HEAVY VEHICLE DRIVER INVOLVEMENT IN ROAD SAFETY AND MULTIPLE VEHICLE ACCIDENTS IN BANGLADESH




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Abstract

Every day around the world, almost sixteen thousand people die from injuries. For every person that dies, several thousands more are injured, many of them with permanent sequels of injuries. An estimated 1.2 million people lose their lives in road traffic crashes every year, and another 20 to 50 million are injured (Zaman, 2007). This problem of road traffic crashes and resulting injuries and fatalities is however more acute in a developing country like Bangladesh. This paper aims to depict the overall road safety situation of Bangladesh and focuses on the heavy vehicle involvement in all accidents. At the same time this paper tries to show the trend of multiple vehicle accident, major collision types, casualty type, and composition of vehicles involved in such accidents and discusses the factors related to these accidents. Considering all the facts of involvement of heavy vehicles and the scenario of multiple vehicle accidents this paper aims to discusses the possible solutions to improve the continuously deteriorating situation.

Keywords: Heavy vehicle, multiple vehicle accidents, casualty, collision type.

Résumé

Chaque jour environ 16 000 personnes meurent de leurs blessures dans le monde. Pour chaque personne tuée, plusieurs milliers d'autres sont blessées, dont beaucoup avec des séquelles définitives. On estime que 1,2 millions de personnes sont tuées chaque année dans des accidents de la circulation et 20 à 50 millions sont blessées (Zaman, 2007). Ce problème d'accidents de la circulation et des décès et blessés qui en résultent est encore plus critique dans les pays en développement comme le Bengladesh. Cet article décrit la situation globale de la sécurité routière au Bengladesh et en particulier sur l'implication des poids lourds dans les accidents. On essaye aussi de mettre en évidence l'évolution des accidents entre plusieurs véhicules, les principaux types de collisions, de blessures et de véhicules impliqués, ainsi que les facteurs reliés à ces accidents. A partir des données sur l'implication des poids lourds et les scénarios d'accident entre plusieurs véhicules, des solutions sont proposées pour améliorer une situation en constante dégradation.

Mots-clés : poids lourds, accidents entre plusieurs véhicules, blessure, type de collision.

1. Brief Derails of Road Safety Context in Bangladesh

1.1 Bangladesh and Its Road Transport System

Transport is an extremely important part of the Bangladesh economy. Some 12% of GDP and 20% of the annual development budget is spent on transport, and 9.4% of the national employment is in the transport industry. Bangladesh, a country having an area of 144,000 sq-km, and a population of 130 million, has about 0.6 million motorized vehicle and 1.5 million non-motorized vehicles. At the current growth the number of vehicles in the country is expected to be double in the next ten years. There has been a continued increase in the shares of passengers and freights carried by road compared to rail and water; currently 79% of passenger and 73% of freight is carried by road transport.

1.2 Vehicle Statistics of Bangladesh

From the statistics it is evident that the predominant registered vehicle is motorcycle, Jeep, car and taxi and auto-rickshaw. It is also revealed from the study that there is an inconsistency between the registered and total vehicles present on the roadway.

Table 1 – Number of vehicles registered and present on the roadway.

Vehicle types	Number of vehicles (Registered)	Number of vehicles (On Road)
Bus/Minibus	40469	29717
Trucks	65239	48753
Jeep/Car/Taxi	189287	78236
Microbus/Pickup	18492	14743
Auto-rickshaw/Tempo	116242	77700
Motorcycle	328294	220225
Rickshaw/Rickshaw Van	N/A	N/A
Bi-cycle	N/A	N/A
Others	26324	15854
Total	**784347**	**485228**

1.3 The Road Safety Problem of Bangladesh

Road accidents in Bangladesh claim, on average 4000 lives and injure another 5000 a year but it is estimated that there could be about 10,000 to 12,000 deaths each year as many cases remain underreported. The statistics reveals that in Bangladesh the fatality rate is at least 50 times higher than the rates in Western Europe and North America. Table 2 shows the growth of motor vehicles and road accidents in Bangladesh.

Figure 1 gives the national trends of police reported road traffic accidents, fatalities and injuries for the period 1993-2003 of Bangladesh. It is clear that number of fatalities has been rapidly increasing particularly in recent years, from 1495 in 1993 to 3334 in 2003, i.e. nearly two and half times in an eleven year period. The statistics also reveal that Bangladesh has one of the highest fatality rates in road accidents, which is higher than 160 deaths per 10,000 motor vehicles on road every year compared with the rates of 2.0 in the USA and 1.4 in UK, for example.

