



Analysis and mitigation of road accidents in the aspects of Bangladesh

Fahmida Akter, Sakhawat Hossain

Lecturer, Department of Civil Engineering, Prime University, Dhaka, Bangladesh

Abstract

Bangladesh is a highly populated and developing country. In our country, Road Traffic Accident (RTA) is a vital issue. This study analyzes highlights and compares the dimensions of the accident problems of the road in the aspects of Bangladesh. Terrible losses of lives and injuries with consequent property damages results from the road accidents. The mitigation of road accidents is very important for the social and economic welfare of Bangladesh. A comparative study was performed on accidents for the period of 2009-2018. Accidents of 39717, 19 and 12 occurred on roads, railways and waterways, respectively out of 39748 major accidents. The road accidents are occurred due to various reasons such as ineligibility of drivers, inadequateness of vehicles, lack fitness of vehicles, poor condition of road, and unawareness of road users. Almost 6686 of people lost their lives and 8600 were injured in a sum of 4891 road accidents in 2020 in Bangladesh. On an average, 18 people died due to road accidents every day in 2020. According to the Accident Research Institute (ARI) of Bangladesh University of Engineering and Technology (BUET), no fewer than 56987 people were killed in 58208 road accidents across Bangladesh in the last two decades [2]. The number of road accidents and casualties can significantly be mitigated by adopting road and road environment improvement measures, vehicle and traffic operation improvement measures, research, education and awareness development measures and post-crash care measures. If one hundred and eleven recommendations of the National Road Safety Council (NRSC) are properly implemented, according to the Accident Research Institute (ARI) of BUET, Road accidents will likely be mitigated by 30-40% within 2024 [2]. Finally, a number of recommendations based on the findings from the comparative analysis have been made for improving road safety in Bangladesh and for the further research and investigations.

Keywords: RTA, bicyclists, mitigation, fatality, MAAP data

Introduction

Road Safety is an important matter in the view of immense human proportions, economic proportions, social proportions, and equity. The traffic accidents still cause a large and increasing number of fatalities and severe injuries particularly in developing countries like Bangladesh in spite of being great progress in international traffic safety work. Through the entire world, the number of people killed in road traffic crashes is estimated at almost 1.3 million and at least 50 million are injured each year. In low- and middle-income countries, more than 85 percent of the casualties having 96 percent of child deaths occur. The prediction says that the number of people killed on roads will increase by at least 80 percent over the next 20 years in developing countries like Bangladesh whereas it is expected to decrease by 30 percent in high income countries. The sustained declinable trends of road fatalities in the developed countries have been attributed to concert efforts in different sectors such as effective coordination, community involvement, well researched road safety initiatives, road safety good practices and improved targeting of resources. The major considerations of the above approaches are needed on urgent basis in the developing countries like Bangladesh. Several studies conducted by Hoque *et al.*, based on the police reported accident database revealed that Bangladesh has become one of the highest fatality's countries in the view of road accidents having over 50 fatalities per 10000 on- road motor vehicles. Those studies also found out that Vulnerable Road Users (VRUs) viz. pedestrians, children, bicyclists, cycle rickshaw occupants and pullers are the worst affected

victims and responsible for about 80 percent of road traffic accidents fatalities in Bangladesh..

Literature Review

In Bangladesh, road accidents, especially expressway accidents have become a major ascent in the recent years. The predictions say that road traffic injuries will move up to the third position by the year 2023 among leading causes of the world. The road accidents guarantee the death of 12000 lives and lead to around 35000 wounds each year as indicated by an examination of Accident Research Center (ARC) of BUET [16]. The yearly basis casualty rate from street mishaps is observed to be 85.6 fatalities per 10000 vehicles as per World Bank insights. As a result, the streets in Bangladesh have turned out to be dangerous. In Bangladesh, there has been an alarming rise in road accidents, significantly highway accidents throughout the last few years. In Bangladesh, a proper manipulation of the economic cost of lives taken by road accidents would surely reflect the considerable loss in addition to GDP. The economic cost of road accidents in developing countries is 2-3% of GDP, according to WHO [17]. Allowing its citizens to perish in road accidents is not only tragic but unacceptable for a developing country like Bangladesh.

