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PROVINCIAL ANALYSIS OF TRAFFIC ACCIDENTS IN PAKISTAN

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ABSTRACT

The focal point of this study was to provincially analyze traffic accidents in Pakistan. There are many types and causes of accidents. However, mostly accidents take place due to negligence which might and must have been avoided. A vast literature had reviewed to make this study more persuasive. This research comprised of working on secondary data. Different variables included total accidents, fatal and nonfatal accidents, Persons killed and injured and total number of vehicles involved in accidents from year 2000 to 2010 has tested statistically. Coefficient of variances had applied to ensure consistent Province of Pakistan concerning traffic accidents. ANOVA and Post-Hoc LSD test used to check mean difference between provinces and lastly OLS regression model had determined to ensure positive or negative relationship between total accidents and total number of vehicles involved in accidents. Results show that Punjab is dominant among all provinces in term of traffic accidents. Additionally, C.V. shows Punjab as most consistent province regarding traffic accidents. ANOVA and LSD test shows significant mean difference between all provinces. At last, regression model shows positive relationship between total accidents and total vehicles involved in accidents. The goodness of fit of that model was 98%.

Keywords: Accidents, Traffic, KPK, OLS, C.V., ANOVA, Post-Hoc LSD.

INTRODUCTION

Accident can be defined as "an unanticipated and detrimental event, a misfortune unexpected and with no obvious cause." Exactingly speaking, a large amount of accidents are not accidents by any means. They are clashes that might and must have been evaded. There are a lot of diverse kinds of traffic accidents that consequence in severe personal damages and fatalities.

A rear-impact car accident can take place while one car hits the car in face of it from back. Generally, these accidents come about when first car does not stop in time to avoid striking the second car. Insurance policies typically always put guilt on the car that bang into another car for issues of driving distance and rashness. A side-impact accident comprises any accident where one car strikes the side of second car.

A head-on accident is when one vehicle front strikes another vehicle front or a fixed entity. This occurs when one vehicle enters a lane on the opposite side of the boulevard. This can also ensue when a car come into a thruway, driveway or one-way street from the wrong route. A rollover accident is when a car turns over on top of either the side or the top of the car. The key reason is turning harshly while speeding. Giant vehicles, like SUVs or trucks, are more possibly to flip over than smaller cars.

A runoff accident is when a car runs off of the street and generally just one car involves. This comes about normally when the driver is not giving concentration or when veering is concerned with the intention of avoids striking another car or animal in the path. However, there are many causes of these accidents.

Traffic Accidents can be caused by equipment breakdown. The main referred forms of equipment malfunction are brake fails, tire blowouts and steering or suspension breakdown. That's why producers are requisite by regulation to plan and engineer cars that congregate a least security benchmark.

Roadway preservation may be the reason of some motor vehicle casualties, although not to the echelon that some drivers exploit it as a justification. Unluckily safeguarding agendas and measures differ to a great extent from town to town and area to area, so nationally principles don't subsist. Some mistakes happen when a driver becomes inattentive, maybe by a telephone call or a drip cup of tea. Over speeding is surely a cause of mostly accidents as the faster the pace of a vehicle, the higher the hazard of a mishap.

LITERATURE REVIEW

Among three E'-s of traffic safety, Education and Enforcement are as significant as Engineering for talking about road traffic security actions, although the assessment of road traffic security procedures from the point of view of Education and Enforcement has been unsatisfactory contrasted to Engineering. It is possibly one of the causes that there is no organized assessment system for Education or Enforcement. (Nishida, 2009)

According to Nishida (2009), the input of an arbitrary issue to a road traffic accident is not diminutive, and the distinctiveness of a solitary road traffic misfortune does not all the time imitate of psychological and corporeal driving attributes of drivers concerned in the apprehensive accident. However, the trait of road traffic accidents originated by a driver, who is the source of similar sort of accidents or devoted the equivalent form of traffic contravention numerous times, is contemplation to replicate the driving attributes of the driver. Furthermore, a driver with specific driving distinctiveness may commit a specific sort of accident or consign a specific form of infringement. It is functional to examine the association between accident or infringement occurrence and driving traits for argument of human issues of traffic disaster.

