

## COMPARATIVE ACCIDENT STUDY ON SOME SELECTED NATIONAL HIGHWAYS OF BANGLADESH

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### ABSTRACT

Road accidents in Bangladesh claim on average 4000 lives and injuries another 5000 every year. Previously many studies on accident were performed for different corridor of Bangladesh. But a comparative study on accident between more than single national highways are not too much available. This is probably due to limitation of summarized accident data of same year interval for different highways. The primary objective of this study is to make a comparative analysis of accident characteristics by using accident data on the selected three important national highways in Bangladesh. This analysis is based on accident severity, road users' class, timing of accident, type of vehicle involved and location of accident. For this study, seven years (2000 to 2006) accident data have been collected from Accident Research Institute (ARI), BUET and detail diagnosis have been done on these available data. In this study, analysis has been carried out for about 257, 317 and 78 km length for the Dhaka-Chittagong, Dhaka-Sylhet and Dhaka-Aricha highway. Based on accident characteristics, it has been found that exposure to accident is too much in Dhaka-Aricha national highway than the other two selected highways. It is observed that among the three selected highways accident rate based on study highway length was maximum for Dhaka-Aricha national highway is about 5.26 which is 1.84 times more than Dhaka-Chittagong national highway and 3.44 times more than Dhaka-Sylhet national highway. Among the total reported accident, fatal type accident was highest for each of the highway. From this study it is observed that accident frequency was highest for the time period 10.00A.M to 14.00 P.M. and around 88% accidents were causes in rural area on these national highways. It is also revealed that maximum accident involved vehicle was large bus and truck on these highways.

**KEYWORDS:** Accident Exposure, Accident Severity, Black Spot, Comparative Analysis, National Highway

### INTRODUCTION

Travel, and especially road travel, is one of the most hazardous activities which people in developed countries undertake. Each year, some half million people die and 10-15 million people are injured in road accidents worldwide<sup>1</sup>. This situation is rapidly worsening in developing countries causing a serious challenge for tackling the road safety problem. In 2003, an estimated 430,000 persons were killed and more than 2 millions were injured in accidents on the roads of Asia and the Pacific. More than half of the world's traffic fatalities are in the ESCAP region. The number of road users killed in accidents has increased rapidly in Asia in recent decades. Globally about 1 million deaths and 15 million injuries occur on roads each year<sup>2</sup>. In Bangladesh, road accidents and injuries are now a growing and serious problem and safety situation is

very severe by international standard. Nearly about 37% accidents occurred on national highways, 12% on regional roads and 15% on feeder roads<sup>3</sup>. Dhaka-Chittagong, Dhaka-Sylhet and Dhaka-Aricha national highways play a vital role in inter regional road transport of this country. This study lays emphasis on comparative accident analysis among above stated three national highways based on severity, accident involved vehicle types, period and area of accidents on highway and comparative black spot study on Dhaka-Chittagong, Dhaka-Sylhet and Dhaka-Aricha national highways.

## ROAD SAFETY PROBLEM IN DEVELOPING COUNTRIES

Growth in urbanization and in the number of vehicles in many developing countries has led to increased traffic congestion in urban centre and increase in traffic accidents on road networks, which were never designed for the volumes and types of traffic, which they are now required to carry. In addition, unplanned urban growth has led to incompatible land uses, with high levels of pedestrian-vehicle conflicts. The drift from rural areas to urban centre often results in large number of new urban residents unused to such high traffic levels. As a result, there has often been a severe deterioration in driving conditions and a significant increase in the hazards and competition between different classes of road users. In addition, the inherent dangers have often been made worse by poor road maintenance badly designed intersections and inadequate provision for pedestrians. All of these have contributed to the serious road safety problems in developing countries like Bangladesh. It has been estimated that over 300,000 persons die and 10 to 15 million persons are injured every single year in road accidents throughout the world<sup>4</sup>. Road accidents in developing countries are a cause for growing concern and road accidents cost around one percent of Annual Gross National Product (GNP) resources of developing Countries, which they can ill afford to lose<sup>5</sup>.

## ACCIDENT SCENARIO ON NATIONAL HIGHWAY OF BANGLADESH

Of the total reported accidents on national highways, hit pedestrian emerges as the most common type of accidents accounting to 40 percent of total accidents and 47 percent of all fatal accidents (Table 1). This is followed by head on collision (18%), rear end collision (13%) and overturning (11%) types of accidents. These four accident types accounted for 82 percent of all accidents and 86 percent of fatal accidents. The greater incidence of head-on types collisions on national highways as compared with its share in total accidents, highly justifies the necessity of separating opposing traffic stream.