Data Used

1. Length of road

Total length of roads in Bangladesh is 319519 km as per RHD (2018) [11]. The lengths of different types of road are given in Table 1

Table 1: Classification of road

Road Classification	Total length (km)
National Highways	3791
Regional Highways	4206
Zilla Roads	13122
Upazila Roads	37800
Union Roads	44750
Village Roads	215750
Total	319519

2. Accident data

The authority of BRTA and ARI is preserving the Road Traffic Accident database based on police MAAP (Micro-Computer Accident Analysis Package) data. In 1995, The Accident Report Form (ARF) was firstly introduced and advanced throughout the sectoral ventures supported by The

World Bank and DFID [6]. The framework was prepared throughout the country by 1998. The duty of gathering the information regressed on the police division for whom the preservation of records is mandatory after the entry of Regulation 254(B). The traffic accident’s data in 2019 are given in Table 2

Table 2: Month-wise road accidents data in 2019

Month	Janu-ary	Febru-ary	Mar-ch	Apr-il	May	June	July	Aug-ust	Septe-mber	Octo-ber	Nove-mber	Dece-mber	Total	
Accidents	383	401	384	327	297	367	311	337	353	356	314	389	4219	
Death	Total	411	415	386	340	338	439	348	398	367	398	342	446	4628
	Male	287	295	258	249	247	321	262	294	265	265	227	319	3289
	Female	53	58	46	38	47	49	46	47	38	55	53	55	585
	Child	71	62	82	53	44	69	40	57	64	78	62	72	754
Injured	Total	725	884	820	610	504	818	513	823	842	667	725	681	8612
	Male	627	710	677	536	465	739	470	727	773	624	637	615	7600
	Female	58	88	67	46	27	54	21	58	57	39	61	37	613
	Child	40	86	76	28	12	25	22	38	12	04	27	29	399

3. Year wise road accidents data including death and injured

The data of road accidents having deaths and injured are

collected from the Passenger Welfare Association of Bangladesh (Jatri Kalyan Samiti) [18]. The Table 3 shows the yearly road accident data.

Table 3: Year wise road accidents data

Year	Accident	Death	Injured
2015	6581	8642	21855
2016	4312	6055	15914
2017	4979	7397	16193
2018	5514	7221	15466
2019	5516	7855	13330
2020	4891	6686	8600
2021	5629	7809	9039
2022	6749	9951	12356

4. District wise accident data (2016): The district wise accident data are collected from the Statistical Yearbook

Bangladesh 2020 [15]. The Table 4 shows the district wise accident data in 2016

Table 4: District wise accident data (2016)

District	Accident	Death	Injured
DMP	353	278	89
CMP	76	67	9
KMP	11	8	2
RMP	34	34	5
BMP	18	8	29
SMP	35	34	11
Bandarban	2	3	1
Chattogram	138	139	96
Cox’sBazar	54	55	51
Khagrachhari	14	17	100
Rangamati	4	5	2
Cumilla	213	179	116
Chandpur	12	11	-
Brahmanbaria	34	44	76
Feni	35	26	8
Lakshmipur	18	15	8

Noakhali	11	8	1
69Habiganj	40	40	4
Maulvibazar	28	24	5

District	Accident	Death	Injured
Sunamganj	18	18	5
Sylhet	18	17	4
Dhaka	43	27	7
Gazipur	93	104	-
Manikganj	95	66	196
Munshiganj	7	5	3
Narayanganj	97	88	15
Narsingdi	57	52	58
Faridpur	29	28	52
Rajbari	29	31	42
Gopalganj	24	24	10
Madaripur	11	22	4
Shariatpur	2	11	1
Jamalpur	7	5	2
Sherpur	19	22	15
Kishoreganj	18	23	-
Mymensingh	94	114	16
Netrokona	15	15	1
Tangail	117	128	268
Barishal	17	13	14
Bhola	7	3	8
Jhalakathi	5	2	1
Pirojpur	11	9	6
Jashore	28	31	-
Jhenaidah	14	9	4
Magura	14	12	8
Narail	8	14	-
Bagerhat	13	12	18
Khulna	20	25	57
Satkhira	7	5	8
Chuadanga	8	4	1
Kushtia	12	9	7
Meherpur	4	3	3
Barguna	10	9	1
Patuakhali	26	17	18
Bogura	44	71	19
Joypurhat	12	12	2
Dinajpur	18	17	10
Panchagarh	6	9	4
Thakurgaon	10	13	1
Pabna	33	37	36
Serajganj	85	70	220
Naogaon	14	12	20
Natore	50	53	50
Nawabganj	18	38	-
Rajshahi	13	8	11
Gaibandha	50	40	34
Kurigram	17	19	-
Lalmonirhat	10	11	2
Nilphamari	6	6	-
Rangpur	53	75	79
Bangladesh	2566	2,463	1,954

