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Study on Frequency Analysis of Sylhet City's Road Accident

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ABSTRACT

Traffic accident has now become a very serious problem in the world. In fact to tackle the problem of increasing traffic accident, analysis of the situations are deemed necessary and the plans should be designed on the basis of the results of analysis. This study provides methodological analysis of accident frequency and severity. Traffic accident distributions are discussed in terms of locations, frequency, vehicles and duration. The maximum percentage of accident is occurred by rickshaw. Regression model analysis is used for the analysis of accidents using SPSS. The frequency of accidents has been established and trend of frequency of involvement in the road accident by the registered vehicles and population has been statistically formulated. Here dependent variable is number of accident and independent variables are registered Vehicle and population. Finally, it is found that regression model data is closed to the collected accident data.

Keywords: *Accident, regression model, frequency, SPSS.*

1. INTRODUCTION

Road traffic accidents are a major cause of premature deaths and disabilities .Globally about one million people deaths occur on roads each year. The situation is rapidly worsening in Bangladesh with increasing number of road accident deaths, largely as direct consequences of rapid growth in population, motorization and urbanization causing a serious challenge for tackling the road safety problems. The number of fatalities has been rapidly increasing particularly in the recent years. In economic terms road accident in Bangladesh costing community in the order of BDT.5000core. Recent national statistics indicate that about one-third of fatal traffic crashes are associated with vehicles running off the road [1]. Poisson and negative binomial regression models are a more appropriate tool in accident modeling. Multidisciplinary research has shown that traffic accidents are caused by diverse human, vehicular and environmental factors that often interact in a complex way to trigger the initiation of the event[2,3].

The contributing factors in the occurrence of Accidents are Alcohol involvement, Ignoring toll, use narrow road, Accelerator defective, Insecure load ,Attempted Suicide, Improper Turning, Avoiding Vehicle/pedestrian/cycle, Improper overtaking, Breaks defective , Obstruction on road, Cutting In, Illness of driver, Driverless vehicle, Previous traffic accident, Domestic animal, Preexisting physical disability, Defective pavement surface, Prescribed Medication, Drugs, Pedestrian error confusion, Driving without due care, Reversing Unsafely, Defective bridge , Restraint system, Drivers talking with passenger, Roadside hazard, Dangerous goods, Road construction, Defective Brake light, Road/Intersection design, Defective Turn signal, Road Maintenance, Detective head light, Steering Failure, Driver inexperience, Sudden loss of consciousness, Driving on the wrong side of road, Suspension Defect, Engine failure, Sign obstruction, Extreme fatigue ,Two Hitch failure, Failing to signal, Tires failure, Feel Asleep, Unsafe speed, Falling head light on other drivers eye, Vehicle Modification, Following- too closely, Visibility impaired, Failing to Yield Right of way ,Windshield defective, Glare artificial, Wild animal, Glare sunlight Weather, Ignoring traffic control device ,Oversize Vehicle, Insufficient traffic control, Others [4,5,6] .

According to the official statistics, there were at least 3334 fatalities and 3740 injuries in 4114 reported accidents in Bangladesh during 2011. It is estimated that the actual fatalities could well be 10000-12000 each year [7,]. 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 3334 in 2003, nearly 3.5 times in 22 years period [8]. The statistics revealed that Bangladesh has one of the

highest fatality rates in road accidents, over 100 deaths per 10,000 motor vehicles [9]. About 70 percent of road accident fatalities occurred in rural areas including rural sections of national highways ;Here vehicles on road excluding motorcycle and others non-motorized vehicles [10].

