

## Determinant of Frequent Road Accidents in Megacities (A Case Study of Karachi)

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### Abstract

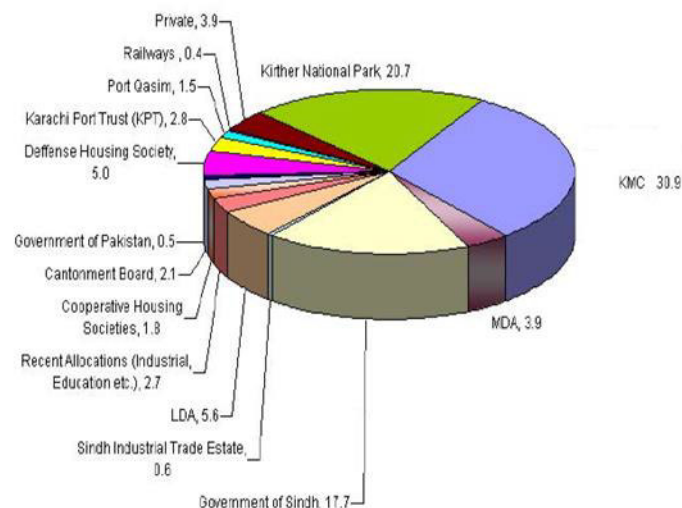
Karachi is the seventh largest megacity in the world with respect to population and its growth. Since the last census held in 1998 the population of Karachi has doubled. Karachi city is the economic hub of Pakistan and migrants from all over Pakistan come to Karachi for employment opportunities. More than 3.79 million vehicles are running on the roads of Karachi, which are controlled by only 3200 traffic police staff. The ratio of traffic controlling staff to Number of vehicle is 1: 118438 one person for more than 0.1 million vehicles. Study reveals that rapid increase in motorization, lack of awareness about traffic rules and illegally occupied land (encroachments), and poor law enforcement are contributing to the frequency of road traffic accidents in the Karachi city. According to Excise and Taxation department of the Government of Sindh, that is responsible for registration of vehicles in the province, vehicles in Karachi are increasing by 908 per day and every year the lives of approximately 1.25 million people are cut short as a result of a road traffic crash. Karachi is now dealing with more than 30,000 road traffic accidents every year, a situation that may worsen with time. This paper analyzes the factors that significantly impact on frequent road traffic accidents. A survey of 1991 households was conducted in 2015 – 2016 and a 1,127 respondents were interviewed out of which 7,697 people having age ranging from 15 to 70 years have been considered.

**Keywords:** Road Traffic accident, motorization, Encroachments

### 1.0. Introduction

Karachi is a city of road vehicles. The agenda of planning and development in a mega city like Karachi has been slipping away especially when it comes to the transport sector in terms of road safety and frequent road accidents.

Karachi is one of the fastest growing mega cities in the world. The population has increased by more than 100% as per 1998 census figure house count and this increase in population has dramatically affected the road accident ratio.



Land Control in Karachi<sup>1</sup>

Karachi is not only the biggest city of Pakistan but also considered to the hub of economic development in the country.

“Researches carried out in 2010 suggests that road traffic crashes cost countries approximately 3% of

<sup>1</sup> Source: (CDGK, 2007)

their gross national product. This figure rises to 5% in some low- and middle-income countries”.<sup>1</sup>

It is very important for a city like Karachi to adopt the principles of a safe and sustainable commute system where insufficient and ineffective public vehicles has raised a question mark for individual mobility resulting in the face of as drastic increase in automobile ownership and road accidents.

The rapid growth in ownership of private vehicles, poorly planned road designs and infra structure, mismanagement in traffic control strategies, outdated and poorly maintained vehicle stocks, absence of law enforcement, a lack in traffic rules awareness, a continuous increase in the density of population, road encroachment and in efficient transport planning are all characteristics that are responsible not only for traffic congestions and road accidents but also for long travel times and additional fuel consumption.

SR. No	Type of Vehicle	Total
1	Mini Bus	16,494
2	Buses	6403
3	Mini truck	14240
4	Trucks	16829
5	Vans	119501
6	Taxi	47049
7	Rickshaw	141705
8	Lifter	3083
9	Tractor	3760
10	Tanker	3051
11	Pvt. Vehicle	1102645
12	Motorcycle	1649943
13	Ambulance	2168
14	Coffin Carrier	72
15	Disable Person	105
16	Catholic Trust	109
17	School Bus	257
18	Church	49
	<b>Total</b>	<b>3127483</b>

Registered on road Dec, 2013

When we talk about road accidents in mega cities like Karachi, they are directly or indirectly linked to all of the controllable and uncontrollable factors. Since 1949 five development plans have been prepared for Karachi, but they remain unimplemented and have resulted in chronic shortages of basic facilities like dwelling units, water supply, electricity, and public transport.<sup>2</sup>

### 1.1. Who is at risk?

#### Socioeconomic status

Globally more than 90% of deaths and injuries resulting from road accidents occur in low- and middle-income countries. Even in high-income countries, people from lower socioeconomic and status backgrounds are more likely to be involved in road accidents.