5. District wise accident data (2017): The accident data based on district are collected from the statistical Yearbook

Bangladesh 2020 [15]. The district wise accident data (2017) are given in the Table 5.

Table 5: District wise accident data (2017)

District	Accident	Death	Injured
DMP	297	215	99
CMP	68	69	11
KMP	13	12	2
RMP	31	27	21
BMP	19	12	24

SMP	16	14	11
Bandarban	3	6	10
Chattogram	114	117	28
Cox'sBazar	53	55	65
Khagrachhari	14	20	18
Rangamati	3	3	2
Cumilla	166	178	67
Chandpur	26	23	11
Brahmanbaria	70	55	72
Feni	21	24	14
Lakshmipur	6	9	2
Noakhali	14	14	8
69Habiganj	57	65	4
Maulvibazar	32	28	9
Sunamganj	28	22	11
Sylhet	26	31	1
Dhaka	55	42	18
Gazipur	123	143	19
Manikganj	78	51	163
Munshiganj	31	13	36
Narayanganj	111	105	6
Narsingdi	60	79	63
Faridpur	29	51	42
Rajbari	27	26	15
Gopalganj	28	38	31
Madaripur	21	23	7
Shariatpur	9	6	7
Jamalpur	24	11	7
Sherpur	16	14	17
Kishoreganj	34	24	9
Mymensingh	121	131	66
Netrokona	27	21	3
Tangail	106	114	166
Barishal	14	11	13
Bhola	2	2	1
Jhalakathi	2	2	-
Pirojpur	14	13	-
Jashore	31	31	1
Jhenaidah	12	-	-
Magura	21	19	5
Narail	5	5	-
Bagerhat	11	20	70
Khulna	12	15	29
Satkhira	4	4	4
Chuadanga	16	-	-
Kushtia	9	4	27
Meherpur	1	-	1
Barguna	13	13	1
Patuakhali	23	19	20

District	Accident	Death	Injured
Bogura	53	72	30
Joypurhat	6	4	14
Dinajpur	12	21	11
Panchagarh	7	11	2
Thakurgaon	6	6	4
Pabna	32	36	55
Serajganj	57	65	131
Naogaon	22	23	11
Natore	43	60	0
Nawabganj	14	13	-
Rajshahi	31	29	15
Gaibandha	40	42	39
Kurigram	4	4	-
Lalmonirhat	10	7	2
Nilphamari	11	10	2
Rangpur	46	61	54
Bangladesh	2562	2513	1767

6. District wise accident data (2018): The district basis accident data are collected from the statistical Yearbook

Bangladesh 2020 ^[15]. The Table 6 indicates the district wise accident data (2018).

Table 6: District wise accident data (2018)

District	Accident	Death	Injured
DMP	310	221	136
CMP	89	64	26
KMP	17	12	3
RMP	39	34	34
BMP	10	13	2
SMP	21	25	3
Bandarban	9	4	19
Chattogram	97	97	47
Cox'sBazar	42	57	21
Khagrachhari	10	7	6
Rangamati	8	4	5
Cumilla	120	115	132
Chandpur	27	23	7
Brahmanbaria	48	46	61
Feni	34	60	19
Lakshmipur	4	4	0
Noakhali	27	27	6
69Habiganj	63	63	40
Maulvibazar	32	25	8
Sunamganj	36	37	13
Sylhet	37	49	0
Dhaka	90	86	85
Gazipur	137	133	9
Manikganj	67	55	98
Munshiganj	38	11	84
Narayanganj	97	104	2
Narsingdi	48	63	50
Faridpur	42	51	73
Rajbari	14	13	14
Gopalganj	94	59	47
Madaripur	12	13	3
Shariatpur	12	10	3