Road collisions are the leading cause of permanent disability for children in Bangladesh accounting for about 1360 children being permanently disabled each year. Out of 30,000 children (aged 0-17) killed each year from injury and 3400 children (aged 1-17) are killed in road accidents, the majority of whom are from poor families [11,12]. Although no information is available regarding the total number of disability and its relation to road accidents the proportion would be in the same range.
According to a study In Bangladesh carried out by TRL of UK it is observed that about two thirds of road deaths occur at the scene of the crash, one quarter take place in hospital within 30 days, and the remaining deaths occur after 30 days. Most of the seriously injured are treated at emergency units in hospitals (74%) with another 16 % visiting doctors, and the remaining 10% seeing allopathic quack [13].

The current road crash costing of the Roads and Highways Department is based on the assumption that 49% are fatal, 19 percent grievous, and 7% of simple crashes are reported (24% not reported.). Average property damage cost (includes average vehicle damage cost and average cost of the damaged goods) is Taka 55,430 for fatal crash, Taka 73,210 for grievous injury, and Taka 60,620 for simple injury. Medical costs include the any at-scene treatment through to rehabilitation; and the discounted value of funeral costs (average cost of funeral is Taka 10, 600). . For all those apart from vehicle owners, medical costs is the largest direct cost and have the most immediate impact on the family. Average medical cost is Taka 11,800 for road death, Taka 18,800 for serious injury, and Taka 1,400 for slightly injured [14,15].

2. METHODOLOGY

In terms of accident severity, this study attempted to extend the contributions of previous work by developing accident severity models that can isolate risk factors, identify severe roadway geometric and roadside conditions, and ultimately lead to roadway improvements that will reduce the severity of crashes. On the basis of previous efforts, some methodological directions for modeling accident severities are described. Following this, the empirical setting and data of this study are detailed, then model estimation results and a summary of the findings are presented.

Among those eight stations were selected for questionnaire survey and also selected three major hospitals for the collection of accidental data. Locations of study area and survey which are given below:

Different types of vehicle station at different place of Sylhet city were selected
Amborkhana, Chowhatta, Bondor, Naiorpul,
Lichubagan, Zindabazar, Modina market
South Surma
Multiple regression model is selected for this study. Here dependent variable is number of accident and independent variables are registered variable and population.

Fig 1: Map of study area (symbol [16]

So the multiple regression model for this study is of the following form:

Accident, $A = \beta_0 + \beta_1 * RV + \beta_2 * P$

Where,

$\beta_0, \beta_1, \beta_2$ = Coefficient

RV = Registered vehicle

P = Population

3. RESULT AND DISCUSSION

Distribution of accidents at different locations are given in Table-1(2001 to 2011). From the table-1 it is seen that Bondor and Zindabazar are the most vulnerable sites.

Table 1: Distribution of accidents at location (2001 to 2011)

Name of location	Fatal	Accident Injury	Numbers Property Damage	Unknown	Total
Ambarkhana	69 (5.21%)	537(40.56%)	703(53.10%)	15 (1.13%)	1324(100%)
Zindabazar	87(5.72%)	603(39.62%)	805(52.89%)	27(1.77%)	1522(100%)
Bondor	76(5.87%)	577(44.56%)	623(48.11%)	19(1.47%)	1295(100%)
Naiorpul	52(6.07%)	402(46.96%)	385(44.98%)	17(1.99%)	856(100%)
Lichubagon	41(5.24%)	382(48.85%)	348(44.50%)	11(1.41%)	782(100%)
Chowhatta	57 (4.88%)	441(37.76%)	647(55.39%)	23(1.97%)	1163(100%)
Madina market	43 (5.28%)	395(48.47%)	367(45.03%)	10(1.23%)	815(100%)
South Surma	54(5.84%)	423(45.73%)	435(47.03%)	13(1.41%)	925(100%)
Total	479(5.52%)	3760(43.28%)	4313(49.65%)	135(1.55%)	8687(100%)

