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A Study of Heavy Vehicle Involvements in Road Accidents in Bangladesh

Ashfia Siddique¹

***Abstract :** Heavy vehicle involvement in road accidents and fatalities are increasing day by day. Almost three-fourth (74 percent) of total accidents occurs due to heavy vehicles. Heavy vehicle includes mini buses, large buses, all types of trucks, oil tankers and tractors. Involvement of bus in road accidents and casualties is the highest and truck is in second position. The most predominant type of collision is hit pedestrian. About 44 percent of total accidents due to heavy vehicle occurred in national highways and Dhaka-Aricha as well as Dhaka-Chittagong highways have significant involvements. The high accident period of heavy vehicle is from 10:00am to 6:00pm. Fatalities and injuries due to heavy vehicles are lower than that of non heavy vehicles.*

***Key words:** Heavy vehicle, road accident, casualty, severity, collision type.*

Introduction

Road Traffic injuries are considered as major health hazard all over the world. Over 1.2 million people die each year on the world's roads and between 20 and 50 million suffer non-fatal injuries. In most regions of the world this epidemic of road traffic injuries is still increasing. Over 90 percent of the world's fatalities on the roads occur in low-income and middle-income countries, which have only 48 percent of the world's registered vehicles (WHO Safety Report 2009). According to police statistics, road accidents claim, on average 4000 lives and injure another 5000 a year in Bangladesh. Actual estimated road fatalities each year about 12,000 which is at least 50 times higher than the rates in Western Europe and North America (Road User Cost Annual Report, RHD, 2004-05). This report also revealed that about 1.3 percent of total GDP was wasted for road traffic so the present situation of accident and the involving factors should be analyzed. But in Bangladesh heavy vehicle involvement^f in road accidents and fatalities are increasing day by day. Recently some major accidents of heavy vehicle like Mirsarai truck accident and Tareq Masud's death by collision with a large bus have shocked the whole nation. The Highway Capacity Manual (2000) defines a heavy vehicle as "a vehicle with more than four wheels touching the pavement during normal operation". In this category, mini buses, large buses, small trucks, large trucks, articulated trucks, oil tankers and tractors are considered as heavy vehicles. It is found from the data base of ARI of BUET that in average these heavy vehicles cause 74 percent of all accidents and kills 25 percent of people a year in Bangladesh. These above mentioned numbers clearly demonstrate that heavy vehicle accidents are becoming the burning question of Bangladesh. Besides, these accidents are amenable to targeted goal of safety if necessary actions and proper

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counter measures are applied after analyzing accident data and records. This study tries to find out the involvement of heavy vehicles in road accidents all over Bangladesh which costs lots of human lives and properties.

Collection of accident data

Any accident based research needs accurate and comprehensive accident data to make effective road safety analyses. After reporting an accident, these are recorded by the police in First Information Report (FIR). As a part of FIR, police enter data in Accident Report Form (ARF) which had been introduced nationwide by the beginning of year 1998 (Ahsan et al 2011). All these data are then entered into Microcomputer Accident Analysis Package 5 (MAAP5) software that was developed by the Transport Research Laboratory (TRL), U.K and specifically used for the storage and analysis of road accident data. Essentially the MAAP5 software is used by Accident Research Institute (ARI) of BUET. The collected data are sent to ARI with collaboration of Road Safety Cell (RSC) of the BRTA and Police Department. The current road safety measures and analysis works are done based on this database. The data used in this study was collected as secondary data from ARI of BUET.

Accident data and discussion

The main objective of this research is to find the trends and characteristics of heavy vehicles in road accidents in Bangladesh. The detailed analyses of heavy vehicle accidents have been presented here. The data for the analyses were taken from the year 1998 to 2006. The analyzing topics are accident severity, accident locations, collision type, time of accident, number of heavy vehicles involvement and casualties of heavy vehicles.

