Australian Journal of Basic and Applied Sciences, 10(6) March 2016, Pages: 86-96

AUSTRALIAN JOURNAL OF BASIC AND APPLIED SCIENCES

ISSN:1991-8178 EISSN: 2309-8414
Journal home page: www.ajbasweb.com

"Using Factor Analysis to Analyze Slight and Sever Injury by Age Group and Road User in Jordan".

Adeeb A. Ali ALRahamneh and Omar M. Hawamdeh

Associated Professor, Applied Statistics, Faculty of Business, Al-Balqa Applied University, Jordan

Address For Correspondence:
Adeeb A. Ali Alrahamneh, Associated Professor, Applied Statistics, Faculty of Business, Al-Balqa Applied University, Jordan
E. mail: moheeb982005@yahoo.co.uk

ARTICLE INFO

Article history:
Received 1 January 2016
Accepted 12 March 2016
Available online 20 March 2016

Keywords:
Slight Injury, Sever Injury, Age Group, Road User, Factor Analysis,Jordan

ABSTRACT

The study is aimed at analyze the slight and sever injury by age group and road user in Jordan. Statistics resulting from traffic accidents in Jordan for the year accidents (2014) reached a total of (12727) injury, while sever injuries reached in the same year (2063) injury. Implying that the total injuries, both slight and sever reached (14790). The factor analysis is used to analyze the slight injuries statistics and sever according to age category (0-2 , 3-5 , ... +60), and road user (pedestrian , driver , ..., means of transportation passenger).The study revelled that variables(X_3,X_4) which reprehensive by (Next to Driver, Back Seats) it's shown in four cases in the first factor, which refer to importance of those two factors, while the variable (X_3) hidden or disappears in the 2nd.3rd and 5th factors. However, the variable (X_4) shown in the 2nd factor, where disappears in the 3rd , 4th and 5th factors. The variable (X_1) which reprehensive by (Pedestrian) its appears in the first factor in three cases, and appears in 2nd factor in two cases, also its appears in 6th factor in one cases only while disappears in other factors.

INTRODUCTION

In 2014, traffic accidents costs estimated to reach the threshold of (JD 239 million.The number of slight injuries resulted from traffic accidents in 2014 (12727), while the number of Severin juries in 2014(2063).The highest number of slight injuries was amongst the age group (24-26), that reached (9.6%) of the total number of slight injuries, the highest number of traffic accidents slight injuries resulted from drivers that reached (33.7%) of the total number of slight injuries. The highest number of Sever injuries was amongst the age group (21-23), that reached (9.74%) of the total number of Sever injuries, the highest number of traffic accidents Sever injuries resulted from pedestrian that reached (32.8%) of the total number of Sever injuries.

Every (5.13) minutes a traffic accident occurs, every (24) hours (10.52)pedestrian accidents occurs, every(34) minutes a person is injured in a traffic accident, every(12) hours a person is killed in a traffic accident. Taking into account the lavish financial cost resulting from accidents, these numbers are considered worrying in a country like Jordan which suffers from a scarcity of natural resources, and where human is the center of human development and purpose(Public Security Directorate Traffic Accidents In Jordan , 2014)

Taking into account the lavish financial cost resulting from accidents, these numbers are considered worrying in a country like Jordan which suffers from a scarcity of natural resources, and where human is the center of human development and purpose

Literature Review:

Christian A. Hesse, John B. Ofosu,(2014) discussed the morbidity and mortality of road traffic accidents (RTAs) and other epidemiological variables of RTAs in Ghana between 1991 and 2011. The main results were

To Cite This Article: Adeeb A. Ali ALRahamneh & Omar M. Hawamdeh, "Using Factor Analysis to Analyze Slight and Sever Injury by Age Group and Road User in Jordan". ***Aust. J. Basic & Appl. Sci.**, 10(6): 86-96, 2016*

that more than two thousand people died annually during the period. The morbidity pattern was similar throughout the mortality rate per 100 accidents between 1991 and 2011, increased from 11.0 to 20.2, during this period. Although the number of accidents increased during the period 1991 to 2011, the number of fatal and injurious accidents per 100 road traffic accidents remained almost constant, with an average of 14.8 and 62.0, respectively. The highest fatalities during the period 1991 to 2011 were in the 26 – 35 year old age group. Pedestrians were more likely to be injured or killed in a road traffic accident, than all other road users.

Hammoudi, Abdulla *et al*(2014).The aim of the study was to evaluate relevant factors related to causes of Road Traffic Accidents, RTAs, among drivers in Abu Dhabi, United Arab Emirates, UAE. The results have identified a number of factors as causes of road traffic accidents in Abu Dhabi and suggested ways to reduce the high RTAs reported in the country. The paper argues that the government should continue to encourage participation of all relevant stakeholders for RTAs reduction initiatives.

