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Analysis of Road Traffic Accidents and Identifying Black spots Locations along Megenagna – Yeka Abado Road

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Abstract

Road traffic accidents were unpredicted actions that occurred and left bad scenarios on the life the peoples. The main aim of this study was to analyze trends of road accidents and identify the black spots locations along the road. This study analyzed secondary road crash data between the years 2017/2018 and 2020/2021 obtained from Yeka Sub-city traffic police office. The result showed that 1,140 people involved different levels of injuries which 35(3.07%) were fatal, 113(9.91%) major injuries, and 992(87.02%) of minor injuries. The total accident of 829(18.38%) occurred in the early morning 7:00-9:00 AM on the working days of Monday and Friday. The drivers involved in the crashes were 2352(97.23%) male and 46(1.90%) female drivers with 50.50 % grade 9 to 12 education level and 73.75% employed for others regardless of their sex. On the other hand, the crash sustained 555(48.68%) private workers. The most ranked black spots road locations were Wesen Grocery and Kara junction respectively. Generally, among other main risks of factors assessed including following to close and improper use of steering causes largely a vehicle-to-vehicle collision type on the straight road condition. The Driver Training Institutions should be pointed out guidance and standards before license is issued.

Keywords: Road Traffic Accidents, Black spot, Trends, injuries

1. Introduction

Road traffic accidents (RTAs) are increasingly being recognized as one of the greatest public health issues where every day thousands of people are killed and injured on roads across the world. The deaths from road traffic crashes have increased to 1.35 million a year and cause up to 50 million injuries, and it is also now the leading cause of death for children and young adults aged 5–29 years (Sleet et al., 2011; WHO, 2018). in the same case that's nearly 3700 people dying on the world's roads every day. Countries in Africa and South-East Asia have regional rates of traffic death higher than the global rate with 26.6 and 20.7 deaths per 100,000 populations (WHO, 2018). Projections indicate that, without a new and sustained commitment to preventing such injuries, the situation will worsen with a projected increase in deaths of about 66% over the next 20 years (Kopits and Croppeiopia has the high road crash rate in the world. A study made in Ethiopia noted that the occurrence of traffic accidents in the country was increasing as the exposure to this risk increased due to rapid motorization without appropriate regulation, rapid population growth, and an

increase in the road network coupled with a poor attitude and safety culture of road users (UNECA, 2020). Know a day; the country has roads under construction but not enough road infrastructure facilities as compared to its total coverage area and the number of users. Despite having a very low road network density and vehicle ownership level, Ethiopia has a relatively high accident record (Ahmed and Yismaw, 2015). Addis Ababa city is one of the highest numbers of road traffic crashes that occurred in the country almost sharing above half of the accidents that occurred in this city. Among the crashes, more than 60% occur in the capital city of Addis Ababa (Abdi, et al. 2017).

The locations of road places where the traffic accidents are occurring more repeated again were called black spots. Black spot identification is basically necessary to separate the locations of traffic accidents considering and evaluating risk areas dangerous location of an accident occurred and to solve the problem basically main reasons contributing for the same to garnet road transport safety. , black spots can be defined as any location that has a higher expected number of accidents than other similar locations, as a result of local risk factors (Elvik, 2007). Identifying the accident factors that contribute to road traffic accidents is important in identifying interventions that can reduce the accidents associated with those factors (Spainhour et al., 2005). The factors for road traffic accidents can be categorized into the following major groups, namely: Person Related Factors (e.g. driver, passenger, and pedestrian), Physical Environment Related Factors (e.g. road type and condition, location), Vehicle-Related Factors (e.g. service in a year, technical condition) and Weather Condition.

Analyzing and identification of road traffic accidents for single each major road at the sub-city level is one of the necessary steps in controlling accidents and management for countermeasure. Therefore, the current study aims the analysis the trends of traffic crashes and identify the black spot locations along Megenagna to Yeka abado road based on available data obtained from Yeka sub-city traffic police offices, in-depth interviews, and field observations to recommend the remedy for the road safety issues. In addition to that, this may provide a reference for road safety engineers and traffic policies about updated black spot (dangerous) locations along the road.

2. Materials and Methods

2.1 Study Area

The study was conducted in Addis Ababa, Yeka Sub city along Megenagna to Yeka abado road pass through Lambert bus station having 13.1 Km total length with median divided dual carriageways, 3 lanes in one direction as shown in Figure 1. This study of area has higher traffic volume movements.

2.2 Study Design and Approach.

A research design is a procedural plan that is adopted by the researcher to answer questions validly, objectively, accurately, and economically (Kumar, 2011). A descriptive design was used in this study. Also, the study used quantitative and qualitative data research approaches to get full important data, valid and realistic. As quantitative research method is based on the aspect of quantity or extent. This approach is applied to conduct in-depth analysis and process countable and empirical data along the road. The qualitative approach is concerned with a qualitative phenomenon, i.e., relating to quality or variety. The qualitative method is used to explain the situation, understand and explore in-depth using direct observation, recorded document analysis, and unstructured in-depth interviews.