**Table 1: Most frequent Accident Types on National Highways**

Accident Type	All Accidents		Fatal Accident	
	No.	Percent	No.	Percent
Hit Pedestrian	3373	40.0	2843	47.0
Head on	1553	18.0	962	16.0
Rear end	1102	13.0	706	12.0
Overturning	921	11.0	654	11.0
Side swipe	485	5.8	269	4.4
Hit Parked Vehicle	275	3.3	164	2.7
Hit object on/off road	315	3.8	156	2.6
Others	375	4.5	298	4.9
Total	8399	100	6052	100

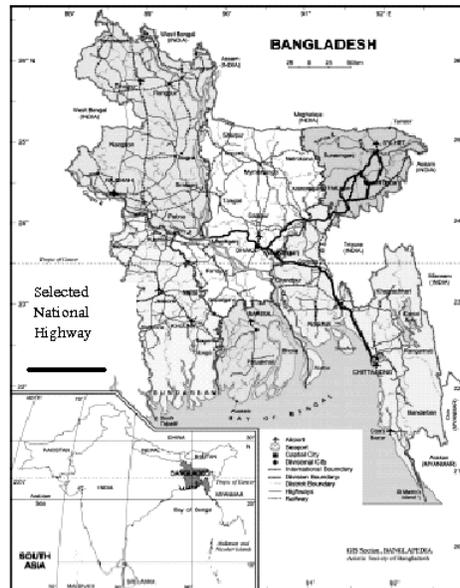
Source: Police Reported MAAP-five data (1998-2003)

**CORRIDOR SELECTION AND DATA COLLECTION**

In Bangladesh Roads and Highway Department (RHD) defined national highways as when it connects the national capital with divisional headquarters, old district headquarters, port cities and international highways<sup>6</sup>. In RHD definition, for category A type national highway crest width 12.2m, pavement width 7.32m, shoulder width 2.44m and for category B type national highway crest width 12.2m, pavement width 5.5m, shoulder width 3.36m. Some of the major highway corridors in Bangladesh are-

1. Dhaka-Chittagong National Highway (N-1)
2. Dhaka-Sylhet National Highway (N-2)
3. Dhaka-North Bengal Corridor (N-5, N-6)
4. Dhaka-Aricha Road to South Bengal (N-5, N-7, N-8)

Among the major highways, three have been selected for comparative accident analyses which have highest accident record (Figure.1). Dhaka-Chittagong (N-1) National Highway is selected from km post 13, which starts from Katchpur Bridge (Chittagong end) and ends to km post 270, at Rajakhali bazaar Bus Stand before Karnofuli Bridge. Whereas, Dhaka-Sylhet (N-2) National Highway is selected from km post 13, which starts Katchpur Bridge (Chittagong end) and end to km post 330, at Tetli Bus Stand, before Sylhet town. And Dhaka –Aricha (N-5) National Highway is selected from km post 12, Amin Bazaar Bridge (Aricha end) and ends to km post 90, at Aricha Ghat, Shivaloy. For this study, seven years (2000~2006) accident data based on accident severity, accident involvement by vehicle class, period of accident and area of accident on Dhaka-Chittagong, Dhaka-Sylhet and Dhaka-Aricha highways have been collected from Accident Research Institute (ARI), BUET and detail diagnosis have been done on these available data.



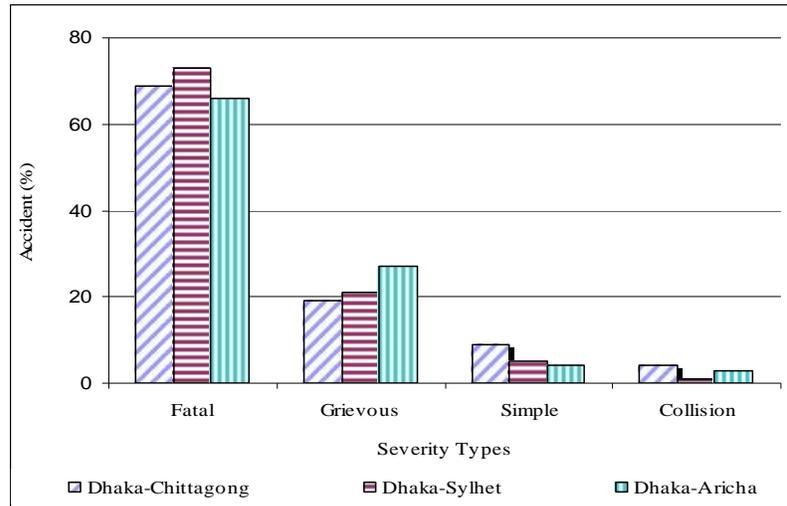
**Figure 1: Map of Bangladesh Showing Selected Three National Highways**