J. W. Bolderdijk *et al* (2011)Speeding is an important cause for young drivers' involvement in traffic accidents. Driving speed was monitored through GPS technology during one year. Analyses showed that, relative to pre- and post-measurement, as well as a control group, the introduction of a Pay-As-You-Drive insurance fee significantly reduced speed violations of young drivers.

D.Rao, S Mukerjee (2010). The present study was carried out both prospective and retrospectively. The period of study was four year in which 254 cases were analyzed. The cases consisted both fatal and non-fatal, all the cases were analyzed for age, sex, nature and distribution of injuries sustained as a result of road traffic collisions. The major age group affected was 21-30 years (31.51%) and the least age group affected was between 61-70 (01.97%).

Harnam Singh, A. D. Aggarwal,(2010),The study investigate accidents in childhood. The major results is young children are extremely vulnerable to such injuries which are vastly preventable. 59 cases of fatal road traffic accidents in children aged below 16 years, autopsied during 1 year period were studied. More than50% of the cases occurred in winter seasons and majority occurred at 12.00-4.00 pm . None of the victim received any treatment or first-aid at the site of accident. 72.9% of victims died within 6 hrs of accident. The study highlights the pattern of fatalities due to road accidents in children and suggests suitable preventive measures to reduce burden childhood mortality due to road accidents.

Dow Chang,(2008) The aim of this study is to investigate the ratio and distribution pattern of motor vehicle crash fatalities by sex and age from 1996 to 2006.The major findings of the analysis: In Motor vehicle crash fatalities were higher for males than females in all age groups, while the male population is equal to or less than the female Population in all age groups.

Abdel -Aty . Mohamed(2003). This study is concerned with the outcome of the crash. Driver injury severity levels are analyzed using the ordered probit modeling methodology. All models showed the significance of driver's age, gender, seat belt use, point of impact, speed, and vehicle type on the injury severity level. Other variables were found significant only in specific cases. A driver's violation was significant in the case of signalized intersections. Other variables that entered into some of the models were weather condition, area type, and some interaction factors. This study illustrates the similarities and the differences in the factors that affect injury severity between different locations.

Quddus , A. Mohammed (2002). In this paper, an ordered probit model is used to examine factors that affect the injury severity of motorcycle accidents and the severity of damage to the vehicle for those crashes. Nine years of motorcycle accident data were obtained for Singapore through police reports. These data included probit models because they require no assumptions regarding the ordinality of the dependent variable, which in this case is the severity score. Various models are examined to determine what factors are related to increased injury and damage severity of motorcycle accidents. . Factors leading to increased probability of vehicle damage include some similar factors but also show some differences, such as less damage associated with pedestrian collisions and with female drivers. In addition, it was also found that both injury severity and vehicle damage severity levels are decreasing over time.

The Formulation of Factor Analysis Model:

Suppose that we have (P) from factors referred to them by($f_1, f_2, \ldots, f_p$), and we have (n) from observations for (m) among independent variables vectors($\underline{X}$), has Arithmetical means (μ),and variance covariance ($\sum$)such that (p<m), and only one Factor(u_j), to be(Neil H. Timm,2002)

$$x_j = a_{j_1} f1 + a_{j2} f2 + \ldots + a_{jp} fp + u_j \qquad (1)$$

s.t: i=1, 2, 3… m , j= 1, 2, 3,., p

fi: General factors selected among (m) variables

a_{ji} : factors coefficients (fi) related to (X_j) variable, and it's called factor loading (p) to the variable (X_j)

U_j : Unique factor

The researcher formulates the model using matrices as the following (Timothy,2006)

$$\underline{X}_{m*1} = \underline{A}_{m*p} . \underline{f}_{p*1} + U_{m*p} \quad (2)$$

Assumptions of Factor Analysis:

There is Inter-correlation between the group of variables. The Inter-correlation is produced because of general factors that affect it, and what the. Amount these factors represent is referred to the actuality of these factors Variables and reduction of the numerous variables to a few factors. Since this assumption depends on the standard value of the variables, so that the previous variables change to new standard variables that are distributed With a mean of (Zero) and variation of (1). Thus the Assuming the existence of (m) from the variables with a standard value (Zj), it can be re-formulate the main model of factor analysis as follows effect of different measure units variables is disappearing, and therefore, the standard value (m) will be found from of the variables of a sample size (n) (Neil H. Timm,2002)

$$Z_j = L_{j1}F_1 + L_{j2}F_2 + ...L_{ip}F_p + e_j \quad (3)$$

Where that (Zj) represents the standard value of the variable (j), and (Lji) is representing the value of the saturation factor (i) of the variable (j), and (Fi) is a standard value of the variable (i), and (ej) represents the standard value of the individual factors .

