

Road accident trends in Bangladesh: A comprehensive study

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ABSTRACT: Road accident is a global trauma and like many other countries in the world Bangladesh also suffers a great deal due to road accidents every year. With the growth of motorization, urbanization and hence number of road users, the number of accidents and fatalities on road are increasing with the passage of time. Proper and rational rates of accidents and corresponding trends are required to understand or judge the situation accordingly. In Bangladesh, the fatalities per 10,000 registered motor vehicle were 62 in 1985 and have decreased to 45 in 2007. Considering on road motor vehicle instead of registered motor vehicles, the decrease in this fatality rate is much more significant, 98 in 1985 to 56 in 2007 and latter should be better representatives of the real scenario. From 1971 to 2007 the population of the country has doubled and with some interim fluctuations accidents and fatalities have increased from 1.14 to 3.87 and 0.41 to 2.98 per 100,000 populations respectively. In terms of vehicle kilometer, accident and fatality rates have decreased by 49.08% and 42.77% respectively per 100 million vehicle kilometers from 1999 to 2004. In this study, an attempt has been made to evaluate the rate of road traffic accidents and fatalities trends in terms of total numbers, vehicle population, population, road length and vehicle kilometer using police reported accident data.

1 INTRODUCTION

An accident is an unexpected occurrence of physical damage to animate inanimate structure. Road accident in particular is now acknowledged to be a global phenomenon with authorities in virtually all countries of the world concerned about the growth in the number of people killed and seriously injured on their roads. In 1990, road accidents as a cause of death or disability were by no means insignificant, lying in ninth place out of a total of over 100 separately identified causes (WHO 1999). However, by the year 2020 forecasts suggest that as a cause of death, road accidents will move up to sixth place. In case of Bangladesh, the number of accidents and fatalities on road are also stepping up with the passage of time.

But all these comparisons are based only on numbers. Severity and fatality in road accidents demand extra attention in addition to numbers as it is a complex combination and interaction of different road user, vehicular, environmental, road and roadside factors. Hence to understand or judge an accident scenario accordingly, influence and contribution of all the related factors are needed to be taken in account and on the basis of these proper and rational rates of accidents and corresponding trends are required to be drawn.

Accident or fatality rates based on the elements directly involved in an accident event are generally expressed as per unit registered motor vehicles, per unit population, per kilometer of roadway length and per unit vehicle kilometer traveled. Although accident or fatality rates based on vehicle kilometers travel would reveal actual situation, but due to data limitations and other constraints accident or fatalities per unit registered motor vehicles are more commonly used worldwide as a tool of global comparison in different countries.

In this paper, the safety situation in Bangladesh has been presented in terms of number of accidents and fatalities occurring each year over the time period subsequently accident and fatality rates in terms of unit registered motor vehicles and vehicle kilometer traveled and corresponding trends over the time period has been evaluated. Influence of different factors in particular cases to rationalize the rates and trends will also be conceived. After conducting detail analysis based on the collected data, some concluding remarks and recommendations has been presented pertaining to the observations.

2 METHODOLOGY

In order to achieve the aforementioned objectives, required information and data of accidents, motor vehicles, population record, road network etc. are collected from relevant sources like-Police HQ, ARI, BRTA, RHD, BBS etc. and a questionnaire survey is carried out among the drivers to find out the mobility and frequency of travel of the long distance buses in different intercity bus terminals of Dhaka.

Bangladesh Police are the main source of accident data as they formally collect and records all the accidents within the country in the form of First Information Record (FIR). Accident and fatality data are collected from Police HQ, Dhaka for the year 1993 to 2007 and data for the year 1970 to 1992 are collected from Statistical Yearbooks of Bangladesh published by Bangladesh Bureau of Statistics (BBS). To calculate accident and fatality rates on the basis of registered motor vehicles and motor vehicles plying on road, relevant data have been collected from BRTA and Statistical Yearbooks of Bangladesh published by BBS. To calculate accident and fatality rates per unit population data have been collected from Statistical Yearbooks of Bangladesh. To calculate vehicle kilometers traveled, data have been collected from RHD vehicle operation survey 1999, 2000, 2002 and 2004 where annual kilometers driven by each mode of vehicles per vehicle are shown.