#### Age and gender

Based on the data analyzed in the Karachi Mega city Survey, it has been reported that people aged between 15 and 44 years account for 48% of deaths caused by road accidents, while males are more likely to be involved in road traffic crashes than females.

“About three-quarters (73%) of all road traffic deaths occur among men. Among young drivers, young males under the age of 25 years are almost 3 times as likely to be killed in a car crash as young females”.<sup>3</sup>

### 1.2. How traffic related issues have affected commuters?

- Restrict mobility as long time commute affecting in restriction to work, education and socializing opportunities.
- Increase in noise and environment pollution
- Increase in transportation cost, economic cost (time, stress) and power consumption (CNG, petrol, diesel)

<sup>1</sup><http://www.who.int/mediacentre/factsheets/fs358/en/>

<sup>2</sup>IUCN – The World Conservation Union Sindh Program “Status paper on urban environment of Sindh”

<http://www.sindh.iucnp.org/pdf/urban.environment.PDF2005-11-27>.

<sup>3</sup><http://www.who.int/mediacentre/factsheets/fs358/en/>

- High cost of health problems, accidents, mortality and attitude.
- Declining in living standard
- Traffic congestion and road stress and fatigue
- Less trust in government initiatives for improved efficiency and reliability for public transport.

One of the major causes of road accidents in a mega city like Karachi is unskilled drivers without valid driver's license, over speeding and overtaking. A shortage of law enforcement staff can also be treated as a factor of frequent road accident. Only 3,200 traffic policemen are assigned to control movements of vehicle in Karachi where, around 3.79 million vehicles are running on the roads; the number of vehicles is increasing at a rate of by 908 vehicles per day (DIG traffic Dr Amir Sheikh, 2016). The main cause of traffic jam is encroachment on roadways and their bums by poorly planned illegal parking of vehicle outside offices and shopping malls.

New vehicles are registered in Karachi at an increasing rate as people opt for private vehicles to save their time. One may contrast this with the case of Singapore where the government is changing commuter habits by promoting the use of public transport for reducing traffic issues. In Singapore 52.4% residents rely on public transport. Pakistan's government can also tackle traffic problems by improving Public Transport. (Qureshi, 2012).

Percentage	Mode of vehicle on road
0.85%	Buses
4.04%	Rickshaw
38.21%	Cars
50%	Motorcycles

\*vehicles in Karachi as per 2011

Statistics shows that although conditions in Karachi have gone from bad to worse, 60% of the 24.2 million trips generated in Karachi every day are through the existing public bus transport sector and rickshaws.<sup>1</sup>In order to manage this situation, the private sector has inducted more than 50,000 QINGQIs.

### 1.3. What are the factors and how can one could minimize the occurrence of road accidents?

Knowing the key reasons from the commuters' perspective may help to identify and control road accidents and minimize their effect on people's life.

"Effective interventions include designing safer infrastructure and incorporating road safety features into land-use and transport planning; improving the safety features of vehicles; and improving post-crash care for victims of road crashes. Interventions that target road user behavior are equally important, such as setting and enforcing laws relating to key risk factors, and raising public awareness"<sup>2</sup>.

### 1.4. Key identified factors contributing to road accidents

- Over speeding
- Drink-driving
- Running red lights and traffic signs
- Teenage drivers
- Improper turns
- Pedestrians negligence
- Ignorance to motorcycle helmets
- Negligence to seat-belts and child restraints
- Distracted driving and mobile phone usage
- Lack of traffic rules awareness
- Road encroachment
- Leniency in law enforcement
- Improper and poorly planned parking slots
- Poorly road development designs
- Wrong way driving
- Negligence to children road safety measures
- Poor infrastructure of roads
- Deliberate public attitude towards following and obeying law and regulation.

<sup>1</sup>Transport and Communication Department, Karachi Metropolitan Corporation, February 2014

<sup>2</sup><http://www.who.int/mediacentre/factsheets/fs358/en/>

## 2.0. Problem Statement

Karachi, being the hub of Pakistan's economic development, it is always in the process of expansion (population and geographic) where safety always remains a question mark. The commuting distances are usually long and Karachi commuters travel by buses, mini buses, contract carriages, qingqi, rikshaw, motor bikes and private cars with many ignoring road safety rules. The rapid urbanization and motorization in cities like Karachi is directly proportional to the matter of road encroachment, proper law enforcement and lack of awareness in drivers about the traffic rules.