Further to the above, the total variation can be divided into three sections as follows:

1) ***Common Variance:***

Common Variance is part of the total common variance and is associated to the rest of variables. It is calculated from general factors and is symbolized by))which can be written as follows (Aivinc,2002)

$$h^2 j = L^2 j1 + L^2 j2 + L^2 jp \quad (4)$$

Special Variance:

The special variance is considered one of the total variance components. It is not linked to the rest of the variables , but is linked to the same variable , and the way they are calculated as follows:

$$Uj^2 = bj^2 + ej^2 \quad (5)$$

$$\Rightarrow bj^2 = Uj^2 - e^2 j$$

Where (bj^2) represents the special variance if the variable (j), and ($e^2 j$) is the error variance.

2) ***Error Variance:***

That part of the total variation resulting from unexplained factors in the model, which usually result from errors in the selection or measurement of the sample, as well as any changes that cannot be controlled and they are symbolized with($e^2 j$) and error variance can be rewritten as follows. (Neil H. Timm,2002)

$$e^2 j = 1 - (h^2 j + b^2 j) \quad (6)$$

The second assumption:

Assuming that there is a correlation between the two variables (j, jt) that can be calculated based on nature and effect saturation and of the common factors. This assumption can be represented for the orthogonal factors in the following format:

$$r_{ijt} = a_{j1ajt1} + a_{j2ajt2+....+......a_{jmajtm}} \quad (7)$$

This means that the correlation coefficient between the two variables represents the sum of the multiplication of the downloads of variables by the common factors between, and by using matrixes, it can be expressed by rewriting the previous equation as follows:

$$\underline{R} = \underline{A}\underline{A}^t$$

As the (R) represents the correlation matrix , and that (A) is a matrix downloads of factors

Communalities:

The saturation quantity if the factor is defined as it is the sum of squaring downloads (saturations) factors of that variance, and the percentage of the saturation contrast that explained by the factors from the correlation matrix analysis, and it represents the extent of the overlap between variances and common factors. So the quantities of saturations is:

$$h^2_{j=} = \sum_{p=1}^{m} a^2 jp$$

$0 \le h^2 j \le 1$, as:

If the value of (h2 j) for very large variable close to the correct one, it is an indication that this variable interferes fully with the abstracted factors, and this means the importance of variable (j) in the studied phenomenon, but if the quantity of saturation (h2j) for one of the variables equal zero, then, the factors saturations for that variable will be (zero), so extracted factors could not interpret any part of the variation of that variable, and if the amount of the quantity saturation (h2j) between zero and one, this is that sufficient indication to the existence of a partial overlap between the variables and factors (Harman, 1976)

Factor Analysis Methods:

The factor methods analysis aims to estimate the value of saturation matrix for factors (X) of the data matrix (X), and this step is called the initial solution. and after that, it is turning the factors to be interpreted in the light of the data which is dealt by the study to achieve a final solution.

Principle component Method:

The method of the main components is considered one of the most important methods in downloads factors to reach the initial solution. The principle in this methods is based on the conversion of the independent variables , which suffers from a linear correlation to linear combinations and are called the principal components in order to reclassify data according to number of components that are derived from the original independent variables that explain most of the total variance of the original variables and be Orthogonal to these combinations, so it means no correlation between them.

There are two prerequisites that must coexist to build basic components:

The first: should be the key components is not correlated to the orthogonal.

The Second: the first principal component explains the largest proportion of variations in the independent variables while the second component explains the second largest proportion of the variations in the independent variables, and so on for the rest of the main components.

Eigen Roots and Vectors:

This is to say that the zero vector (Xpx1) is an Eigen vector for the distinctive square matrix (Apxp) if there is such a constant (λ) so that (Richard A. and EnricoS,1999) :

$$(A - \lambda I)X = \text{Zero} \qquad (9)$$

The Eigen root of the matrix (A) which is symmetric to the vector Eigen vector (X) b (λ) and that the (Eigen Equation) of the square matrix of (APXP) is Polynomial Equation from class (P) and as follows (Richard A. & EnricoS,1999):

$$|A - \lambda I| = \text{Zero} \qquad (10)$$

And its general format could be written as following:

$$\lambda\ p + Cp\text{-}1\ \ \lambda\ p\text{-}1 = \text{Zero} \qquad (11)$$

And solving the equation (11) we get the (P) from the Eigen roots (pλ,. . . , 2λ, λ)

The Factor Analysis and Principle components (Neil H. Timm,2002)

The principle idea is based on finding the key components as the number of original variables (xj) and (j = 1, 2, ..., m), then finding (p) from the key components to be modified in order to create a model. The reason for selecting the first (p) of the key components is to interpret the largest proportion of the variance. We note that the value of the main components are non-correlated, and this could be of advantage to select the factors, and in order to achieve the assumption that states that variation factors are equal to (1).

