

## Trends, Causes & Prevention Measures of Road Traffic Accidents in South Gondar Zone District, Ethiopia

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### Abstract

The trends, causes, and prevention of road traffic accidents in the south Gondar zone district are investigated in this study. The escalating patterns and causes of death, morbidity, and property damage from road traffic accidents in developing nations, particularly Ethiopia, are causing considerable concern because of their impact on low-income countries. This article is divided into three sections, the first of which looks at the trends in road traffic accidents in the south Gondar zone district. Second, it aims to determine the causes of traffic accidents between 2015 and 2019. Finally, based on the study results, it is suggested that the zone implement road traffic accident prevention measures. Furthermore, the findings revealed that road traffic accidents in the zone primarily affected people aged 18 to 30, regardless of gender, and that the rate of occurrence begins to decline after age 31. As a result, road traffic accidents disproportionately impact economically active people, such as youths and young adults. According to the data, road traffic affected 93% of human variables, 5% of vehicle factors, and 2% of road and environmental factors. In order to reduce fatalities and injuries on south Gondar district roads, the essay recommends that the district administration prioritize road safety policy and law enforcement, as well as capacity building, education, and awareness creation, as well as cooperation and integration between and/or among all transportation stakeholders.

**Keywords:** Road Traffic Accident, serious injury, slight injury, property damage, Causes, prevention

### 1. Introduction

Everyone employs a variety of forms of transportation to get around, whether for work, business, school, or leisure. Vehicles are a common means of transportation and a major source of traffic accidents all over the world. A substantial number of road users were unable to return home as a result of road traffic accidents: they had to say their final goodbyes to this world, spend days, weeks, months, and even years in health centers and/or hospitals, and would never be able to work or play as they had previously. Road traffic accidents, in particular, have attracted the attention of governments, civil society organizations, and corporate and community leaders all over the world as a public health and development concern. Road traffic accidents (RTA) are one of the leading causes of death and illness around the world, with low- and middle-income countries bearing the brunt of the burden (Krug, 2000). According to (World, World health statistics 2015, 2015), it has been estimated that road traffic accident takes the live of nearly 1.3 million each year, as a result, nearly 3500 people die each day and as many as 50 million people suffer non-fatal injuries each year as a result of road traffic accident worldwide. Most of these deaths are in countries with low-income and middle-income countries where rapid economic growth has been accompanied by increased motorization and road traffic injuries. Unless adequate measures are taken timely, the situation is expected to get worse and will be among

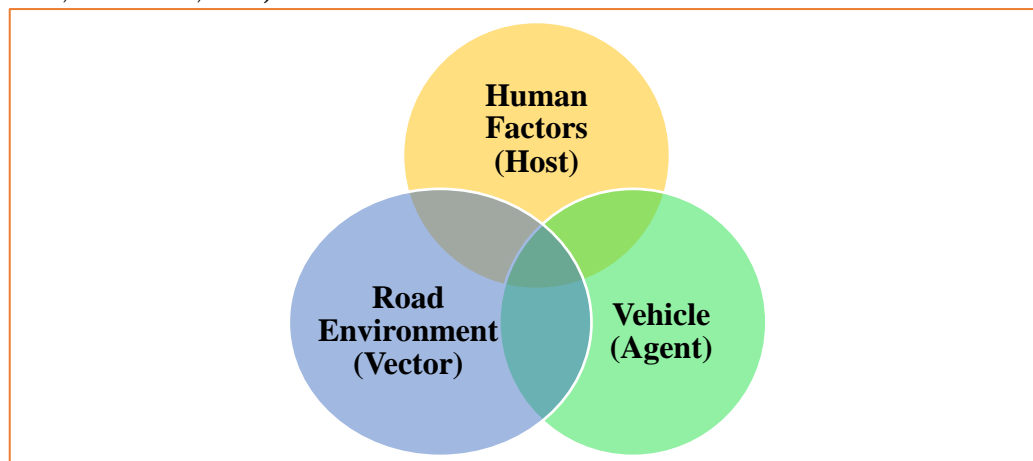
the top five leading cause of death by the year 2030. World Health Organization also shows that 90% of world's fatalities on the roads occurring in developing countries (World, Road traffic injuries fact sheet, 2016). According to (Deme, 2019) the report, out of more than 291577 traffic accidents, 36796, 54731, 58987, and 141063 road traffic accidents resulted in fatalities, serious injuries, minor injuries, and property damage, respectively, and Ethiopia loses 36.3 billion ETB (1.3 billion dollars at the current exchange rate of 28 ETB for 1 dollar), resulting in a loss of 0.9 percent of the country's budget annually due to traffic accidents.

In both industrialized and developing countries, and for both women and men, road traffic accidents are one of the main causes of injury and death (Murray, 1996; Nantulya, 2002).

Accidents are caused by three main factors: (1) human factors - the road user or host; (2) road environment vector - the road's nature, junctions, and surface type; and (3) vehicle agent - vehicle design and traffic volume (BakamaNume, 2006).

- Human factors - the road user or host;
- road environment vector - nature of the road, junctions, and surface type; and
- vehicle agent - design of the vehicle, and volume of traffic

Demographic parameters such as age and sex, psychological factors, and alcohol and drug usage are all examples of human factors. Some qualities of the host can enhance the likelihood of an accident (Odendaal, 1976; North side, 1994).