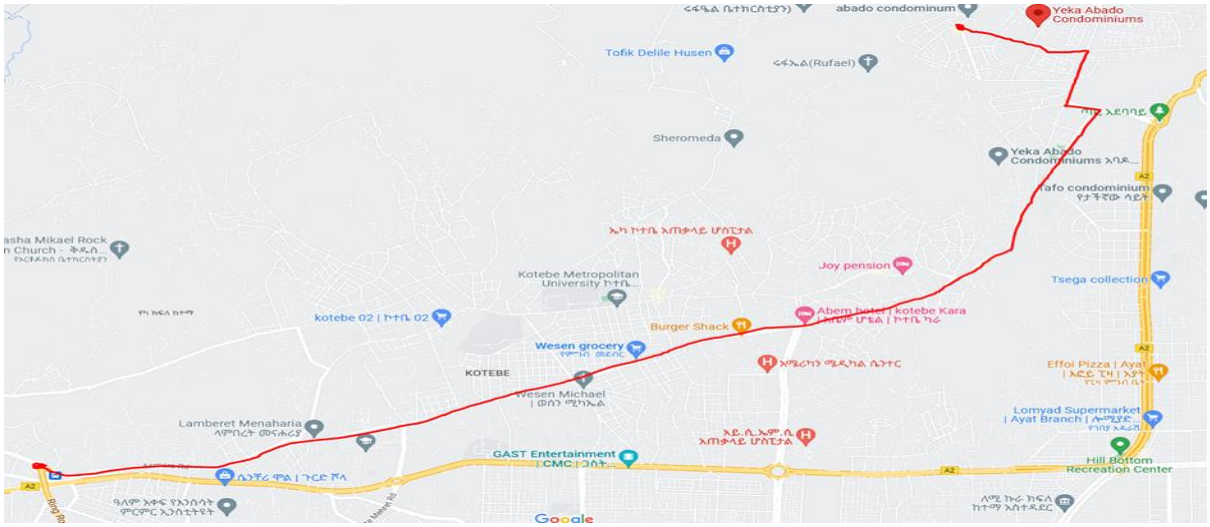


Figure 1: Location map of Megenagna – Yeka abado road in Addis Ababa

2.3 Data Collection Instrument

The collision data of the study area were collected from Yeka sub-city traffic police office recorded between 2017/2018 to 2020/2021. This research study used primary and secondary sources of data. The primary sources of data were collected through un-structured interviews, site observation, and intensive field measurement for location coordinates using GPS. The secondary source data were obtained from different documents such as journal articles, unpublished and published books, Yeka sub-city traffic offices for traffic accident recorded data, and a satellite image from Ethiopian Geospatial Institute.

2.4 Sample Population and Sampling Technique

The sample population was taken out from Yeka Sub-city roads found in Addis Ababa while the method of sampling used, is purposive sampling technics. The study area sampled in this research was Megenagna to Yeka abado road segment pass through Lambert bus station as higher number of traffic accident registered and road users.

2.5 Data analysis

The main objective of this research project is to analyze the trends, identify road traffic accident black spot locations, and develop a black spot road map in the study area. The descriptive statistical method was used to analyze frequencies and percentages of road traffic accidents during the study period. Identifying the black spot locations was also the main goal of this study; different researchers describe methods and formulas for calculating black spots on roads. The researchers have developed a classification of black spots locations of road traffic accidents using the traffic severity index value (SI). After calculating SI, the top three were selected to identify the most black spots using the equation of (Iqbal et al., 2020; Sandhu et al., 2016).

$$SI = 6(A) + 3(B) + 0.8(C) + 0.2(D)$$

Where, SI = Severity index Value, A = Number of Fatality (Death), B= Number of Serious Injuries, C= Number of Light Injuries, D= A number of Property damages.

2.6 Ethical considerations

The study got an ethical approval letter from the Ethiopian civil service university Research Publication and Coordination office then, permission was obtained from the Yeka Sub-city administration office.

3. Results and Discussion

3.1 Temporal Variation V_s Trends of Road Traffic Accidents

The summary of the trends of road traffic accident analysis from 2017/2018 to

2020/2021 is shown in Figure 2. It shows that the highest number of road traffic accidents occurred in 2020/2021 of 993 total cases and the lowest in 2017/2018 of 720 recorded accidents. The severity of road traffic accidents categorizes as Fatal 35(0.78%), Major injury 113 (2.51%), Minor injury 992(22.01%), and property damage only 3367 (74.7%) occurred. The number of road accident crashes during the same period range between 20% and 30.5% each year.

Table 1 shows road traffic accidents Road traffic accidents are normally higher on the weekday on Monday 742 (16.46%) followed by Friday with an accident severity of 711(15.78%) and lower on Sunday 464 (10.3%). Those days represent the first and last working days in Addis Ababa city maybe there are two reasons to cause the highest number of an accident than the other working days; the first was like the most civil servants, private workers, students, and other business people restart their work on Monday so, the occurrence of the accident along the road was highest. The second is due to the higher number of the journey on Monday from the city to neighboring regions and returns to their family on Friday to the city hence the road passes the bus station of lambert. contrary to this, the result shows on Sunday the lowest number of accidents occurred which represent the road user spend at rest with their families at their home and the government and most private business offices are closed. Dis agrees with the study of Asegie (2018) studied in Debrebrhan city revealed that the highest number of the accident was recorded on Saturday. But the result is nearly similar to the U.S Department of Transportation (2012) where a higher number of accidents occur on Tuesdays followed by Fridays.