Each principle component is divided on its standard deviation, and the result is called the general factor.

$$Fi = \frac{pc_j}{\sqrt{\text{var}(pc_j)}} = \frac{pc_j}{\sqrt{\lambda_j}}, \quad j = 1,2,4,\ldots..m \qquad (12)$$

Represent general factor (i): F_j

Represent major component (j): Pc_j

The variance of major component (j) λ:

Its notice that from the equation (12), that the major component model contains of (Pc_j) which represent linear function to (X_j) as the following:

$$x_1 = a_{11} pc_1 + a_{21} pc_2 + ... + a_{m1} pc_m$$

$$x_2 = a_{12} pc_1 + a_{22} pc_2 + ... + a_{m2} pc_m \quad (13)$$

$$x_p = a_{1p} pc_1 + a_{2p} pc_2 + ... + a_{mp} pc_m$$

From equation (12) it possible to represent the (Pc_j) as the following:

$$pc_j = F_i(\text{var}(pc_j)^{1/2} \quad (14)$$

It could represent to equations system (13) as the following:

$$x_j = a_1 jF_i(\text{var}(pc_1))^{1/2} + a_2 jF_2(\text{var}(pc_2))^{1/2} + ...mjF_m(\text{var}(pc_m))^{1/2} \quad (15)$$

The equation (14) contains all general factors effects which numbers (m), selection (p) number among factors which (P<m) , equation became in this formula:

$$A_j i = a_{ij}(\text{var}(pc_j))^{1/2} \quad (16)$$

But other ( ) factors are errors or residuals

$$e_j = a_{p+1}.F_{p+1}(\text{var}(pc_{p+1}))^{1/2} + a_{p+2}.F_{p+2}(\text{var}(pc_{p+2}))^{1/2} + ... + a_{mj}F_m(\text{var}(pc_m))^{1/2} \quad (17)$$

Based on equations numbers (16) and (17) it is possible to reformulate any variable (x_j) as the following:

$$x_j = A_{j1}F_1 + A_{j2}F_2 + ... + A_{jp}F_p + e_j$$

But the variable variance ( )

$$\text{var}(x_j) = h^2{}_j + u_j{}^2$$

Since the variables in its standard form then ,

$$\text{var}(x_j) = 1 = h^2 j + u^2 j$$

$$\Rightarrow u^2{}_j = 1 - h^2 j$$

The researcher used vertical axes rotation method by (varimax), which is characterized by conserve the independent character. Among variables .it works on excess rotation in the way to make the variance satisfy loading degrees to all factors in maximization possible.

Definitions:

Traffic Accident:

Any incident caused by at least one vehicle resulted in injuries or fatalities or property damages only.

Driver:

Any person who is in actual manual control of a motor vehicle

Passenger:

Any person, other than a driver who is an occupant in a motor vehicle, stepping down or up into it.

Pedestrian:

Any person walking on his feet on roads. This also, includes: bicyclists, persons pulling or towing a children wagon, wheelchairs, and wagons.

Road:

The paved land surface provided for public traffic including movement of vehicles and pedestrians, bridges, tunnels and parking areas.

Passenger Coach:

A vehicle designed to transport more than thirty persons

Slight Injury:

Any injury resulting from a traffic accident, including superficial wounds and bruises, as well as entries to the hospital for period not exceeding (24 hours) definition does not include scratches and bruises and enter the hospital for surveillance.

Sever Injury:

Is the infection that need to be interventions specialized medical, both within hospitals or outside ,such as surgery or treating bone fractures , or deal with cases that nerves and others and other includes cases of head injuries and loss of consciousness according to (Glasgow coma scale): (0-15) infection to severe if the measurement at least (10). Application Side:

Table 1: Slight Injuries by Age Group and Road User

Age Group	Pedestrian (X_1)	Driver (X_2)	Next to Driver (X_3)	Back Seats (X_4)	Bus Passengers (X_5)	Cargo Passengers (X_6)	Total
0-2	168	1	454	137	11	2	773
3-5	373	0	235	91	3	4	706
6-8	361	0	180	85	2	3	631
9-11	237	0	182	79	2	4	504
12-14	167	64	80	84	5	5	405
15-17	181	61	115	75	3	10	445
18-20	271	306	209	151	13	2	952
21-23	323	365	316	137	11	7	1159
24-26	234	503	325	142	8	11	1223
27-29	93	479	285	103	5	5	970
30-32	86	434	258	59	4	3	844
33-35	87	426	154	42	4	3	716
36-38	79	346	136	32	5	2	600
39-41	84	259	120	26	3	4	496
42-44	63	235	116	31	3	1	449
45-47	52	207	96	19	1	4	379
48-50	49	148	105	18	0	1	321
51-53	46	98	70	11	3	2	230
54-56	33	80	59	17	2	0	191
57-59	37	62	53	7	0	0	159
60+	177	213	153	27	3	1	574
Total	3201	4287	3701	1373	91	74	12727