*Adapted from* (Haddon Jr, 1972)

**Figure 1: Principal Causes of Traffic Accidents**

Four high-risk groups of road users have been identified in epidemiological research conducted in industrialized and developing nations. Children are the first category of high-risk road users. In both rich and developing countries, children have one of the highest rates of fatal accidents. The second group comprises young people aged 15 to 25. Traffic accidents are the leading cause of death among males aged 15 to 25 (Catchpole, 1994). Pedestrians are the third group of high-risk road users. In both developing and developed countries, pedestrians have a greater fatal accident rate than the general population. Cyclists are the fourth group of high-risk road users. Cyclists have one of the highest fatal accident rates of any group (Gilbert, 1994) especially in developing countries.

The second most common cause of accidents is the road environment. The road environment is described as the road conditions at the time of the accident, whether they were wet or dry, the location of the accident—a junction or a flat stretch—and the surface conditions—tarmac, dirt, or murrum. The speed at which cars drive is influenced in part by the road environment. One of the most significant contributors to traffic accidents is speed. Vehicles and the traffic environment make up the third major category of accident causes. Vehicle

design, seat belts, and crash helmets are all part of the vehicle factor. The volume of traffic-the number of cars, motorcycles, and pedestrians-is the traffic environment.

Excessive speed has been noted as an important factor in accidents(Hedgecock, 1995).The speed at which vehicles drive is influenced by both road conditions and human variables. On better roads, drivers prefer to drive faster. When speed data is available, it is frequently unavailable, and when it is, it is based on the police investigator's best guess. An increase in average speed has a direct correlation with the likelihood of a collision and the severity of the collision's consequences. For example, for every 1% increase in mean speed, the likelihood of a fatal crash increases by 4% and the likelihood of a major crash increases by 3%. Pedestrians hit by front-end collisions have a 4.5-fold increased risk of death (from 50 km/h to 65 km/h). In car-to-car side accidents at 65 km/h, the fatality rate for car occupants is 85 percent. The overall purpose of this research is to look into the general trends, causes, and preventive methods of road traffic accidents in the region of south Gondar.

### **3. Methodology**

In order to attempt the set objectives, the present work has been analyzed. Because the essay is about discussing the trends and causes of road traffic accidents, the descriptive research approach was chosen and employed. The entire paper is based on secondary data. That is, it is based on data acquired by the South Gondar Zone District Police Commission during a five-year period (2015–2019).

#### **3.1. Description of the Study Area**

The study area is located in South Gondar Zone, Amhara regional state, Northern part Ethiopia. The zone is consisting of eleven rural woredas and five town administrative woredas, which is sixteen woredas. South Gondar zone is bordered on the south by East Gojam, on the south west by west Gojam and Bahir Dar, on the west bay lake Tana, on the north-by-north Gondar, on the north east by wag Hemra, on the east by north Wollo and on the south east by south Wollo. The zone is connecting the capital administrative city of Amhara regional state in Bahir Dar, Lake Tana, Gondar palace, Lalibela, and different historical and religious places. Debre Tabor Town is the zonal administrative center of the zone. The road density in the south Gondar zone is congested during holydays, market days, compared to other zones in Amhara regional state due to the above mentioned connected historical and religious places. According to the Central Statistical Agency (CSA) of Ethiopia's 2007 census, south Gondar Zone has a population of 2,051,735 people.

#### **3.2. Sampling Design**

The sample design for this study is a list of people who were engaged in a traffic collision in the south Gondar Zone from 2015 to the end of 2019. Purposive sampling was employed to obtain qualitative data, while simple sampling was used to make the sample size representative. Between 2015 and 2019, 811 people were involved in a road collision, according to statistics.

#### **3.3. Data collection Techniques**

Secondary sources were used to compile the data. The statistics for the south Gondar district from 2015 to 2019 were used in the analysis. The following information is used: the number of vehicles on the road, road accidents, and annual traffic accident statistics by woreda district; types of collision diagrams, age groups, driving experience, and traffic accident reasons. Accidents reported to the south Gondar district police commission were used to create the data. Although all significant accidents are reported to the authorities, some smaller ones may not be.

### 3.4. Data Analysis

The trends of road traffic accident analyzed using a descriptive statistical method to clarify and substantiate explanations, tables, charts, and figures are used.

### 3.5. Road Traffic Accident Data Record

Road traffic accident data were collected from South Gondar Zone traffic police stations for the study period from 2015- 2019. The road traffic accident form was included, day and time of accident, vehicle type and ownership, driver sex, age and education, weather, road, and illumination condition, accident type, degree of severity, and number of victims (driver, passenger, and pedestrian), sex, age, severity, and location of accident.