The trend of road traffic accidents was shared higher in early morning time 7:00-7:59 AM hours of 455 (10.09%) followed by 8:00 - 8:59 AM hours contributing to a total of 374(8.29%) and lowers during 24:00-00:59 hours of 12 (0.26%) accidents along the road show in Table 1 . this, may be referred to the fact that institutions like schools, governmental offices, and non-governmental enterprises start their working hours of the day and the workers of those sectors leave their homes at the same time of the early morning. In addition to the above, the road is used as an entrance and exit for the large bus traveling to regional cities from the bus station passing through. The result is basically consistent with the researchers Iqbal et.al. (2020) studied in the country of Pakistan conclude the trend of road traffic collisions is higher in the early morning time 2:00-6:00 hours (13.9%).

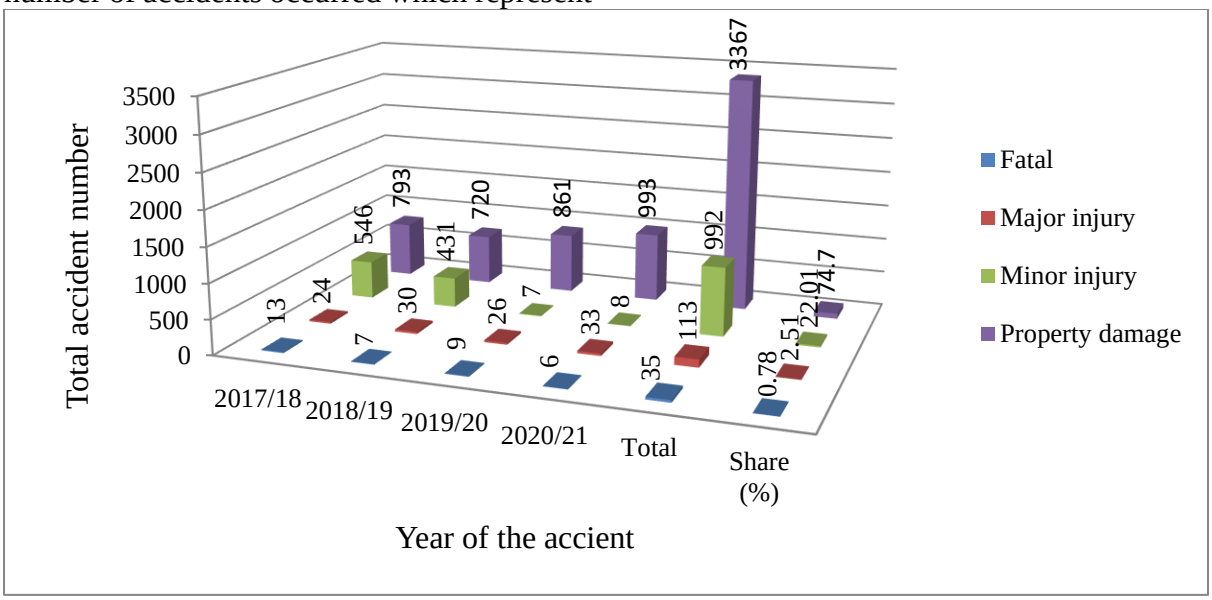


Figure 2: Yearly trend of road traffic accidents (2017/2018-2020/2021)

Table 1: Hourly variation, Day of the Week, and trends of road traffic accident

Day of the week	Year of the accident					
	2017/18	2018/19	2019/20	2020/21	Total	Share (%)
Monday	217	195	164	166	742	16.46
Tuesday	183	176	133	161	653	14.49
Wednesday	190	181	120	158	649	14.4
Thurs day	175	146	127	169	617	13.67
Friday	225	201	155	130	711	15.78
Saturday	209	143	121	148	621	13.79
Sunday	156	137	83	88	464	10.3
Undefined	21	9	0	20	50	1.11
Total	1376	1188	903	1040	4507	100
Hourly interval						
1:00-1:59	37	27	29	10	103	2.29
2:00-2:59	22	26	25	18	91	2.02
3:00-3:59	12	17	19	5	53	1.18
4:00-4:59	11	12	14	5	42	0.93
5:00-5:59	16	27	28	19	90	1.97
6:00-6:59	74	41	34	32	181	4.02
7:00-7:59	126	110	100	119	455	10.09
8:00-8:59	115	119	60	80	374	8.29
9:00-9:59	93	84	54	78	309	6.85
10:00-10:59	84	85	56	56	281	6.23
11:00-11:59	95	75	55	64	289	6.42
12:00-12:59	79	37	52	64	232	5.15
13:00-13:59	53	47	27	42	169	3.75
14:00-14:59	63	43	53	33	192	4.26
15:00-15:59	92	56	22	50	220	4.89
16:00-16:59	85	76	42	65	268	5.95
17:00 -17:59	48	81	47	50	226	5.01
18:00-18:59	61	66	41	63	231	5.13
19:00-19:59	72	76	24	55	227	5.05
20:00-20:59	49	42	35	46	172	3.81
21:00-21:59	32	16	37	33	118	2.62
22:00-22:59	24	11	23	17	75	1.66
23:00-23:59	10	4	9	3	26	0.58
24:00-00:59	1	3	6	2	12	0.26
Undefined	22	7	11	31	71	1.59
Total	1376	1188	903	1040	4507	100

3.2 Drivers Characteristics V_s Trends of Road Traffic Accidents

The occurrence of RTA along with the road shows greater variations in terms of driver's gender involvement as shown in Figure 3. The higher number of Male drivers of 2352(97.23%) were involved and 46(1.90%) were female drivers. In other means, the

number of male drivers involved in the cause of an accident is 51.2 times higher than females. The result indicates male drivers have more power in the profession of driving rather than females. In line with this finding, Burgut et al., (2010) study findings on risk factors contributing to fast-developing countries [in the case of Qatar] revealed that among the socio-demographic factors, male drivers were found to have a higher accident involvement.

