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ROAD TRAFFIC ACCIDENT: A LEADING CAUSE OF THE GLOBAL BURDEN OF PUBLIC HEALTH INJURIES AND FATALITIES

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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 sequelae of injuries. Injuries occur in all regions and countries, and affect people of all ages and income groups. The magnitude of the problem however varies considerably by age, sex, region and income group. An estimated 1.2 million people lose their lives in road traffic crashes every year, and another 20 to 50 million are injured. This problem of road traffic crashes and resulting injuries and fatalities is however more acute in a developing country like Bangladesh. Considering all the facts this paper aims to depict the scenario of road traffic accident in Bangladesh and discusses the possible solutions to improve the continuously deteriorating situation

Keywords: Injury, Road traffic crash, Fatality.

1. INTRODUCTION

The huge number of injury and death due to road traffic accident reveals the story of global crisis of road safety. Road collisions are the second leading cause of death for people between the ages of 5 and 29 and third leading cause for people between 30 and 44. With the number of vehicles rapidly rising in developing countries, this epidemic is quickly worsening in low and middle-income countries and is on its way to becoming the third leading cause of death and disabilities by the year 2020 (WHO 2000). The loss in road traffic accident is enormous in economy and health related issues. Families having accident victims shatters with death and the victims seriously injured often needs medical facilities for the rest of their life and eventually becomes a burden to their family. Road traffic injuries are burdening health care systems in countries around the world. Low and middle income countries suffer from a significant percentage of preventable deaths and injuries from road collisions in these countries. Bangladesh is no exception as a developing country. The economic cost on average is between 1 and 2 percent of the countries gross national product. This paper represents the overall road traffic scenario in Bangladesh and discusses some possible low cost improvement techniques that could be useful to reduced further deterioration of the situation.

2. THE GLOBAL ISSUE OF ROAD SAFETY

The current figures of road traffic injuries and fatalities are alarming enough throughout the world. Even the trends of these injuries and deaths are more alarming. If they continue, road traffic injuries will rank the third position of global burden of disease from its ninth position in 1998 (Table 1). This burden falls most heavily on low income and middle income countries.

Table 1: Top ten leading contributors to global disease burden

Ranking	*1998*	*2020*
1.	Lower Respiratory infections	Ischaemic heart disease
2.	Perinatal conditions	Unipolar major depression
3.	Diarrhoeal diseases	**Road traffic injuries**
4.	HIV/AIDS	Cerebrovascular diseases
5.	Unipolar major depression	Chronic obstructive pulmonary diseases
6.	Ischaemic heart disease	Lower Respiratory infections
7.	Cerebrovascular diseases	Tuberculosis
8.	Malaria	War
9.	**Road traffic injuries**	Diarrhoeal diseases
10.	Tuberculosis	HIV/AIDS

Source: WHO, Evidence, Information and Policy, 2000

3. BRIEF DETAILS OF ROAD SAFETY CONTEX IN BANGLADESH

Bangladesh, a country of South Asia, is densely populated and low lying country with about 140 million inhabitants living in a area of 147570 sq. Km. Road accident and injuries are now a growing and serious problem in Bangladesh and the safety situation is very severe by international standard. Each year as reported to police, more than 3300 individuals lose their lives in road traffic accidents in Bangladesh and many more sustain disabling injuries. Almost 2% of Gross Domestic Product (GDP) is lost in road traffic accidents in our country which itself demonstrates the severity both in terms of deaths and injuries as well as in monetary terms.

Although Bangladesh is one of the lowest motorised countries (motorisation level 2.3) in the world, it has, however, the worst road fatality rates in the Asia-Pacific region.

3.1 Accident Statistics

According to the official statistics, there were at least 48631 fatalities and 25437 injuries in 29319 reported accidents during eight years study period (1998-2005) shown in table 2. But it is estimated that the actual fatalities could well be 10000-12000 each year. Significant fluctuations in the numbers of fatalities and injuries as reported by police clearly reflect the problems of reporting and recording inconsistencies. The number of fatalities has been increasing from 1009 in 1982 to 5530 in 2005, nearly 5.5 times in 23 years period. The statistics revealed that Bangladesh has one of the highest fatality rates in road accidents.