From Table 1, it is clear that almost 74 percent accidents occur due to heavy vehicles among all the types of vehicles. This is significantly a high portion of accidents in Bangladesh. Observing Figure 1, the trend of the involvement of heavy vehicles is nearly consistent for these mentioned years.

Table 1: Trends of accidents of heavy vehicle and non heavy vehicle, 1998-2006

Year	Heavy Vehicle		Non Heavy Vehicle		Total	
	No.	%	No.	%	No.	%
1998	2494	71	1039	29	3533	100
1999	2862	72	1086	28	3948	100
2000	2939	74	1031	26	3970	100
2001	2235	76	690	24	2925	100
2002	2974	75	967	25	3941	100
2003	3162	77	952	23	4114	100
2004	2697	76	869	24	3566	100
2005	2418	73	904	27	3322	100
2006	2636	74	913	26	3549	100
Total	24417	74	8451	26	32868	100

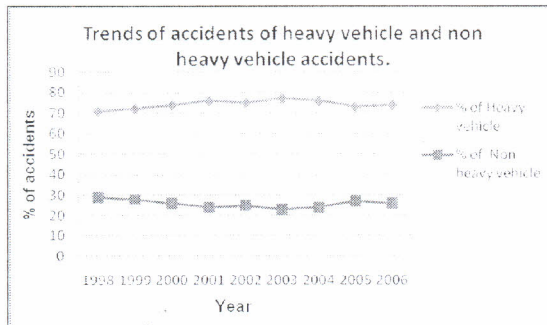


Figure 1: Yearly trends of accidents of heavy vehicle and non heavy vehicle accidents

From Table 2, it is found that about in average 68 percent of total heavy vehicle accidents are fatal accidents. The next type is injury accidents which covers 27 percent in average. The trends shows (Figure 2) that fatal accidents increased with time from 60 to 78 percent but injury accidents reduced from 35 percent to 20 percent in the years 1998-2006.

Table 2: Yearly trends of accident severity of heavy vehicle

Year	Fatal		Injury		Collision (Damage only)		Total	
	No.	%	No.	%	No.	%	No.	%
1998	1496	60	852	34	146	6	2494	100
1999	1827	64	882	31	153	5	2862	100
2000	1926	66	852	29	161	5	2939	100
2001	1580	71	561	25	94	4	2235	100
2002	1973	66	816	27	185	6	2974	100
2003	2152	68	246	27	164	5	3162	100
2004	1907	71	664	25	126	5	2697	100
2005	1764	73	552	23	102	4	2418	100
2006	1985	75	538	20	113	4	2636	100
Total	16610	68	6563	27	1244	5	24417	100

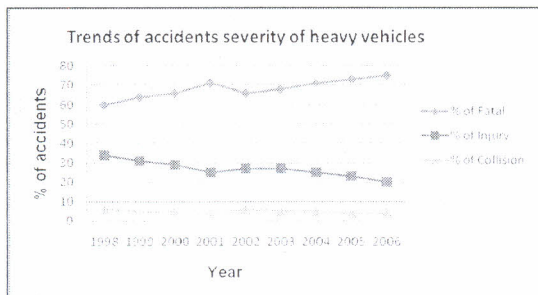


Figure 2: Trends of accidents severity of heavy vehicles

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Here, accident of heavy vehicle per 10,000 heavy vehicles (bus, mini bus, truck) is quite high with respect to the all accident per 10,000 vehicles. In most of the years from 1998 to 2005 it is more than 250 accidents but 50-70 fatalities per 10,000 heavy vehicles. In the year 2005 the registered total vehicle and heavy vehicle numbers were 850000 and 123000 respectively which is 14.8 percent of total.