Table 2 – Growth of motor vehicles and road accident for the period 1998-2002*

Year	No of registered vehicles	No of fatal accidents	No of non-fatal accidents	Total accidents
1998	572847	2000	1533	**3533**
1999	603079	2432	1510	**3942**
2000	631912	2523	1447	**3970**
2001	673537	2029	896	**2925**
2002	678152	2599	1342	**3941**
Total	**2481375**	**12864**	**8074**	**20938**

*Source: National Road Safety Council (2002-2004)

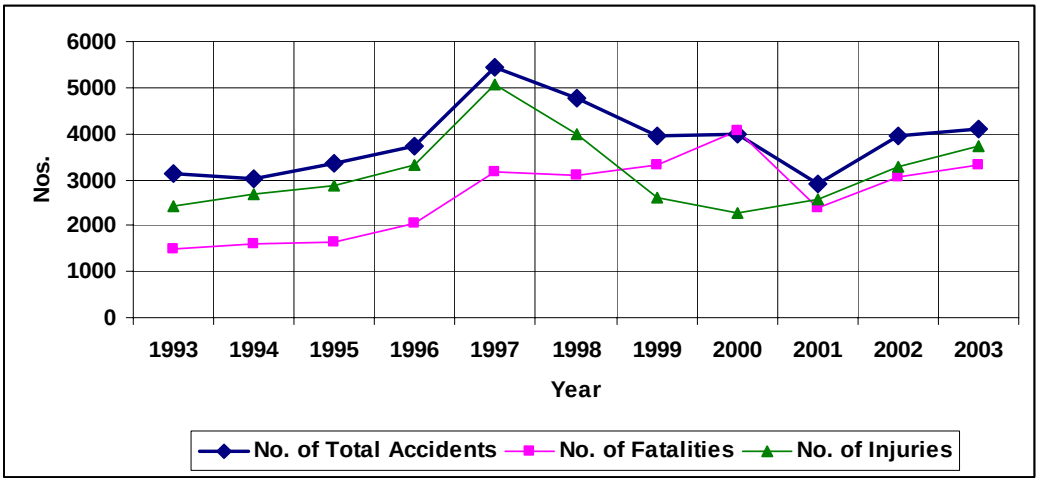

Figure 1 – Reported road accident trends in Bangladesh (1993-2003).

2. Vehicular Involvement in Road Traffic Accidents of Bangladesh

2.1 Overall Vehicular Involved in Road Traffic Accidents

The percentage of number of vehicles by type involved in recorded accidents by year is shown in Figure 2. The analyses revealed that buses (36.6%) and trucks (26.0%) contribute nearly sixty three percent of the total recorded accidents.

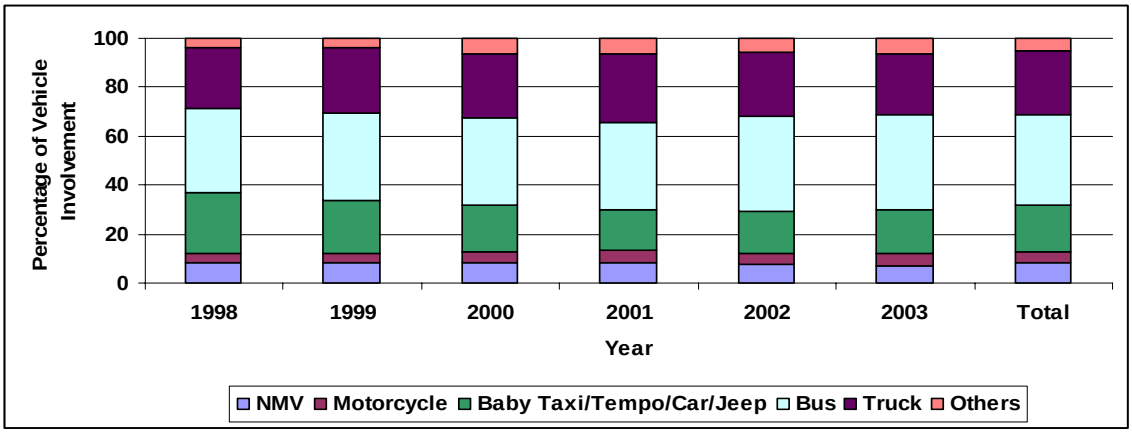

Figure 2 – Percentage of number vehicles by type involved in recorded accidents by year.

