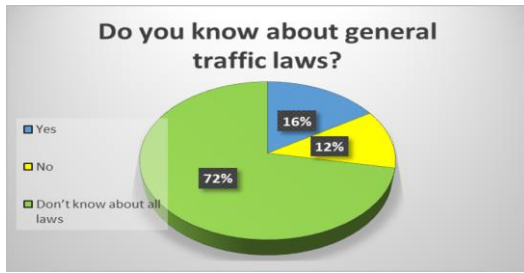


Fig. 5 Driver's knowledge on Traffic Rules

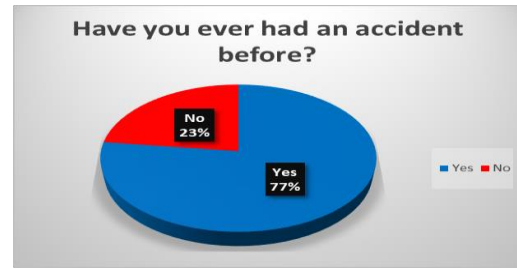


Fig. 6 Accident Information

**Fig. 1** shows that, greatest number of drivers (nearly 45%) belongs to 25-35 years age group and nearly 29% of drivers belong to 35-50 years age group. Unfortunately there are a countable number of drivers which age below eighteen. 14% of drivers belong to 15-25 years age group. There are very few drivers (nearly 12%) whose ages are above 50 years and none of the drivers belongs to less than 15 years and more than 70 years age group. The average age of the drivers were found to be nearly 32 years. **Fig.2** shows, large number of drivers (nearly 43%) having the experience of up to 10 years and about 17% drivers having the experience between 7 to 9 years, 12% drivers having the experience between 5 to 7 years, 13% drivers having the experience between 3 to 5 years, whereas about 15% of drivers having experiences only for 1-3 years. The average experience of the drivers was found about 8 years whereas their average age was nearly 32 years. **Fig. 3** indicates, the greatest number of drivers (nearly 56%) having only primary education. If observed more deeply most of the bus drivers do not have any basic education. About 24% drivers having the secondary education, 15% drivers having the experience of Higher Secondary, whereas only about 5% of drivers had completed their Hon's and above degree. Almost all drivers who had Hon's and above degree are car driver and they have their own vehicles. **Fig. 4** represents the driving hours. Nearly 55% have to drive more than ten hours in a day. About 22% drivers have to drive between 7 to 10 hours, 11% drivers have to drive between 5 to 7 hours and 12% drivers have to drive between 1 to 5 hours. The last group of drivers all is private vehicle drivers. But in case of public transport driver, most of them have to drive more than ten hours in a day. **Fig.5** shows that, 72% of the driver do not have sufficient knowledge about traffic rules. 12% drivers do not have primary knowledge about traffic rules and very few (nearly 16%) drivers have enough knowledge about traffic regulations. **Fig. 6** shows that 77% of the driver had an experience of accidents previously. 23% drivers do not accident experience in their driving time. Actually driving in Dhaka City is really difficult for some unavoidable reasons.

#### 4.2 Field Investigation

**Table 1:** Geometric parameters of Airport Road

Standards for Geometric Design	MES	Kurmitola	Khilkhet	Nekunjo	Airport	Hazi Camp	Uttora	Rajllokhi	Azimpur
Travel Lanes	3	3	3	3	3	3	4	4	3
Shoulder	Yes	Yes	No	No	No	No	No	No	Yes
Side Slopes	No	No	Yes	Yes	No	No	No	No	Yes
Curbs	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Median & Median barriers	No	Yes	No	Yes	Yes	Yes	Yes	Yes	Yes
Guardrails	No	No	No	No	No	Yes	Yes	No	No
Drainage Channel	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