Table 2: Traffic accident trends in Bangladesh

Year	*No. of Accidents*	*No. of Fatalities*	*No. of Injuries*	*Total Casualties*
1998	3533	5655	3297	2358
1999	3948	6362	3469	2893
2000	3970	6543	3485	3058
2001	2925	4953	2565	2388
2002	3941	6338	3285	3053
2003	4114	7074	3740	3334
2004	3566	6176	3026	3150
2005	3322	5530	2570	2960
Total	29319	48631	25437	23194

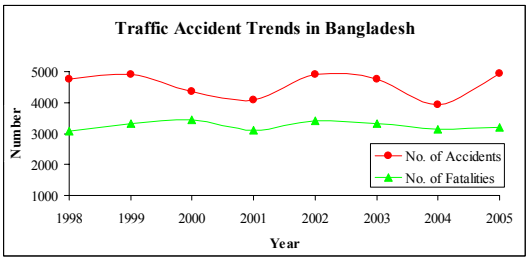

Fig 1: Traffic accident trends in Bangladesh

3.2 Vehicle Statistics in Bangladesh

From the statistics it is evident that the predominant registered vehicle is motorcycle (328294), Jeep, car and taxi (189287) and autorickshaw (116242). It is also revealed from the study that there is an inconsistency between the registered and total vehicles present on roadway.

Table 3: 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
Autorickshaw/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

3.3 Fatalities per 10000 Vehicles

For the vehicles present on road excluding motorcycles and others non-motorized vehicles the statistics revealed that Bangladesh has one of the highest fatality rates in road accidents, over 100 deaths per 10,000 motor vehicles.

Table 4: Traffic and pedestrian fatalities per 10,000 vehicles in Bangladesh

Year	*Traffic fatalities per 10,000 vehicles*	*Pedestrian fatalities per 10,000 vehicles* *
1998	137.4	53.2
1999	143.1	61.2
2000	142.6	59.6
2001	123.2	46.9
2002	126.2	58.4
2003	116.1	55.5
2004	102.9	50.3
2005	97.6	45.7

*Vehicles excluding motorcycle and other non-motorised vehicles

3.4 Vehicular Involvement in Road Fatalities

Studies of road accidents depicts that heavy vehicles such as trucks and buses including minibuses are major

contributors to road accidents (bus & minibus 33%, trucks 27%) and in fatal accidents their shares are 35% and 29% respectively. This group of vehicles is particularly over involved in pedestrian accidents accounting for about 68 percent (bus/minibus 38%, trucks 30%). For the case of death due to road traffic accident, the share of buses and trucks are nearly 70 percent (bus/minibus 36%, trucks 24%) and for pedestrian about 72 percent (bus/minibus 40%, trucks 32%).

Table 5: Vehicular involvement in road traffic fatalities

Vehicle Types	*Percent Death*	*Percent Pedestrian Death*
Bus/Minibus	36%	40%
Trucks	24%	32%
Jeep/Car/Taxi	5%	5%
Microbus/Pickup	7%	8%
Autorickshaw/Tempo	9%	4%
Motorcycle	5%	3%
Rickshaw/Rickshaw Van	5%	0%
Bi-cycle	4%	0%
Others	6%	7%
Total	100%	100%

3.5 Age Distribution of Road Accident Victims

The national road accidents statistics in Bangladesh revealed a serious threat to the children. The incidence of overall child involvement in road accident fatalities in Bangladesh is found to be very high, accounting for about 21 percent (Figure 2). This involvement of children less than 15 years of age in road accident fatalities is much higher than those in other developing countries. It is important to note that compared with industrialized countries, the proportion of fatalities to under 15 years of age in developing countries is approximately two and half times higher.