According to World Health organization details on road traffic damage avoidance (WHO, 2004), globally, a probable 1.2 million public are exterminated in road collides every year and as much as 50 million are wounded. Forecasting specify that these statistics will rise by about 65% over the upcoming 20 years if there is no new commitment to prevention.

It is currently entrenched that numerous African and Asian countries have a severe road accident dilemma (Jacobs & Cutting, 1986). According to Jacobs (1995), casualty rates (per certified vehicle) are far above the ground in contraction with those in developed states and even as in Europe and North America the circumstances are normally civilizing, various developing countries face a deterioration condition. For instance, over the phase 1969 to 1986, the figure of people tool their loves in road accidents in twelve European states pooled really cut down by about 20 percent. In eight Asian countries over the similar session, a raise in the quantity killed of about 150 percent.

Speedy expansion of road accidents in the majority of the huge metropolitan cities is gradually more becoming an enormous concern to which carries away as much as 90,000 lives addition to human desolations. Causes of road accidents can be well tacit with the assistance of investigation of accident data, which can present clues to many issues of road accidents (Valli, 2004). A lot of researchers counting Smeed (1968) have dedicated their investigation to the area of road accidents and account ground-breaking work on the examination of road accidents. Smeed (1968) auxiliary examined the differences in the model of accident rates in diverse countries and their reasons.

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Livneh and Hakkert (1972) accomplished a comprehensive case study on road accidents in Israel. Utilizing employment and population data, Partyka (1984) built up uncomplicated models with an outlook to recognize the variety of factors distressing the augment of accidents in developing countries. According to Andreassen (1985), the Smeed's method cannot be concerned commonly to all countries. Mekky (1985) exercised the time series data for his study and premeditated the effects of a quick amplify in motorization stages on fatal accident rates in various developing countries. Mohan (1985) endeavored to comprehend total crash patterns in Delhi. Jacobs and Cutting (1986) endeavored additional to modernize the association based on former studies. The investigation on the effect of speed restrictions on road accidents has been performed by Fieldwick and Brown (1987). According to Fieldwick and Brown (1987), it was originate that speed limits have a substantial effect on security equally in urban and rural areas.

Adams (1987) makes development on Smeed's law and presents some insights in the scrutiny. Minter (1987) confers a relevance of the two models (Wright and Towell) for road security tribulations and lastly widened a model for approximation the road accidents in U.K. Valli and Sarkar (1993) examined the disparities in the pattern of road accidents in different States and Union Territories of India. Emenalo et al. (1987) set up the tendency curves for the road accidents, fatalities, and other pertinent quantities for Zambia. Valli and Sarkar (1997) built a road accident model by utilizing the added limit of road span. Ameen and Naji (2001) offered a wide-ranging modeling policy to cast road accident sufferers in Yemen.

OBJECTIVES

The objectives and aims to fulfill this research were as follows:

1. To check the dominant province in term of traffic accidents.
2. To identify consistent province regarding total accidents over the decade.
3. To verify mean difference among Provinces of Pakistan with concern to traffic accidents.
4. To ensure positive or negative relationship between total accidents and number of total vehicles involved in accidents.

METHODOLOGY

This research comprised of working on secondary data. Data had obtained from Pakistan Bureau of Statistics. However, the basic source of information was Provincial Police Departments (Crime Branch). Variables included total accidents, fatal and nonfatal accidents, Persons killed and injured and total number of vehicles involved in accidents from year 2000 to 2010. Microsoft Excel 2007 and Statistical Package for Social Sciences (SPSS v. 16) had utilized to analyze and present the results. Charts had prepared by Microsoft Excel.

Moreover, Coefficient of variances had applied to ensure consistent Province of Pakistan and the year of consistency. Furthermore, ANOVA and Post-Hoc LSD test used to check mean difference between provinces of Pakistan. Additionally, OLS model had determined to ensure positive or negative relationship between total accidents and total number of vehicles involved in accidents.