### 2.1. Research Question

What are factors that are responsible for frequent road accident in megacities?

### 2.2. Research Objective

Safe and sustainable transport infrastructure combined with awareness about traffic rules, proper law enforcement and responding to road encroachment seems to be the as most logical solution to minimize the challenges of economic development, social equity, natural and environmental hazards in a megacity like Karachi. The purpose of this study is to identify and analyze the factors that are responsible for the level of road traffic accidents in Karachi.

It explores and analyzes the following factors believed to contribute to road accidents:

- Lack of traffic rules awareness
- Road encroachment
- Absence of proper law enforcement

### 2.3. Research Hypotheses

**H<sub>1</sub>:** Lack of awareness for traffic rules increases the frequency of road accidents.

**H<sub>2</sub>:** Road encroachments increase the frequency of road accidents.

**H<sub>3</sub>:** Absence of proper law enforcement increases the frequency of road accidents.

### 2.4. The Traffic situation in Karachi

"Karachi is ranked as number 1 in terms of road traffic accidents in Asia and is in the on 48<sup>th</sup> position in the world. In 2012 35,671 people were injured in road accidents. Karachi is in the fourth position in road accident fatalities. Due to an increase and frequent road accidents Karachi suffered a financial loss of more \$670 million due to road traffic accidents for the year 2012".(The Express Tribune, 2015)

## 3.0. Methodology

Karachi city is administratively divided into six districts and six cantonment areas. Districts are further divided into 18 towns. For every town and cantonment blocks were defined on the basis of average 200 – 250 households, with a total of 13,233 blocks. A two stage stratified sampling method was used to draw the sample of households that would answer the survey questionnaire.

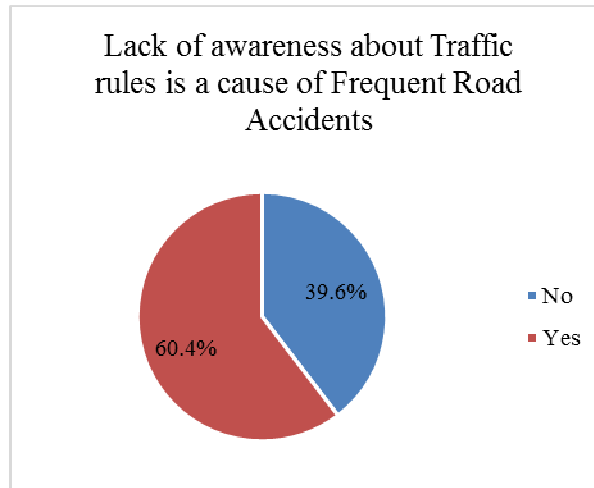
At the first stage 1% blocks from each town/cantonment were selected through systematic random sampling after a random starting point. At the second stage 15 households were selected for on-site interviews of its residents through systematic random sampling after a random starting point. Therefore, 1991 households were visited and 11,127 respondents were interviewed.

## 4.0. Dependent and Independent Variables

Dependent/Independent Variables	Definition
Road traffic accident involvement (DV)	Self or family member involved in a traffic accident in the last year
Agrees car drivers not aware of traffic rules (IV)	Drivers of buses, rickshaws, motorcycles are not aware about Traffic rules
Agrees roads are encroached (IV)	Roads are illegally occupied by land Mafias or small business owners
Agrees there is an absence of proper law Enforcement (IV)	Unavailability and shortage of Traffic Police Staff, and/ or the available staff is not loyal to his duty
Agrees car drivers are aware of traffic rules but ignore them (IV)	Buses, Rickshaws, Motorcycles drivers are not willingly follow the Traffic rules

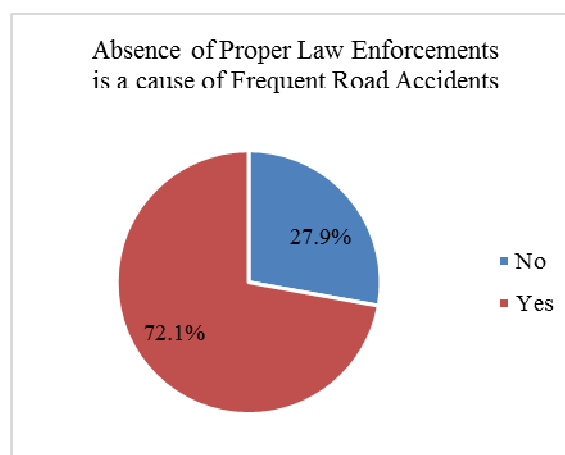
### 5.0. Findings of Survey

Frequent Road Accident	Lack of awareness about traffic rules		Total
	No	Yes	
No	75.7%	39.6%	60.0%
Yes	24.3%	60.4%	40.0%
Total	100.0%	100.0%	100.0%