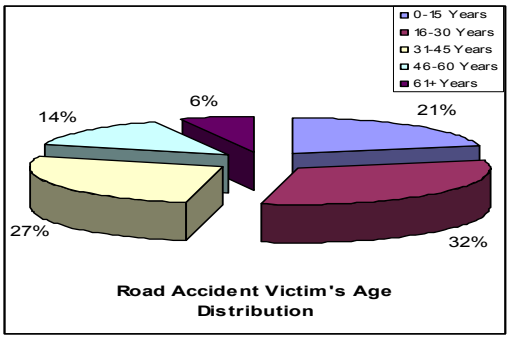

Fig 2: Age distribution of road accident victims in Bangladesh

3.6 The Most Vulnerable Road User Group

In Bangladesh, with a low level of motorization, the role of walk mode is quite significant. Pedestrians have received far less attention than vehicular traffic. Up to 62 percent of urban road accident deaths are pedestrians alone. Pedestrians accounted for 49 percent of all reported fatalities in the accident database. Indeed walking appears to be a major contributor to sustainable transport strategy. Pedestrians can still claim to be most forgotten and neglected road user group in Bangladesh. It is the motorists not pedestrians who normally receive the attention and greater share of priority. Pedestrians need protection in the form of facilities by ensuring their legitimacy, safety and convenience.

Table 6: Pedestrian fatalities per 10,000 vehicles in Bangladesh

Year	*Pedestrian fatalities*	*Percent of pedestrian fatalities (out of all)*
1998	1275	51%
1999	1532	49%
2000	1517	47%
2001	1262	50%
2002	1678	52%
2003	1687	48%
2004	1609	49%
2005	1491	50%
Total	11424	49%

3.7 Predominant Accident Types

Accident type analysis showed 'hit pedestrian' as the dominant accident type both in urban and rural areas, 45 percent involvement in fatal accidents. Other common accident types are: rear end collision (16.5%), head on collision (13.2%) and overturning (9.3%). These four accident types account for nearly 85 percent of the fatal accidents. In rural areas, accident types which are highly overrepresented in fatalities and injuries are 'hit pedestrian', 'head-on', 'running-off-the-road' and 'out-of-control' vehicles. Indeed the running-off-road accident has the highest rate of about 19 casualties per accident. Frequent and most severe consequences of overloaded buses hitting bridge rails and plunged into deep ditches appeared to be of considerable concern.

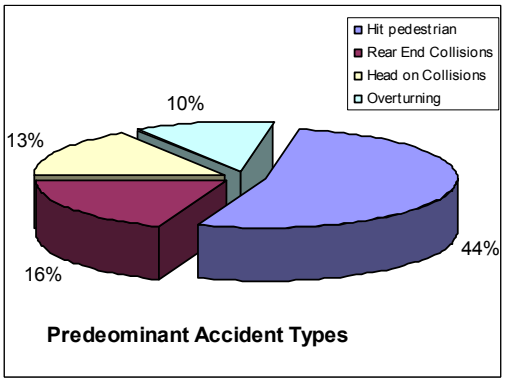

Fig 3: Predominant accident types

3.8 The Accident Scenario on National Highways of Bangladesh

Of the total reported accidents nearly 37 percent occurred on national highways. Almost 30 percent of total accidents on national highways are occurring only in 4 percent of total kilometrage. Hazards associated with roads and roadsides were particularly predominant. Adverse roadway elements contributing to highway accidents were substandard road way alignment or geometry, lack of shoulders and shoulder defects, absent or inappropriate pedestrian facilities, narrow and defective lanes and bridges/bridge approaches, roadside hazards, undefined pavement centre and edge lines, poor sight distances and visibility, unmarked and inappropriate design of intersections, serious delineation deficiencies along the route, haphazard bus shelters/stops, and others. In many of these cases "running-off-road" accidents involved vehicles leaving the carriageway and falling down the unprotected steep drops into ditches, accounting for nearly 60 percent of total, " running-off-road" and "out-of-control" accidents. Roadside trees were involved in about 20 percent of these accident types. Studies are underway at Accident Research Centre (ARC) for identification and treatments of hazardous road locations using standard definitions, criteria and methods together with field observations so that the cost effective countermeasures particularly low cost countermeasures can be devised for highway safety improvements.

3.9 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.

