

Determination of the main factors of road accidents In Algeria during the period (2012-2014)

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ملخص:

لإيجاد حلول مناسبة لمشكلة الحوادث المرورية، تكافح سلطات جميع دول العالم (ومن بينها الجزائر) باستمرار وتعمل بلا كلل من أجل الحد من مأساة ضحايا وعائلات ضحايا هذه الحوادث، التي أصبحت تشكل عنصرا رئيسيا لانعدام الأمن، كما أصبحت نتيجة لمجموعة معقدة من عدة عوامل تكمل بعضها البعض. نحاول من خلال هذه الورقة البحثية توضيح واقع حالة انعدام الأمن على الطرق في الجزائر، ومعرفة العوامل الرئيسية لحوادث المرور على المستوى الوطني. ولقد تبين من خلال النتائج أن العامل البشري هو السبب الرئيسي لحوادث الطرق في الجزائر.

الكلمات المفتاحية: حوادث الطرقات، العامل البشري، تحليل المركبات الأساسية.

Abstract :

Authorities of all countries of the world (and therefore of Algeria) are constantly struggling and working tirelessly to find adequate solutions to the problem of traffic accidents, in order to weaken the tragedy of those who are hard hit (Minimizing its severity and reducing the frequency of its occurrence). The traffic accident - the main element of insecurity - is the result of a complex combination of several factors that are at least complementary to one another. In this work, we tried to clarify the reality of the state of road insecurity in Algeria, and to know the main factors of traffic accidents at the national level. The object of this study is to determine the main factors influencing the number of traffic accidents in Algeria, as a result, it has been found that the human factor is the

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main cause of road accidents in Algeria.

Keywords: Traffic accidents, human factor, PCA.

Introduction

In 2014, according to CNPSR (Centre National de Prévention et de Sécurité Routière, National Center for Road Safety and Prevention), 40101 accidents were registered on the Algerian road network with 4812 deaths, 65263 wounded, with an average of 13 deaths, 181 wounded and 111 accidents per day¹. In Algeria, this phenomenon constitutes a major danger that affects everyday life, to the point that it becomes a terrorism of the roads.

Road accident and the severity of their consequences are due to a combination of factors related to the driver, vehicle, road and traffic conditions. On the basis of available informations on the main causes of road accidents, and in the context of a statistical study, we are interested here to determine the main factors correlated with the number of road accidents at national level. The aim of this paper is therefore to make an analytical study of the direct causes of road accidents and to determine the main causes of road accidents during the period from January 2012 to December 2014, including 36 months.

Therefore, this issue will focus on the following main question :
What are the main factors of road accidents in Algeria?

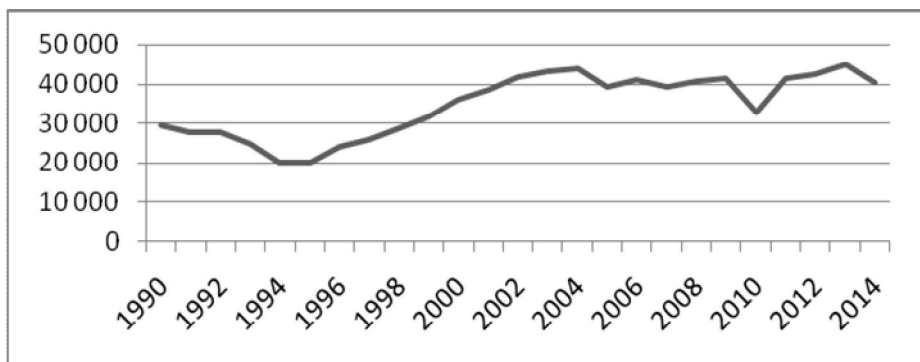
1. Road accident in Algeria: Descriptive analysis

1.1 Evolutions of road accidents in the period (1990-2014)

The following graph illustrates the evolution of the number of road traffic accidents in Algeria during the period (1990-2014)

1 National Center for Road Safety and Prevention (Link : <http://www.cnpsr.org.dz/files/download/12%20mois%202014.pdf>, P 02, (seen: 04/14/2016),

Graph 01 : Evolutions of road accidents in Algeria 1990-2014



Source: developed on the basis of CNPSR data

In general, it is shown that each year has a different relative importance than the other years .According to the reading of the data, we can distinguish four main periods:

- The first period from 1990 to 1995 where the number of accidents is reduced; In 1990, 29493 accidents were recorded, which fell to 20127 accidents in 1995 (year of rupture), i.e. an average variation of 7.36% per year .The most significant increase was observed during the period (1993-1994) with a variation of 18.92%.