**Table 1: Traffic accident by day-wise from 2015-2019**

Years	Day-wise accidents from (2015-2019)							
	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday	Sunday	Total
2015	37	31	22	27	23	32	18	<b>190</b>
2016	23	20	16	23	14	27	17	<b>140</b>
2017	29	15	24	24	22	22	25	<b>161</b>
2018	18	22	20	18	22	28	17	<b>145</b>
2019	37	28	17	23	25	32	13	<b>175</b>
<b>Total</b>	<b>144</b>	<b>116</b>	<b>99</b>	<b>115</b>	<b>106</b>	<b>141</b>	<b>90</b>	<b>811</b>

*Source: South Gondar zone district Police Commission 2015- 2019*

**Table 2: Traffic accident by types of collision from 2015-2019**

Types of collision	Years (2015-2019)					
	2015	2016	2017	2018	2019	Total
Head on collision	44	18	47	41	45	<b>195</b>
Hit pedestrian	66	45	49	59	65	<b>284</b>
Vehicle overturn	49	37	50	37	44	<b>217</b>
Others*	31	40	15	8	21	<b>115</b>
<b>Total</b>	<b>190</b>	<b>140</b>	<b>161</b>	<b>145</b>	<b>175</b>	<b>811</b>

*Source: South Gondar zone district Police Commission 2015- 2019*

**Table 3: Traffic accident by Vehicle Types from 2015-2019**

Types of Vehicles	Years (2015-2019)					
	2015	2016	2017	2018	2019	Total
Bicycle	5	0	2	0	2	<b>9</b>
Motor Bicycle	6	7	3	5	1	<b>22</b>
Automobile	2	1	0	1	2	<b>6</b>

Station wagon	5	4	2	3	3	<b>17</b>
Pickup (10quintal)	17	18	12	8	10	<b>65</b>
Truck (11-40 quintal)	3	7	21	3	8	<b>42</b>
Truck (41-100 quintal)	40	27	30	38	35	<b>170</b>
Truck Trailer	28	9	10	7	9	<b>63</b>
Liquid cargo	1	2	8	2	1	<b>14</b>
Taxi	3	6	6	7	1	<b>23</b>
Bajaj	7	0	1	7	7	<b>22</b>
Minibus – (12 seats)	37	34	41	34	62	<b>208</b>
Bus (13-45 seats)	14	15	12	20	28	<b>89</b>
Bus >46seats	8	0	1	7	4	<b>20</b>
Special vehicles	5	2	1		0	<b>8</b>
Cart	0	1		1	1	<b>3</b>
Others	9	7	11	2	1	<b>30</b>
<b>Total</b>	<b>190</b>	<b>140</b>	<b>161</b>	<b>145</b>	<b>175</b>	<b>811</b>

*Source: South Gondar zone district Police Commission 2015- 2019*

\*Includes run-off road, hit fixed object, hit animal, hit parked vehicle and other unspecified collision types

**Table 4: Traffic accident by age groups from 2015-2019**

Age groups (years)	Years (2015-2019)					
	2015	2016	2017	2018	2019	Total
<18	5	0	0	0	0	5
18-30	107	92	82	76	81	438
30-50	48	23	35	30	49	185
≥51	3	2	4	1	8	18
Unknown	27	23	40	38	37	165
<b>Total</b>	<b>190</b>	<b>140</b>	<b>161</b>	<b>145</b>	<b>175</b>	<b>811</b>

*Source: South Gondar zone district Police Commission 2015- 2019*

**Table 5: Traffic accident related with drivers Experience from 2015-2019**

Drivers Experience	Years (2015-2019)					
	2015	2016	2017	2018	2019	Total
No License	7	2	4	0	0	13
1 Year	16	9	0	1	2	28

1-2 Year	21	26	20	42	47	<b>156</b>
2-5 Year	70	55	60	44	59	<b>288</b>
5-10 Year	33	20	29	17	30	<b>129</b>
>10 Year	16	5	8	3	0	<b>32</b>
Unidentified	27	23	40	38	37	<b>165</b>
<b>Total</b>	<b>190</b>	<b>140</b>	<b>161</b>	<b>145</b>	<b>175</b>	<b>811</b>

*Source: South Gondar zone district Police Commission 2015- 2019*

**Table6: Number of Persons and Property affected due to road accident(2015-2019)**

Types of Road Accident	Total Road Traffic Accidents					Total	% Share
	2015	2016	2017	2018	2019		
Fatal Accidents	98	78	71	84	94	425	52.4
Serious Injury Accidents	27	20	14	21	28	110	13.56
Slight Injury Accidents	12	11	24	10	10	67	8.26
Property Damage	53	31	52	30	43	209	25.77
<b>Total</b>	<b>190</b>	<b>140</b>	<b>161</b>	<b>145</b>	<b>175</b>	<b>811</b>	<b>100</b>

*Source: South Gondar zone district Police Commission 2015- 2019*

**Table 7: Road traffic accidents in the woredas of south Gondar Zones district**

S.N	Worda's	Road Traffic Accident Per Year					Total	% Share
		2015	2016	2017	2018	2019		
1	D/Tabor	24	11	11	14	11	71	8.75%
2	Worta	11	17	17	10	6	61	7.52%
3	A/Zemen	1	3	3	42	4	15	1.85%
4	N/Mewcha	5	9	6	11	14	43	5.30%
5	M/Eyesus	0	1	2	2	4	9	1.11%
6	Farta	17	11	16	15	24	83	10.23%
7	Fogra	26	19	22	20	41	128	15.78%
8	L/Kemkem	7	6	13	7	6	39	4.81%
9	Ebnat	6	4	5	4	6	25	3.08%
10	Dera	31	31	34	26	14	136	16.77%
11	L/Gaynt	44	18	19	12	24	117	14.43%
12	T/Gaynt	5	4	5	2	1	17	2.10%

13	Semada	4	2	5	5	3	19	2.34%
14	Estie	7	6	3	9	10	35	4.32%
15	Andabit	2	0	0	4	7	13	1.60%
	<b>Total</b>	<b>190</b>	<b>140</b>	<b>161</b>	<b>145</b>	<b>175</b>	<b>811</b>	<b>100.00%</b>