When drivers' accident victims were compared by their age category, Table 2 shows drivers with an age category 31-50 years of 2040(45.26%) were the most shared for RTAs and the lowest accident involvement the age of less than 18 years of 6(0.13%). This may be due in part to the dominancy of economic active age driver groups paid their own the cost of training and license issues. Road traffic incidences have higher accident severity of 1128(25.03%) that have been caused by those whose driving experience of the driver is between 3 to 5 years compared to the other experience. Terms of employment or relationship of driver and vehicle also contribute to the occurrence of road traffic accidents in line with the condition of RTA. 1784(73.75%) The number of drivers employed for others shared the highest involvement and 91 (3.76%) family members' drivers were least involved. So, regarding this output, the driver employed for others has no sense of ownership of the vehicle and has a fixed amount of lower salary per month on the side that they drive carelessly.

The researcher also analyzed the education level of the driver versus trends of the accident. The analysis showed that the highest proportion of accident severity shared 2279(50.56%) was associated with grade 9 - 12 education level followed by grade 1-8 educated level of 732(16.24%) accidents shown in Figure 4. This result agreed with Zewude and Ashine (2016) that drivers with an elementary, junior secondary, and secondary level of education are more likely to get involved in fatal/serious injuries as compared to those with above secondary school level of education. The reason for this, the license requirement in the country is a minimum of grade 10, and the opportunity to get a job at this stage is higher for all drivers with a short time of training. This resulted from the largest number of drivers with education level finishing a maximum with high school as well as their lower skill of knowledge to know the traffic regulations.

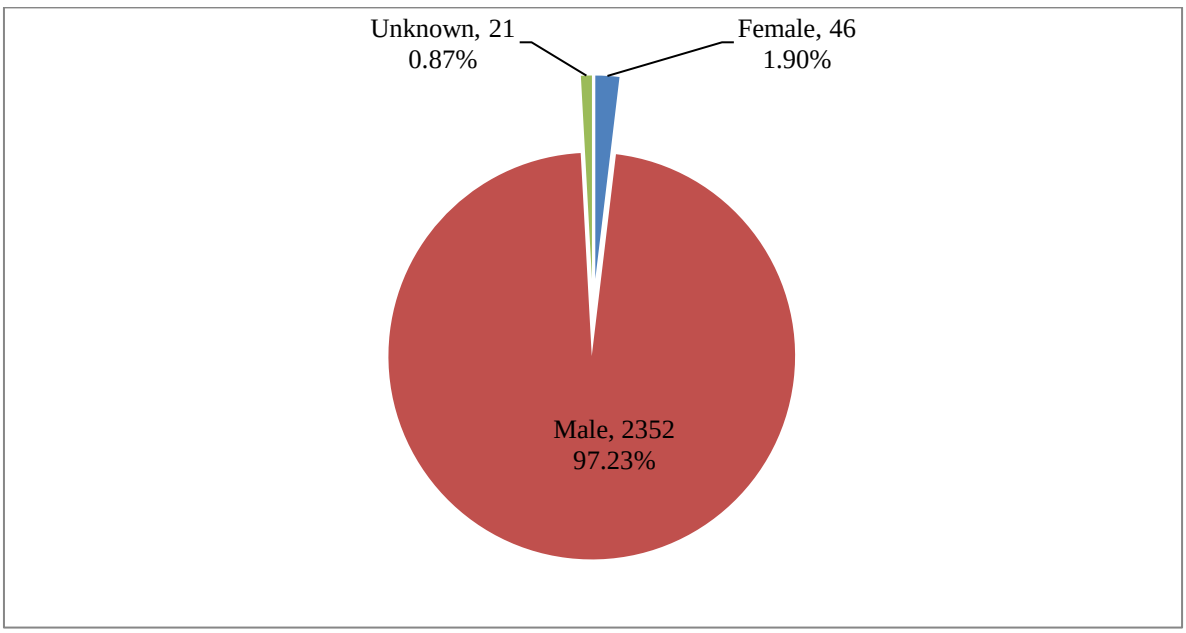


Figure 3: Driver's genders and percentage involvement

Table 2: Analysis of Age of the driver, Experience, Relationship, and trends of road accident

Age of the driver	Accident severity					Share (%)
	Fatal	Major injury	Minor injury	Property damage	Total	
< 18 years	0	2	1	3	6	0.13
18-30 years	11	48	433	1418	1910	42.38
31-50 years	14	52	420	1554	2040	45.26
> 51 years	1	6	110	324	441	9.79
Unknown	9	5	28	68	110	2.44
Total	35	113	992	3367	4507	100
Driving experience in years						
< 1 year	0	3	28	66	97	2.15
1-2 years	8	30	223	738	999	22.17
3 - 5 years	10	27	227	864	1128	25.03
6-10 years	1	22	190	727	940	20.86
11 -20 years	1	16	183	601	801	17.77
>20 years	0	5	90	241	336	7.46
Unknown	15	10	51	130	206	4.56
Total	35	113	992	3367	4507	100
Driver–vehicle relationship						
Owner	112	98	114	163	487	20.13
Employee	355	431	465	533	1784	73.75
Family member	6	30	32	23	91	3.76
Unknown	20	16	12	9	57	2.36
Total	493	575	623	728	2419	100