EMPIRICAL RESULTS

Results of this study have interpreted graphically, descriptively and inferentially. Different techniques have applied to validate the results as per objectives of this research.

Chart 1 shows graphical representation of fatal and non-fatal accidents across all provinces of Pakistan. Bar Chart (Chart 1) shows that Punjab had maximum and Baluchistan had minimum ratio of traffic accidents from year 2000 to 2010 as compared to other provinces of Pakistan. Fatal accidents and non-fatal accidents had minimal difference in all provinces except Khyber Phaktoon Khwa. However, in Sindh fatal accidents were greater than non-fatal accidents.

Chart 1. Fatal and Non-Fatal Accidents across all Provinces

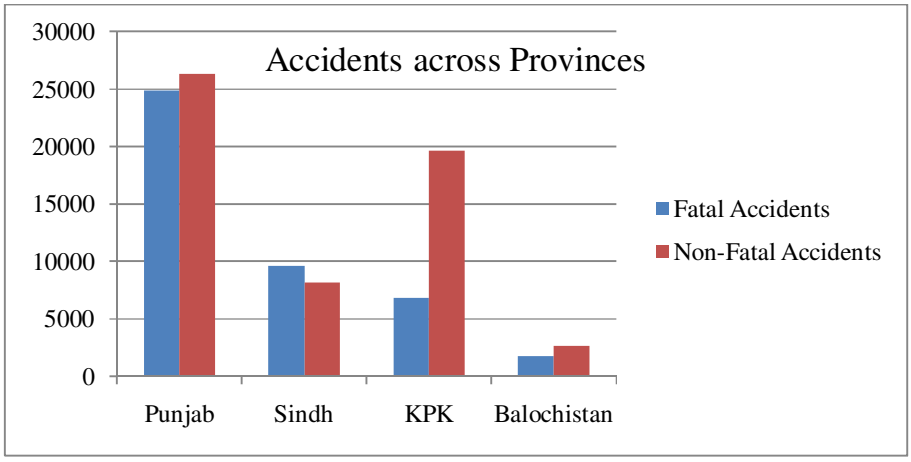

Chart 2. Total Persons Killed in Traffic Accidents across all Provinces

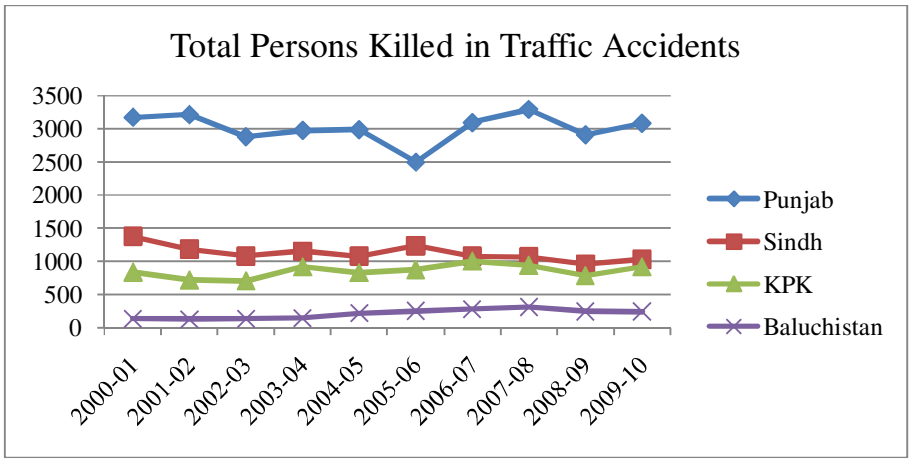

Chart no. 2 shows provincially illustrations of total person killed in traffic accidents in Pakistan from year 2000 to 2010. It demonstrates that in Punjab persons killed in traffic accidents were far above the ground as compared to other provinces. Baluchistan had least no. of persons killed over the decade. Persons killed in Sindh were greater than person killed in Khyber Pakhtoon Khwa. However, in 2005-07 and 2009-10 overlapping lines of KPK and Sindh shows approximately same results.