**COMPARATIVE ACCIDENT ANALYSIS (N-1, N-2 AND N-5)**

Dhaka-Chittagong, Dhaka-Sylhet and Dhaka-Aricha national highways plays a very important role in road transport network of Bangladesh. Accident reduction is the first aspects for this comparative study. The following approach may help state transport official of different countries to take proper steps in accident reduction by noticing some of the important issues responsible for accidents and can take some priority actions.

### Based on Accident Severity

Based on accident severity data, it was observed that fatal accidents are too much high on each national highway. This is followed by grievous, simple and collision types of accidents. From the analysis of accident severity rate for three national highways, it is observed that fatal type accident was about 69% for Dhaka-Chittagong highway, 73% for Dhaka-Sylhet highway and 63% for Dhaka-Aricha highway with respects to each of their total accident severity occurred. Secondly, grievous types of accidents were about 19% for Dhaka-Chittagong, 21% for Dhaka-Sylhet and 28% for Dhaka-Aricha national highway. Other accidents types have low frequency on these national highways. Based on this study it is observed that accident fatality rate of Dhaka-Chittagong national highway is about 1.43 times more than Dhaka-Sylhet national highway and 1.88 times more than Dhaka-Aricha national highway.



**Figure 2: Comparison of Accident Severity on Three National Highways**

### Based on Accident Exposure

In this study, accident data has been collected for a stretch of 257, 317 and 78 Km of Dhaka-Chittagong, Dhaka-Sylhet and Dhaka-Aricha respectively. From the table 2, it is observed that accident exposure per unit length for Dhaka-Aricha national highway is the highest among others. Accident per km for this highway is about 5.26, which is 1.84 times more than Dhaka-Chittagong national highway and 3.44 times more than Dhaka-Sylhet national highway.

**Table 2: Accident Exposure Based on Study Length**

National Highway	Study Length (km)	Total Accident (2000~2006)	Accident/km
N-1	257	734	2.86
N-2	317	486	1.53
N-5	78	410	5.26

Again, from the figure 3, it is observed that the accident frequency per unit study length on Dhaka-Aricha national highway is much higher than the other two national highways except the year 2004. In the year 2005, the highest accident exposure has been observed on N-5. The figure also reveals that accident exposure on Dhaka-Chittagong national highway is comparatively more than Dhaka-Sylhet national highway and that is greatly increased after the year 2003. Based upon accident exposure per Km it is obvious that Dhaka-Sylhet national highway is comparatively safer than other two national highways.