Table 3: Trends of accidents per 10,000 registered vehicles in Bangladesh

Year	Registered All Vehicles	Accident and fatalities per 10,000 vehicles		Register Heavy Vehicles	Accident and fatalities per 10,000 heavy vehicles	
		Accident	Fatalities		Accident	Fatalities
1996	455734	-	-	88630	-	-
1997	488017	-	-	90877	-	-
1998	520498	68	45	94498	264	52
1999	552001	72	52	97262	294	76
2000	580785	68	53	100728	292	83
2001	623275	47	38	105115	213	56
2002	678152	58	45	110546	269	61
2003	737400	56	45	115356	274	72
2004	786602	45	40	119418	226	68
2005	852480	39	35	123353	196	64

The primary classification of accident (Ogden, 1996) based severity of accident has been discussed above. The trends of the secondary classification i.e. location type, road classes will be examined here. Table 4 shows that in average about 44 percent of accidents due to heavy vehicles have been occurred in national highways and 24 percent of accidents in city roads. It is interesting to note that from Figure 3, 16 percent of accidents in national highways increased and 24 percent of accidents decreased in city roads during the years 1998-2006. It is mentionable that the feeder road has been changed as zilla road now.

Table 4: Trends of accidents of heavy vehicle in road classes

Year	National		Regional		Feeder		Rural		City		Total	
	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
1998	855	34	278	11	250	10	109	4	987	40	2479	100
1999	1238	43	336	12	380	13	130	5	774	27	2858	100
2000	1225	42	353	12	463	16	149	5	744	25	2934	100
2001	948	42	323	14	358	16	140	6	462	21	2231	100
2002	1213	41	351	12	512	17	129	4	768	26	2973	100
2003	1450	46	420	13	407	13	139	4	740	23	3156	100
2004	1346	50	335	12	352	13	113	4	545	20	2691	100
2005	1168	48	380	16	231	10	170	7	466	19	2415	100
2006	1315	50	279	11	470	18	152	6	408	16	2624	100
Total	10758	44	3055	13	3423	14	1231	5	5894	24	24361	100
%	44.2		12.5		14.1		5		24.2		100	

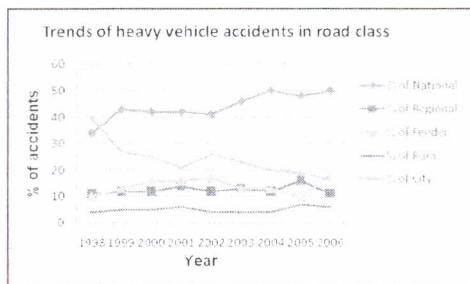


Figure 3: Yearly trends of heavy vehicle accidents in road class

The accident in national highways is the highest among the other classes of roads. That is why it is important to know the overall situation of accident on these highways of Bangladesh. Here it is found that route number N1 (Dhaka-Chittagong) and route number N5 (Dhaka-Aricha) have the significant percentage of accidents (14.4% and 17.4% respectively). The accidents of major national highways contribute 68.9 percent of total accident in route numbers. The rest of the routes contribute 31 percent.

Table 5: Trends of accidents of heavy vehicle on the national highway route numbers

Year	Route number								Total N1-N8 Routes	Other National Routes	Total National Routes
	N1	N2	N3	N4	N5	N6	N7	N8			
1998	122	112	22	9	226	90	67	24	672	1012	1684
1999	176	193	81	91	233	86	91	42	993	514	1507
2000	142	142	43	81	186	54	157	36	841	334	1175
2001	112	126	54	74	120	75	116	30	707	208	915
2002	207	113	72	108	235	70	165	35	1005	286	1291
2003	117	103	69	106	241	57	128	58	879	269	1148
2004	317	154	65	43	253	70	101	31	1034	215	1249
2005	246	101	24	93	225	46	65	59	859	311	1170
2006	199	92	55	81	267	45	39	80	858	386	1244
Total	1638	1136	485	686	1986	593	929	395	7848	3535	11383
%	14.4	9.9	4.3	6	17.4	5.2	8.2	3.5	68.9	31.1	100

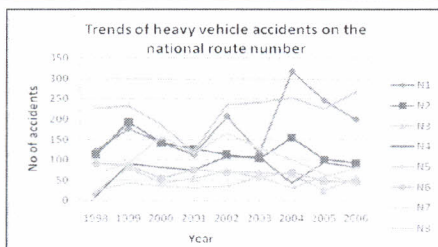


Figure 4: Trends of accidents of heavy vehicle along national route

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From Table 6, it is found that, almost 40 percent of all heavy vehicle accidents are the cause of hit pedestrian which is the highest of all. Head on and rear on accidents are also significant types which cover 15 and 16 percent respectively. Figure 5 shows that the highest number of hit pedestrian accidents occurred in 2003 but it gradually decreased and came to the former situation in 2006. All curves but that of hit pedestrians is steady over the years.