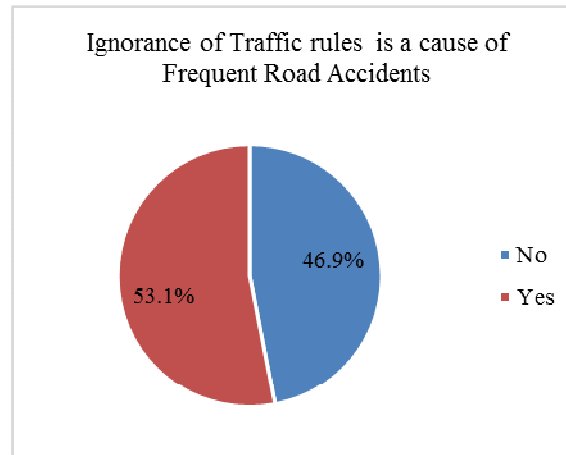


Frequent Road Accident	Road Encroachments		Total
	No	Yes	
No	90.0%	28.9%	60.0%
Yes	10.0%	71.1%	40.0%
Total	100.0%	100.0%	100.0%

Frequent Accident	Road	Absence of Proper Law Enforcements		Total
		No	Yes	
No		90.2%	27.9%	60.0%
Yes		9.8%	72.1%	40.0%
Total		100.0%	100.0%	100.0%



Frequent Road Accident	Ignorance of Traffic Rules		Total
	No	Yes	
No	99.1%	46.9%	60.0%
Yes	.9%	53.1%	40.0%
Total	100.0%	100.0%	100.0%



### 5.1. Logistic Regression

Logistic regression is appropriate for the analysis of dichotomous data. It represents a more rigorous picture of data rather than linear regression. It depends on three assumptions:

- The outcome of the data should be discreet and the dependent and independent variables should be in dichotomous form.
- The data should not have any outlier
- There is no multi-co-linearity between explanatory variable.

#### Model Summary

Step	-2 Log likelihood	Cox & Snell R Square	Nagelkerke R Square
1	6133.766	.428	.578

Estimation terminated at iteration number 7 because parameter estimates changed by less than .001.

Step 1 <sup>a</sup> Variables in equation	Wald	df	Sig.	Exp (B)
Constant	397.614	1	.000	.007
Lack of awareness about traffic rules (1)	27.317	1	.000	.679
Road Encroachments (1)	412.297	1	.000	4.846
Absence of Proper law enforcement (1)	512.395	1	.000	6.468
Ignorance of Traffic Rules	138.671	1	.000	19.752

The Logistic Regression analysis identified the following four significant factors which influence the variation in frequency of road accidents in Karachi. These are

- Ignorance of traffic rules has greatest impact of 19.752 times on frequency road traffic accidents on its rise in one time.
- Absence of proper Law Enforcement has an impact of 6.468 times on frequency of road accidents in response to a one unit increase in enforcement.
- Road Encroachments impacts of 4.846 times.
- Lack of awareness has a less significant impact of only 0.679 times.

### 6.0. Conclusion

- Government should improve public transportation.
- Government should develop and adopt innovative ideas for traffic rules awareness programs.
- There should be daily markets (like Sunday market) in order to persuade small business road encroachers to earn their daily bread in safer locations.
- Government should encourage improved morale of public traffic constables including improving their recruitment and training. A small amount (Rs.10-50) could be added to the motor vehicle tax which could be utilized for any accidental death/disability of traffic constables.
- Government should develop and implement efforts to shift the mindset of drivers of private vehicles and of public transport vehicles to improve compliance with traffic rules.
- Studies demonstrate that people experience many psychological symptoms and disorders after road accident injuries and accidents which not only result as psychological stress and travel anxiety but also may force commuters to find other means to commute (mostly use of private vehicle).

## 7.0. Recommendation for policy

- Government should improve public transportation.
- Government should develop and adopt innovative ideas for traffic rules awareness programs.
- There should be daily markets (like Sunday market) in order to persuade small business road encroachers to earn their daily bread in safer locations.
- Government should encourage improved morale of public traffic constables including improving their recruitment and training. A small amount (Rs.10-50) could be added to the motor vehicle tax which could be utilized for any accidental death/disability of traffic constables.
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