Table 1: Police Reported Accidents in Bangladesh (1970 to 2007)

Year	No. of accidents	No. of fatalities	No. of injuries	Total no. of casualties
1970	2,066	265	551	816
1971	759	75	170	245
1972	1,140	187	421	608
1973	1,394	268	490	758
1974	1,490	432	631	1,063
1975	1,404	356	769	1,125
1976	1,513	428	1,006	1,434
1977	2,004	551	939	1,490
1978	2,683	665	1,478	2,143
1979	3,022	744	1,389	2,133
1980	2,956	791	1,483	2,274
1981	3,222	928	1,897	2,825
1982	2,782	1,009	2,172	3,181
1983	3,195	1,116	3,515	4,631
1984	3,787	1,242	2,587	3,829
1985	3,923	1,463	2,741	4,204
1986	1,568	1,169	1,651	2,820
1987	1,521	1,156	1,988	3,144
1988	1,890	1,367	2,083	3,450
1989	2,986	1,867	3,016	4,883
1990	3,276	1,844	2,687	4,531
1991	3,224	1,982	2,929	4,911
1992	4,012	2,317	4,509	6,826
1993	3,134	1,487	2,434	3,921
1994	3,013	1,597	2,686	4,283
1995	3,346	1,653	2,864	4,517
1996	3,730	2,041	3,300	5,341
1997	5,448	3,162	5,076	8,238
1998	4,769	3,085	3,997	7,082
1999	4,916	3,314	3,453	6,767

Continued				
Year	No. of accidents	No. of fatalities	No. of injuries	Total no. of casualties
2000	4,357	3,430	1,911	5,341
2001	4,091	3,109	3,127	6,236
2002	4,918	3,398	3,772	7,170
2003	4,749	3,289	3,818	7,107
2004	3,917	2,968	2,752	5,720
2005	3,955	3,187	2,755	5,942
2006	3,794	3,193	2,409	5,602
2007	4,869	3,749	3,273	7,022

3 YEARLY ACCIDENT TRENDS IN BANGLADESH

Number of accidents and fatalities that are occurring each year gives us some idea about the safety situation. The following table and figure will demonstrate the road safety scenario in the history of the country.

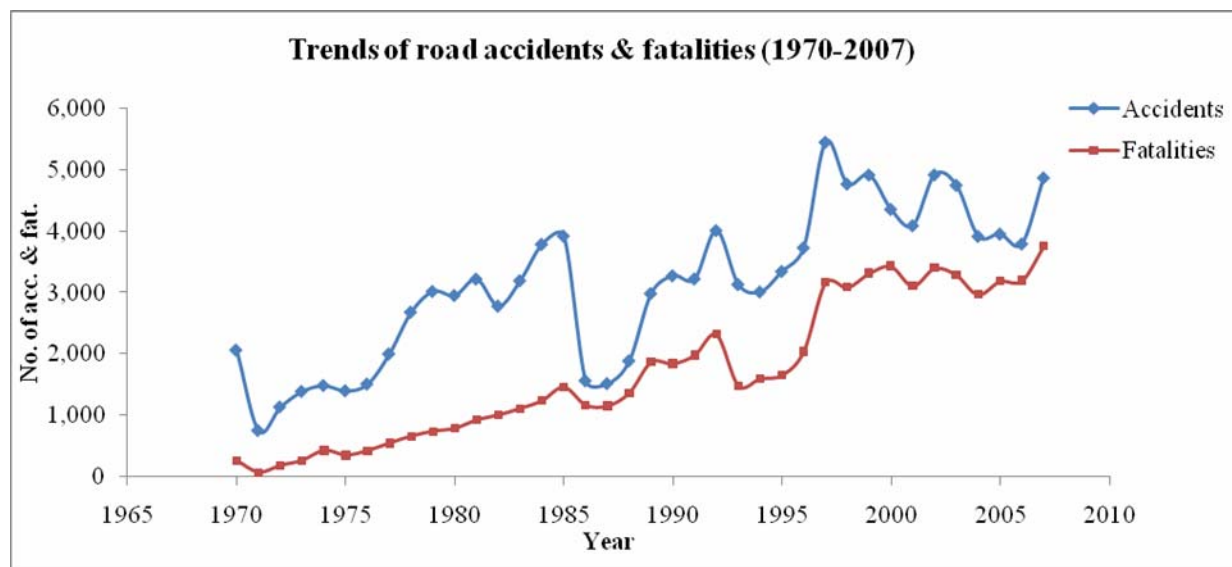


Figure 1: Police reported Trend of Road Accidents & Fatalities (1970-2007)

From the above figures it is evident that number of accidents and number of fatalities have been changing over the years. Although in certain years the numbers are less than those of previous ones, the general trend indicates the increment in the number of accidents and fatalities. Number of accidents has increased from 1,140 in 1972 to 4,869 in 2007, nearly 4.3 times in the history of the country. The highest number of accidents reported is 5,448 in the year 1997. Number of fatalities has increased from 187 in 1972 to 3,749 in 2007, more than 20 times in the history of the country. The highest number of fatalities reported is 3,749 in the year 2007.