District	Accident	Death	Injured
Jamalpur	11	9	4
Sherpur	22	91	11
Kishoreganj	31	25	8
Mymensingh	161	178	93
Netrokona	25	29	6
Tangail	67	66	109
Barishal	18	18	19
Bhola	2	2	0
Jhalakathi	4	3	0
Pirojpur	6	5	4
Jashore	54	49	8
Jhenaidah	12	2	4
Magura	22	21	25
Narail	4	5	0
Bagerhat	18	20	35
Khulna	23	28	32
Satkhira	16	17	11
Chuadanga	5	2	1
Kushtia	32	26	4
Meherpur	3	3	0
Barguna	7	13	1
Patuakhali	9	6	8
Bogura	53	64	5
Joypurhat	1	1	0
Dinajpur	5	5	2
Panchagarh	9	22	20
Thakurgaon	6	7	0
Pabna	20	16	14

Serajganj	40	53	156
Naogaon	25	27	37
Natore	44	64	74
Nawabganj	24	23	2
Rajshahi	26	31	13
Gaibandha	37	59	125
Kurigram	20	17	3
Lalmonirhat	17	19	1
Nilphamari	8	17	13
Rangpur	40	59	14
Bangladesh	2658	2687	1918

7. District wise accident data (2019): The district based accident data are collected from the statistical Yearbook

Bangladesh 2020 ^[15]. The Table 7 indicates the district wise accident data (2019).

Table 7: District wise accident data (2019)

District	Accident	Death	Injured
DMP	321	230	139
CMP	63	54	72
KMP	24	24	16
RMP	27	18	19
BMP	26	33	8
SMP	1	0	1
Bandarban	27	30	69
Chattogram	47	59	56
Cox'sBazar	17	12	57
Khagrachhari	11	7	10

District	Accident	Death	Injured
Rangamati	19	15	62
Cumilla	101	117	203
Chandpur	34	34	17
Brahmanbaria	44	46	61
Feni	19	16	18
Lakshmipur	13	19	4
Noakhali	33	51	69
69Habiganj	68	75	20
Maulvibazar	31	20	17
Sunamganj	31	36	30
Sylhet	65	62	126
Dhaka	85	83	36
Gazipur	86	65	27
Manikganj	78	75	103
Munshiganj	34	17	72
Narayanganj	99	113	26
Narsingdi	50	63	34
Faridpur	49	66	115
Rajbari	18	20	26
Gopalganj	15	26	20
Madaripur	17	21	51
Shariatpur	35	26	50
Jamalpur	13	14	5
Sherpur	28	27	22
Kishoreganj	-	-	-
Mymensingh	161	164	118
Netrokona	31	36	5
Tangail	94	84	89
Barishal	12	12	2
Bhola	7	6	6
Jhalakathi	8	6	7
Pirojpur	18	16	22
Jashore	74	67	7
Jhenaidah	43	39	32
Magura	10	11	11
Narail	1	0	1
Bagerhat	34	54	35
Khulna	28	30	69

Satkhira	10	9	6
Chuadanga	18	12	15
Kushtia	22	23	14
Meherpur	3	2	1
Barguna	10	10	7
Patuakhali	17	11	32
Bogura	75	75	87
Joypurhat	11	16	23
Dinajpur	12	15	7
Panchaghar	12	15	4
Thakurgaon	11	19	14
Pabna	16	16	15
Serajganj	67	85	38
Naogaon	15	13	7
Natore	32	26	33
Nawabganj	17	16	16

District	Accident	Death	Injured
Rajshahi	12	14	13
Gaibandha	34	39	46
Kurigram	8	11	2
Lalmonirhat	24	26	12
Nilphamari	15	15	16
Rangpur	40	47	39
Bangladesh	2631	2614	2512

Research Methodology

Both the qualitative and quantitative research methods are implemented in order to fulfill the goal of the study during the entire period of this study which is stated below;

- Firstly, the relevant literature review is done to broadly understand the various characteristics and status of road accidents.
- Secondly, the road map of Bangladesh (Figure 1) is studied to locate the network of different types of roads.
- Secondly, accident data are collected from Bangladesh

Road Transport Authority (BRTA), Accident Research Institute (ARI), BUET, Local Government Engineering Department (LGED), Roads and Highways Department (RHD) and Dhaka Metropolitan Police (DMP) and Daily Newspapers [9].