Table 2: correlation matrix between the six variable's shown in the table below

	pedestrian	Driver	Next to Driver	Back Seats	Bus Passengers	Cargo Passengers
pedestrian	1					
Driver	-.173-	1				
Next to Driver	.488	.288	1			
Back Seats	.726	.188	.804	1		
Bus Passengers	.434	.353	.710	.830	1	
Cargo Passengers	.418	.287	.354	.549	.291	1

Determinant = .014

We notice that the determinant of correlation matrix equal (0.014 > 0.00001) which means there is no Multi-Collinearity Problem

Table 3: KMO and Bartlett's Test

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.616
Bartlett's Test of Sphericity	Approx. Chi-Square	73.597
	df	15
	Sig.	.000

According to (KMO) test, we notice that its value equal (0.618) which is acceptable to judge that sample size is valid. The acceptable lower limit in (KMO) test is (0.5).

Based on (Bartlett's Test) the researchers going to test the following hypotheses:

Ho: correlation matrix is Identity matrix

H1: correlation matrix is not Identity matrix

Since (p-value) is equal 0.000 , then we reject Ho and accept H1, which means the that correlation matrix is not Identity matrix.

Data Analysis by using (5) Factors

Data appears in table (1) analyzed , according to items numbers (4,6,7) formulas. The results shown in the following table (4):

Table 4: shown the Rotated Component Matrix

	Component					Extraction
	1	2	3	4	5	
Bus Passengers	.907*	.184		.295	.202	.997
Back Seats	.656*	.464	.340	.450		1.000
pedestrian	.239	.910*	.215	.202	-.157-	.998
Cargo Passengers	.122	.199	.952*	.120	.151	.965
Next to Driver	.406	.229	.138	.860*	.148	.991
Driver	.153	-.120-	.141	.107	.965*	.998
Variance %	25.211	19.744	18.551	18.252	17.376	99.134

It can be seen in the table above that the first factor interprets (25.211%) from the total variance. the first factor includes two statistically significance variables Those variables are bus Passengers(X5) and back Seats(X4). The second factor interprets (19.744%) from the total variance. This factor includes one statistically significance which is pedestrian (X1). The third factor interprets (18.551%) from the total variance. This factor includes one statistically significance which is Cargo Passengers (X6). The fourth factor interprets (18. 252%). from the total variance. This factor includes one statistically significance which is Next to Driver(X3).The Fifth factor interprets (17.376%) from the total variance. This factor includes one statistically significance which is a driver (X2).It is observed that the total of the first five factors reaches (99.134%), in accordance to the accumulative percentage, as a result, the five factors would be chosen based on the acceptable percentage that records a value of 99.134%.

Table 5: shown the Rotated Component Matrix

	Component				Extraction
	1	2	3	4	
Next to Driver	.942*	.200	.102	.181	.914
Back Seats	.672*	.635*	.117	.299	.948
Bus Passengers	.645	.569	.408		.971
pedestrian	.260	.827*	-.266-	.305	.958
Driver	.152		.942*	.170	.909
Cargo Passengers	.157	.220	.172	.933*	.973
Variance %	31.165	25.122	19.642	18.629	94.558

It is observed that, As shown from the above table, the first factor interpret (31.165%) from the total variance. the first factor includes two statistically significance variables Those variables are Next to Driver (X3) and back Seats(X4) The second factor interpret (25.122%) from the total variance .This factor includes two statistically significance variables Those variables are Next to back Seats(X4) and pedestrian (X1). The third factor interprets (19.642%) from the total variance. This factor includes one statistically significance which is Driver (X2).The fourth factor interprets (18.629%). from the total variance. This factor includes one statistically significance which is Cargo Passengers (X6). Its observed that the total of the first five factors reaches (94.558%), in accordance to the accumulative percentage, this percentage is valid to choose the four factors. As a result, the five factors would be chosen based on the acceptable percentage that records a value of 94.558%.