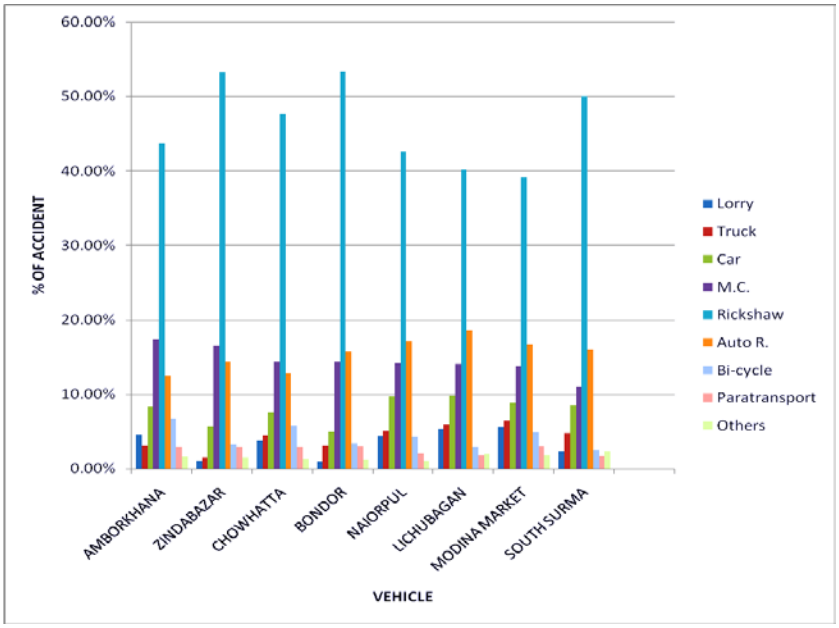

Fig 2: Distribution of Vehicles involved in Accidents (Avg. value of 2005& 2006)

The above graph indicates percentage of accident in Zindabazar and Bondor are higher than other places. In spite of some fluctuation in the percentages of accident in different places probably continue to increase in the consecutive two years. Among various types of vehicle Rickshaw is responsible for most accident.

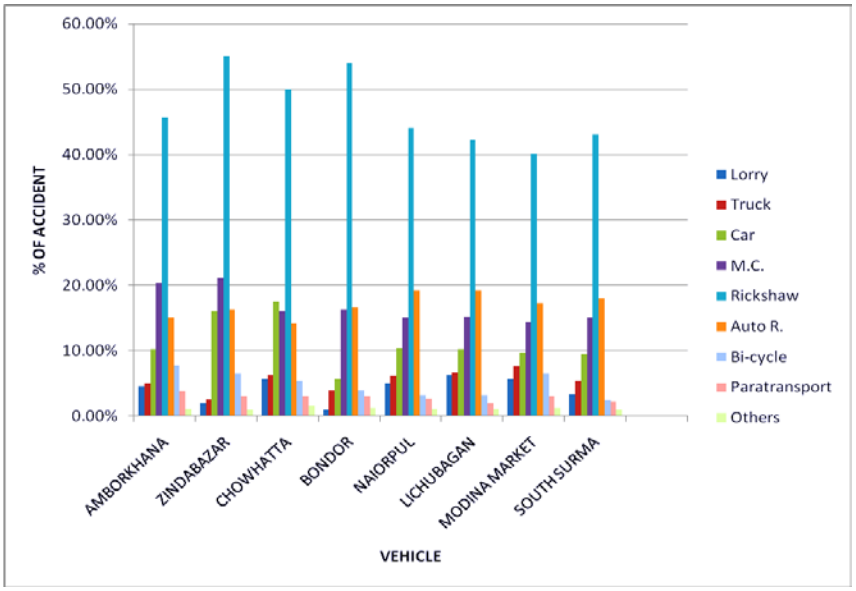

Fig 3: distribution of vehicles involved in accidents (Avg. value of 2007 & 2008)

It can be clearly seen from the graph that the result is approximately same in next two years above one.

