Evaluation of Truck Related Accidents on Egyptian Roads Safety

Mohmad Ahmed Okil

Abstract— All countries of the world concerned about the growth in the number of people killed and seriously injured on their roads because of road crashes. Studies of the Egyptian Ministry of Transport (MOT) carried out in cooperation with the Egyptian Ministry of Interior, showed that heavy vehicles cause 60% of road accidents in Egypt of them about 13% are due to trailers [1].
This research aims at assessing trucking characteristics on safety of roads in Egypt by analyzing the collected data from Egyptian roads network like (Damietta/Portsaid - Giza/ElFayoum - Asyut/Suhag - El Zagagig/sinbillawein - Tanta/Zefta - Beni Suef/Elminya) by regression model of SPSS software program. It includes analyzing the progress of the relation between the number of the average annual daily traffic volumes (AADT) and traffic compositions to determine the share percent of traffic composition in traffic volume. In addition, it includes analyzing the relation of traffic compositions with the number of the traffic accidents to determine the percent of influence of the traffic volume of trucks on the traffic accidents. Analysis of collected traffic data indicated that Trucks and passenger cars have almost the highest percent share in traffic volumes among vehicles in most roads. It was concluded from the regression linear model that truck percent and passenger car have the highest significant correlation with traffic accident, which means that trucks and passenger cars have the most impact on traffic accidents rate where truck share percent in accidents is the highest percent with (1.93 car percent) on traffic accidents rate.

Key words — Road safety, Traffic composition in traffic volume, Truck related accidents, Analysis by SPSS Software Program.

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1 INTRODUCTION

1.1 Introduction

According to the global status report on road safety, published by the World Health Organization (WHO) in 2020, more than 93% of fatalities occur in low-income and middle-income countries and road traffic crashes cost most countries 3% of their gross domestic product [2].

1.2 Objectives

This research aims at assessing trucking characteristics on safety of roads in Egypt by:

- Analyzing the relation between the number of the average annual daily traffic volumes (AADT) and traffic compositions to determine the percent of each type of traffic compositions in traffic volumes.
- Analyzing the relation of traffic compositions with the number of the traffic accidents to determine the share percent of the traffic volume of trucks on the traffic accidents and how can reducing this percent.

2 LITERATURE REVIEW

Traffic accident is an expression used to describe a certain failure in the performance of one or more of the traffic system Types of road fatalities due to traffic accidents are divided into property damage only, accidents with injuries and accidents with deaths. Every year the lives of approximately 1.35 million people are cut short as a result of a road traffic crash. Between 20 and 50 million, more people suffer non-fatal injuries, with many incurring a disability because of their injury **[2]**. A crude estimate of accident costs at 1997 suggests a total global figure of about US$500 billion **[3].**

In Egypt, about 156 persons die per 100000 vehicles in 2006. This rate is the highest in the world compared to other countries where the rate is 73 in Turkey 29 in Greece, 13 in Italy and 9 in Switzerland [4]. All researches show road deaths continuing to increase in developing regions of the world but falling in the developed regions.

The random-parameters model in Tobit regression model (over the 9-year analysis period in India) shows that a variety of factors relating to pavement condition and quality are International Roughness Index (IRI), the average rut depth, pavement condition rating and surface deflection. In terms of geometric factors are horizontal curve and vertical grade, median barrier, junction, the annual average daily traffic (AADT) of passenger cars and combination trucks [5].

In 2005, over 5000 people died and an additional 114,000 were injured in the 442,000 large-truck (gross vehicle weight rating greater than 10,000 pounds) crashes in the United States. Approximately 12% of all traffic fatalities involved a large truck crash [6]. Based on the 2007 Commodity Flow Survey, among all the modes, trucks moved 70.7% of all freight by value, 68.8% by weight and 39.8% by ton-miles [7].

Large trucks have many operating characteristics, which have an impact on accident severity such as high gross weight, long vehicle length and poor acceleration /deceleration performance, which have an impact on accident severity [8].

- *Mohamed Ahmed Okil: Lecturer of Highway & Airports. Eng., Higher Institute of Engineering, El Shorouk City, Cairo, Egypt.*
E-mail:Eng_mokail@yahoo.com

3 METHODOLOGY AND DATA COLLECTION

In order to achieve the main objective of this thesis the steps of the research methodology are summarized in a flow chart as shown in Figure (1):