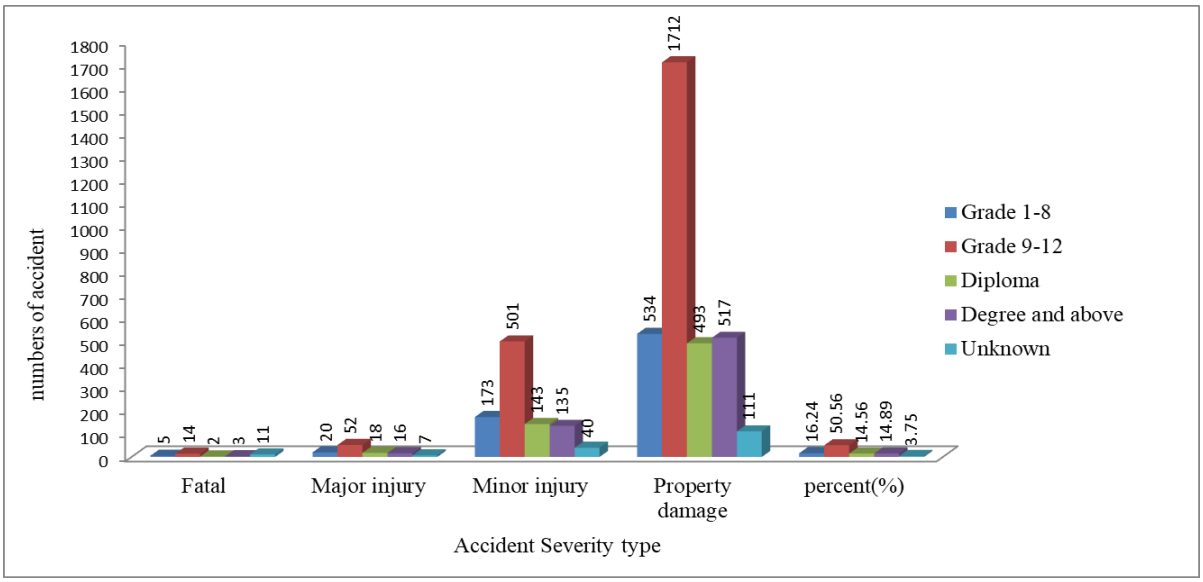


Figure 4: Educational level of the drivers and road traffic accident

3.3 Job Category Vs Trends Road traffic accident

The road users and passengers that were affected by road traffic accidents along the road and have significant involvement during crash occurrences were found. Table 3 shows Private workers of 2148 (47.66%) and drivers of 1369 (30.37%) most affected people in the study.

Table 3: Analysis of job category and trends of road traffic accident

Job category type	Accident severity type					
	Fatal	Major injury	Minor injury	Property damage	Total	Share (%)
Driver	2	9	336	1022	1369	30.37
Student	3	7	3	43	56	1.24
Governmental worker	1	9	68	126	204	4.54
Private worker	16	70	469	1593	2148	47.66
Job less	3	2	10	41	56	1.24
Unknown	10	16	106	542	674	14.95
Total	35	113	992	3367	4507	100

3.4 Vehicle Characteristics Vs Trends Road Traffic Accidents

The vehicle service determines the condition of the vehicle to be engaged in a road traffic accident. The vehicle service age increases the accident number also increases throughout the study period as shown in Table 4. The riskiest vehicles having a service age of greater than 10 years and 5 - 10 service in years caused accidents of 2757(56.73%) and 689 (15.29%) respectively. hence, the life span of the vehicle usage increase decreases the quality of physical parts of the vehicle decrease to control during steering. the major types of collisions along the road are shown in Table 4. Vehicle to vehicle collisions has been a higher number of RTAs fatal, major injury, minor injury, and property damage of 3930(87.20%) followed by Vehicle to Pedestrian 249(5.52%). This result is consistent with the U.S Department of Transportation (2012) that Collision with another motor vehicle in transport was the most common first harmful event for fatal, injury, and property-damage-only crashes. On the other way, Bajaj to Vehicle collision type is the lowest proportion sharing about 3(0.07%) of accidents.

The major possible causes of road traffic accidents commonly committed faults of drivers include following too close, improper use of steering, not giving priority, and careless driving with several accidents numbers of 1466 (32.52%), 1374(30.49%), 995(22.08%), and 206 (4.57%) respectively along Megenagna to Yeka abado road. Most of the time it may be due to their ignorance of considering the other road users' speed traveling, lack of experience of driving and getting a higher level of driving competition between them, and they have no patience to give priority for pedestrians to cross the road.