Table 6: Trends of accidents of heavy vehicle in collision types

Year	1998	1999	2000	2001	2002	2003	2004	2005	2006	Total	%
Head on	373	420	434	331	399	518	484	427	428	3814	15.6
Rear end	472	514	543	377	479	512	410	332	369	4008	16.4
90 degree	48	20	44	36	48	27	24	34	25	306	1.4
Side swipe	201	220	161	116	203	193	196	160	190	1640	6.7
Over Turn	184	267	269	243	315	330	226	190	213	2237	9.2
Hit Object	83	118	115	80	114	100	77	124	102	913	3.7
Park Vehicle	48	53	68	74	85	118	62	56	55	619	2.5
Hit Pedestrian	971	1130	1159	873	1217	1229	1097	983	1178	9837	40.3
Animal	3	1	1	0	0	3	1	2	1	12	0.1
Other	106	117	144	105	113	126	115	105	71	1002	4.1
Total	2489	2860	2938	2235	2973	3156	2692	2413	2632	24388	100

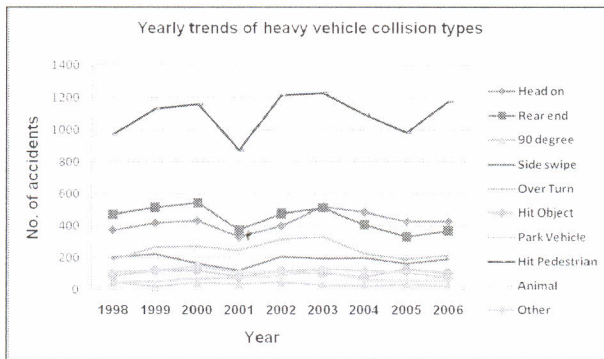


Figure 5: Yearly trends of accidents of heavy vehicle in collision types

Table 7: Hourly distribution of accidents of heavy vehicle

Time	Fatal		Injury		Damage only		Total	
	No.	%	No.	%	No.	%	No.	%
0	559	3.4	198	3	31	2.5	788	3.2
1	254	1.5	132	2	33	2.7	419	1.7
2	233	1.4	92	1.4	38	3.1	363	1.5
3	246	1.5	102	1.5	22	1.8	370	1.5
4	328	1.9	123	1.8	33	2.7	484	2
5	489	2.9	142	2.2	42	3.4	673	2.8
6	610	3.7	208	3.2	39	3.2	857	3.5
7	817	4.9	296	4.5	50	4	1163	4.8
8	824	5	319	4.9	63	5.1	1206	4.9
9	1043	6.3	440	6.7	65	5.3	1548	6.4
10	1212	7.3	495	7.5	79	6.4	1786	7.3
11	1226	7.4	513	7.8	82	6.6	1821	7.5
12	1097	6.6	497	7.6	86	6.7	1680	6.9
13	948	5.7	379	5.8	47	3.8	1374	5.6
14	940	5.7	359	5.5	66	5.3	1365	5.6
15	991	6	363	5.5	63	5.1	1417	5.8
16	988	5.9	384	5.9	77	6.2	1449	5.9
17	958	5.8	352	5.4	46	3.7	1356	5.6
18	561	3.4	214	3.3	31	2.5	806	3.3
19	625	3.8	211	3.2	48	3.9	897	3.7
20	505	3.1	219	3.3	66	5.3	790	3.2
21	424	2.6	188	2.9	42	3.4	654	2.7
22	321	1.9	148	2.2	42	3.4	511	2.1
23	301	1.8	145	2.2	43	3.5	489	2
Total	16500	100	6532	100	1234	100	24266	100