*Source: South Gondar zone district Police Commission 2015- 2019*

**Table 8: Causes of road traffic accidents in the south Gondar Zones**

S. N	Causes of traffic accidents	Total	%age
1	Influence of alcohol or drug	6	0.74
2	Failure to respect right hand rule	28	3.45
3	Failure to give-way for vehicles	16	1.97
4	Failure to give-way for pedestrians	157	19.36
5	Following too closely	19	2.34
6	Improper overtaking	55	6.78
7	Improper turning	2	0.25
8	Over speeding	348	<b>42.91</b>
9	Failure to respect traffic signs	0	0.00
10	Driving with fatigue	10	1.23
11	Driving without attention	5	0.62
12	Improper parking/moving from parking	8	0.99
13	Excess loading	9	1.11
14	Failure in vehicle	43	5.30
15	Defective road environment	4	0.49
16	Pedestrian error	0	0.00
17	Others	40	5.18
18	Unidentified	61	7.52
	<b>Total</b>	<b>811</b>	<b>100</b>

#### 4. Analysis of Results and Discussion

##### 4.1. Trends of Road Traffic Accidents in South Gondar District

Road traffic accident information data provides a good infrastructure for the prevention of road accident. Road traffic analysis particularly focuses on driver’s experience, pedestrian, and drivers’ age casualties. According to road traffic accident from 2015-2019, a total of 811 accidents happened on the road in traffic study area. Figures 2 showed that the revealed trends of fatal accidents from 2015 to 2019.