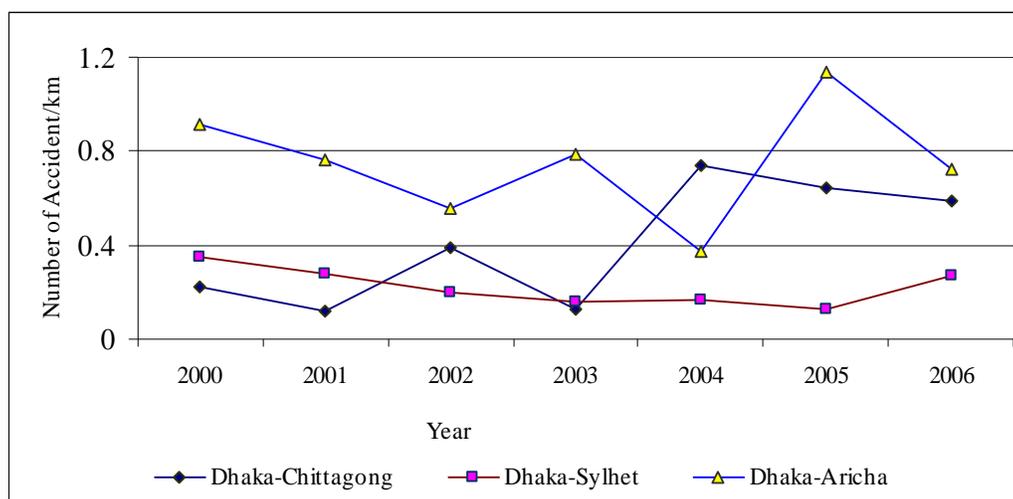


Figure 3: Accident Rate in Different Years

**Based on Accident Involvement by Different Vehicle types**

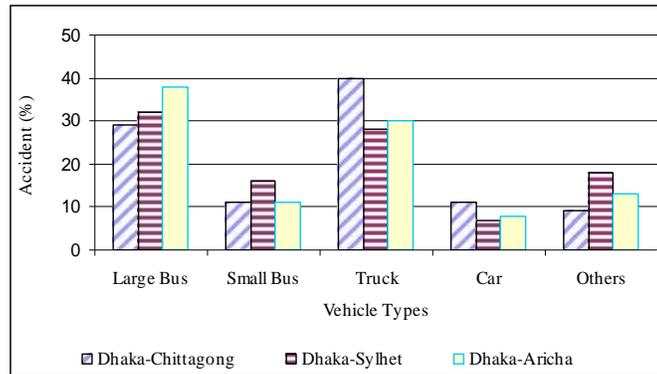
Accident involvement by different vehicle types for the study years (2000~2006) have been represented in Table 3. From this table it is clear that for any of the selected highway accident involvement by large bus was the highest.

Table 3: Accident Involvement by Different Vehicle Class on the Selected National Highways

Vehicle Type	Car			Large Bus			Small Bus			Truck			Others		
	N-1	N-2	N-5	N-1	N-2	N-5	N-1	N-2	N-5	N-1	N-2	N-5	N-1	N-2	N-5
2000	10	9	5	30	46	38	7	26	12	7	26	12	1	21	13
2001	4	6	7	10	31	25	4	18	6	4	18	6	0	26	5
2002	8	6	4	31	29	19	21	15	13	21	15	13	8	12	10
2003	6	3	9	17	15	34	9	13	12	9	13	12	5	14	12
2004	36	3	3	88	22	15	24	15	7	24	15	7	31	20	3
2005	24	3	8	61	15	45	42	7	5	42	7	5	26	12	17
2006	24	12	6	60	43	35	14	10	10	14	10	10	21	8	9

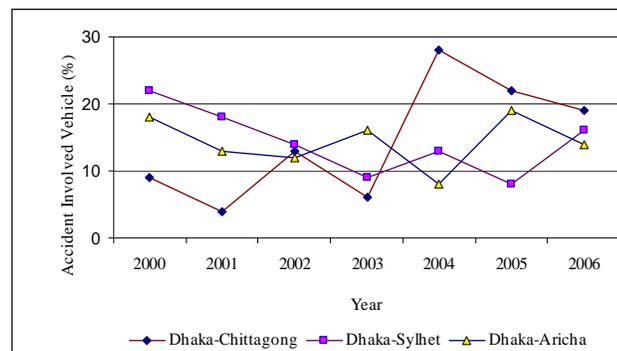
Source: Accident Research Institute (ARI), 2007, BUET, Dhaka-1000

From the figure 4, it is observed that large bus and truck are involved for maximum accidents. From the collected data, total number of vehicle in accidents were found 1013, 637 and 549 on Dhaka-Chittagong, Dhaka-Sylhet and Dhaka-Aricha national highway respectively, which count for vehicle class involvement in accident on Dhaka-Chittagong national highway almost 1.59 times of Dhaka-Sylhet and 1.85 times of Dhaka-Aricha national highway.



**Figure 4: Accident Involvement by Different Vehicle Classes on Selected Highways**

Large bus involved in accident on Dhaka-Chittagong, Dhaka-Sylhet and Dhaka-Aricha national highways are about 29%, 32% and 39%. Similarly trucks involved in accident are about 40%, 28% and 30% of total accidents for these individual national highways. Small buses also contribute more accidents which is about 11% for Dhaka-Chittagong and Dhaka Aricha national highways and 16% for Dhaka-Sylhet national highway. Other road vehicle class involvement in accidents is considerably lower.



**Figure 5: Yearly Variation of Vehicle Involvement in Accident**

Figure 5 reveals that vehicle involvement in accident on Dhaka-Chittagong national highway is comparatively low over other two national highways for the first four study years and it is increased seriously after year 2003. On the other hand vehicles involvement in accidents for other two national highways is relatively close to each other and remains nearly same through out the study period.