2.2 Vehicular Involvement in Road Traffic Fatalities

Road traffic accident analyses revealed that heavy vehicles such as trucks and buses are the major contributors to road accidents and in fatal accidents their shares are thirty five and twenty nine percent respectively. This group of vehicles is particularly over involved in pedestrian accidents accounting for about 68 percent (bus 38% and trucks 30%). For the case of road death, the share of buses and trucks are nearly sixty seven percent and for pedestrian fatalities about eighty percent. Figure 3 describes several vehicular involvements in road traffic fatalities.

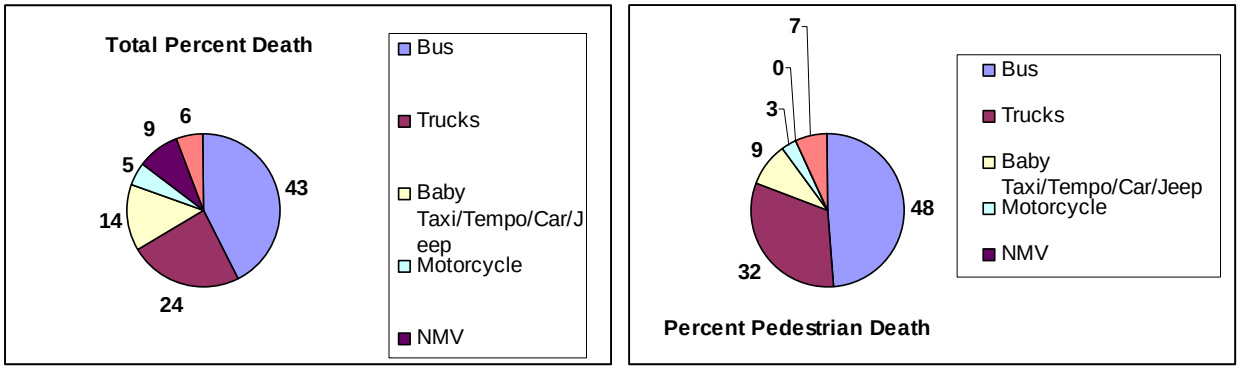

Figure 3 – Vehicular involvement in road traffic fatalities.

3. Drivers' Involvement in Road Traffic Accident and Casualties

A total of 25,700 vehicles were involved in over 17,600 road traffic accidents in Bangladesh resulting in 25,500 casualties during the period of five years (1998-2002) and of the total casualties about twelve percent were drivers.

3.1 Age Distribution of Overall Drivers' Involvement

Drivers in 26-35 years of age constitute the most dominant group involved in accidents in between 1998-2003. The following are the overall age distributions of drivers involvement in accidents during the specified time period.

- 26-35 age group, 51.8 percent (26-30 age group, 24% and 31-35 age group, 27.8%)
- 36-45 age group, 27.3 percent
- 16-25 age group, 16.3 percent
- 46-55 age group, 3.4 percent

3.2 Age Distribution of Drivers Casualties

Drivers in the 26-35 age group form the dominant cohort in driver casualties which is 48.2 percent of total driver casualties. (26 – 30 age group, 23.6 % and 31 – 35 age group, 24.6 %).

3.3 Heavy Vehicle Drivers' Involvement

Of the total of 8,500 drivers with recorded information, about 4,480 drivers were heavy vehicle (buses and trucks) drivers which accounted for nearly fifty three percent of total drivers' involvement in the casualties.

4. Multiple Vehicle Road Traffic Accidents in Bangladesh

4.1 The Multiple Vehicle Accidents in Bangladesh

Multiple vehicle traffic accident refers to a crash between two or more moving objects. Police reported road traffic accident data for multiple vehicle accidents occurring in Bangladesh were analyzed by $MAAP_{five}$ (Micro-computer Accident Analysis Package) during a study period of eight years (1998-2005). From the analysis it was evident that a total of 40,600 vehicles were involved in 29,314 accidents resulting in 48,632 casualties during the period between 1998 and 2005 (Table 3). Among these accidents a total of 22,400 vehicles were involved in 11,102 accidents resulting in 22,300 casualties. Among the total accidents, nearly thirty eight percent were multiple vehicle accidents and about twenty nine percent of all fatal accidents were multiple vehicle accidents. During the study period nearly forty six percent of the total casualties and about forty one percent of the total fatalities were due to involvement of multiple vehicles.

Table 3 – Accident severity and casualties with respect to no. of vehicles.