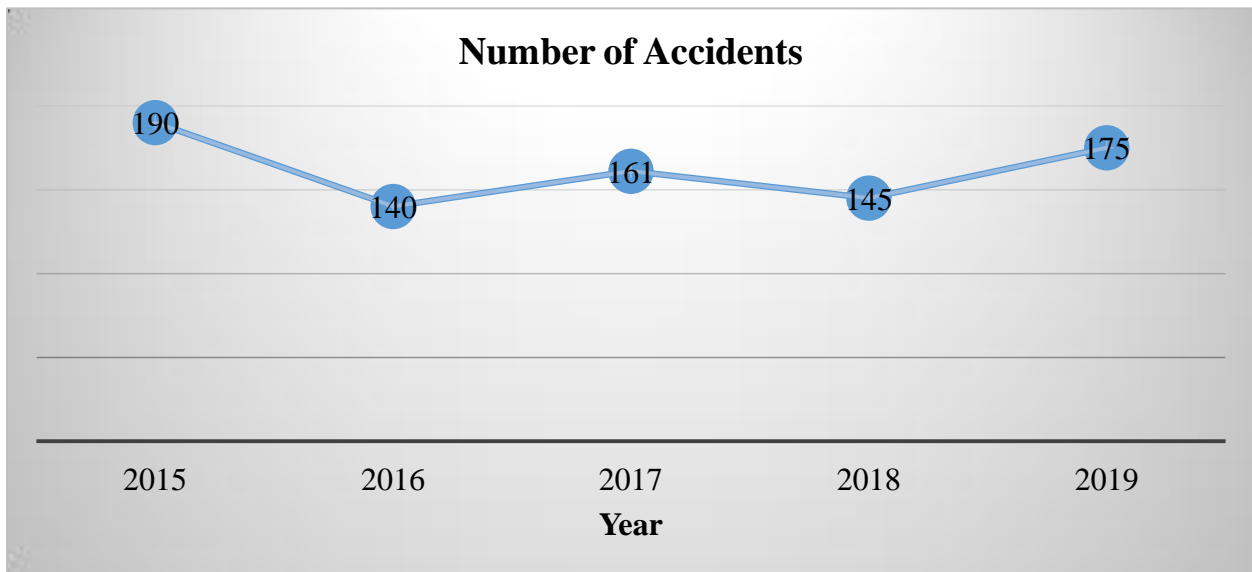


Figure 2: Total Road Accident from 2015-2019

##### 4.1.1. Trends of Road Traffic Accidents in Day-wise

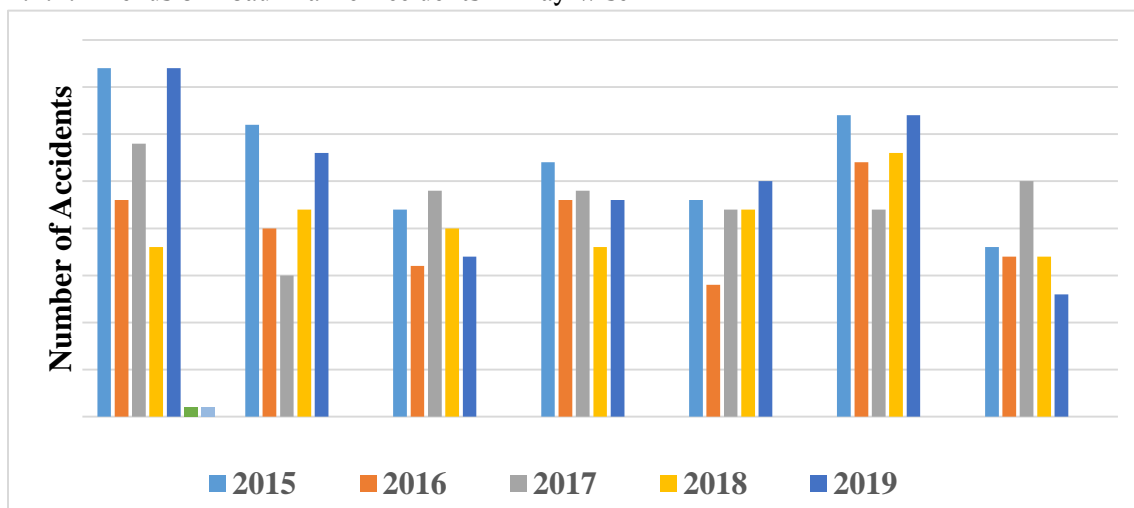


Figure 3: Road Traffic Accident by Daily-wise in 2015-2019

Figure 3 depicted the total number of road accidents reported in this study on all days of the week, indicating that accidents occurred in the Zone on all days of the week, with the majority of incidents occurring on Monday (17.76 percent) and Saturday (17.76 percent) (17.39 percent). Mondays and Saturdays are the days when the majority of Woredas in the south Gondar zone gather at a local market to trade products. As a result, compared to other days, there is a lot of movement of people from one place to another.



4.1.2. Trends in Road Traffic Accidents with vehicle type

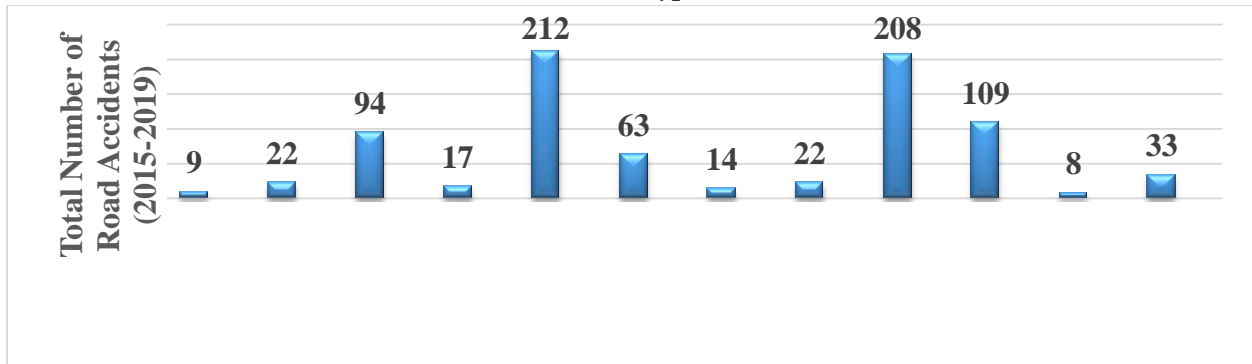


Figure 4: Road accident with vehicle type from 2015-2019

Figure 4, showed that the revealed the groups of vehicles involved road traffic accidents accounting for about 64% (26% for trucks, 13% for buses and 25% for minibus).

4.1.3. Road Traffic Accidents by Ages groups

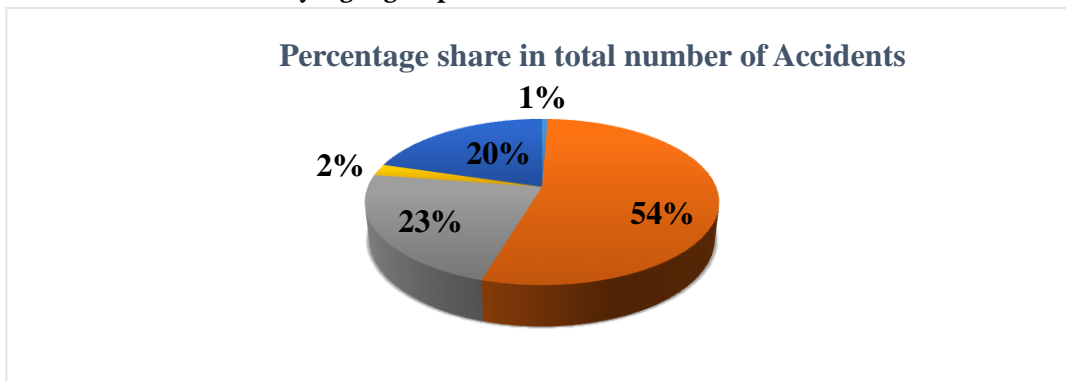


Figure 5: Distribution of Road accident by age groups from 2015-2019

The most commonly affected age groups were from 18-30 years (54%) followed by up to 20 years age group (20%).