Here it is consistency analysis of total traffic accidents. Table no. 1 shows total accidents from year 2000 to 2010 taken place in all provinces of Pakistan. Co-efficient of variance has evaluated to find out consistent Province and consistent year. In order to calculate C.V., Means and Standard deviations of all provinces and all years has computed. Results show that total accidents were consistent in year 2005-06. Moreover, Punjab shows most consistent results among all provinces as it has lowest value of C.V. Further information has given in the table.

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Table 1. Consistency Analysis of Traffic Accidents

Years	Punjab	Sindh	KPK	Baluchistan	*Mean*	*S.D.*	*C.V.*
2000-01	5277	2239	2705	430	2662.75	2000.07	75.11
2001-02	5270	1959	2459	345	2508.25	2050.29	81.74
2002-03	4771	1798	2402	406	2344.25	1820.96	77.68
2003-04	5015	2150	2728	415	2577	1899.4	73.71
2004-05	4969	1780	2666	481	2474	1889.94	76.39
2005-06	4431	1809	2732	520	2373	1644.78	69.31
2006-07	5355	1618	2942	551	2616.5	2071.12	79.16
2007-08	5522	1561	2893	490	2616.5	2172.13	83.02
2008-09	5240	1433	2392	431	2374	2071.63	87.26
2009-10	5344	1562	2559	379	2461	2118.51	86.08
Mean	5119.4	1790.9	2647.8	444.8			
S. D.	326.41	262.83	192.41	64.45	Note: KPK= Khyber Pakhtoon Khwa		
C.V.	6.38	14.68	7.27	14.49			

ANOVA Test

Analysis of Variances has utilized to compare the means of all provinces. The hypothesis for this test can be as follows:

H_0: Punjab = Sindh = Khyber Pakthtoon Khwa = Baluchistan

H_1: At least one variable is different

Table 2a. ANOVA test for Traffic Accidents across all Provinces

		Sum of Squares	df	Mean Square	F	Sig.
Total Accidents	Between Groups	116097689.5	3	38699229.83	714.008	0.00
	Within Groups	1951198.5	36	54199.958		
	Total	118048888	39			
Fatal Accidents	Between Groups	29662945.68	3	9887648.558	886.682	0.00
	Within Groups	401446.3	36	11151.28611		
	Total	30064391.98	39			
Non-fatal Accidents	Between Groups	34507805	3	11502601.67	494.85	0.00
	Within Groups	836807	36	23244.63889		
	Total	35344612	39			

Table 2b. ANOVA test for Traffic Accidents across all Provinces

		Sum of Squares	df	Mean Square	F	Sig.
Persons Killed	Between Groups	43445811.28	3	14481937.09	742.844	0.00
	Within Groups	701829.5	36	19495.26389		
	Total	44147640.78	39			
Persons Injured	Between Groups	188176153.4	3	62725384.47	300.739	0.00
	Within Groups	7508542.2	36	208570.6167		
	Total	195684695.6	39			
Total Number of Vehicles Involved	Between Groups	121059343.5	3	40353114.49	448.176	0.00
	Within Groups	3241390.5	36	90038.625		
	Total	124300734	39			

Table 2a & 2b includes ANOVA by taking different variables dependent, one by one. Variables include total accidents, fatal accidents, non-fatal accidents, Persons Killed, Person Injured and total number of vehicles involved in traffic accidents. Results show highly significant values of all variables, which are less than 0.05. Therefore, H_1 is acceptable in all case, which means there was at least one province different from other. At this instant, to analyze the actual mean difference, LSD has applied.

Post-Hoc LSD Test

Post-Hoc LSD (Least Square Difference) test has concerned to identify the mean difference between provinces.