Significant fluctuations in the numbers reflect the problems of reporting inconsistencies. Calculating the increase rates of the number of accidents and fatalities corresponding to very previous years it is found that in some years, especially in last five years increase rates of fatalities are higher than accidents increase rates of corresponding years. Increase rates of accidents and fatalities are as high as 57.99% (1989) and 149.33% (1972). But after 1997 such high rates are not observed and they are well below 20%.

4 RATE AND TRENDS ANALYSIS

Different methods are in practice through which accident rate can be expressed. Among them rates based on registered motor vehicles, motor vehicles on road, population of the area, road kilometer, vehicle kilometers

traveled are widely practiced for national and international indices. In this study accident and fatality rates based on above parameters in Bangladesh will be discussed chronologically.

4.1 Based on Registered Motor Vehicles

Accidents or deaths per 10,000 registered motor vehicles is a measure of traffic safety and internationally accepted as a parameter of describing accident phenomena and a tool of comparison. Police reported accident data and registered vehicle data from BRTA are used in the following table and figure to calculate the accident and fatality rates in the country.

Table 2: Accidents and Fatalities per 10,000 Registered Motor Vehicles

Year	No. of registered vehicles	No. of accidents	No. of accidents per 10,000 motor vehicles	No. of fatalities	No. of fatalities per 10,000 motor vehicles
1970	78,495	2,066	263	265	34
1971	88,856	759	85	75	8
1972	94,960	1,140	120	187	20
1973	101,637	1,394	137	268	26
1974	105,842	1,490	141	432	41
1975	107,875	1,404	130	356	33
1976	115,182	1,513	131	428	37
1977	125,910	2,004	159	551	44
1978	135,496	2,683	198	665	49
1979	146,896	3,022	206	744	51
1980	160,214	2,956	185	791	49
1981	178,055	3,222	181	928	52
1982	201,759	2,782	138	1,009	50
1983	234,245	3,195	136	1,116	48
1984	235,050	3,787	161	1,242	53
1985	237,005	3,923	166	1,463	62
1986	237,030	1,568	66	1,169	49
1987	253,430	1,521	60	1,156	46
1988	270,860	1,890	70	1,367	50
1989	315,530	2,986	95	1,867	59
1990	341,648	3,276	96	1,844	54
1991	362,185	3,224	89	1,982	55
1992	377,081	4,012	106	2,317	61
1993	392,384	3,134	80	1,487	38
1994	418,420	3,013	72	1,597	38
1995	409,215	3,346	82	1,653	40
1996	455,734	3,730	82	2,041	45
1997	488,017	5,448	112	3,162	65
1998	519,498	4,769	92	3,085	59
1999	552,001	4,916	89	3,314	60
2000	583,105	4,357	75	3,430	59
2001	623,275	4,091	66	3,109	50
2002	624,696	4,918	79	3,398	54
2003	736,417	4,749	64	3,289	45
2004	758,571	3,917	52	2,968	39
2005	785,370	3,955	50	3,187	41
2006	812,858	3,794	47	3,193	39
2007	841,308	4,869	58	3,749	45

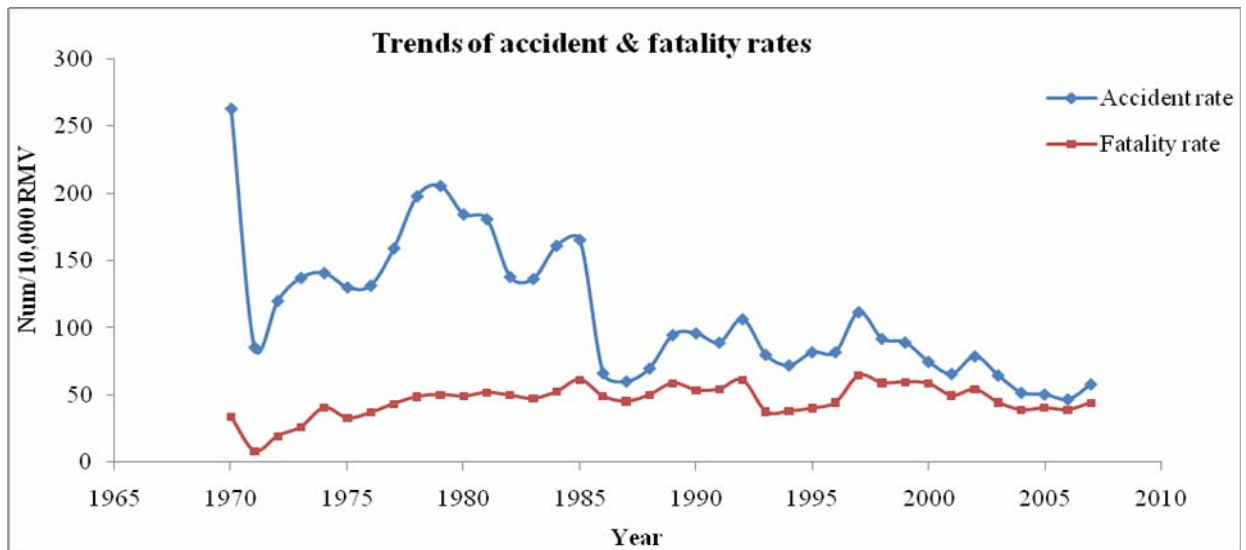


Figure 2: Trends of Accident and Fatality per 10,000 Motor Vehicles (1970-2007)