**Based on Different Time Period of a Day**

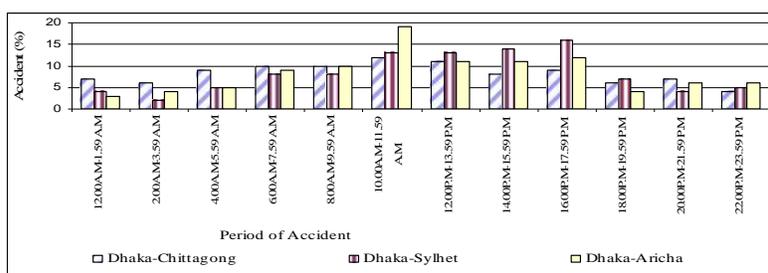
Police reported total accident for different time period of a day has been represented in the table 4. From the analysis of percentage of accident for different time period of a day on individual N-1, N-2 and N-5, it is observed that maximum accidents were dominated for the time period 10.00A.M to 13.59 P.M. which is 23.12%, 26.9% and 29.9% respectively. From the analysis of percentage of accident during day as well as night time, it reveals that majority of

accidents were occurred during day time. From the last seven years data analysis, it reveals that on an average on Dhaka-Chittagong national highway around 61% accidents occur at day time in comparing to 39% at night. Similarly for the other two national highways, it is observed that maximum accident occurs during day time over night time and it is nearly around 73% at day time and 27 % at night time for the both N-2 and N-5.

**Table 4: Number and Percentage of Total Accident for Individual Highway on Different Time Period of a Day**

Time of a Day	No. of Accident			Accident (%)		
	N-1	N-2	N-5	N-1	N-2	N-5
12.00A.M-1.59 A.M	53	17	14	7	4	3
2.00A.M-3.59 A.M	43	11	16	6	2	4
4.00A.M-5.59 A.M	67	24	19	9	5	5
6.00A.M-7.59 A.M	76	40	36	10	8	9
8.00A.M-9.59 A.M	73	37	40	10	8	10
10.00A.M-11.59 A.M	87	65	76	12	13	19
12.00P.M-13.59 P.M	81	65	46	11	13	11
14.00P.M-15.59 P.M	60	69	46	8	14	11
16.00P.M-17.59 P.M	67	79	49	9	16	12
18.00P.M-19.59 P.M	44	32	17	6	7	4
20.00P.M-21.59 P.M	48	19	25	7	4	6
22.00P.M-23.59 P.M	28	25	23	4	5	6

Based on the police reported data, figure 6 has been drawn which clearly depicts accident variation of different period of a day based on 7 years reported data.

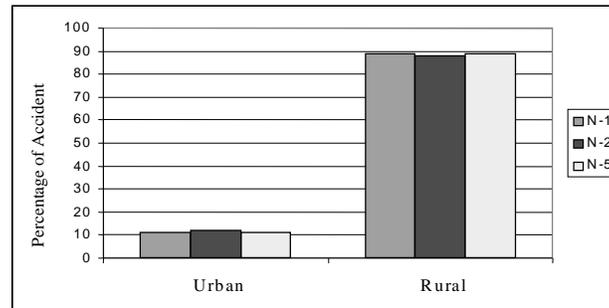


**Figure 6: Hourly Variation of Accident**

**Based on Location of Accident**

It is very essential to identify the area of maximum accident exposure on each highway. From the figure 7, it is observed that for the selected three national highways maximum accidents were occurred in rural areas. Possible reasons of

more accident exposure in rural areas might be over speeding, drivers fell freeness to drive at rural area, not to obey the traffic sign properly and tendency for overtaking. Accidents in rural areas on Dhaka-Chittagong, Dhaka-Sylhet and Dhaka-Aricha national highways are 89%, 88% and 89% respectively. Accident frequency in rural area is almost eight times more than urban areas on these three national highways.



**Figure 7: Percentage of Accident on the Urban and Rural Areas**

## CONCLUSIONS

Based on accident characteristics, it has been found that exposure to accident is too much in Dhaka-Aricha national highway than the other two selected highways. Maximum accidents are fatal types and than followed by grievous, simple, and collision types on these three national highways. Large bus and truck are responsible for most of the accidents for all the selected highways. Maximum accidents are occurred during day time and in fair environment. Around 88% accidents were occurred in rural areas of these three study national highways

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