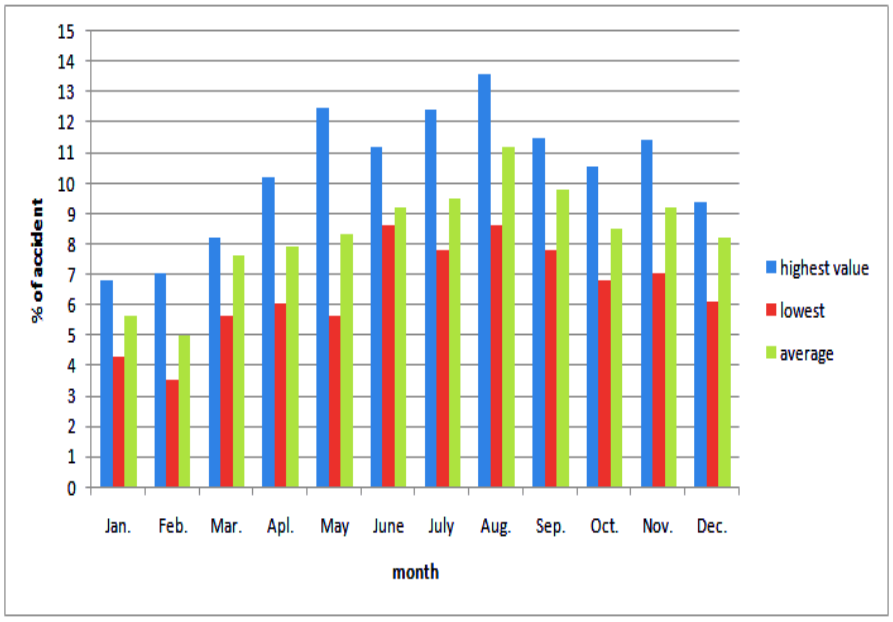

Fig 4: Monthly variation of accidents (2001-2011)

Here,The graph illustrates the highest value of occurrence of accident in August and lowest value of occurrence of accident in February. It also shows percentage of accident in 7th months (from May to November) is higher than others 5th months (from December to April).

Table 2: Frequency of accident types on the study area following RUM (Road User Movements) codes [RUM is shown in Appendix]

The distribution of pedestrian accident tires demonstrated the behaviour of pedestrians in traffic and thus identified the most vulnerable movements involved. The most frequent accident types for the whole highway were identified. Table shows these accident types as described by the road user movement (RUM) codes. It can be seen that accidents involving "pedestrian"(0-9) have by far the greatest number on frequency.

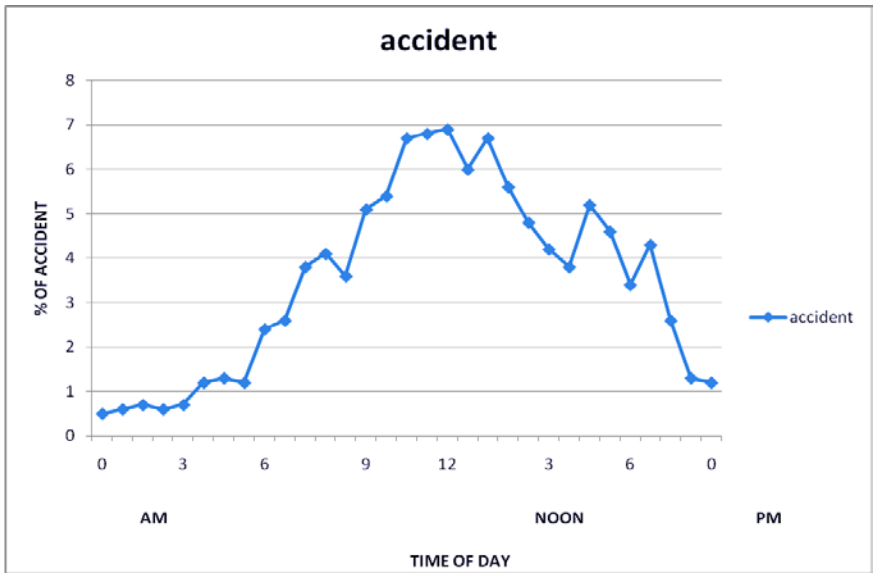

Fig 5: Variation of accidents with time of day

Frequency of accedent is highest approximately at 12 pm. In this study, traffic accidents are evaluated by using a regression model equation analysis.