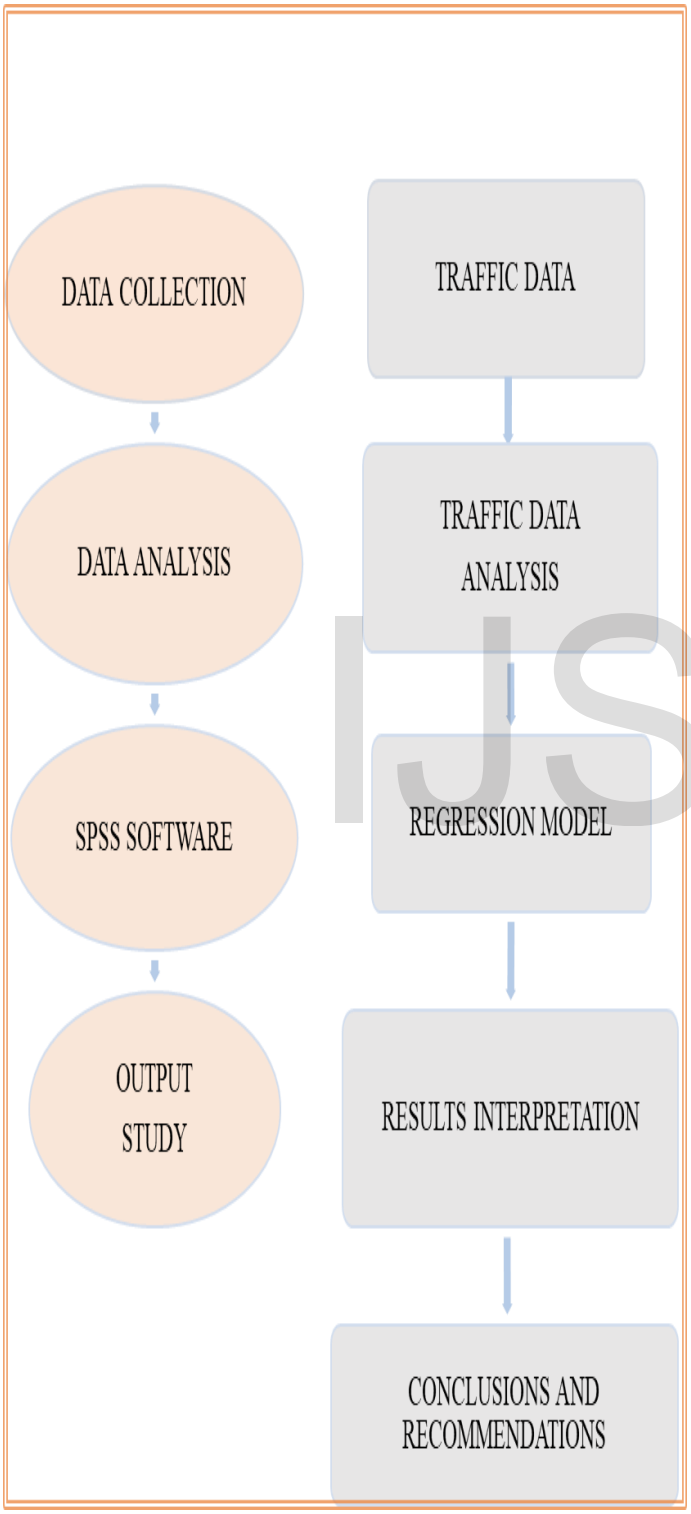

Figure (1) steps of the research methodology

-The inputs, analysis and outputs summary are shown in Table (1):

Table (1) Inputs, Sources, Analysis and Outputs summary

INPUTS	SOURCES	ANALYSIS	OUTPUTS
-Average annual daily traffic volumes (AADT) -Traffic compositions for representative vehicle fleet. -Traffic accidents.	The traffic reports available in the Information Department of The General Authority of roads, Bridges, and Inland Transport of Egypt (GARBLT).	-Analyze the relation between these data. -Regression analysis model	- The impact on each other from year to year. -Influence of the traffic volume of trucks on the traffic accidents on the Egyptian roads.

- A sample of the collected traffic data are shown in Tables (2, 3)

Table (2) Example of AADT and the Traffic composition at year 2006 from GARBLT

Ministry Of Transport
General Authority For Roads & Bridges and Land Transport
Information Department

Vehicles Classification Table

Station No. : 132 Direction : T
Road Name : Assuit - Sohag
Location : ASU-SHG
A.A.D.T. (2006) = 7497

Types Of Vehicles	No. OF Vehicles
Bikes	885
Cars and Trlrs	2047
2 Axle Long	1192
Buses	960
2 Axle 6 tyre	270
3 Axel Singel	622
4 Axel Singel	720
> 5 Axel Double	30
5 Axel Double	240
> 6 Axel Double	187
< 6 Axel Multi	30
6 Axel Multi	
> 6 Axel Multi	90

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Table (3) Example of Traffic Volumes and Traffic Accidents for some roads at year 2006 from GARBLT.