Table 6: shown the Rotated Component Matrix

	Component			Extraction
	1	2	3	
Bus Passengers	.909*		.204	.856
Back Seats	.887*	.408		.921
Next to Driver	.876*	.160	.119	.807
pedestrian	.595	.479	-.522-	.957
Cargo Passengers	.189	.950*	.155	.872
Driver	.208	.167	.922*	.962
Variance %	46.901	22.598	20.092	89.59

It is observed that, As shown from the above table, the first factor interpret (46.901%) from the total variance. the first factor includes two statistically significance variables Those variables are Bus Passengers (X5) and Next to Driver (X3) The second factor interpret (22.598%) from the total variance. This factor includes one statistically significance which is Cargo Passengers (X6).The Third factor interprets (20.092%) from the total variance. This factor includes one statistically significance which is Driver (X2). Its observed that the total of the first five factors reaches (89.59%), in accordance to the accumulative percentage, this percentage is valid to choose the three-factor. As a result, the five factors would be chosen based on the acceptable percentage that records a value of 89.59%.

Table 6: shown the Rotated Component Matrix.

	Component		Extraction
	1	2	
Back Seats	.977*		.841
Next to Driver	.837*	.193	.913
Bus Passengers	.814*	.281	.738
pedestrian	.787*	-.470-	.954
Cargo Passengers	.600	.168	.741
Driver	.192	.936*	.388
Variance %	55.554	20.702	76.256

It is observed that, As shown from the above table, the first factor interpret (55.554%) from the total variance. the first factor include four statistically significance variables Those variables are Back Seats (X_4) and Next to Driver (X_3) , and Bus Passengers (X_5) and pedestrian(X_1) . The second factor interpret 20.702%) from the total variance

This factor include one statistically significance which is Driver (X_2). As a result, the two factors would be chosen based on the acceptable percentage that records a value of 76.256%.

Table 7: Comparison Results For Slight Injuries.

	First Factor	Second Factor	Third Factor	Fourth Factor	Fifth Factor
Five Factors	X3, X4	X1	X6	X3	X2
Four Factors	X3, X4	X4,X1	X2	X6	-
Three Factors	X5,X4,X3	X6	X2	-	-
Two Factors	X4,X3,X5,X1	X2	-	-	-

It is noted from the table (7) that the two variables (X3) and (X4) have appeared I (7) in the four cases in the first factor I,

The variable (X_3) has disappeared In the factor II , III and V , while the variable (X_4) has appeared in the factor II , I V and V.

The Variable (X_1) has appeared in factors (1,2) and disappeared in the rest of factors.

The variable (X_2) has emerged in the second , third and fifth factors and disappeared in the first and fourth factors. The fifth variable has appeared in the first factor and only disappeared in the rest offactors.The sixth variable has emerged in the second factors , III, IV , while it disappeared in the first and fifth factors.

Table 8: Sever Injuries by Age Group and Road User

Age Group	Pedestrian (X_1)	Driver (X_2)	Next to Driver (X_3)	Back Seats (X_4)	Bus Passengers (X_5)	Cargo Passengers (X_6)	Total
0-2	38	0	75	17	0	1	131
3-5	77	0	64	13	1	3	158
6-8	86	0	25	13	0	1	125
9-11	61	0	39	6	1	0	107
12-14	31	14	8	12	1	1	67
15-17	31	15	19	15	0	0	80
18-20	32	68	24	23	0	1	148
21-23	80	69	32	17	2	1	201
24-26	40	62	33	18	0	0	153
27-29	22	83	27	7	0	0	139
30-32	19	53	24	6	1	3	106
33-35	14	59	22	11	0	3	109
36-38	12	35	21	5	0	1	74
39-41	15	40	19	5	0	1	80

42-44	7	35	14	3	0	0	59
45-47	22	23	11	3	0	1	60
48-50	18	21	11	2	0	0	52
51-53	8	22	9	3	0	0	42
54-56	9	9	14	6	0	0	38
57-59	6	8	6	1	0	0	21
60+	49	32	24	8	0	0	113
Total	677	648	521	194	6	17	2063

Table 9: correlation matrix between the six variables' shown in the table below

	pedestrian	Driver	Next to Driver	Back Seats	Bus Passengers	Cargo Passengers
pedestrian	1.000					
Driver	-.165-	1.000				
Next to Driver	.561	-.153-	1.000			
Back Seats	.544	.243	.515	1.000		
Bus Passengers	.552	.068	.259	.224	1.000	
Cargo Passengers	.190	.113	.346	.219	.359	1.000

Determinant = .165

We notice that the determinant of correlation matrix equal (0.014 > 0.00001) which means there is no Multi-Collinearity Problem

Table 10: KMO and Bartlett's Test.

