MAJOR FATAL ROAD ACCIDENTS IN BANGLADESH: CHARACTERISTICS, CAUSES AND REMEDIAL MEASURES

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ABSTRACT
This paper presents a brief overview of current major fatal road accidents statistics in Bangladesh for the period from 2002-2005. It is found that each year at least 126 major fatal accidents are occurred causing at least 612 deaths and 1857 injuries on the highways. The accident types, which resulted in considerable amount of fatalities are head on (39%), lost control (34%), rear end (16%), and hit object on/off road (7%). Fatal accidents which occurred on highways are likely to involve heavy vehicles, especially buses, and likely to involve multi vehicle accidents. Excessive speeding and road & roadside hazardous conditions accelerate the severity of accident. This study specially assesses the contributory factors responsible for the occurrence of accidents at the most frequent locations. Improving safety of the road environment is now a great concern which emphasizes on wider application of proven road engineering measure at locations identified by systematic accident investigation and research.

INTRODUCTION
In Bangladesh, road transport has to bear solely the major part of passenger and freight movements. For this, it is now the most important mode of transport but ironically deaths from road traffic accidents (RTA) have been now characterized in this country as a hidden epidemic which affects all sectors of society. It is found that, of all total reported accidents, 65 percent are fatal and a considerable number of fatal accidents are occurring every year in which a large number of road users lose their lives in each accident. This paper assess prevalence of these major fatal road traffic accidents (MFRTAs) reporting to the newspapers, electronic media etc. and an analysis of the factors in relation to victims, vehicles and sites of impacts, accident pattern etc. Besides, this paper makes an attempt to prescribe some effective countermeasures pertaining to hosts (road users), the agents (vehicles) and the road environmental conditions.

WHAT IS MAJOR FATAL ROAD TRAFFIC ACCIDENT (MFRTA)

The authors define the major fatal road accident as “the single accident in which at least three persons are killed”. Accident statistics of 2002-2005 shows that this type of accident constitutes nearly 5 percent of total fatal accidents and 3 percent of all accidents in Bangladesh but claims at least 19 percent of total fatalities and 57 percent of total injuries each year.

CHARACTERISTICS OF MAJOR FATAL ACCIDENTS IN BANGLADESH

This section summarizes the findings of the major fatal accident characteristics:

ACCIDENT STATISTICS
In total, there were 505 reported major fatal accidents over the period 2002-2005 which claims 2446 lives and injured at least 7427 people (Table 1). On average at least 126 major fatal accidents are occurred in each year resulting 4.85 fatalities and 14.7 casualties per accident. Though major fatal accidents are only 3 percent of total accident, they allege 19.0 percent of total fatalities and 57.0 percent of total injuries each year.

Table 1: Major Fatal Accidents in Bangladesh

<table>
<thead>
<tr>
<th>Year</th>
<th>Major Fatal Accident No.</th>
<th>Person Killed</th>
<th>Person Injured</th>
<th>Fatalities per accident</th>
<th>Injuries per accident</th>
</tr>
</thead>
<tbody>
<tr>
<td>2002</td>
<td>105</td>
<td>621</td>
<td>1460</td>
<td>5.9</td>
<td>13.9</td>
</tr>
<tr>
<td>2003</td>
<td>103</td>
<td>497</td>
<td>1781</td>
<td>4.8</td>
<td>17.3</td>
</tr>
<tr>
<td>2004</td>
<td>134</td>
<td>645</td>
<td>2032</td>
<td>4.8</td>
<td>15.2</td>
</tr>
<tr>
<td>2005</td>
<td>163</td>
<td>683</td>
<td>2154</td>
<td>4.2</td>
<td>13.2</td>
</tr>
<tr>
<td>Total</td>
<td>505</td>
<td>2446</td>
<td>7427</td>
<td>4.9</td>
<td>14.9</td>
</tr>
</tbody>
</table>

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MOST FREQUENT ACCIDENT TYPES

Australian model guidelines (Andreassen, 1994) are used to describe the movements of the road users and vehicles involved in the accident event where different types of accidents are expressed by different codes. It is found that Head on (201,205,501) type accidents which accounts for 39% of total accidents dominating the others. This is followed by Lost Control (701,702,703,705,502) 34%, Rear end (301,304,305) 16%, Hit object on/off road (601,605,607,608) 7%. These four accidents types accounted for 96% of the total accidents. Hit object on/off road type of accident represents the highest rate of about 5.0 fatalities and 23.5injuries per accident. This is followed by lost control (about 5.34 fatalities and 19.6 injuries per accident) and Head on (5.0 fatalities and 16.1 injuries per accident).