Analyzing the data and figure it is evident that before 1986 accident rates were very high. On an average about 150 accidents were occurring per 10,000 registered motor vehicles every year. Since then the rates are mostly pretty below 100 accidents per 10,000 registered motor vehicles. Like accident rates, the fatality rates are not fluctuating drastically. About 35 to 60 persons are dying per 10,000 registered motor vehicles every year in the history of the country. Comparing Figure 1 with Figure 2, it can be visualized that the slope of the latter curve is flatter, which means that the rates are not growing as fast as the numbers. In fact, for the last few years the rates are slowly decreasing.

4.2 Based On Motor Vehicles on Road

Accidents or fatalities per 10,000 motor vehicles do not reflect the genuine situation on count. As every year BRTA only adds the newly registered vehicles with the previous accumulated ones. The scraped, deteriorated, and damaged which are out of order and taken off the street are not excluded from the list. Moreover, there are plenty of un-authorized and non-registered vehicles not accounted for. The good thing is that BRTA also keeps the record of mechanized vehicles plying on road each year. Accident rates base on vehicles plying on road can be a better representation of real situation as vehicles that ply on road are the vehicles that get involved in accidents. The following table and figure will execute the accident and fatality rates based on motor vehicles plying on road.

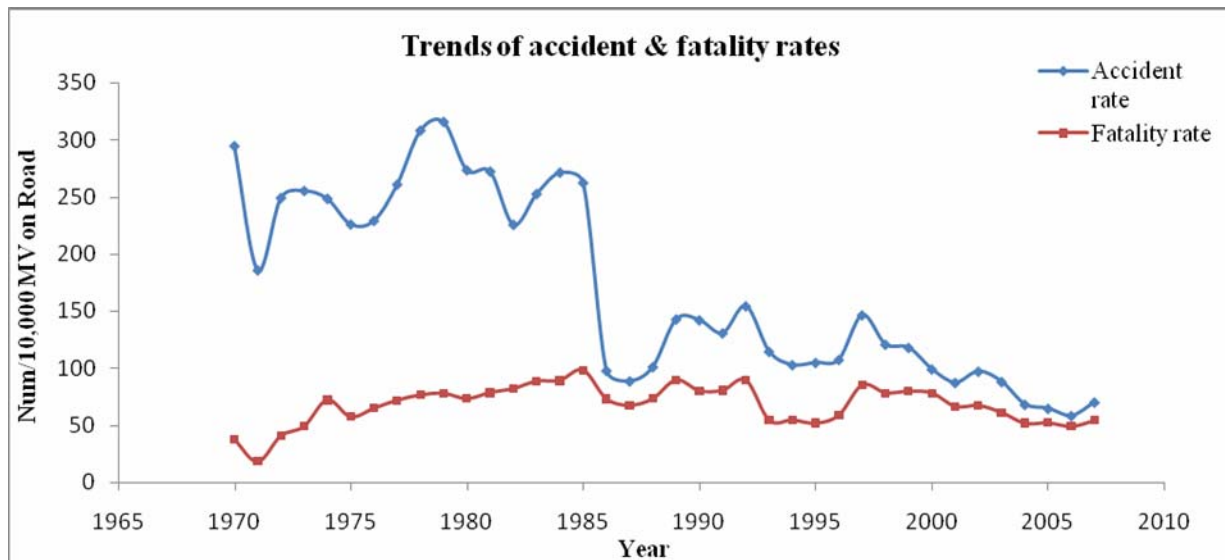


Figure 3: Trends of Accident and Fatality per 10,000 Motor Vehicles on Road (1970-2007)

Observing Figure 2 and Figure 3, it is evident that shapes of both the curves are quite identical. This means trends of accident and fatality rates are almost same whether numbers of registered motor vehicles or motor vehicles plying on road are considered. But the individual accident and fatality rates have increased on an average 25% to 50% over the time period.