Station No	Road	Traffic volume (AADT)	Traffic Accidents
13	Giza/El-Fayoum	13708	12
102	El- Zagazig /Mit Ghamr	9029	22
104	Bilbeis/ El-Abbasa	7648	23
106	El-Zagagig/ Abu Hammad	15011	27
107	Damietta/Port-said	8712	10
113	Tanta/Zefta	10472	40
114	Tanta/ Shibine El-Koum	8365	10
118	Talkha/Shirbine	21758	11
122	Tanat/ Kafr El-Sheikh	6897	10
123	Desouq/ Kafr El-Sheikh	9508	9
130	Beni Suef/El-minya	6861	74
131	Waslit Asyut/El-Kharga	7079	17
132	Asyut/Suhag	7273	92
133	El-Agmy/ Marsa Matrouh	16286	39
141	Beni Suef/El-koraimat	5860	9

4 RESULTS & DISCUSSIONS

The relation between the share percent of traffic compositions and traffic accidents by regression linear model (SPSS software program) illustrates that truck percent and passenger car percent have the highest significant correlation with traffic accident, which means that trucks and passenger cars have the most imapct on traffic accidents rate. Truck percent and passenger car percent have a significant effect on accident rate as shown in Table (4):

- Truck percent (0.011< 0.05) is a significant and its coefficient is 1.954.
- Passenger car (0.006< 0.05) is a significant and its coefficient is 1.013.
- The constant coefficient is -20.957 but it has not an effect on traffic accident on accident rate because it is insignificant (0.291> 0.05).

Table (4) Coefficients (a)

Model		Unstandardized Coefficients		Standardized Coefficients	t	Significant.
		B	Std. Error	Beta		
1	(Constant)	-20.957	19.371		-1.082	.291
	Car. per	1.013	.330	.476	3.071	.006
	Truck. Per	1.954	.705	.429	2.772	.011

a. Dependent Variable: traffic. accidents

Table (5)Excluded Variables b

Model		Beta In	t	Significant.	Partial Correlation	Collinearity Statistics
						Tolerance
1	Bike. per	.141a	.764	.453	.164	.691
	2axle long. per	.190a	.665	.514	.144	.290
	Bus. per	-.278a	-1.562	.133	-.323	.681

a. Predictors in the Model: (Constant), car. per, truck. per
b. Dependent Variable: traffic. accidents

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Other traffic compositions are insignificant as shown in Table (5):

- Bike percent (0.453 > 0.05) is insignificant
- 2axle long percent (0.514 > 0.05) is insignificant
- Bus percent (0.133 > 0.05) is insignificant

So these variables have been excluded from the model because they have not a significant effect on accidents rate.
-From Tables ((4), (5)), the general equation has been extraced, which showed the percent of the traffic composition share on traffic accidents:

Traffic accidents = - 20.957+1.954*truck percent+1.013*car percent

Where the constant is insignificant which has not effect on accident rate as shown in Table (5-4).

-From Tables ((4), (5)) and the previous equation, truck share percent in accidents has been extracted as shown:

$$truck\ share\ percent\ in\ accidents = \frac{coefficient\ of\ p.truck}{coefficient\ of\ p.car} = \frac{1.954}{1.013} = 1.93 * p.car$$

It means that truck percent has the most effective share on accidents rates with value equal (1.93 car percent) and have appositive relation with accidents rates, thus increasing truck percent in traffic volumes cause increasing in traffic accidents rate.

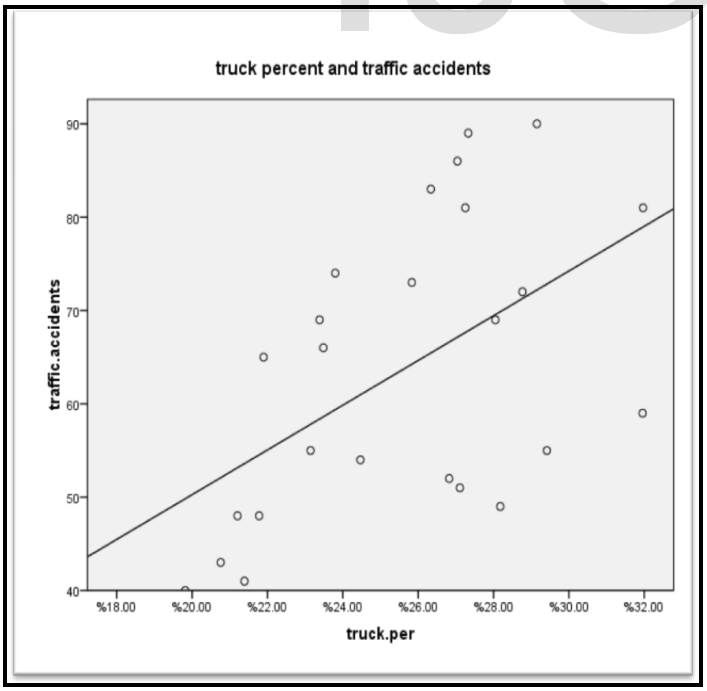

Figure (3) Relation between truck percent and traffic accidents

5 STUDY CONCLUSIONS

1. Trucks and passenger cars have almost the highest percent share in traffic volumes among other vehicles in most of Egyptian roads.
2. Truck percent and passenger car have the highest significant correlation with traffic accident, which means that trucks and passenger cars have the most effect on traffic accidents rate.
3. From the regression linear model, it has been concluded that truck percent and passenger car percent have a significant effect on accident rate as equation:

Traffic accidents = - 20.957+1.954*truckpercent+1.013*car percent

Where the constant is anon significant which has not effect on accident rate.

4. It have been extracted that:

Truck share percent in accidents = 1.93 * p.car

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