Table 4: Analysis of vehicle service, collision type, and possible causes of accident and trends

Vehicle service age in years	Accident severity type					
	Fatal	Major injury	Minor injury	Property damage	Total	Share (%
< 1 year	0	0	7	30	37	0.82
1-2 years	1	0	31	99	131	2.91

Vehicle service age in years	Accident severity type					
	Fatal	Major injury	Minor injury	Property damage	Total	Share (%
2-5 years	5	17	147	511	680	15.09
5-10 years	3	11	163	512	689	15.29
>10 years	11	68	557	1921	2557	56.73
Unknown	15	17	87	294	413	9.16
Total	35	113	992	3367	4507	100
Collision type						
Vehicle - vehicle	3	5	889	3033	3930	87.2
Vehicle - pedestrian	24	80	32	113	249	5.52
Vehicle - passenger	2	10	0	13	25	0.55
Vehicle - Bajaj	0	4	8	35	47	1.04
Motor cycle - pedestrian	0	2	0	2	4	0.09
Vehicle - motorcycle	0	4	7	20	31	0.69
Bajaj - pedestrian	1	5	1	6	13	0.29
Bajaj - vehicle	0	0	0	3	3	0.07
Vehicle-roadside object	0	2	50	114	166	3.68
Bajaj- motorcycle	0	0	1	3	4	0.09
Falling of vehicle	0	0	2	15	17	0.38
Unknown	5	1	2	10	18	0.4
Total	35	113	992	3367	4507	100
Causes of traffic accident						
Improper uses of steering	2	21	350	1001	1374	30.49
backward driving	0	3	32	94	129	2.85
Not give priority to pedestrian	11	32	11	45	99	2.2
Not give priority	14	41	205	735	995	22.08
Following to close	1	9	304	1152	1466	32.52
over speed	0	0	1	2	3	0.07
Careless driving	7	1	34	164	206	4.57
without respect right-hand rule	0	4	3	20	27	0.6
Illegal parking	0	0	22	85	107	2.37
vehicle defect	0	0	4	12	16	0.36
on turning	0	0	5	12	17	0.38
over maximum loading height	0	0	2	2	4	0.09

Vehicle service age in years	Accident severity type					
	Fatal	Major injury	Minor injury	Property damage	Total	Share (%
Inappropriate opening of the door	0	1	2	12	15	0.33
missing traffic light rule	0	0	1	4	5	0.11
on doubled over	0	0	7	14	21	0.47
No license	0	0	2	3	5	0.11
Unknown	0	1	7	10	18	0.4
Total	35	113	992	3367	4507	100

3.5 Road characteristics Vs Trends of Road Traffic accidents

The gradient of the road, curvature, and light condition have challenged effects on the occurrence of road traffic accidents. Table 5 most road traffic accidents took place on straight 4420 (98.07%) and junction 49 (1.09%) of the road. Psychologically, on the straight road, the drivers think there is no accident and safe that leads them to fail. As for light conditions were concerned, most road traffic accidents occurred at daylight 4149 (92.06 %) followed by dusky 193 (4.27%).

Table 5: Analysis of gradient type, light condition, and trends of road traffic accident

	Accident severity type					
Gradient type	Fatal	Major injury	Minor injury	Property damage	Total	Share (%)
Straight	35	111	984	3290	4420	98.07
Slightly zigzag	0	0	0	5	5	0.11
Highly zigzag	0	0	0	17	17	0.38
Junction	0	2	5	42	49	1.09
Unknown	0	0	3	13	16	0.35
Total	35	113	992	3367	4507	100
Light condition						
Day light	32	104	941	3072	4149	92.06
dusky	2	4	24	163	193	4.27
Sunset	0	1	0	2	3	0.06
Morning	0	3	22	100	125	2.77
Dark road unlighted	1	1	4	30	36	0.8
unknown	0	0	1	1	2	0.04
Total	35	113	992	3367	4507	100

3.6 Identification of RTA Black Spots Locations Analysis

The aim of this was to identify the location of major road traffic accident black spot areas, and then to rank the sites and suggest engineering solutions (Black spot treatment). Table 6 shows the rank of black spot locations on the highway. Of, the thirty-three accident-

prone locations from the most vulnerable top three RTA black spots are Wesen Grocery, Kara junction, and Abado Condominium having the severity value of 454, 387, and 214 respectively. Due to illegal vehicles parking on the side of the road like in front of hotels and restaurants, loading and unloading passengers, uncontrolled selling and exchanging of goods, and not well-delineated pedestrian crossing marking and installing warning of pedestrian crossing on both sides of the road. In Kara junction the main problem encountered such as 16% gradient, more accident collision occurred due to slope and unmarked visible pedestrian crossing signs in all directions of the junction.

Table 6: Ranking of black spots locations along Megenagna – Yeka Abado Road

Code	Name of black spot locations	Accident severity				SI	Rank
		Fatal	Major injury	Minor injury	Property damage		
1	Wesen Grocery	4	20	268	778	454	1
2	Kara Junction	7	26	202	527	387	2
3	Abado Condominium	4	13	101	351	214	3
4	Jelisa Sefer	2	3	61	131	96	4
5	Israel Embassy	1	4	46	175	89.8	5
6	Hillside School	2	4	36	138	80.4	6
7	Abem hotel Junction	1	10	12	159	77.4	7
8	Megenagna Diaspora Roundabout	1	0	50	133	72.6	8
9	Ethio- China College	0	4	39	136	70.4	9
10	Gedera Junction	1	4	23	91	54.6	10
11	Kara Begtera	4	3	13	48	53	11
12	Kara Sanshine	2	3	19	46	45.4	12
13	Wesen Nok	1	2	9	70	33.2	13
14	Wesen Michel Junction	1	1	11	67	31.2	14
15	Condominium junction	1	2	10	50	30	15
16	Lamberet Bus station	1	0	10	72	28.4	16
17	Megenagna on above	0	0	14	65	24.2	17
18	Lamberet Roundabout	0	1	6	68	21.4	18
19	Sara Ampule	1	2	5	24	20.8	19