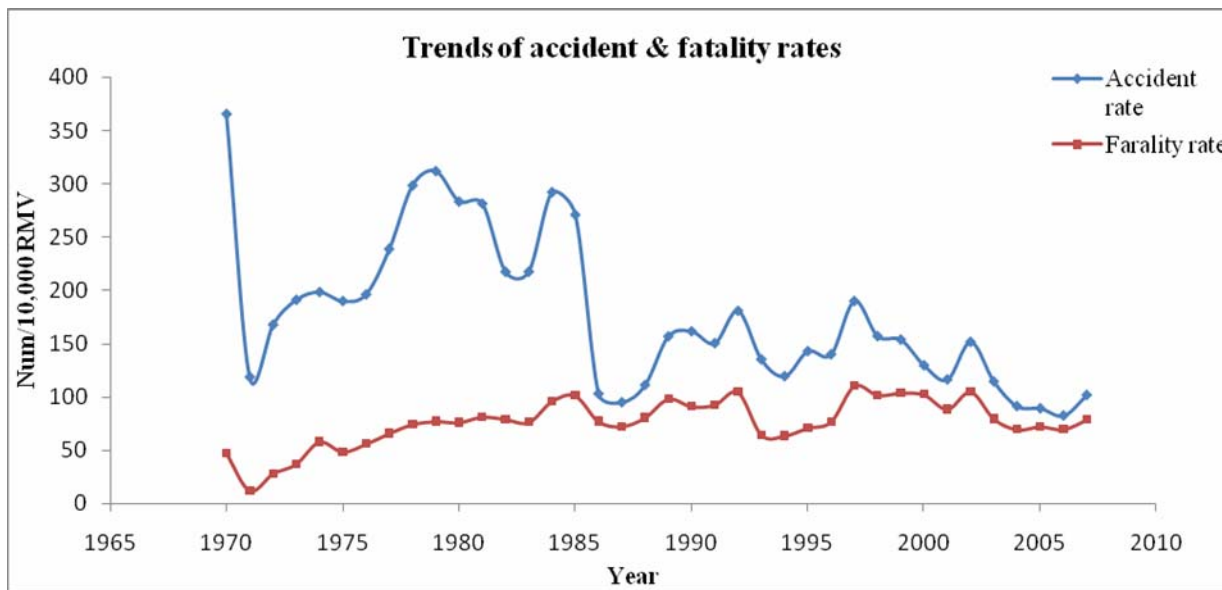


Figure 4: Trends of Accident & Fatality per 10,000 Registered Motor Vehicles (excluding motor cycles) (1970-2007)

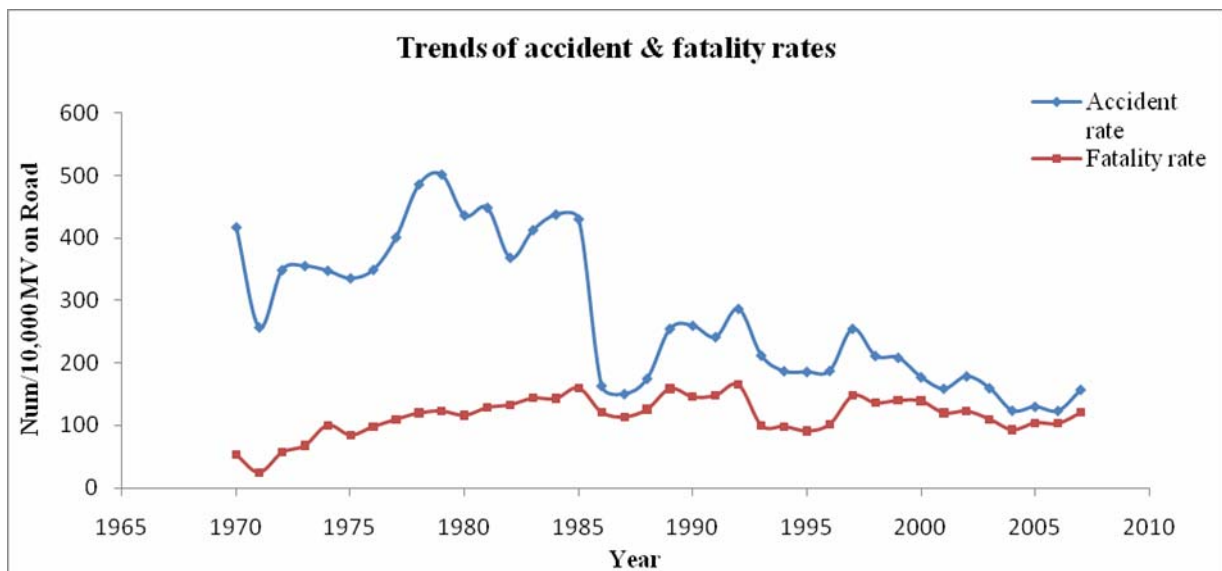


Figure 5: Trends of Accident & Fatality per 10,000 Motor Vehicles on Road (excluding motor cycles) (1970-2007)

4.3 Based on Excluding Two or Three Wheelers

In some cases, to calculate accident rates, two or three wheeler vehicles especially motor cycles are exempted from total no. of motorized vehicles. The idea behind this may be is that two or three wheelers would not be critical accident fabricators because of their size, shape, speed and momentum. Excluding the motor cycles from the total motor vehicle fleet would result in the following rates and trends.