- Thirdly, the collected data are analyzed from different angle such quality and quantity.
- Fourthly, various types of measures are recommended to mitigate the intensity of road accident.
- Fifthly, the road environment is predicted based on analysis.

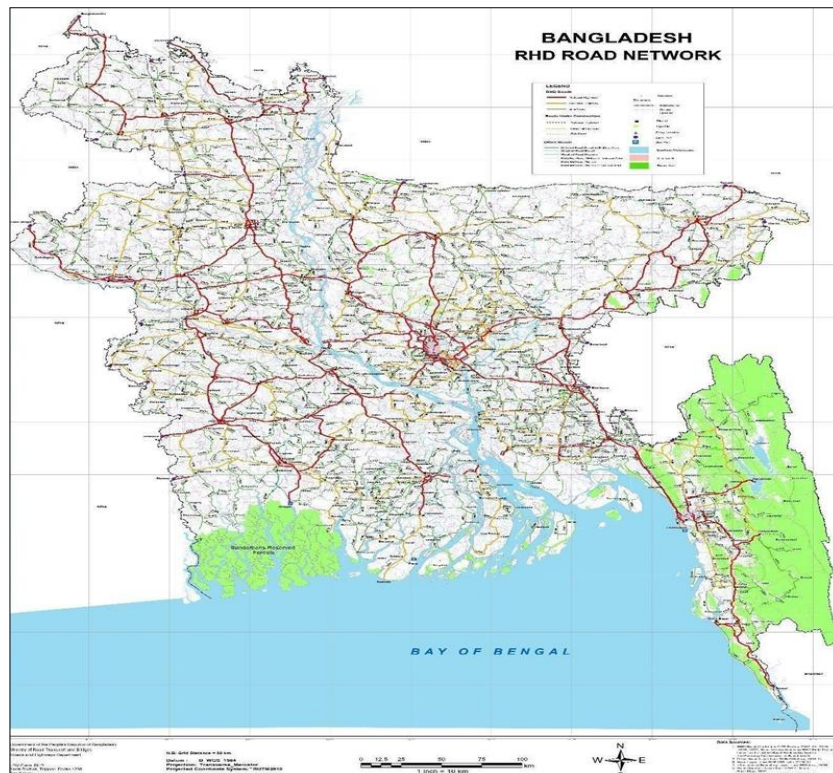


Fig 1: Road Map of Bangladesh

Results and Discussions

This is found to be several types of road accidents occurred in Bangladesh. The severity of fatal accident and grievous accident are 69% and 15%, respectively. The severity of different types of accident (2007-2011) is given in the pie

chart (Figure 2). A huge amount of damage related to lives and property is occurred due to the fatal accident. An approximate estimation of the economic cost of lives taken by road accidents in Bangladesh is 2-3% of GDP, according to World Health Organization (WHO) [17].

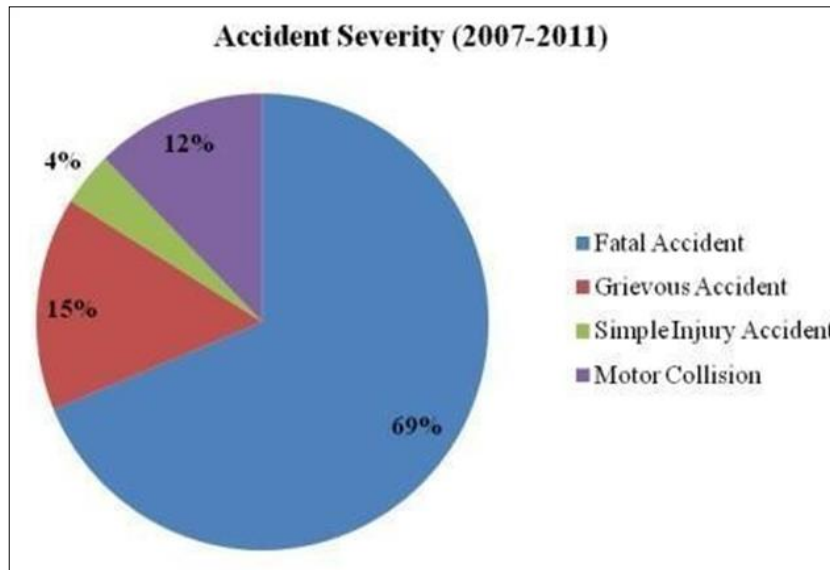


Fig 2: Accident Severity pie chart (2007-2011)