Hourly distributions of heavy vehicle accidents are shown below in Table 7 and Figure 6. The trend of distributions from the year 1998 to 2006 indicates that the number of accidents varied considerably with the time of the day. The peak period occurs from 10:00am to 1:00pm. The next moderate peak appears from 1:00pm to 6:00pm which varies 5.6 percent to 5.9 percent. The fatal and injury curves have followed the same path over the years.

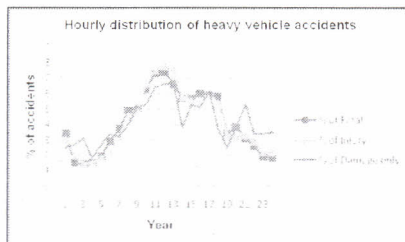


Figure 6: Hourly distribution of accidents of heavy vehicle

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Sometimes in an accident more than one vehicle are involved. Here involvement of buses is the most predominating vehicle with percentage of 55 of total heavy vehicles. Truck is the second highest number. The trend curve shows that involvement of buses have increased more than that of trucks in recent years.

Table 8: Number of heavy vehicle involvement in accidents

Year	Bus	Truck	Oil Tanker	Tractor	Heavy vehicle
1998	1450	1215	11	39	2715
1999	1644	1472	20	49	3185
2000	1674	1464	34	65	3237
2001	1246	1126	15	46	2433
2002	1824	1386	24	56	3290
2003	1989	1417	32	65	3503
2004	1756	1198	22	63	3039
2005	1515	1103	20	48	2686
2006	1655	1145	16	76	2892
Total	14753	11526	194	507	26980
% of Total	54.9	42.6	0.7	1.8	100

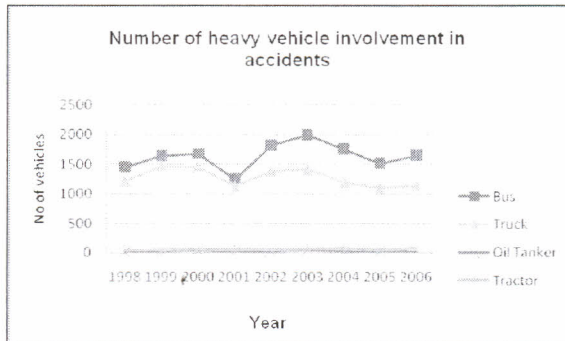


Figure 7: Yearly trends of number of heavy vehicle involvement

Casualties mean the degree of damage to the human health during accidents that is very concerning in the accident analysis. From the graph it can be said that heavy vehicle fatalities and casualties are substantially less than that of non heavy vehicles. All the curves in Figure 8 are steady over the mentioned periods.

Table 9: Trends of casualties in severity

Year	Casualties of All vehicles	Casualties of Heavy vehicles	Casualties of Non Heavy vehicles	% of Heavy vehicle casualties	Fatalities of all vehicle	Fatalities of heavy vehicle	% of Heavy Vehicle fatalities
1998	5655	1493	4162	26.4	2358	487	20.6
1999	6362	2094	4268	32.9	2893	736	25.4
2000	6543	2211	4332	33.8	3058	835	27.3
2001	4953	1668	3285	33.7	2388	588	24.6
2002	6338	2186	4152	34.5	3053	672	22
2003	7074	2512	4562	35.5	3334	829	24.8
2004	6176	2225	3951	36	3150	809	25.7
2005	5530	2007	3523	36.3	2960	794	26.8
2006	5230	1625	3605	31	3134	758	24.2
Total	53861	18021	35840	33.4	26328	6508	24.7