From the above figures (Figure 4 & 5) it comes forward that accident and fatality rates are increased 25% to 50% in each case when numbers of motor cycles are deduced from the vehicle fleet. This is because motor cycles occupy about 25% to 45% of the total vehicle fleet in total number of registered motor vehicles and 30% to 50% in motor vehicles plying on road. Involvements of motor cycles are involved in 5% to 8% of the accidents annually. So the very idea of expelling motor cycles from the total motor vehicle fleet for calculating accident rates seems to be unreasonable and unrealistic. As numbers of accidents where motor cycles are involved are counted, so should be the numbers in the vehicle fleet while deriving the rates.

4.4 Based on Population and Road Kilometer

Bangladesh is a country of mass population with comparison to its land area. From 1971 to 2007 the populations of the country have increased about 1.9 times and with some interim fluctuations corresponding accidents and fatalities have increased from 1.14 to 3.87 and 0.41 to 2.98 per 100,000 populations which are quite significant. The road network of the country is not that healthy. The RHD constructed and maintained road length has increased from 3,891 km in 1971 to 20,782 km in 2007. Accident and fatalities per road kilometers are near zero for the history of the country.

Table 3: Accident and Fatalities based on population and Road Kilometers

Year	Population	No. of accidents per 100,000 population	No. of fatalities per 100,000 population	Road kilometers	No. of accidents per road km	No. of fatalities per road km
1970	64,651,422	3.20	0.41	4,202	0.49	0.06
1971	66,401,063	1.14	0.11	3,891	0.20	0.02
1972	68,198,053	1.67	0.27	4,178	0.27	0.04
1973	70,043,676	1.99	0.38	4,265	0.33	0.06
1974	71,478,000	2.08	0.60	4,339	0.34	0.10
1975	73,433,250	1.91	0.48	4,353	0.32	0.08
1976	75,441,985	2.01	0.57	4,417	0.34	0.10
1977	77,505,668	2.59	0.71	4,551	0.44	0.12
1978	79,625,802	3.37	0.84	4,642	0.58	0.14
1979	81,803,932	3.69	0.91	4,381	0.69	0.17
1980	84,041,643	3.52	0.94	5,691	0.52	0.14
1981	87,120,000	3.70	1.07	6,591	0.49	0.14
1982	89,332,273	3.11	1.13	7,432	0.37	0.14
1983	91,600,723	3.49	1.22	7,997	0.40	0.14
1984	93,926,776	4.03	1.32	8,516	0.44	0.15
1985	96,311,896	4.07	1.52	10,374	0.38	0.14
1986	98,757,582	1.59	1.18	11,185	0.14	0.10
1987	101,265,373	1.50	1.14	11,815	0.13	0.10
1988	103,836,844	1.82	1.32	12,321	0.15	0.11
1989	106,473,615	2.80	1.75	12,960	0.23	0.14
1990	109,177,341	3.00	1.69	13,627	0.24	0.14
1991	111,455,000	2.89	1.78	14,104	0.23	0.14
1992	113,155,400	3.55	2.05	14,500	0.28	0.16
1993	114,881,742	2.73	1.29	15,053	0.21	0.10
1994	116,634,422	2.58	1.37	15,670	0.19	0.10
1995	119,957,000	2.79	1.38	16,070	0.21	0.10
1996	122,125,000	3.05	1.67	17,554	0.21	0.12
1997	122,470,224	4.45	2.58	20,276	0.27	0.16
1998	122,816,424	3.88	2.51	20,854	0.23	0.15
1999	123,163,602	3.99	2.69	20,958	0.23	0.16
2000	123,511,762	3.53	2.78	20,799	0.21	0.16
2001	123,851,120	3.30	2.51	20,799	0.20	0.15
2002	124,201,223	3.96	2.74	20,799	0.24	0.16
2003	124,552,316	3.81	2.64	20,799	0.23	0.16
2004	124,904,402	3.14	2.38	20,799	0.19	0.14
2005	125,257,483	3.16	2.54	20,782	0.19	0.15
2006	125,611,562	3.02	2.54	20,782	0.18	0.15
2007	125,966,642	3.87	2.98	20,782	0.23	0.18

4.5 Based on Vehicle Kilometers Traveled

Accidents rates based on unit registered motor vehicles are widely used as an indicators and for the purpose of global comparison. But merely number of registered vehicles or vehicles plying on road should not be the representative of the actual situation. Their mobility or travelled length should also be taken in account. Because the more a vehicle travels the more its exposure and vulnerability towards accidents increases.