VEHICLE INVOLVEMENT

Overinvolvement of Buses and Trucks: At least 1.44 vehicles are involved in each major fatal accident. Of the total vehicles involved, 46 percent are buses, 25 percent are trucks and 10 percent are Babi taxi/Tempo. Heavy vehicles i.e., Buses and Trucks are involved in 71% of all major fatal accidents. Each accident in which buses are involved claims 23.9 casualties (5.2 fatalities and 18.7 injuries) whereas for trucks each accident claims 18.0 casualties (5.0 fatalities and 13.0 injuries).

Single and Multi vehicle Accident: The study reveals that around 38% accidents are single vehicle and 62% are multi vehicle types for all the highways. Of the total multi vehicle involvement in accidents, 35 percent are occurred between the bus and others except truck (Fig.1). From Critical observation, it can be seen that most of the single vehicle accidents are Hit object on/off road and Lost control. The severity level of single accident is high as at least 5 persons are killed and 16 persons are injured per accident whereas in multi vehicle accident at least 4.6 persons are killed and 14 persons are injured.

DISTRIBUTION OF MAJOR FATAL ACCIDENTS

ACCIDENT BY ROUTES

It is found that out of 505 reported major fatal accidents; at least 120 major fatal accidents (24% of total accidents) are occurred in Dhaka-Chittagong-Cox's Bazar (N1), which alleges 587 fatalities and 1469 injuries (Table 2). This is followed by Bogra-Rangpur-Dinajpur-Banglabandha (N1) highway on which 67 fatal accidents (13% of total accidents) and Dhaka-Sylhet (N2) highway (8% of total accidents). In terms of severity level, the fatal accidents occurring on Dhaka-Tangail-Jamalpur-Sherpur Highway (N4) are most serious as at least 6.5 persons are killed per accident.

ACCIDENT BY MONTH, DAY OF WEEK AND TIME OF DAY

Effect of monthly variation in relation to number of accidents display that May month recorded maximum number 56 cases (11.1%) followed by December (51 cases, 10.1%). The day, on which major fatal road traffic accident (MFRTA) are frequently occurred is Saturday (17.4 percent), followed by Monday (15.8 percent) and Friday (13.9 percent). Wednesday and Sunday are the days of the fewest number of major fatal accidents occurrence. Moreover from the frequency distribution of accidents for the various times of the day depict that the peak time of accident occurrence for major fatal accidents is 10:00-10:59 a.m. (9.8 percent). Approx. one-fifth of the accidents are occurred between 9:00-10:59 a.m. (17 percent). Other time periods in which relatively high numbers of accidents occurrence are 5:00-5:59 a.m. (5.9 percent), 7:00-7:59 a.m. (6.9 percent), 1:00-1:59 p.m. (5.9 percent), 4:00-4:59 p.m. (6.7 percent).
ROAD USERS INVOLVED IN ACCIDENT

The age distributions of fatalities and injuries among various road user groups are shown in Figure 2. The study observes that most economically active and productive people (25-44 years age groups) are the main victims of road accidents which are 57 percent of all victims. The other significant road accident victims groups are 20-24 years group (8 percent), 45-49 years group (6 percent). Children who are aged under 15 represent a significant proportion (13 percent) of road accident casualties.

Fig2: Age Distribution of Road Accident Victims

MAJOR ROAD ACCIDENT CAUSATIONS

Accidents constitute a complex phenomenon of multiple causation. The etiological factors are classified into human and environmental factors (Norman LG, 1962). In present era, population explosion, urbanization, tremendous growth of motorized as well as non-motorized and para-transit vehicles, solitary dominancy of road transport sector over other modes (viz. rail and water) are catalyzing factors for a number of accidents in Bangladesh.