3.10 Socio-economic Burden of Accident

Together with the social impact in terms of pain, grief and suffering, there is a serious economic burden. Overseas research has shown that countries lose the most economically active years from road accident victims, and approximately 70 percent of the 'years of life' lost due to accidents are 'working years'. Road accidents affect the poor disproportionately. People of 15–44 years old account for more than half of all road traffic deaths, and 73 percent of the people killed are male. People of that age are in their most productive earning years, so their families suffer financially when they are killed or disabled. A recent study in Bangladesh found that 21 percent of road traffic deaths occurred to household heads among non-poor people versus 32 percent among poor people. Three quarters of all poor families who had lost a member to road traffic death reported a decrease in their standard of living, and 61 percent reported that they had to borrow money to cover expenses following their loss. Families who lose the earning capacity of members disabled by road traffic injuries and who are burdened with the added cost of caring for these members may end up selling most of their assets and getting trapped in long-term indebtedness.

4. SOME SAFETY OPTIONS TO IMPROVE THE DETERIORATING SITUATION

Clearly, the above statistics demonstrate that road accidents are a very serious problem in Bangladesh. 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. It is possible to significantly reduce the number of road accidents by implementing an effective and co-coordinated safety policy and actions which require significant improvements in the relevant sectors viz. better enforcement, better roads, (including the treatment of hazardous road locations) and improved public education programs. There is need for remedial road improvements setting realistic problem specific targets. Countermeasures must be implemented at sites identified by systematic understanding and investigation of the accident problems with the use of correct procedures.

Strategies for reducing and preventing road traffic accidents and injuries are many and varied. It should be realized that the road traffic accidents results from failures in the interaction of humans, vehicles and the road environment-the elements that produce the road traffic system. The combination of these various elements to produce road accidents means that the road safety itself has to be tackled in a multi-functional manner in order to break the chains of events that lead to accidents and the eventual injuries of road users. An integrated, multidisciplinary approach is required to reduce road accidents and consequent injuries and economic losses. The principle for achieving a safer road essentially seeks to apply various measures by focusing on five strategies. These are exposure control (restrict certain travel and deny access to hazardous situation), accident prevention (design, construction and maintenance of vehicles and road system), behavior modification (road user education, the law and its enforcement and sanctions), injury control (vehicle design, roadside hazards management) and post-injury management (recovery, treatment and rehabilitation measures).

Indeed road safety engineering strategies demand priority consideration as the road environment component remains a major consideration in the overall road safety management strategies. Significant reduction (40 percent or more) of accidents could be expected to accrue from the provision of a safer road environment. It is argued that real advances in road safety can be best guaranteed-as in the past- through building greater safety into roads and vehicles. With regard to Bangladesh, there is specific need and much scope for road environment improvements aimed at correcting the most common deficiencies through wider application of traffic engineering approaches.

4.1 Road Safety Engineering: Road Environmental Improvements

A few of 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. Investigational studies in accident problem characteristics dictate that priorities be placed on such principles as traffic segregation to provide separate movement facilities and road spaces for pedestrians and Non-Motorised Vehicles (NMVs), pragmatic measures to improve and correct road user behavior (self enforcing measures) through public motivational programs, proper channelisation of road junctions, effective speed control/reducing measures and properly enforcement of traffic safety laws etc. Immediate measures to achieve enhanced road safety and which would also offer cost-effective results include:

- Safety conscious planning of new road networks and safety audits of existing roads.
- Small changes/improvements in road layout and use of roundabouts.
- Incorporation of safety features in the design and construction of new road schemes.
- Treatments of roadway shoulders (provide wider and stronger shoulders).
- Provision for and augmentation of adequate pedestrian facilities (crossings, urban and rural footways, safety zones).
- Provision of special facilities for non-motorised vehicles and designated truck/bus lanes.
- Intersection designs/improvements (flaring, channelisation, traffic islands etc.).
- Installation and upgradation of median barriers, edge barriers at turning roads and refuse islands.
- Treatments of roadside hazards (trees, ditches, other fixed objects).
- Improvements of narrow and deteriorated bridges, culverts and lanes.
- Control overspeeding and dangerous undesirable overtaking including traffic calming measures.
- Installation of delineation devices (lane markings, guide posts, chevrons) to facilitate and guide traffic movements.
- Improved access controls, cross-sections, sight distances and alignments.
- Setting safety standards for fronts of vehicles, which would be less hazardous to pedestrians and cyclists.
- Improved conspicuity of vehicles in general, bicyclists and pedestrians in particular.
- Compulsory helmet use for motorcyclists and effective enforcement of laws and sanctions against alcohol impaired drivers.
- Compulsory use of seatbelts by motor vehicle operators and car occupants including child restraints.