From analysis, it is found that 47% and 14% of accident are occurred in National Highways (NH) and Regional Highways. This greater extent of accident in National and Regional Highways is happened due to poor condition of road, unconsciousness of road users, unfitness of vehicles

and violation of traffic rules. In the Figure 3, it is found that 90% and 72% of accident are happened in a straight portion and non-junction of a road, respectively due to the high speed of vehicle and the overtaking tendency of the drivers.

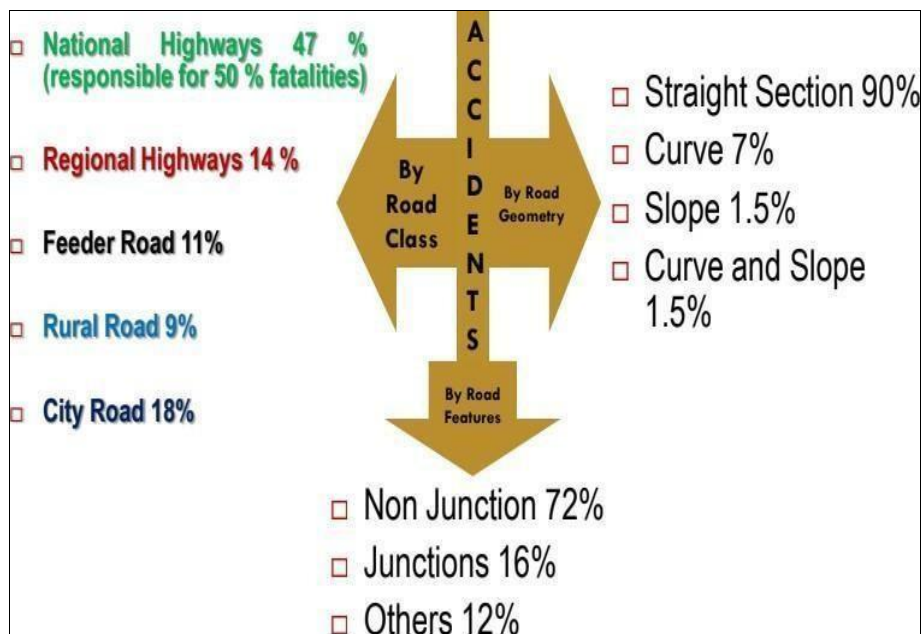


Fig 3: Percentage of accident occurred on the different section of road

The statistics of accident and casualties for the last eight years are shown in the Figure 4. In 2015, the number of occurred accident was 6581 and number of deaths and injured were 8642 and 21855, respectively. The number of accident and deaths stand 6749, 9951, respectively due to the greater amount of increment in 2022. On the contrary, the number of injured person stands 12356 due to increment

in 2022. The number population increase day by day. As a result, a large number of vehicles are required for serving the additional people. Consequently, the existing road is unable to serve the people due to the lack of proper maintenance. So, the intensity of accident, death and injury is increasing day by day.