Data of various year are shown in table 3. These data are used for multiple regression model. Here dependent variable is number of accident and independent variables are registered vehicle and population.

Table 3: data input in SPSS for regression model

Year	No. of accident (A)	Registered vehicle (RV)	Population (P)
2001	61	2196	311166
2002	71	2926	356166
2003	78	3775	401043
2004	88	2826	451574
2005	98	3548	508506

2006	110	5768	572577
2007	122	5439	644722
2008	151	6842	795248
2009	175	7852	945248
2010	200	8872	1095773
2011	228	9772	1235773

Table 4: data from SPSS
Value of various parameter found from SPSS are shown in table-4

Parameter	Coefficient (β)	Adjusted R square	t
Constant	7.691	0.856	1.6507
Registered Vehicle (RV)	0.00104		1.7034
Population (P)	0.000171		1.9220

So, the regression equation for accident:

A= 7.691+ 0.00104*RV + 0.000171*P

From the above regression equation we can find that registered vehicle (RV) is more correlated than population (P) with accident in regression model. Comparison between the regression model data and collected data are shown in table-5.

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Table 5: Comparison between the regression model data and collected data.

Year	No of accidents from model equation (A= 7.691+ 0.00104*RV + 0.000171*P)	No of accidents from data collection
2001	A=7.691+0.00104*2196+0.000171*311166=63	61
2002	A= 7.691+0.00104*2926+0.000171*356166= 72	71
2003	A= 7.691+0.00104*3775+0.000171*401043= 80	78
2004	A= 7.691+0.00104*2826+0.000171*451574= 88	88
2005	A= 7.691+0.00104*3548+0.000171*508506= 98	98
2006	A= 7.691+0.00104*5768+0.000171*572577= 112	110
2007	A= 7.691+0.00104*5439+0.000171*644722= 124	122
2008	A= 7.691+0.00104*6842+0.000171*795248= 151	151
2009	A= 7.691+0.00104*7852+0.000171*945248=178	175
2010	A=7.691+0.00104*8872+0.000171*1095773=204	200
2011	A=7.691+0.00104*9772+0.000171*1235773=229	228

3. CONCLUSION

Percentage of fatal and accident injury in Zindabazar (5.72 %and 39.62% respectively) are the most vulnerable among different sites (Table-1) between 2001 and 2011. Occurrence of accident by rickshaw (above 35%) is higher than others vehicles (figure2 and 3). Frequency of accident (Figure4) from May to November (above 15%) is higher than December to April (below 15%). Percentage of accedent (Figure5) is highest at 12 pm (about 7%). It can be seen from table-2 that accidents involving "pedestrian" (0-9) have by far the greatest number on frequency. Analyzing data by SPSS multiple regression model has been found. Registered vehicles are more correlated than population which is found from equation. From the table-5 it is seen that the agreement between the model data and the collected data appear to be satisfactory since the model results approximately agreed with the collected data. The regression equation obtained from model can be used to predict accident number. Traffic rules and regulations should he maintained on roads by increasing the number of duty police at road junctions and other busy places. Required number of speed breakers. Zebra crossings, traffic signals, light posts with street lights are to be constructed. Better medical emergency services and infrastructure on highways and streets thus, more survivors after crashes.