Out of 505 accidents reported in newspapers, accident factors are informed properly in 263 accidents. It is shown that 70 percent of accidents involved a human factor with 23 percent involving a road factor and just 7 percent involved a vehicle factor. The most frequently recorded factor is excessive speeding (40 per cent) which includes both “speed in excess of the speed limit” and “inappropriate speed for the conditions” and this is followed by overloading/passenger carrying on bus roof or truck (16 percent) and careless/thoughtless/reckless driving (13 per cent). Outwardly, it can be said that human factors/errors must have to given priority for improving road safety but Sabey (1980) cautions that “It is too easy to conclude that all effort should be applied to influencing human behaviour directly, without taking into account the detailed circumstances, the multiplicity of factors which lead to accident occurrence, and the chances of success of measures applied.” And for this, an integrated and multi-disciplinary approach (Hoque, 2001) must have to be implemented for dipping road accidents massacres with particular emphasis on the measures of reducing human errors on road.

Regarding road factors, roadside hazards are of particular concern as road side ditch and road side objects are involved in 8 percent and 7 percent of all accidents respectively. Road side objects particularly trees, electric pole, fence, are involved in accident. The different road side objects contributed to fatal accidents is shown in fig. 3 from which it found that the most common roadside object hit is tree (33%) which is followed by standing vehicles in haphazard vehicle stops (21%), encroachment of road sides by markets, shops, fuelling stations etc. (13%) and bridges (11%).

Fig 3: Contribution of road side hazards in accidents
DISTRIBUTION OF ACCIDENT OCCURRENCES ON SOME HIGHWAY LOCATIONS

The most fatal accident prone locations are presented in Fig 4. This clearly reveals that the road accident situation is very severe on some sections of specific national highways.

![Fig 4: Locations of Major Fatal Road Accident in Bangladesh](image)

IMPROVING ROAD SAFETY: DEVELOPMENT OF COUNTERMEASURES

Below is a summary of countermeasures which have the potential to reduce the number and severity of accidents. These summarized countermeasures are divided into two categories; Direct countermeasures- which are directly related to road aspects and indirect countermeasures- which relates road safety indirectly.

DIRECT COUNTERMEASURES

- Improvement of shoulders: Running-off-road and head on type collisions can be significantly reduced by shoulder widening and sealing. The safety benefits of shoulders widening or improvement were shown to be the highest, with a benefit cost ratio of 29:1 (Srinivasan, 1982).

- Installation of median: The placement of road medians with flaring openings, provision of pedestrian refuge island will ensure pedestrian safety as well as will reduce the frequency and severity of accidents by 30 percent for a narrow painted median and 48 percent for narrow raised median and 54 percent for wide median. (Ogden 1994). Provision of median is a long term solution and has particular importance on reducing head-on collisions on national highways in Bangladesh.

- Treatment of roadside objects: Provision of “Clear Zone” is a mitigating approach of improving roadside safety which emphasizes on reducing the severity of consequences when vehicles leave the paved area. Adequate clear zone enables an errant driver to safely return to the roadway or bring the vehicle to a safe, controlled stop. A 9.0 m (29.7 ft) clear zone width is generally recommended for high-speed, high-
volume roads with nearly level rights of way, whereas a minimum clear zone of 3.0 m (9.9 ft) is recommended for low-speed roads. Clearance distances may be less if a fixed object is located behind a guardrail or other approved barrier (Kathleen et al 2006).

- Provision and improvement of crashworthy infrastructure: In consideration of high embankment (4 to 8 m) without any at-grade recovery area, it is suggested that, continuous W-beam type of flexible roadside barriers should be given preference over rigid (concrete) guard-posts. By extensive use of this barriers, fatal and serious injury crashes involving run-off-road and head-on events are reduced by up to 90 percent (Larsson et al., 2003). Moreover as tree are the leading causes of death by vehicles striking fixed objects, minimum distance of tree placement from the roadway and their well spacing along with selection of certain tree species may improve driver comfort by providing relief from the sun and wind (Neale, 1949) as well as acts as a physical protective devices for pedestrians from run-off road vehicles (Zeigler, 1986). Conversely, tree must be removed and protective devices must be installed especially on curves where sight distance is poor.