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.549
Bartlett's Test of Sphericity	Approx. Chi-Square	30.901
	df	15
	Sig.	.009

According to (KMO) test, we notice that its value equal (0.549) which is acceptable to judge that sample size is valid. The acceptable lower limit in (KMO) test is (0.5).

Table 11: shown the Rotated Component Matrix

	Component						Extraction
	1	2	3	4	5	6	
Bus Passengers	.950*			.178		.229	1.000
Driver		.983*	.126				1.000
Back Seats		.162	.920*		.249	.232	1.000
Cargo Passengers	.165			.969*	.150		1.000
Next to Driver		-.105-	.253	.178	.915*	.218	1.000
pedestrian	.331	-.127-	.298		.272	.842*	1.000
Variance %	17.578	17.071	17.068	16.927	16.824	14.532	100.000

It is observed that, As shown from the above table, the first factor interpret (17.578%) from the total variance. This factor includes one statistically significance which is Bus Passengers (X5).The second factor interprets (17.071%) from the total variance. This factor includes one statistically significance which is Driver (X2). The Third factor interprets (17.086%) from the total variance. This factor includes one statistically significance which is Back Seats (X4).The fourth factor interprets (16.927%) from the total variance This factor include one statistically significance which is Cargo Passengers (X6).The fifth factor interprets (16.824%) from the total variance This factor include one statistically significance which is Next to Driver (X3).The sixth factor interprets (14.532%) from the total variance This factor includes one statistically significance which is pedestrian(X1). Accordance to the accumulative percentage, this percentage is valid to choose the six factors.

Table 12: shown the Rotated Component Matrix.

	Component					Extraction
	1	2	3	4	5	
Bus Passengers	.950*				.199	.891
pedestrian	.612*	.601*	-.255-	.301		.981
Back Seats		.916*	.200	.244	.105	.999
Driver			.980*			.955
Next to Driver	.143	.303	-.109-	.918*	.177	.958
Cargo Passengers	.168			.147	.968*	.995
Variance %	22.18	21.868	18.100	17.145	17.017	96.310

It is observed that, As shown from the above table, the first factor interpret (22.18%) from the total variance. This factor includes two statistically significance variables those variables are Bus Passengers (X5) and pedestrian (X1). The second factor interprets (21.868%) from the total variance. This factor includes two statistically significance variables those variables are pedestrian (X1) and Back Seats (X4). The Third factor interprets (18.100%) from the total variance. This factor includes one statistically significance which is Driver (X2). The fourth factor interprets (17.145%) from the total variance This factor include one statistically significance which is Next to Driver (X3). The fifth factor interprets (17.017%) from the total variance this factor include one statistically significance which is Cargo Passengers (X6).

Table 13: shown the Rotated Component Matrix.

	Component				Extraction
	1	2	3	4	
Back Seats	.870*	.113	.328		.878
Next to Driver	.798*		-.264-	.338	.944
pedestrian	.663	.632*	-.196-		.827
Bus Passengers		.940*		.222	.878
Driver			.970*		.946
Cargo Passengers	.137	.174		.952*	.961
Variance %	31.002	22.219	19.424	17.934	90.578

It is observed that, As shown from the above table, the first factor interpret (31.002%) from the total variance. This factor includes two statistically significance variables Those variables are Back Seats (X4) and Next to Driver (X3). The second factor interprets (22.219%) from the total variance. This factor includes two statistically significance variables those variables are pedestrian (X1) and Bus Passengers (X5). The Third factor interprets (19.424%) from the total variance. This factor includes one statistically significance which is Driver (X2). The fourth factor interprets (17.934%) from the total variance this factor include one statistically significance which is Cargo Passengers (X6). As a result, the four factors would be chosen based on the acceptable percentage that records a value of 90.578%.

Table 14: shown the Rotated Component Matrix.

	Component			Extraction
	1	2	3	
Back Seats	.849*		.394	.783
pedestrian	.792*	.327	-.221-	.928
Next to Driver	.787*	.220	-.161-	.694
Cargo Passengers		.807*	.146	.877
Bus Passengers	.265	.790*		.696
Driver			.957*	.682
Variance %	34.187	23.977	19.494	77.657

It is observed that, As shown from the above table, the first factor interpret (34.187%) from the total variance. This factor includes three statistically significance variables Those variables are Back Seats (X4) and Next to Driver (X3), and pedestrian (X1).The second factor interprets (23.977%) from the total variance. This factor includes two statistically significance variables those variables are Cargo Passengers (X6) and Bus Passengers (X5). The Third factor interprets (19.494%) from the total variance. This factor includes one statistically significance which is Driver (X2). As a result, the three factors would be chosen based on the acceptable percentage that records a value of 77.657%.

Table 15: shown the Rotated Component Matrix.