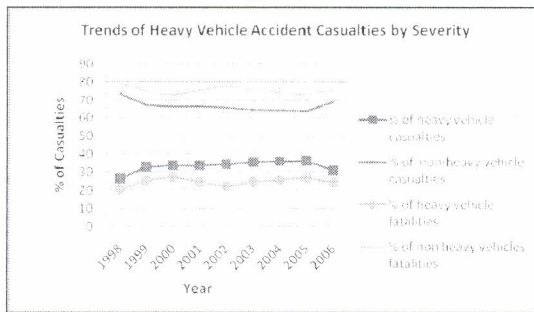


Figure 8: Yearly trend of casualties

To reduce the road casualties due to accidents, it is important to determine the causality distribution among the mode used. Here in curves of Figure 9 it presents that bus is the most contributing mode with 70.1 percent in average and truck is the next highest number of vehicles with 28.4 percent. The curve of bus reached the peak in the year 2003 but after this year it has started to descend from 1800 to 1000. After the year 2003 the curve of truck has been steady. The other vehicles are almost insignificant.

Table 10: Trends of casualties of heavy vehicle in mode used

Year	Bus	Truck	Oil Tanker	Tractor	Total Heavy vehicle
1998	1084	386	5	18	1493
1999	1344	729	2	19	2094
2000	1586	606	6	13	2211
2001	1211	432	2	23	1668
2002	1582	577	10	17	2186
2003	1804	677	4	27	2512
2004	1597	593	10	25	2225
2005	1369	605	5	28	2007
2006	1069	512	5	39	1625
Total	12646	5117	49	209	18021
% of Total	70.1	28.4	0.3	1.2	100

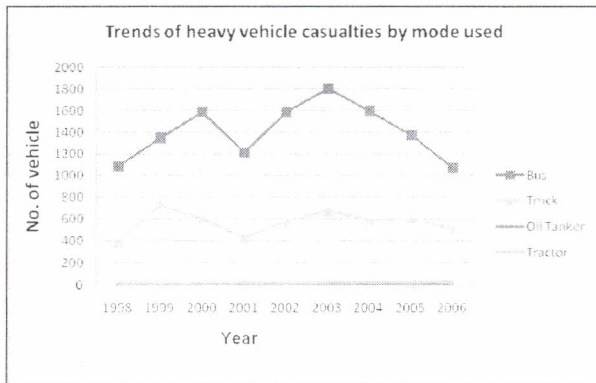


Figure 9: Trends of casualties of heavy vehicle in mode used.

Conclusion

The findings of this study are summarized as follows:

- Almost 74 percent accidents occurred due to heavy vehicles among all the types of vehicles. The trends of the involvement of heavy vehicles are nearly consistent for these years.
- About 65-70 percent of total heavy vehicle accidents are fatal accidents. Fatal accidents increased from 60 to 78 percent but injury accidents reduced from 35 to 20 percent in the years 1998-2006.
- The percentage of registered heavy vehicle number is 14.8 of total vehicle which is very few. But in average 254 accidents per 10,000 heavy vehicles is a very high figure.

- About 44 percent of all accidents in average occurred in national highways and 24 percent of accidents in city roads. Accidents in national highways increased by 16 percent and decreased by 24 percent in city roads during the years 1998-2006.
- Route number N1 and route number N5 have the significant percentage of accidents (14.4% and 17.4% respectively) among the eight national highways.
- In average 40 percent of all heavy vehicle accidents are the causes of hit pedestrian. Head on and rear on accidents are also significant types which cover 15 and 16 percent respectively.
- The high accident period of heavy vehicle is from 10:00am to 6:00pm.
- Involvement of buses in accidents is the most predominant with percentage of 55 of total heavy vehicle. Truck is in second position with the percentage of 42. The involvement of buses in accidents increased more than the involvement of trucks over the later years.
- Fatalities and injuries due to heavy vehicle are lower than that of non heavy vehicles. All the trends of the casualties and fatalities are steady over the mentioned years.
- In case of casualties, bus is the most predominant mode with percentage of 70 and truck is in second position with percentage of 28.

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