Table 3a. Post-Hoc LSD test for Traffic Accidents across all Provinces

Dependent Variable	(I) Provinces	(J) Provinces	Mean Difference (I-J)	Std. Error	Sig.
Total Accidents	Punjab	Sindh	3328.5	104.115	0.00
		KPK	2471.6	104.115	0.00
		Balochistan	4674.6	104.115	0.00
	Sindh	KPK	-856.9	104.115	0.00
		Balochistan	1346.1	104.115	0.00
	KPK	Balochistan	2203	104.115	0.00
Fatal Accidents	Punjab	Sindh	1525.1	47.226	0.00
		KPK	1801.8	47.226	0.00
		Balochistan	2310.8	47.226	0.00
	Sindh	KPK	276.7	47.226	0.00
		Balochistan	785.7	47.226	0.00
	KPK	Balochistan	509	47.226	0.00
Non-fatal Accidents	Punjab	Sindh	1813.1	68.18305	0.00
		KPK	669.9	68.18305	0.00
		Balochistan	2363.8	68.18305	0.00
	Sindh	KPK	-1143.2	68.18305	0.00
		Balochistan	550.7	68.18305	0.00
	KPK	Balochistan	1693.9	68.18305	0.00

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Table 3b. Post-Hoc LSD test for Traffic Accidents across all Provinces

Dependent Variable	(I) Provinces	(J) Provinces	Mean Difference (I-J)	Std. Error	Sig.
Persons Killed	Punjab	Sindh	1886.8	62.4424	0.00
		KPK	2157.5	62.4424	0.00
		Balochistan	2800.4	62.4424	0.00
	Sindh	KPK	270.7	62.4424	0.00
		Balochistan	913.6	62.4424	0.00
	KPK	Balochistan	642.9	62.4424	0.00
Persons Injured	Punjab	Sindh	4695.9	204.2404	0.00
		KPK	2687	204.2404	0.00
		Balochistan	5668.3	204.2404	0.00
	Sindh	KPK	-2008.9	204.2404	0.00
		Balochistan	972.4	204.2404	0.00
	KPK	Balochistan	2981.3	204.2404	0.00
Total No. of Vehicles involved	Punjab	Sindh	3258.4	134.1929	0.00
		KPK	2108.7	134.1929	0.00
		Balochistan	4765.4	134.1929	0.00
	Sindh	KPK	-1149.7	134.1929	0.00
		Balochistan	1507	134.1929	0.00
	KPK	Balochistan	2656.7	134.1929	0.00
	Balochistan	Punjab	-4765.4	134.1929	0.00

Results of table 3a & 3b show that all provinces have significant mean difference regarding every dependent variable. While taking total accidents as dependent variable, Punjab has mean difference of 3328.5 with Sindh, 2471.6 with Khyber Pakhtoon Khwa and 4674.6 with Baluchistan. Likewise Sindh has a mean difference of -856.9 with Khyber Pakhtoon Khwa and 1346.1 with Baluchistan. Similarly, as comparing Khyber Pakhtoon Khwa and Baluchistan a mean difference of 2203 has identified. Furthermore, mean differences for other variables are shown in the table.

Regression Analysis

Different OLS models have developed to ensure their relationship with total traffic accidents. Following is the OLS model in which total accidents is dependent and total vehicles involved is independent:

Total Accidents = $\beta_0 + \beta_1$ (total vehicles involved)

Table 4. Coefficient of Determination for Total Accidents and Vehicles involved

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	0.992142	0.984346	0.983934382	220.5196868

Table 4 shows coefficient of determination for above OLS model of total accidents and total vehicles involved. Results show that the value of R Square is 0.98; it means the model is 98% reliable.

Table 5. Coefficients for Total accidents and Vehicles involved model

Model		Un-standardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	-118.792	63.932		-1.858	.071
	Total Number of Vehicles Involved	.967	.020	.992	48.883	.000

a. Dependent Variable: Total Accidents

Coefficients for above OLS model has defined in Table 5. Putting these values in the model can give the following effect:

Total Accidents = -118.792 + 0.967 (total vehicles involved)

Above model shows that total accidents and total vehicles involved has positive relationship as increase in one unit of total vehicles involved in accidents can affect total accidents with the increase of 0.967. Therefore, it can also be said that increase in number of vehicles is also a cause of increasing traffic accidents.