	Component		Extraction
	1	2	
Pedestrian	.849*	-.230-	.773
Next to Driver	.785*	-.199-	.902
Back Seats	.714*	.278	.656
Bus Passengers	.653*	.119	.587
Cargo Passengers	.518*	.329	.441
Driver		.949*	.376
Variance %	42.359	19.882	62.241

It is observed that, As shown from the above table, the first factor interpret (42.359%) from the total variance. This factor includes five statistically significance variables those variables are pedestrian (X1) and Next to Driver (X3), and Back Seats (X4) and Cargo Passengers(X6). The second factor interprets (19.882%) from the total variance. This factor Include one statistically significance which is a driver(X2). As a result, the two factors would be chosen based on the acceptable percentage that records a value of 62.241%.

Table 16: Comparison Results For Sever Injuries.

	First Factor	Second Factor	Third Factor	Fourth Factor	Fifth Factor	Sixth Factor
Six Factors	X5	X2	X4	X6	X3	X1
Five Factors	X5, X1	X1,X4	X2	X3	X6	-
Four Factors	X4, X3	X1, X5	X2	X6	-	-
Three Factors	X4, X1 X3,	X6, X5	X2	-	-	-
Two Factors	X1, X3 X4. X5, X6	X2	-	-	-	-

It is noted from the table (16) that the Variable (X1) has appeared in factor I and in three cases, and also appeared in the second factor in two cases, and also appeared in the sixth factor in one case, while it disappeared in the rest of factors.

The variable (X2) has appeared in the second factor in two cases, while it appeared in the third factor in the three cases, and disappeared in the rest of the factors. the variable (X3) has appeared in the fourth and fifth factors, while the variable (X4) has appeared in I and II and third. The variable (X5) has appeared in the first factor and in only two cases. The variable (X6) has emerged in the first factors in one case and the fourth in two cases, as well as the factor V.

Conclusions:

1) When studying the slight injuries , this study appears the variables(X3,X4) which reprehensive by (Next to Driver, Back Seats) it's shown in four cases in the first factor, which refer to importance of those two factors, while the variable (X3) hidden or disappears in the 2nd.3rd and 5th factors. But the variable (X4) shown in the 2nd factor, where disappears in the 3rd, 4th and 5th factors.

2) While studying the severe injuries, the variable (X1) which reprehensive by(Pedestrian) its appears in the 1st factor in three cases, and appears also in 2nd factor in two cases, also its appears in 6th factor in one case only. While disappears in other factors.

REFERENCES

Abdel -Aty Mohamed, 2003. *Analysis of driver injury severity levels at multiple locations. using ordered probit models.* Journal of Safety Research, 34(5): 597-603.

Afifi, A.A and V. Clark, 1984." Computer Aided Multivariate Analysis", Life Time .Learning publications, California, USA.

Alvin C. Rencher, 2002. Methods of Multivariate Analysis",2rd,John Wiley & Sons.

Christian A. Hesse, John B. Ofosu, 2014. Epidemiology Of Road Traffic Accidents, European Scientific Journal, 10(9): 370-381.

Dow Chang, 2008. Comparison of Crash Fatalities by Sex and Age Group, National High Way Traffic Safety Administration

Rao, D., S. Mukerjee, 2010. *A STUDY OF PATTERN OF INJURIES IN ROAD TRAFFIC COLLISIONS* ,

Harnam Singh, A.D. Aggarwal, 2010. Fatal Road Traffic Accidents among Young Children, Journal Of The Indian Academy Of Forensic Medicine, 32(4): 286-288.

Hammoudi. Abdulla *et al*., 2014. *Road Traffic Accidents Among Drivers in Abu Dhabi, United Arab Emirates*, Journal of Traffic and Logistics Engineering, 2(1): 7-12.

Harm Chicago, USA. an, H.H., 1976. :"Medren Factor Analysis " , 3rd ed Edition , University of Chicago press ,

Bolderdijk, J.W. *et al*., 2011. *Effects of Pay-As-You-Drive vehicle insurance on young drivers' speed choice: Results of a Dutch field experiment*, Accident Analysis and Prevention, 43(3): 1181-1186.

Neil, H. Timm, 2002. Applied Multivariate Analysis, Springer- Verlag New York, Inc

Quddus, A. Mohammed *et al*., 2002. *An analysis of motorcycle injury and vehicle damage severity using ordered probit models* ,Journal of Safety Research, 33(4): 445-462.

Richard A. Reyment and Enrico Savazzi, 1999. Aspects of Multivariate Statistical Analysis inGeology",Elsevier Science.

Timothy A. Brown, 2006. " Confirmatory Factor Analysis for Applied Research.The Guilford, New