**Table 2:** Geometric parameters from Bijoy Sarani to Banglamotor

Standards for Geometric Design	Bijoy Shoroni	Chandrima Intersection	Minto Road	Khamar bari	Farmgate	Karwan Bazar	Shantinagar	Bangla Motor
Travel Lanes	2lane	2lane	2lane	6 lane	2lane	2lane	2lane	2lane
Shoulder	No	No	Yes	No	No	No	No	No

Side Slopes	Yes	Yes	Yes	Yes	Yes but not in proper way	Yes	Yes	Yes
Curbs	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Median & Median barriers	Yes	Yes	No	Yes	Yes	No	Yes	Yes
Guardrails	No	No	No	No	Yes	Yes	Yes	Yes
Drainage Channel	Yes	Yes	No	Yes	Yes but not working	Yes	Yes	Yes

Dhaka is one of the most popular megacities in the world. Neither road nor road transport vehicles are enough here compared to the one and a half core people in this city. Most of the existing road here are narrow and decrepit. Most of the roads in Dhaka have small and big potholes ditch and the vehicles are not able to run properly. Although the main road is broken in some areas, almost all the branch roads are broken and busy with digging work. For considering all these realities Dhaka's maximum roads are accident prone. But in our study we find three roads which are more and more responsible for death on the road.

According to the report of Dhaka Metropolitan Police Station and the Dhaka Court Register, the highest number of peoples is death in accidents on the airport road in the Dhaka metropolitan. According to the data of six police stations including Dhaka Airport Police Station, 161 people have died in road accidents on the airport road in the last three years and nine months (from 2015 to August 2017). 27 people were injured.

Most of the people who are dying in road accidents on the airport road are pedestrians. These accidents are often happened while the pedestrian running across the road during road crossing time. Analyzing the accident data of Dhaka Cantonment, Airport, Banani, Uttara West, Uttara East and Khilkhet Police Station, it has been seen that Airport Roundabout, Kawla Pedestrian Bridge, Hotel Radisson, Moonmoon Kebab Gate, Golf Club, Shewla Bazar, Shewla Bazar on the Airport Road geometric parameters are not upto the mark. Accidents are increasing in 23 places including MES passenger camp, Zia Colony Gate, Lotus Kamal Tower. Many peoples had been died at the airport roundabout on this road.



Photo1. Broken Footpath



Photo 2. Hawkers on Footpath



Photo 3. Obstructed Footpath



Photo 4. Drainage Condition

### 4.3 Traffic Management Policy and Measures

An appropriate systematic traffic management system is essential for safety and smooth traffic flows on roads, making a maximum usage of road facilities to enlarge the current road capacities. Effective policies are essential to achieve smooth traffic flow, to reduce traffic accident and to create pedestrian friendly facilities. Some measures should be implemented in short term period and the others are needed in medium and long term period. These countermeasures can be summarized as follows;

#### 4.3.1 Short Term Process

- a) Improvement of bottleneck intersections
- b) Improvement at U-turn and right-turn points
- c) Improvement of traffic signals
- d) Improvement of parking system
- e) Improvement of traffic safety facilities
- f) Traffic safety campaign and education
- g) Improvement measure for rickshaw traffic
- h) Improvement of traffic operation
- i) Strengthening traffic enforcement.
- j) Coordination between agencies