In passing it should be noted that the benefits of road safety engineering measures could be best achieved by the understanding of and constant reference to the fundamental safety principles and operational elements of safer road designs. The main principles of a safe road environment are:

- to provide guidance: guide the driver through unusual sections;
- to provide information: inform the driver of conditions to be encountered;
- to warn: warn the driver of any substandard or unusual features;
- to control: control the driver's passage through conflict points or sections; and
- to forgive: forgive the driver's errant or inappropriate behavior.

However, the only long term solution to road accident problems particularly in rural areas is to provide a higher quality road system with increased length of divided highways, which have a better safety record than undivided highways.

The safety of the vulnerable road users must also be sufficiently catered for in the road safety engineering strategies and principles. Vulnerable road users are much more susceptible to accidents when vehicle speeds are high and can even suffer fatal injuries in accidents with motor vehicles at moderate speeds. Thus the most critical and effective measure which perhaps should be immediately adopted is to reduce speeds particularly in urban areas. This measure alone will greatly reduce the overall number of road deaths as shown by experience all over the world (the number of fatalities was reduced by 32 percent in urban areas after speed limits of 50 km/h were enacted and strictly enforced in Hungary). A necessary prerequisite to the development of such cost-effective solutions to the accident problems is of course an improved understanding of the accident problem.

4.2 Road Safety Audit: A New Approach to Road Safety

The road safety audit technique has been able to contribute significantly to making roads safer by identifying many highway designs and operational aspects which would have contributed to the occurrence of road accidents and which would otherwise have been overlooked. Again, road safety audit is of particular importance in the developing countries like Bangladesh because they are still developing their basic national road networks, and unless safety checks are undertaken this will result in unsafe networks in future. A formal road safety audit process would focus on such explicit safety implications and recommend desirable changes or modifications appropriate to the local safety needs/standards. In Bangladesh, the focus should be on the most important national strategic roads or traffic projects (urban and /or rural) which are of considerable safety concern so as to make positive impacts on all concerned viz. the management, the policy makers, road users and the community at large. There is considerable potential that the application of road safety audit

principles will rapidly improve the deteriorating safety situation and could contribute significantly to improving long-term safety at marginal cost. The sooner the safety audit procedures are introduced as a part of a comprehensive road safety program (particularly with severe road safety problems), the more lives will be saved.

4.3 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 offenses and preventing unsafe driver behavior. Road safety education, especially for children is an effective tool for better road users' behavior on road. Public education through community leaders and local officials should be done repeatedly. Voluntary organizations, government/non-government organizations should prepare educational film on safe driving, defensive driving, etc. Extensive research on human factors in accidents could contribute significantly understanding of road users' behavior involved in accidents. 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.

4.4 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. Improved road markings could guide motorists and reduce casualties. 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. CONCLUDING REMARKS

With the process of rapid economic growth together with increasing motorization and urbanization, the situation of road safety problems has been worsening in many developing and so called emerging countries. The road traffic accidents and injury statistics also revealed a deteriorating safety situation in Bangladesh. Addressing road safety problem is a considerable challenge to the transport and road safety professionals. There remains much scope for improving road safety and for that known and proven interventions need to be implemented with due urgency, ranging from education, engineering and enforcement. Importantly, initiatives to improve the conditions would require renewed governmental commitment and considerable resources particularly trained local personnel, safety specialists and researchers to build up indigenous capacity and attain sustainability of effective road safety programs.

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