Severity	No. of vehicles involved in accidents			No. of vehicles involved in casualties		
	Single	Multiple	Total	Single	Multiple	Total
Fatal	13737	5536	19273	19103	12900	32003
Non-fatal	4480	5561	10041	7202	9427	16629
Total	**18217**	**11097**	**29314**	**26305**	**22327**	**48632**

4.2 Yearly Trend of Multiple Vehicle Accidents

The accident trend of multiple vehicle accident clearly demonstrates that a considerable proportion of road traffic accidents occurring in Bangladesh during the study period of eight years (1998-2005) is due to the involvement of multiple vehicles (Table 4). The accident trend clearly shows the contribution of multiple vehicles in overall accidents.

Table 4 – Accident trend of Bangladesh (1998-2005).

Year	Single vehicle accidents	Multiple vehicle accidents	Total	Row % of multiple vehicle accidents
1998	2093	1440	**3533**	40.76
1999	2414	1534	**3948**	38.86
2000	2416	1554	**3970**	39.14
2001	1880	1045	**2925**	35.73
2002	2498	1443	**3941**	36.62
2003	2512	1557	**4114**	37.85
2004	2218	1348	**3566**	37.80
2005	2186	1136	**3322**	34.20
Total	**18217**	**11102**	**29319**	**37.87**

4.3 Vehicular Involvement in Multiple Vehicle Accidents

Form the analysis of vehicular involvement in accidents (Figure 4) it is evident that the involvement of buses (17.7%) and heavy trucks (21.7%) is very prominent which makes the concern about the over involvement of heavy vehicles in multiple vehicle accident more serious.

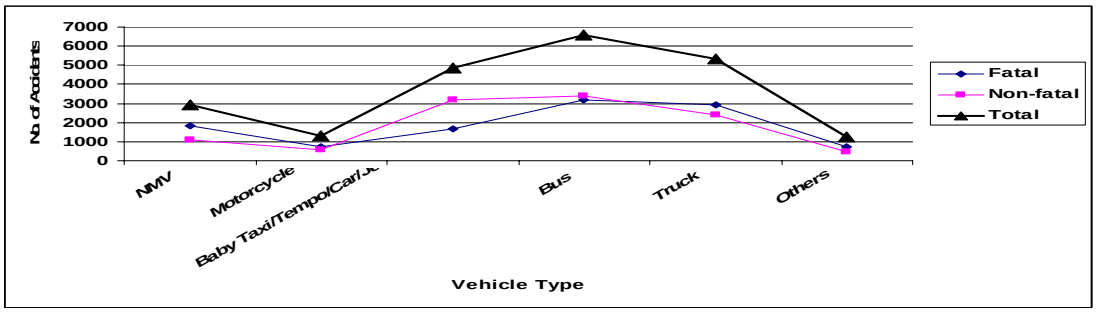

Figure 4 – Involvement of vehicles in multiple vehicle accidents (1998-2005).

4.4 Predominant Accident Types in Multiple Vehicle Road Traffic Accidents

Accident type analysis showed 'hit pedestrian' as the dominant accident type in cases of single vehicle accidents but in case of multiple vehicle accidents head on (34.8%), rear end (38.9), side swiping (14%) and hitting parked vehicles (5.5%) are the most common accident types. These four accident types account for nearly 93 percent of the total multiple vehicle accidents. Table 5 describes the predominant types of multiple vehicle road traffic accidents.

Table 5 – Predominant types of multiple vehicle road traffic accidents.

Collision type	Single vehicle accidents	Multiple vehicle accidents	Total
Head on	184	3858	**4042**
Rear end	275	4314	**4589**
Side sway	237	1547	**1784**
Overturning	2546	89	**2635**
Hit object	997	82	**1079**
Pedestrian	12848	102	**12950**
Others	1097	998	**2095**
Total	**18184**	**11090**	**29274**

4.5 Major Contributory Factors of Accident

The principal contributing factors of accidents are adverse roadway roadside environment, poor detailed design of junctions and road sections, excessive speeding, overloading, dangerous overtaking, reckless driving, carelessness of road users, failure to obey mandatory traffic regulations, variety of vehicle characteristics and defects in vehicles and conflicting use of roads. Others include a low level of awareness of the safety problems, inadequate and unsatisfactory education, safety rules and regulations and traffic law enforcement and sanctions. And most importantly unlike single-vehicle accidents, not all drivers involving in a multiple-vehicle accident are responsible for the occurrence of the event. Variables such as road type, composition of vehicles, human factors, environmental factors, number of vehicles involved in the accident are expected to play a much more important role in association with injury severity in multiple vehicle accidents.