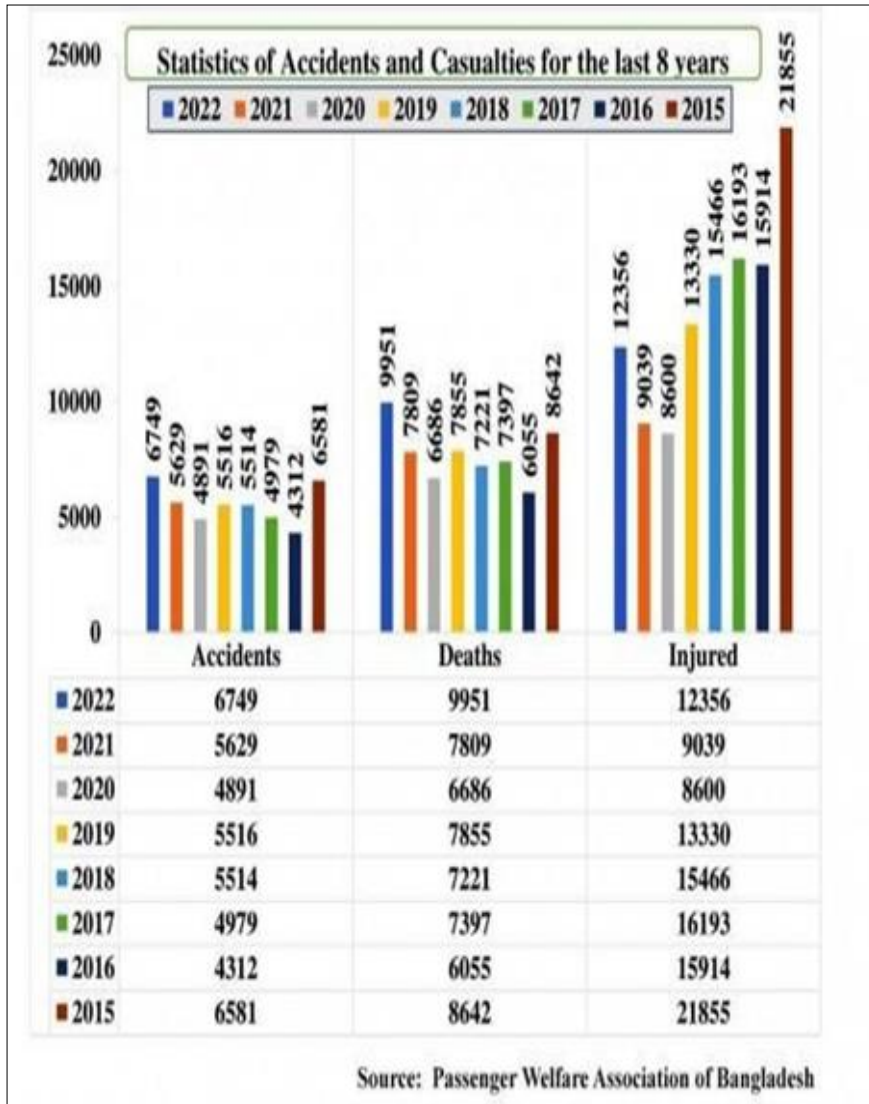


Fig 4: Bar chart of statistics of accident and casualties for the last eight years

After analyzing the previous accident data, it is found that about 40.90% of road accident occurs at bus stop and around 17.80% of accident happens at road intersection

(Figure 5). The main reasons of occurring accident at bus stop are unconsciousness of passenger, bad tendency of getting into the bus and stubbornness of the drivers.

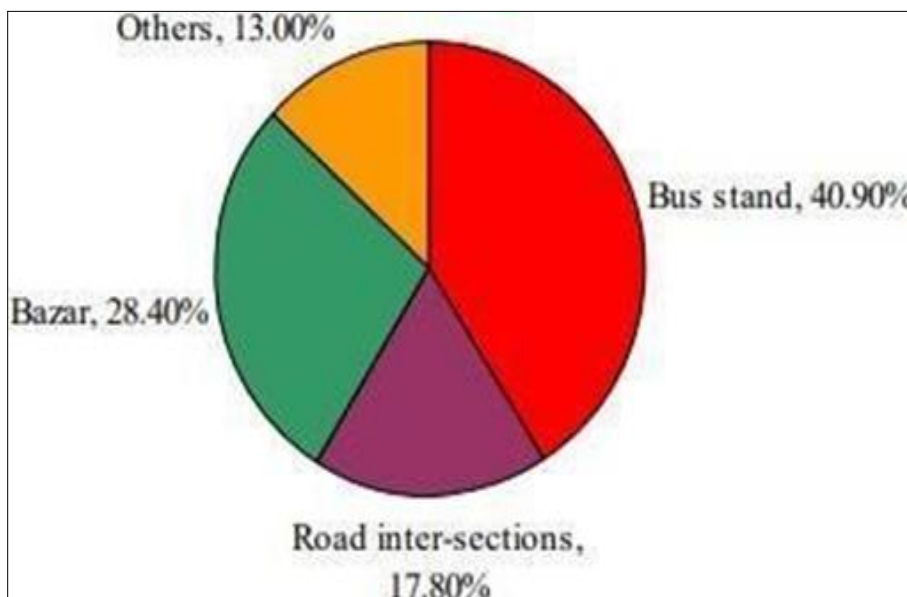


Fig 5: Intensity of accident on spot

At 10:00 AM to 12:00 PM, the tendency of occurring accident is 15.15% because it is the pick hour. At this time, the people go to the office and the students move to the institution. Due to the tendency of reaching at the working place, the road users use the roads randomly. The Table 8 indicates the tendency of occurring accident on different time.