4.1.4. Road Traffic Accidents with collision type

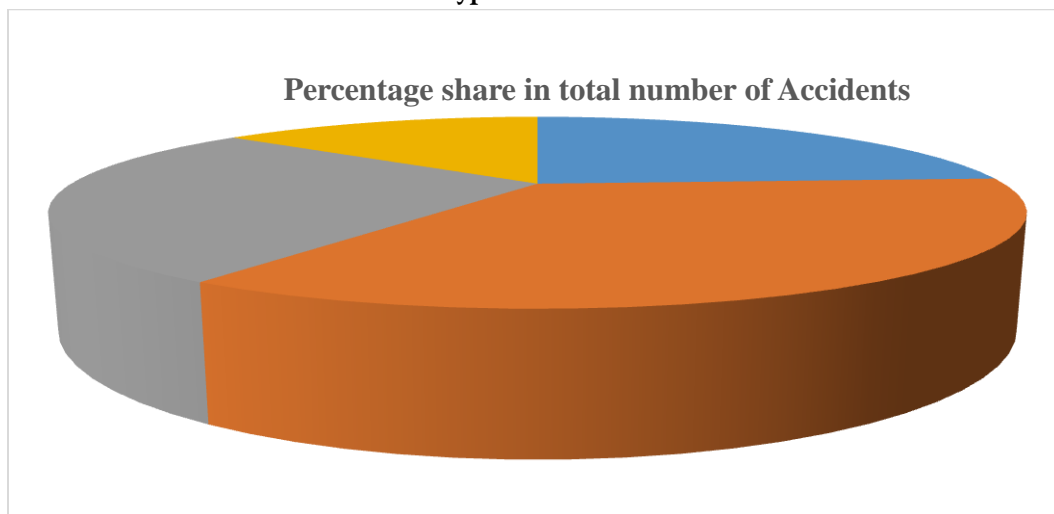


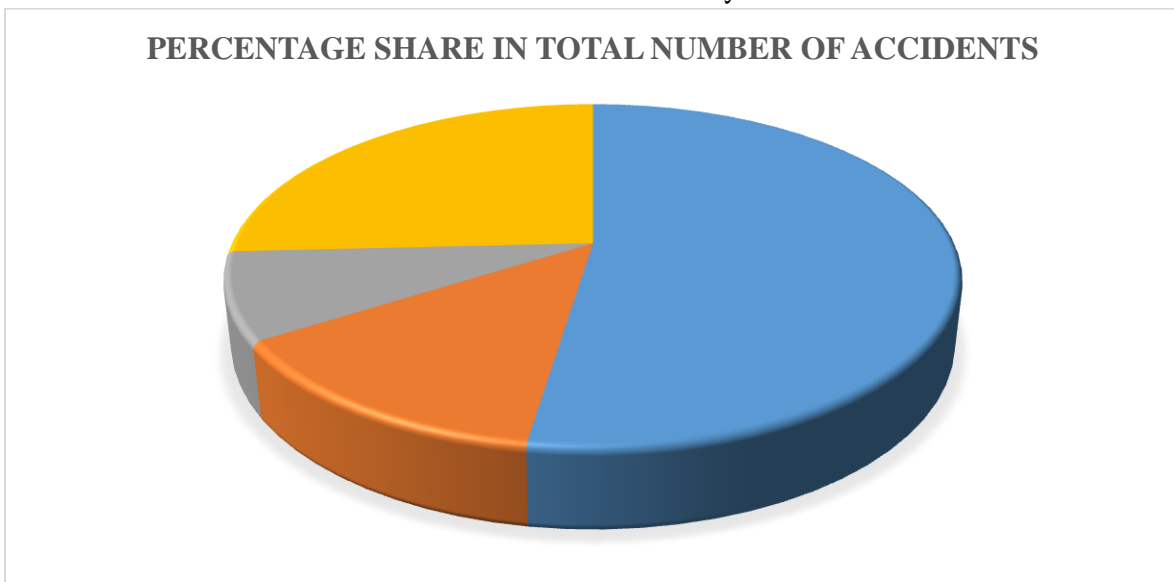
Figure 6: Distribution of Road accident related with collision types from 2015-2019.

In figure 6, showed that collision with pedestrian, vehicle overturn and Head- on collision are the most dominant type of collisions which frequently occurred in the Zone with values of 284 (35%), 217 (27%) and 195(24%) respectively.

**4.1.5. Road Traffic Accidents fatal by sex**

In this study, the total recorded amounts for fatalities were 487 and from this 366 (75%) were males and 121(25%) were females. From the total serious injures of 391 road traffic accident occurred in the five year 291 (74%) were males and 100 (26%) were females and whereas a total of 354(75%) males and 119 (25%) females were a victim from 473 total minor injuries in road crashes in study years.

**4.1.6. Trends in Road Traffic Accidents that Resulted in severity**



**Figure 7: Distribution of Total Road traffic accident severity from 2007-2011 E.C.**

Figure 7 revealed that from 2015to 2019, there were 811RTAs in south Gondar zone district, with 52.40% being fatal, 13.56 serious injury, 8.26% slight injury and 25.77% only property damage.