Code	Name of black spot locations	Accident severity				SI	Rank
		Fatal	Major injury	Minor injury	Property damage		
20	02 exit junction	1	0	10	32	20.4	20
21	Kara Daget	0	3	5	35	20	21
22	Lamberet Elfora	0	2	4	31	15.4	22
23	Wesen center of Competency	0	0	12	17	13	23
24	Kara Micheal	0	2	3	14	11.2	24
25	Yeka abado Junction	0	1	4	15	9.2	25
26	Megenagna ceminto tera	0	0	6	21	9	26
27	Ministry of mine	0	1	4	14	9	27
28	Abado G +7 roundabout	0	1	4	10	8.2	28
29	Wesen Bridge	0	1	1	7	5.2	29
30	Lamberet Nok	0	0	0	17	3.4	30
31	Kara Condominium	0	0	3	4	3.2	31
32	Kara meat Butchery house	0	0	1	9	2.6	32
33	Zobel Menafesha	0	0	0	10	2	33

3.7 Road Accident Line Map Development using GIS software

Geographic Information Systems (GIS) or national grid referencing systems are rarely used with RTA reporting (Downing, et al., 2000). Generally, GIS helps to integrate, visualize, retrieve and store data in a traffic accident prioritization system. The coordinate of the RTAs' black spot location was collected from the site using GPS along Megenagna to Yeka Abado to develop the road black spot location line map with the reference of the national gird of the country and integrating the non-spatial(characteristics of traffic accident) data in GIS as shown in Figure 5.

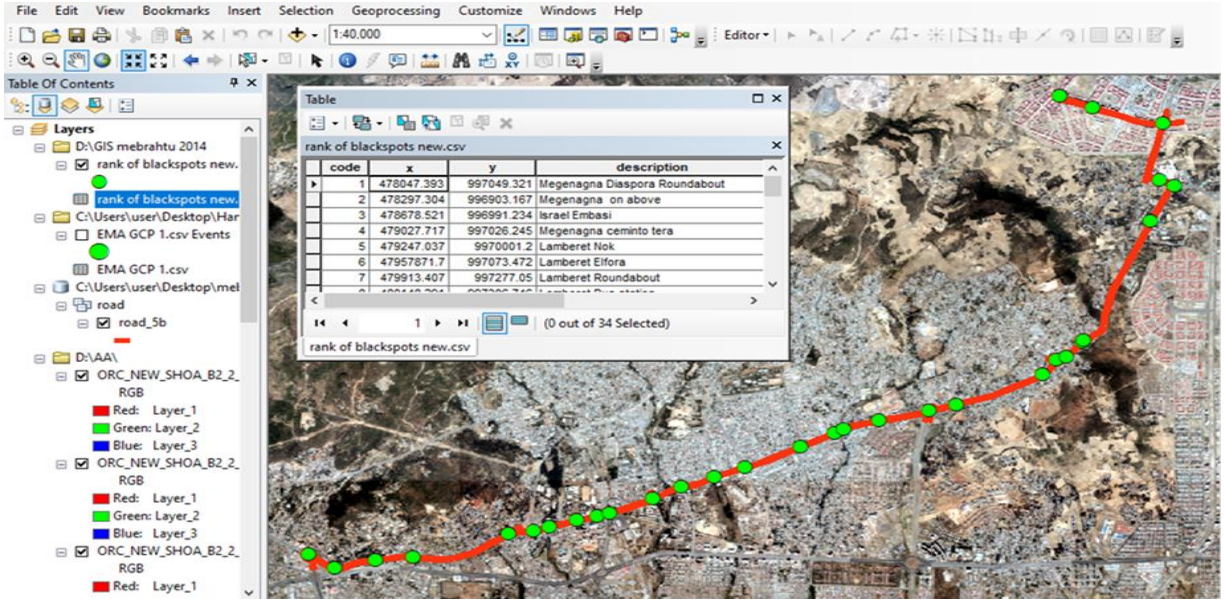
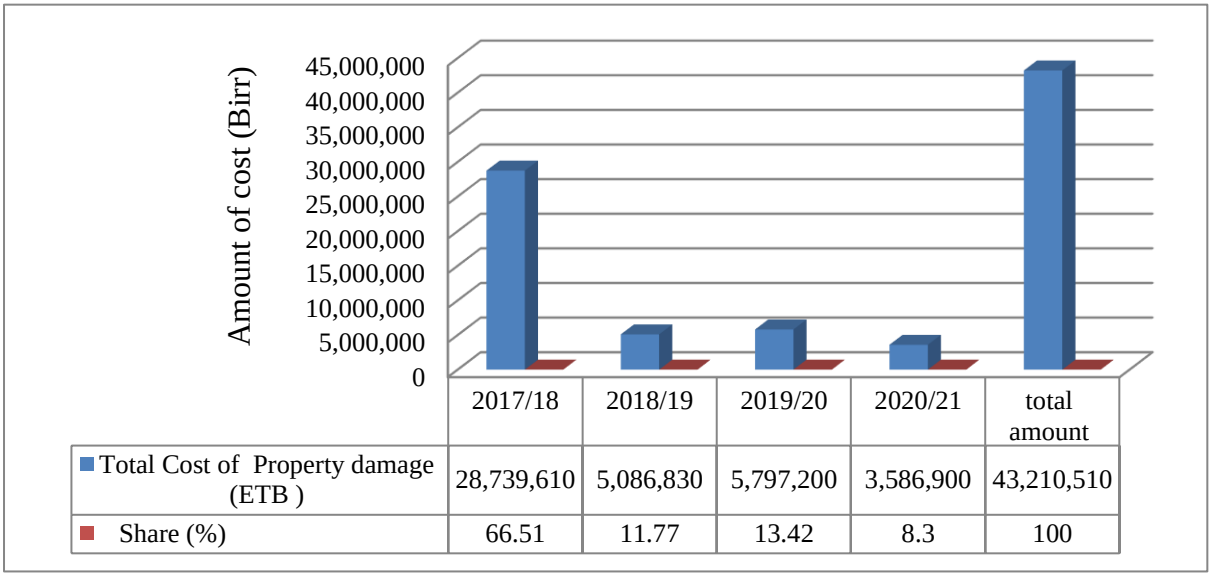