Vehicle kilometers traveled by a vehicle can be calculated precisely by multiplying its fuel efficiency with its fuel consumption in a year. But this is a very delicate process as fuel efficiency and fuel consumption vary from vehicle to vehicle even in the same category of vehicles with the variation of age, type, service quality of engines, fuel type, vehicular configuration, roadway configuration, travel time and condition etc. Moreover, an extensive study reveals that no record of pertinent data of fuel efficiency or fuel consumption of the motor vehicles in the country. As an alternative, data of annual kilometer driven by each mode of vehicle per vehicle have been collected from *RDH Road User Cost Annual Report 1999-00, 2000-01, 2002-03 and 2004-05*. By assuming a value of 12,000 kilometer per vehicle for the vehicle category “Others” complete tables of total annual vehicle kilometers driven have been prepared using total number of registered motor vehicles and number of vehicles plying on road for the year 1999, 2000, 2002 and 2004 respectively. Then rates of accidents and fatalities per 100 million vehicle kilometers of registered motor vehicles (Table 4) and vehicles plying on road (Table 5) are calculated using accident and fatality data for the corresponding years.

Table 4: Accidents and Fatalities per 100 Million Vehicle Kilometers

Year	Total veh-km	No. of accidents	No. of accidents per 100 million veh-km	No. of fatalities	No. of fatalities per 100 million veh-km
1999	18,051,471,000	4,916	27	3,314	18
2000	17,985,350,000	4,357	24	3,430	19
2002	20,316,676,000	4,918	24	3,398	17
2004	28,248,113,900	3,917	14	2,968	11

Table 5: Accidents and Fatalities per 100 Million Vehicle Kilometers on Road

Year	Total veh-km	No. of accidents	No. of accidents per 100 million veh-km	No. of fatalities	No. of fatalities per 100 million veh-km
1999	13,419,385,000	4,916	37	3,314	25
2000	12,719,533,000	4,357	34	3,430	27
2002	14,125,435,000	4,918	35	3,398	24
2004	21,042,770,900	3,917	19	2,968	14

The above analysis shows that in a span of five years (1999 to 2004) total annual vehicle kilometers driven by registered motor vehicles and motor vehicles on road have increased 56.49% and 56.68% respectively. The corresponding accident and fatality rates have decreased 49.08% and 42.77% per 100 million vehicle kilometers of registered motor vehicles and 49.19% and 42.89% per 100 million vehicle kilometers of vehicles plying on road. Although the data of annual kilometer driven by each mode of vehicle per vehicle provided in RHD publications may not be entirely accurate or reliable, significant reduction in accident and fatality rates per 100 million vehicle kilometers indicate a positive approach towards traffic safety improvements in the country.

5 OVERVIEW OF THE SITUATION

The circumstances leading to the occurrence of an accident are the complex interaction of a number of variables like road geometries, traffic characteristics, road user behavior, road environment etc. Contributions of all these factors should be encountered in conceptualization and visualization of the real accident or safety situation. So far the analysis is based on only data like accidents, vehicles, vehicle travel etc. The rates and trends that have been derived on the basis should be rationalized on the trends of the influencing factors over the years.

Figure 6 reveals that number of motor vehicles have been increasing rapidly (especially from 1978 to 1998) as well as length of the roads along with the number of accidents and fatalities. Not only are the numbers of vehicles increasing but also their axle load capacity and percentage of over weight over time which are increasing the potentials of occurring accidents in recent days. One other aspect that should be borne in concern that with the growth of vehicle numbers, their mobility i.e. frequency of movement is also increasing considerably. The same vehicle is travelling greater lengths and spending more times on road than before increasing

its exposure and potential of accident. In support of this observation, data found in the questionnaire survey conducted by the author can be presented. About 42 % of the drivers that were interviewed told that their frequency of travel has increased 1.5 or 2 times over the time period of their experience. During festival occasions the mobility is even higher. All these conceived perspectives are crucial in understanding and judging the traffic safety situation in Bangladesh although most of them can not be quantified.