4.1.7. Trends in Road Traffic Accidents in location

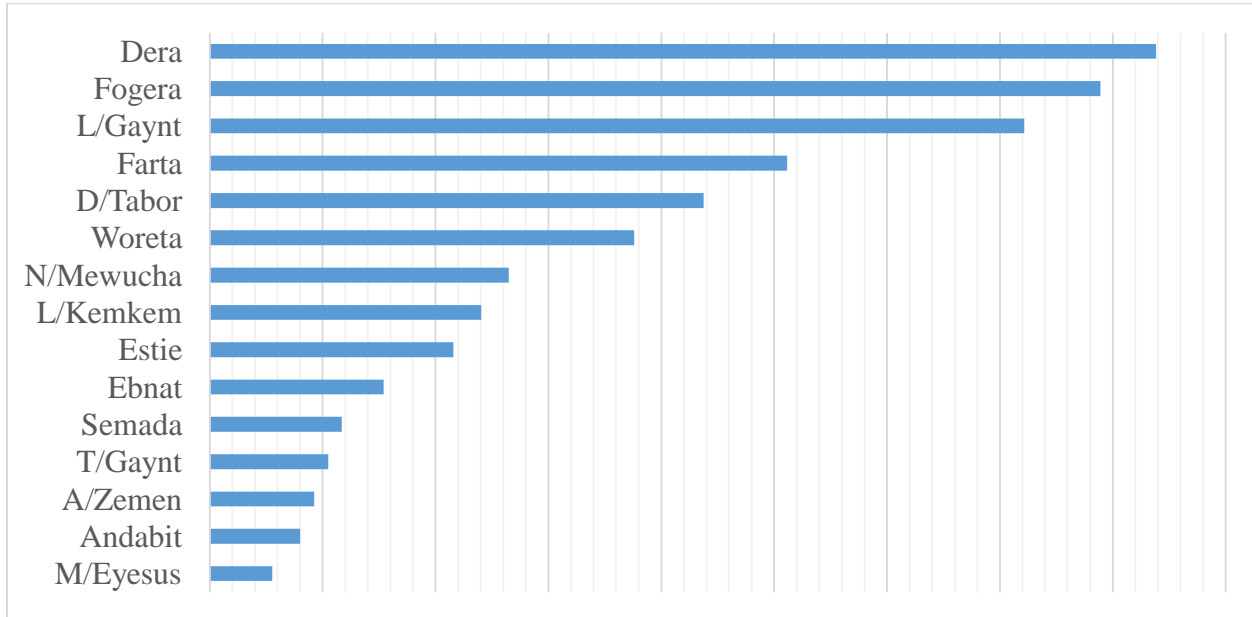


Figure 8: Total accident severity distribution in south Gondar Zone from (2015-2019)

According to the zone police commission survey data, the obtained top of three road traffic accident location is Dera, L/Gaint, and Debre Tabor shown in Figure 8.

4.2. Causes of Road Traffic Accidents

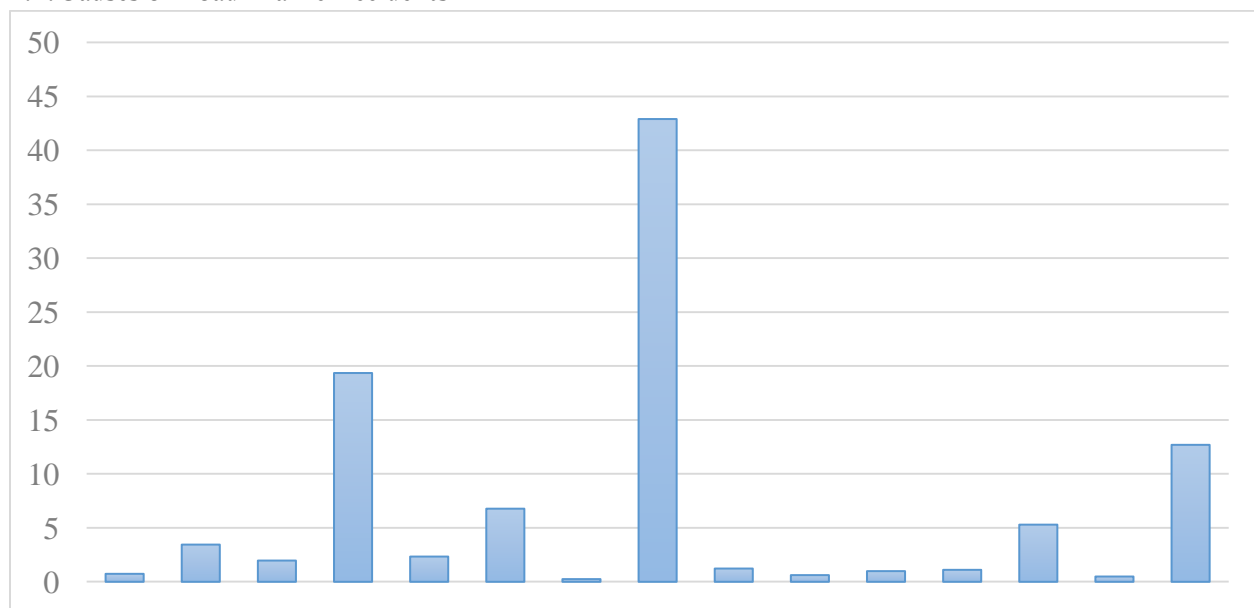


Figure 9: Identified causes of road accidents in the zones

Over speeding (43%), failing to give way to pedestrians (19%), and not violating and not known (13%) in Figure 9 are the top three causes of road traffic accidents, according to survey data. Human factors account for

more than 89 percent of all traffic accidents in the Zones, according to all of the documented causes. Drivers have been identified as the primary cause of all of these collisions. Inadequate training, driving under the influence of alcohol, drugs, or chaat, driving without a valid driver's license, and other factors all contribute to driver errors.

#### **4.3. Preventive Measures of Road Traffic Accidents (3-Es)**

By implementing an effective and coordinated safety policy and actions that require significant improvements in the relevant sectors, such as better enforcement, better roads, enhanced vehicle safety standards, improved and extensive public education and safety related programs, it is possible to significantly reduce the number of road accidents and casualties. Priorities for accident prevention must be identified, and realistic problem-specific goals and targets must be created. Targets that are particular to the situation are significantly more important than macro targets. Road environment improvements aiming at resolving the most prevalent defects through wider application of traffic engineering approaches are urgently needed and have a lot of potential. To promote improved road safety, there should be programs to adopt well-known engineering methods in a widespread and systematic manner, resulting in larger and longer-lasting results at a lower cost. The following are some of the measures that will improve road safety while still being cost-effective:

##### ***Engineering Measures:***

###### **(a) Geometric design standard:**

All around the south Gondar zone, significant upgrades have been made to national and regional roadways, as well as key access roads. Construction of new and strategic roadways, re-alignment of existing roads, road widening, surface treatments, shoulder enhancements, and vision obstacle reduction are among them.