Figure 5: Road traffic accident Black spot locations line map of the study area

3.8 Economic Cost of Property Damage of Road Traffic Accident

Road Traffic Accidents have multifaceted impacts on the economy of a nation. The estimated total cost of property damage from single road Megenagna - Yeka abado in the year 2017/2018 to 2020/2021 reaches ETB 43,210,510 as shown in Figure 7. Out of the total 4507 RTA occurrences along the road in the last four years, 3367 (74.70%) of the accidents have been shared with property damage. Accordingly, every single accident that occurred with property damage has led to an average financial loss of ETB 12,833.53 in the sub-city in the study period. The city is yet struggling to fulfill the needs of its people due to financial insufficient which are a loss of an average ETB 10,802,627.50 every year from the single major roads with having a distance of 13.1 km.

Figure 6: Sample of bus damaged at the straight road geometry along the study



	2017/18	2018/19	2019/20	2020/21	total amount
Total Cost of Property damage (ETB)	28,739,610	5,086,830	5,797,200	3,586,900	43,210,510
Share (%)	66.51	11.77	13.42	8.3	100

Figure 7: Estimated cost of RTA along Megenagna – Yeka abado road

4. Conclusions

The main goal of this study was to analyze the trends of the road traffic accident and identify the black spot locations, and it was focused to propose solutions for the investigated accident along Megenagna to Yeka abado road. As a result traffic accident recorded data and road environment condition was collected to achieve the stated objectives. The number of road accident crashes during the same period range between 20% and 30.5% each year of millions of Ethiopian birr lost from property damage only. The road traffic accidents were higher in the early morning time of 7:00-7:59 AM and the day off Monday as compared to other hours and days. Hence, on Monday the occurrence of traffic was higher due to the users ending their rest with family and starting working jobs. Driver characteristics are one of the factors that cause an accident in such a scenario male drivers, 31-50 years old, 3-5 years driving experience, grade 9-12, and employed for others most shared number of accident severity as compared the others. Private workers are victimized by more accidents rather than other job categories.

The vehicle service of 5-10 years and vehicle-to-vehicle collisions shared the maximum number of an accident as compared to other services and collision types. Most road traffic collisions occurred in straight road geometry as compared to highly zigzag and junction roads. In the light condition of the road, highest occurrence in daylight as compared to Dusky and Sunset. The main causes of road traffic were more of by the behavior of the diver following too close to the other vehicle followed by improper use of steering. The hazardous and black spot locations were identified in most business areas. Other black spot locations were identified on junction areas due to illegal pedestrian crossing and the slope of the road. On the other hand, the traffic office it has shortage of a color for painting during the time accident happened along the road to fix the distance between the crashed vehicle verses vehicle or vehicle verses others. Hence, the nature of chalk in the summer rainy season faded fast at the time of recording that is one of the problems to measure the correct.

Based on the results and conclusions this study it is recommended Public road safety education should be provided through televisions, newspapers, magazines, books, tapes, and well-developed curricula in education centers to minimize accidents, the Road Transport Ministry and Driver Training Institutions should be pointed out guidance and implement a minimum time of driving

experience before a license is issued, mobilize periodically vehicle inspection centers beyond a certain service age of a vehicle strictly by skilled manpower, The traffic police of the sub-city should be available on the site, at the time of high-frequency crash hours 7:00 - 9:00 AM and on Monday day of the week, fix specific site for loading and unloading of the passengers in the mid-block of the road, Zebra crossing should be marked with vertical signs and horizontal marking, install traffic signs that indicate slope, and develop black spot location map using GIS software integrated with the ground coordinate for the specific site of the road. Also, the traffic office of the city must have sufficient colors to paint and delineate the accident area that helps for the law enforcement and investigation Rather than painted by chalk.

Author Contributions

The author declares that this manuscript is my original work and all sources of materials used for this manuscript have been duly acknowledged.

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Abbreviation

RTA - Road Traffic Accident, V_s-Verses, GIS-Geographic Information System, GPS-Global Position System, ETB-Ethiopian Birr.

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Conflict of Interest

The author has no conflict of interest in this original manuscript.

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