Table 8: The tendency of occurring accident based on time duration

Time period	Percentage
12:00 AM to 2:00 AM	5.7
2:0 AM to 4:00 AM	4.8
4:00 AM to 6:00 AM	7.5
6:00 AM to 8:00 AM	10.4
8:00 AM to 10:00 AM	10.2
10:00 AM to 12:00 PM	15.5
2:00 PM to 4:00 PM	13.1
4:00 PM to 6:00 PM	11.9
6:00 PM to 8 PM	13.3
8:00 PM to 10:00 PM	6.3
10:00 AM to 12:00 AM	5.2
Full day	100

Finally, the different types of measures can be adopted in order to mitigate the road accidents and loss of different types property related to road environment and lives. The road and road environment improvement measures, vehicle and traffic operation improvement measures, research, education and awareness development measures and post-crash care measures are very effective for the reduction of road accident and damage of property such as lives and road infrastructures.

Conclusions

There are different types of road in our country. Among those roads, a large number of accidents occur on National Highways that is 47%. Moreover, the tendency of occurring accidents at bus stops which is 40.90%. Out of the various types of road accident, fatal accident is much greater that is 69%. Beside these, the percentage of occurring traffic accidents is 15.5 at 10:00 AM to 12:00 PM. These accidents are happened due to different reasons such as unconsciousness of road users, poor condition of road, violation of traffic rules.

The road and road environment improvement measures, vehicle and traffic operation improvement measures, research, education and awareness development measures and post-crash care measures may be adopted to reduce the road accident and damage of property such as lives and road infrastructures.

References

1. Online Bangla Newspaper, URL <https://www.dhakatribune.com/> (accessed 03.08.2023)
2. Accident Research Institute Web Portal, BUET, URL <https://ari.buet.ac.bd/> (accessed 15.07.2023)
3. Nirapad Sarak Chai Web Portal, URL <https://www.nirapadsarakchai.org> (accessed 14.07.2023)
4. Online the Daily Star, URL <https://www.thedailystar.net> (accessed 14.07.2023)
5. Online the Prothom Alo, URL <https://www.prothomalo.com> (accessed 13.07.2023)

6. World Bank Web Portal, URL <https://www.worldbank.org/en/home> (accessed 13.07.2023)
7. Bangladesh Road and Transport Corporation, URL <https://www.brtc.gov.bd> (accessed 10.07.2023)
8. Bangladesh Bureau of Statistics Web Portal, URL <http://www.bbs.gov.bd/site/> (accessed 07.07.2023)
9. Local Government and Engineering Department Web Portal, URL <https://www.lged.gov.bd/> (accessed 07.07.2023)
10. Bangladesh Road and Transport Authority Web Portal, URL <http://www.brta.gov.bd/> (accessed 06.07.2023)
11. Roads and Highways Department Web Portal, URL <https://rhd.portal.gov.bd/> (accessed 05.06.2023)
12. Dhaka Metropolitan Police Web portal, URL <https://dmp.gov.bd/> (accessed 05.06.2023)
13. Online Portal, URL <https://www.wikipedia.org/> (accessed 03.06.2023)
14. Barisal Metropolitan Police, Web Portal, URL <https://bmp.gov.bd/> (accessed 06.07.2023)
15. Statistical Yearbook of Bangladesh 2020, URP <https://bbs.portal.gov.bd> (accessed 25.05.2023)
16. Accident Research Centre Web Portal, URL <https://arc.buet.ac.bd/> (accessed 24.05.2023)
17. World Bank Web Portal, URL <https://www.who.int/> (accessed 24.05.2023)
18. Bangladesh Jatri Kalyan Samiti Web Portal, URL <https://www.bjks.org.bd> (accessed 23.04.2023)