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APPENDIX

Coding of Road User Movements (RUM)

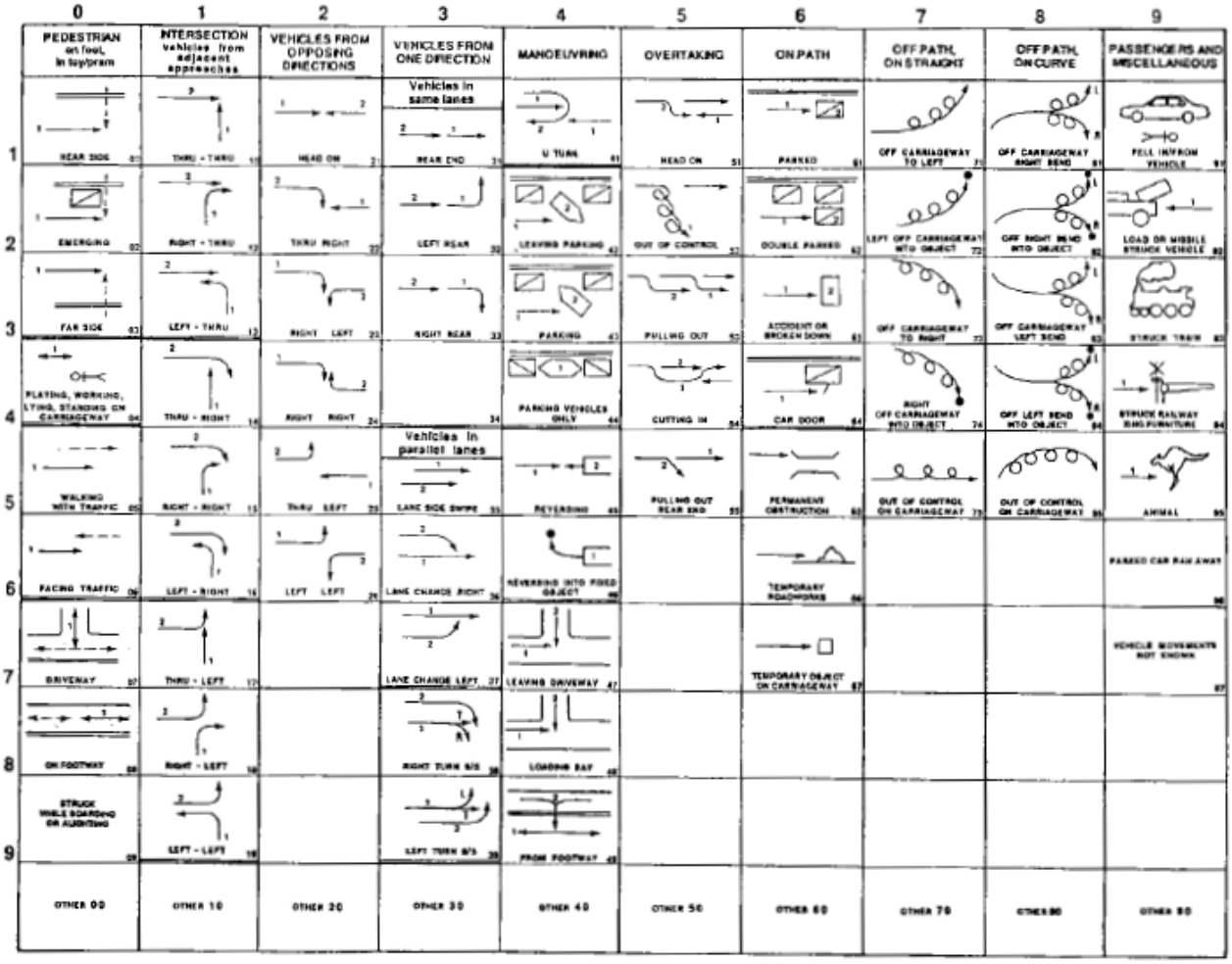

Fig: Types of accident.[Andreassen DC (1991) Model guide line for road accident data and accident types , ARRB Technical Manual ATM 29. 38 p. Australian Road Research Board, Melbourne.]