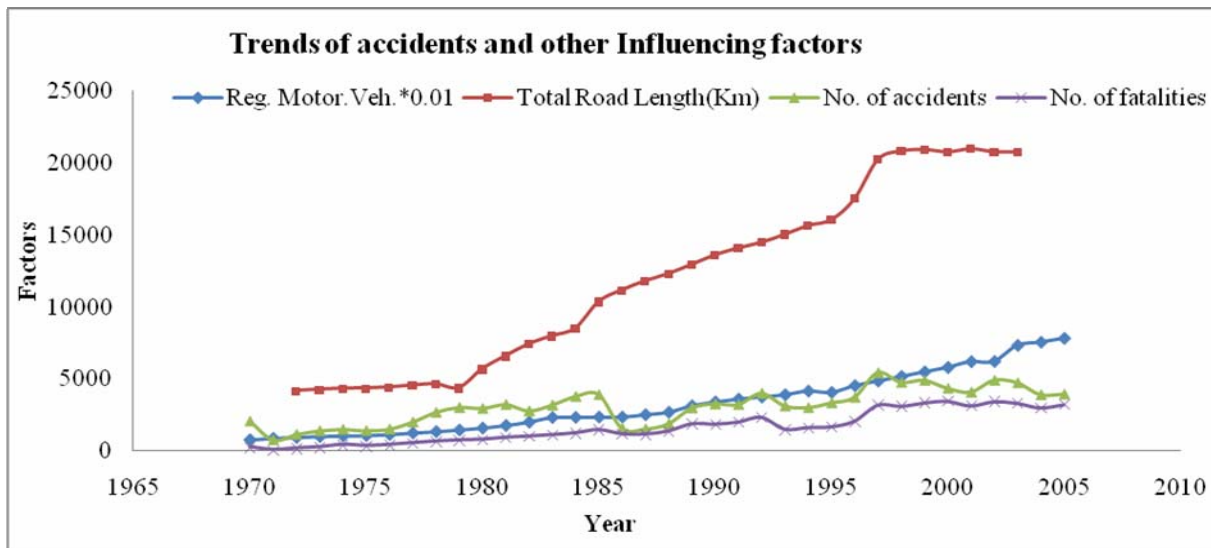


Figure 6: Trends of Accidents and Other Influencing factors (1970-2007)

6 CONCLUSIONS AND RECOMMENDATIONS

The main objective of this study is to find out accident and fatality rates and corresponding trends in different ways specially those suitable or used in international comparison. In this regard necessary and relevant data have been collected and accident and fatality rates and trends have been calculated mainly in terms of unit motor vehicles and vehicle kilometers travelled for the whole country. The important aspects about accidents, rates, trends and other relevant factors that have been found throughout this study are pointed below:

- ✓ Statistics show that number of accidents and fatalities are on an increasing trend over the years in the country. In the past few years increase rates of fatalities are higher than those of accident rates of corresponding years.
- ✓ Before 1986 the number of accidents was lower but the rates per 10,000 registered motor vehicles were very high. Since then, unlike fatality rates accident rates have reduced drastically and with some exceptions they are reducing slowly in the recent years. The fatality rates are somewhat steady over time with 35 to 60 fatalities per 10,000 registered motor vehicles.
- ✓ The accident or fatality rates per 10,000 motor vehicles plying on road are 25 to 50 percent higher than those per 10,000 registered motor vehicles.
- ✓ Both the rates per 10,000 registered motor vehicles and 10,000 motor vehicles plying on road are increased 25% to 50% when numbers of motor cycles are excluded from the motor vehicle fleet.
- ✓ From data based on RHD vehicle operation survey it is found that between year 1999 and 2004, total annual vehicle kilometers driven by registered motor vehicles and motor vehicles on road have increased 56.49% and 56.68% respectively.
- ✓ From 1971 to 2007 the populations of the country have increased about 1.9 times and with some interim fluctuations corresponding accidents and fatalities have increased from 1.14 to 3.87 and 0.41 to 2.98 per 100,000 populations which are quite significant.
- ✓ But corresponding accident and fatality rates have decreased 49.08% and 42.77% per 100 million vehicle kilometers of registered motor vehicles and 49.19% and 42.89% per 100 million vehicle kilometers of vehicles plying on road.
- ✓ No record of fuel consumption or efficiency of any of the vehicle category is available in the country.

Despite all those features that indicate a possibility of increase of accidents, number of accidents and fatalities per 10,000 registered motor vehicles/vehicles plying on road and per 100 million vehicle kilometers that are calculated in this study indicate a decreasing trend over time. But it does not and should not bring about total contentment of the situation because the numbers are still high and more and more cares and measures

should be brought in action for further improvement of the scenario. The following measures are strongly recommended.

- ⇒ In calculating number of registered vehicles by type, records on the vehicles that go out of circulation each year should be kept and deduced from the total vehicle fleet to get actual number of vehicles.
- ⇒ Arrangements should be made by the government to keep the record of type and amount of fuel consumed by each category of vehicles every year. New sections under BPC may be inaugurated too.
- ⇒ Necessary steps should also be taken to keep the record of fuel efficiency per each category of vehicle.
- ⇒ Vehicle kilometers travelled are not only essential in calculating accident or fatality rates but also in many other important safety and economic analysis in transport sector. As it is a too laborious for one person to carry out, government should officially perform and maintain these records.

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