DISCUSSIONS

Accident is typically described as a misfortune or unexpected event with actually no obvious cause. Focus of this study is about traffic accidents. There are mainly four types of traffic accidents. There elaboration is already discussed in introduction of this study. Moreover, literature has reviewed to support this study.

Traffic safety can be consist of three E'-s i.e. Education, Enforcement and Engineering. Driving characteristics of a driver is also a crucial factor in traffic accidents. World Health Organization (WHO) report estimated that approximately 1.2 million killed and 50 million get injured each year in road crashes and their projections indicate about 65% of increase in upcoming years.

Previous studies also show a decrease of traffic accidents in developed countries and its increase in developing countries. Studies regarding traffic accidents in Israel, U.K. and India have discussed. Many researches show very models and implications concerning traffic accidents. However, Smeed's researches and models looks like pioneer work in this field.

Focal point of this study is about provincial analysis of traffic accidents in Pakistan. Results has described and tested graphically, descriptively and inferentially.

This research shows that Punjab had utmost and Baluchistan had least ratio of traffic accidents from year 2000 to 2010 as compared to other two provinces of Pakistan. The reason can be population of these provinces as Punjab has highest and Baluchistan has lowest populace. That's why people killed in Punjab due to traffic accidents were also greatest. Fatal accidents and non-fatal accidents had nominal disparity in all provinces except Khyber Phaktoon Khwa. Nevertheless, in Sindh fatal accidents were beyond non-fatal accidents.

Coefficient of Variance shows consistency from year 2005-2006 regarding total accidents. C.V. also shows Punjab as most consistent province as per as total accidents has concerned. Analysis of variances (ANOVA) shows significant mean difference among all provinces Variables included for this analysis were total accidents, fatal accidents, non-fatal accidents, Persons Killed, Person Injured and total number of vehicles involved in traffic accidents. Furthermore, LSD test shows mean difference whose elaboration has discussed above with its

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table. Lastly, OLS model of regression shows total vehicle involved in traffic accidents with total traffic accidents. An increase in one unit of total vehicles involved in accidents can affect total accidents with an increase of 0.967. For that reason, it can also be said that increase in number of vehicles is also a cause of growing traffic accidents.

CONCLUSION

It is concluded that a large number of accidents are not accidents by any means. They are clashes that might and must have been evaded. There are many types and causes of accidents. However, most of accidents occur due to rashness and inattentive behavior of drivers. The results of this study show that Punjab had maximum and Baluchistan had minimum ratio of traffic accidents from year 2000 to 2010 as compared to other provinces of Pakistan. Additionally, in Sindh fatal accidents were greater than non-fatal accidents. In Punjab, persons killed in traffic accidents were far above the ground as compared to other provinces.

Results also show that total accidents were consistent in year 2005-06 and Punjab shows most consistent results among all provinces. ANOVA and LSD test shows that every province had significant different means regarding all variables. Lastly, OLS regression model shows positive relationship between total accidents and total number of vehicles involved in accidents. Therefore, it can also be said that increase in number of vehicles is also a cause of increasing traffic accidents.

LIMITATIONS

Following were the limitation regarding this study:

- Only one variable has tested with total accidents in OLS model.
- Data didn't include the railway accidents and aircrafts crashes.

RECOMMENDATIONS

1. For future researches it is recommended that a comparative study of different countries or different cities could be done regarding traffic accidents. Moreover, some more variables can also be included in OLS model to increase the validity of the model or to check positive or negative relationship of other variables with total traffic accidents.
2. Government should work on weak infrastructure areas of Pakistan. Drivers should follow all rules and regulations to drive. All safety measures must be requisite before starting journey. Moreover, rashness and inattentive behavior must be behavior. Cell phones must not be used during drive as call can be reconnected but life can never.

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