5. Options for Improving Road Safety Situation in Bangladesh

From the accident statistics it is quite evident that road traffic accidents are a very serious problem in Bangladesh especially considering the involvement of heavy vehicles in single and multiple vehicle accidents. There is urgent need and scope for improving the road safety situation and for that there is obviously need for much efforts and investment in safety measures to reverse the trend.

5.1 Road Safety Engineering: Road Environmental Improvements

A few of the pragmatic road safety measures which could immediately be implemented at relatively low cost and within short periods of time for achieving safer road operations in Bangladesh are identified. Immediate measures are to be initiated to achieve enhanced road safety which would also offer cost-effective results.

5.2 Intensified Enforcement and Safety Education Measures

It is important to intensify the enforcement and educational programs to alleviate the problems of road accidents. The current level of traffic law enforcement, vehicular regulations and road users education is exceedingly low in Bangladesh. The deployment of police traffic law enforcement based on high-risk locations and times is superior to a general increase of enforcement. Enforcement work is best done by having a well-trained, efficient organization that is adequately equipped with modern equipment and vehicles, and by concentrating on moving offences and preventing unsafe driver behaviour. Detailed investigation is also necessary to identify the gaps and deficiencies in the perceived traffic safety knowledge of road users, particularly drivers of heavy vehicles.

5.3 New Innovative High-Tech Solutions

Improved and innovative solutions are also vital to reduce accidents and casualties. Such as safety barriers and crash cushioning (energy absorption system) at increased impact speeds are highly effective in saving lives. Advance roadside management system (fixed object, trees, poles, etc.), high-tech solutions (e.g. ITS) etc. can reduce overall hazards by a big margin. The Intelligent transport System (ITS) is intended for advances in navigation systems, assistance for safety driving, optimization of traffic management and increasing efficiency in road management by building an integrated system of people, roads and vehicles utilizing advance data communication technologies. A recent study on ITS application for Bangladesh revealed that with 100 percent deployment of ITS technology, the fatal and injury related accidents could be reduced as much as 26 percent and 30 respectively (Hasan, 2000).

5.4 Development of Heavy Vehicle Drivers' Awareness of Road Safety

From the analysis it is quite clear that heavy vehicle drivers' are involved in most severe accidents and a huge life loss is encountered with this, it is of most urgency to take the initiatives required to make them understand the scenario. Every heavy vehicle driver should have adequate knowledge about the vehicle brake system, steering system, wheels and tires, engines, tire pressure and the body of the vehicle and the problems associated with every part and they should know how to maintain these parts. For this they should keep in mind some very important strategies and they are (Choudhury, 2006):

- If the brake systems of the motor vehicles are kept defect free then there will be 60% improvement of road accidents caused by defective heavy vehicles.
- The bushes in the steering system, due to their tendency to wear out, often enhances the probability of accidents. The whole steering system must be properly maintained regularly to avoid any accident.
- Sudden displacement bursts of the front wheel and tires during movement may cause serious accidents. The wheels and tires of motor vehicles must be in good condition and be regularly checked to avoid road traffic accidents.
- A vehicle with a defective engine creates congestion and pollutes air by emitting smoke. Therefore the engine must be kept in good order to avoid delays and pollution which may indirectly cause accidents.

- Before starting the vehicle there must be a routine check up of the vehicle every day. The radiator water level, electrical line and battery, wheels and tires should all be routinely checked.
- Before beginning to drive drivers should check the braking system and steering system in a short test drive.

Drivers should have to attend some training programme each year to develop and enhance their knowledge about road safety. Authorities should take the necessary steps so that at least heavy vehicle drivers should be monitored on a regular basis so that incompetencies can be detected at the early stage which can be in turn effective. The concerned authority also can ensure that the drivers get opportunities to strengthen their knowledge about the newly introduced road traffic sign, marking, and other road safety furniture.

6. Concluding Remarks

As severe road traffic accidents lead to economic loss and more importantly loss of lives, it is a serious issue in Bangladesh. Considering the over involvement of heavy vehicles in road traffic accidents and the overall scenario of multiple vehicle accidents efforts should be taken to ensure road safety to protect the lives of road users and to reduce accidents. From both the study it is evident that multiple vehicle accidents have increased enormously with an increase in number of vehicle involvement and casualties. Some striking features of the characteristics of multiple vehicle accidents in Bangladesh are presented which can lead to improve this continuously deteriorating situation. This paper presents a preliminary study regarding heavy vehicle driver involvement in road safety and multiple vehicle accidents. Further detailed studies and investigations are required towards comprehensive understanding of the problem.

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