- Provision of NMT facilities: In addition to the installation of road signs, markings etc. construction of parallel service roads on both sides of a highway, protective raised walking and crossing facilities as well as installation of street lighting facilities should be provided in the locations where pedestrian and NMV activities are high.

- Provision of paved shoulders: Providing paved hard shoulders with a consistent design throughout the route length particularly in the immediate vicinity of towns and villages where there is a significant volume of non-motorized traffic (NMT would resolve most of the danger caused by the mixing of slow-moving NMT and fast moving vehicles.

- Intersection design/Improvements: High accident intersection treatments through adequate visibility, channelization, traffic islands and redesigning cross road intersection into staggered T-Junctions (Hoque, 1994). For limited sight distance in intersection installation of warning signs with advisory speed can be suitable treatment options.

- Provision of delineation: Providing additional delineation as well as advance warning signs with advisory speed through sharp horizontal curves. It must be ensured that proper superelevation has been provided on horizontal curves and no shoulder drop-off problem has been created.

- Access Control: The accesses to all school sites, hospital entrances and other major employment centres be upgraded by adding proper fencing and be protected by the use of appropriate road humps properly signed, designed and maintained and incorporating a pedestrian crossing. The frontages of all Petrol filling stations should be controlled by planted strips or low barriers and vehicles should be constrained from entering and leaving the filling stations to two points only.

- Behavioural modification: As with everywhere in Bangladesh, the behaviour of bus drivers is completely uncontrolled. The blocking of other vehicles’ route is purposely done in order to maintain free passage and to prevent the passage of other buses. This gradual encroachment onto the highway not only reduces the capacity but it encourages pedestrians onto the main running lanes in order to board the bus. To regulate the stopping areas well designed bus bays and separating the bus lines into different areas would be a very effective countermeasure.

- Road safety audit- systematic examination of roadway elements for safety. A formal road safety audit process would focus on explicit safety implications and recommend desirable changes or modifications in highway design and operational aspects appropriate to the local safety needs/standards. (Hoque et al 2001).

**INDIRECT COUNTERMEASURES**

- The benefits of safety improvement measures fell short of expectations owing to the lack of enforcement.
In this respect, the introduction of a highway surveillance team involving local community leaders could be a possibility, in particular to control the conflicting uses of roadway marginal areas for purposes such as, drying of agricultural products, keeping domestic animals near the highway for grazing, playing games by children on roads, temporary markets and hawking, contra-flow on divided highway, operation of unlicensed non-standard vehicles etc.

• Controlling speed as well as controlling errant behaviour of drivers appears to be the most effective ways to reduce accidents in Bangladesh and this can be ensured by addressing police enforcement system strictly. A change in driving behaviour ,regarding speed limit as well drunk driving, overtaking and overloading ,brought by legislation have led to large reduction in accidents (Kathleen et al 2006).

• Road Users specially heavy vehicles drivers can be properly trained by authorized centers.

• Emergency medical care: Special provision on improving access to adequate pre-hospital and hospital trauma care for road crash victims must be set up on an emergency basis. There must have traffic aid posts at suitable distances on the highways to assist injured in case of accidents and quick transport of injured.

CONCLUSIONS

This paper has mainly highlighted the general characteristics of fatal accidents and makes an attempt to establish the most common types of fatal accidents and the causal factors. It is found that Head on collision is the dominating type of major fatal accident which clearly emphasizes on the provision of centre median or dividing strip in highways. Effective road safety countermeasures in accordance with accident pattern have been defined in this paper so that it could enable transport and road safety personnel to apply those countermeasures quickly and fruitfully in accident prone areas as well as to develop more comprehensive preventative actions on the basis of these analyses to combat the accidents in future.

REFERENCES