###### **(b) Pedestrian facilities improvement:**

Because pedestrians are the most vulnerable group of road users, suitable road crossing facilities must be provided for them.

###### **(c) Traffic Control Devices (Traffic sign, signal, and marking improvement):**

Standard sign boards (digital boards) are crucial for controlling traffic system discipline, lane discipline, and other aspects of the road ahead, such as crossings, bends, exits, service stations, direction and distance of significant sites, weather conditions, studs, and cats eyes.

###### **(d) Speed Management:**

Speed limits are set on highways based on factors such as the state of the road surface, traffic congestion, the use of traffic lanes, and the presence of horizontal and vertical curves. Some of the highways in the south Gondar zone have no speed limits. For successful usage of speed limits that prevent accidents, it is necessary to separate different types of traffic vehicles and implement lane management.

###### **(e) Road side hazard and parking management:**

As minimum as possible road side activities should be allowed in the roads. If necessary, however, proper access control must be provided. In south Gondar, generally there are some market places all along the roads. These markets are often remains crowded. Pedestrians, passengers of slow-moving vehicles, vendors, buyers are always remaining vulnerable to become victims i.e., likely to be run over by fast moving vehicles. Vehicle's parking in roads is also an important factor of traffic accident, so management should be provided.

###### **(f) Highway surveillance:**

The establishment of a road surveillance team comprised of local leaders could be a possibility, particularly to control the conflicting use of roadway marginal areas for purposes such as drying agricultural products, playing games on roads by children, temporary markets and hawking, and keeping domestic animals near the roads for grazing, among other things.

**Enforcement Measures:**

## (a) Reducing and control speeding:

Excessive and unsuitable travel speeds are commonly recognized as the most dangerous factor on the road. Reduced speed is arguably the most effective tool for reducing road harm. As a result, the most effective and crucial strategy to take is to minimize and manage speeds. The most effective strategy to minimize the incidence of speeding and other speeding-related offenses, such as risky behavior, is through police enforcement.

## (b) Traffic law enforcement:

Because increased and successful high-profile police enforcement is a vital component in lowering accidents and road trauma, both actual and perceived enforcement techniques should be encouraged to dissuade risky behaviors and infractions.

## (c) Use of seatbelts and helmets:

Mandatory usage of helmets for motorcycle operators and passengers, as well as seatbelts for both drivers and passengers, including appropriate kid restraints.

## (d) Promoting public transport system:

Encourage people to take public transportation, such as buses and Custers, because they are safer than other kinds of transportation, such as minibuses and motorcycles.

**Education Measures:**

## (a) Strengthen accident data reporting and recording system:

The lack of reliable and comprehensive accident data severely limits our capacity to comprehend accident problems and implement effective road safety countermeasures. The government would be required to strengthen and coordinate a multi-agency accident and casualty data collection system (police and hospitals).

## (b) Strengthen institutional and professional capacity:

All responsible agencies and stakeholders must develop their institutional and professional capabilities in order to successfully implement road safety measures.

## (c) Road safety education and information:

Road safety education and information for road users of all ages, particularly youngsters, is a useful technique for improving road user behavior. This training, which is linked to a public education program, should be made available. Teaching children safety skills, particularly practical road safety training, can give society with long-term advantages.

## (d) Awareness development at different levels:

Promote safety-conscious behavior among road users, particularly heavy vehicle drivers and owners, through a concentrated approach that includes a strong motivating program, punishments, and licensing requirements. Increasing public knowledge and public relations efforts about road safety, as well as practical measures to enhance and correct road user behavior through public motivational initiatives.

**5. Conclusions**

- Road traffic accident data were gathered from 2015-2019 in all road corridors of South Gondar Zone. Based on the available data, priority value and accident frequency were used to rank the traffic accident prone areas.
- Road traffic accident trends in the South Gondar Zone in terms of days of a week revealed the occurrence of traffic in all days of the week with a significant severity magnitude difference in Monday and Saturday.
- The severity of road traffic accident significantly differs among different road users and male pedestrians were the highly victims one compared to their female counterparts from the frequently occurred vehicle pedestrian collision type in the Zone.

- The current study showed that the working age group between 18 and 50 years were the most affected drivers accounted (77%) in RTAs in all categories of RTA classifications. These confirms that most of road traffic accidents were highly affecting the economically active citizens i.e., youths and young adult groups. This, in turn, negatively affects the economy of the country and social structure of the population in Zone.
- Road traffic accident that happened within the traffic accident-prone areas occurred on the day time, representing a majority of the accidents incurred by driver's experience year ranges from 2-5 years due to over speeding, and driving without attention.
- The analysis of accident by vehicle type indicates that Minibus up to (12 seats), public transport, are accident prone vehicles that highly involved in fatal accidents followed by a Truck (11-40 quintal).
- Traffic accident reports are not well organized in the zones and it should be more detailed and formatted properly for spatial and statistical analysis.
- The underlying traffic regulations such as local speed limits need to be established on clear and consistent principles.

### References

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