#### 4.3.2 Medium and Long Term Measures

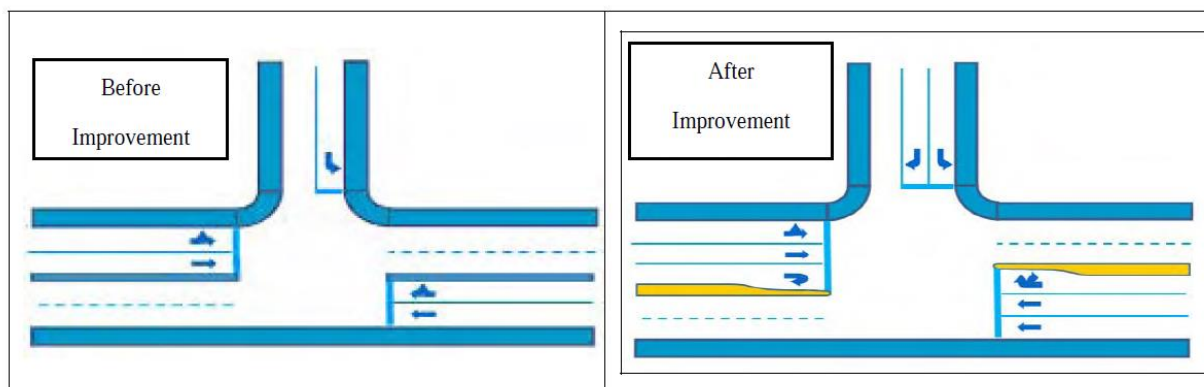
- a) Traffic information system
- b) Bus location information system
- c) Electronic demand management system
- d) Traffic demand management system.

### 4.4 Traffic Enforcement

As observing intersection of traffic movements at the intersections in Dhaka, traffic polices are greatly important roles to ensure safety and smooth traffic flow.

#### U-Turn and Right Turn Points at Mid-Block

Traffic congestion at U-turn and Right points is caused by conflicts between through traffic, right-turning traffic and U-turn traffic. It is, therefore, highly recommended that the improvement of U-turn and right-turn point by geometric improvement and installation of new traffic signal lights at U-turn and right points should be considered in order to control both main traffic flow, right-turn flow and entering traffic flow. The plan proposes a standard design by type of U-turn and right-turn point.



**Fig. 8** U-turn Improvement Plan  
Source: DUTNDS

#### Improvement of Parking System

The main points of the recommendation are:

- To ban on-street parking by zonal parking control in order to make more effective use of road capacity.
- To manage parking duration on-street in order to increase the turnover rate.
- To deter vehicles from long-term parking on-street by introducing a parking charge system in addition to the parking duration control and
- To develop off-street parking facilities with the proceeds from the parking charges.

In addition, the parking guidelines in construction of building that building owners should provide parking spaces that are applicable for building use and by total floor area shall be introduced in the plan.

### **Implementation of Periodical Traffic Safety Campaign**

Traffic safety campaign is one of the most effective countermeasures in reducing traffic accidents. Moreover, constant periodical implementation of these campaigns at a national, local and district level usually has a relatively greater impact on the public. The introduction of traffic safety education to the school curriculum is worth doing, as it is an experience the children could value over their entire life, positively influencing their behaviors future vehicle drivers. They could also exert a large influence over the traffic behavior of their family members.

#### **4.5 Issue of Rickshaw**

It is recommended the following measures;

- a) Registration of Rickshaw should be maintained at present level.
- b) Non licensed Rickshaw should be enforced to prohibit for its usage.
- c) Rickshaw free road should be expanded to primary and secondary roads, especially DIT Road, etc.

### **5 Conclusions**

During field observation it was noticed that most of the places there is no traffic discipline in the road, people are crossing the road as their own wish, very poor pedestrian facility, heterogeneous traffic system, poor traffic signals, poor education of driver, vehicles without fitness, unlicensed unskilled driver, driving by the helper, ignorance or reluctance of drivers about traffic laws, lack of zebra crossings, footpaths and foot overbridged, narrow road, lack of four-lane two-way roads with dividers, hawkers encroaching on footpaths, littering the roads, illegally parking cars on roadsides, competition between bus drivers, defective vehicle, over speed of the vehicle, poor traffic operation are the common scenario of Dhaka city. Many accidents take place in no junction area. There are coordination problems between the traffic agencies and majority of traffic accident can be solved only planning and applying proper and effective traffic management system. Proper traffic management system and effective enforcement of laws is most needed to reduce road accidents. The public and government both should really come forward in obeying, adopting and implementing a long-term plan to solve the problem. Education, engineering and enforcement measures are essential for this.

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