- The second period (1996-2004) is characterized by an upward trend, the number of accidents has increased steadily over the period . In fact, there were 23949 accidents in 1996, the number of accidents more than doubled at the end of 2004 (43777 accidents), i.e. an average variation of 9.02% per year, due to uncontrolled growth of the car fleet in Algeria During this period.

- The third period which extend from 2005 to 2010 is characterized by a number of accidents that remain between 39000 in 2005 and 41000 in 2009, this period of increase is followed by a remarkable decrease in the number of accidents during the year 2010

From 41224 in 2009 to 32873 in 2010, and this can be explained by the application of the new road traffic reform in 2009^{*}.

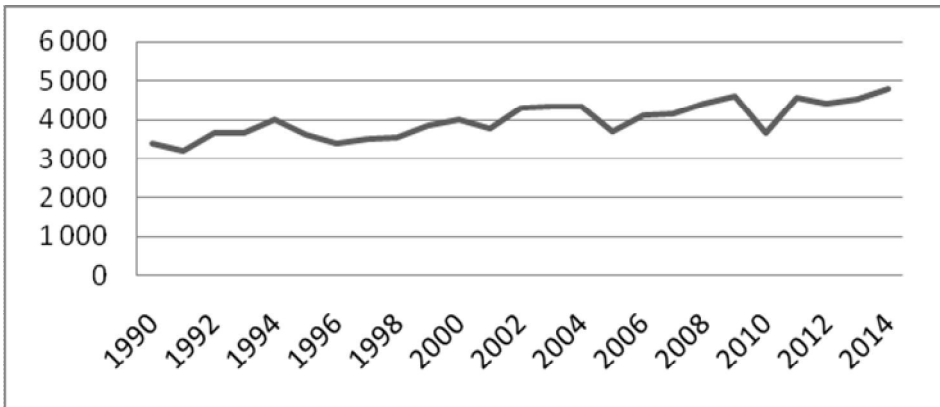
- The fourth period (2011-2014) is marked by a significant increase from 46741 accidents in 2011 to 44904 in 2013, with a difference of 3437 accident, except for 2014 where there has been a remarkable decrease estimated by 4767 accidents ; This positive development can be explained by the good organization and the continue control of the circulation, which is supported by awareness-raising campaigns organized for the benefit of road users.

1 Evolutions of road accidents victims in the period (1990-2014)

1.2.1 Evolutions of Death toll

The following graph illustrates the evolution of death toll in Algeria during the period (1990-2014).

Graph 02: Evolutions of death toll



Source: Developed on the basis of CNPSR data

^{*} In July 2009, on the 22nd, a law was promulgated under the n ° 09-03 of the 29 Rajab 1430 corresponding to 22 July 2009 modifying and completing the law n ° 01-14 of 29 Joumada El Oula 1422 corresponding to August 2001, 19 relative To the organization, security and traffic police.

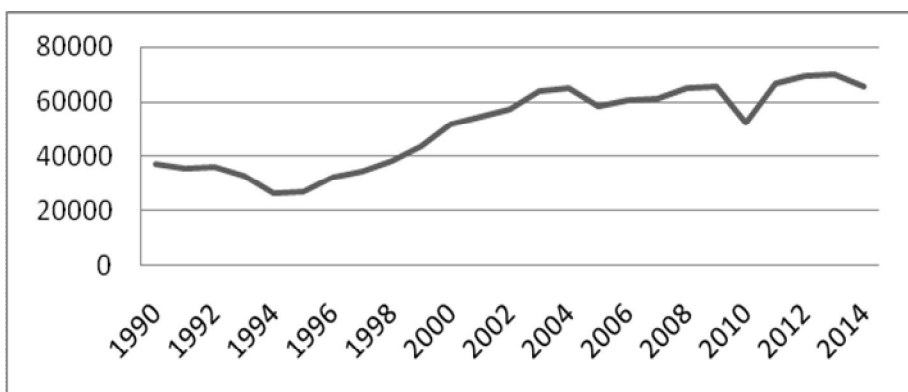
From this graph we can distinguish two periods:

- The first period (1994-2000): with a number of dead less than 4000 deaths per year, this decrease may be justified by the downward trend in the number of accidents recorded during this period.
- The second period (2000-2014): where the number of accidents fluctuated significantly, this implied by an increase in the number of dead from 4025 in 2000 to 4812 in 2014, except for 2005 and 2010 with a decrease of 14.82%, 20.56% respectively, this may be justified by the application of the new road code reforms (March 2005 and 2009) ¹.

1.2.2 Evolutions of wounded number (1990-2014)

The following graph illustrates the evolution of wounded number in Algeria during the period (1990-2014).

Graph 03: Evolutions of tne number of wounded



Source: developed on the basis of CNPSR data

According to the above graph, we can distinguish three periods of evolutions:

- The first period is marked by a significant decrease which lasted 6 years (1990-1995). The number of victims decreased by 31%, from

¹ Insécurité routière en Algérie et dans le monde, (Link : <http://www.cna.dz/Documentation/Travaux-du-CNA/Publications-du-CNA/Bulletin-des-assurances-n-14/Insecurite-routiere-en-Algerie-et-dans-le-monde>, seen : Mars 2016)

36955 wounded in 1990 to 26,768 in 1995. This period is also characterized by a significant decrease of -19.86% in 1994.

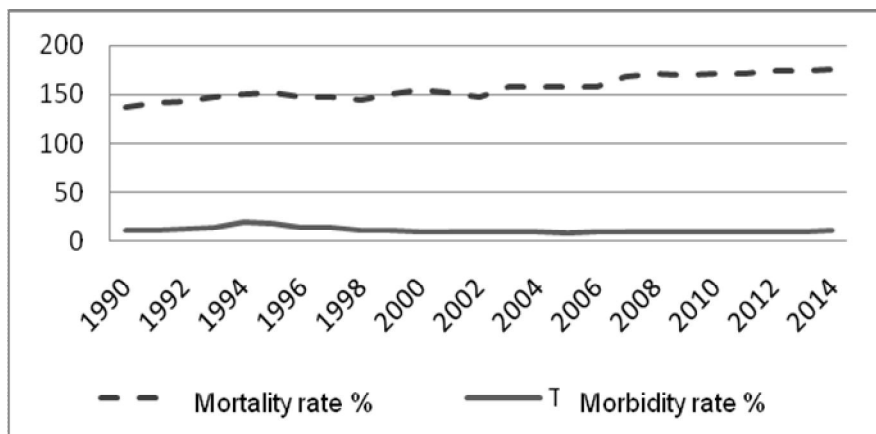
- The second period is characterized by an upward trend, with number of wounded continuing to increase throughout, it is increased from 3995 in 1996 to 64979 in 2009, it has almost doubled, except in 2005, which is reduced by -10.25%. This decrease, may be explained by the application of the new road code provisions in March 2005, and for the first time since 1990, the number of accidents has considerably decreased either by 20,26% (about 9,000 accidents of difference Compared to 2009).

- The third period: a decrease in the number of casualties in 2010 (12544 wounded) with a variation of -19.30% compared to 2009 and it is returning in parallel with the reduction of number of accidents, then followed by a slight increase with 6.69% during 2011, 2012, 2013 and another decrease in 2014 (4319 wounded), this is explained by the intensification of the control of road traffic by the national security services and therefore the limitation of car speed.

1.2 Evolutions of severity of accidents the period (1990-2014)

The severity rate is estimated by reporting the number of fatalities to the number of accidents or the number of persons wounded. The graph below shows the evolutions of the severity of traffic accidents in Algeria during the period (1990-2014)

Graph 04 : Evolutions of the mortality and morbidity rates



Source: developed on the basis of CNPSR data

During the period (1990-2014), the evolution of gravity was almost stable. Four periods can be distinguished:

-The first concerns the period (1990-1994) from 12 deaths per 100 accidents in 1990 to 20 deaths per 100 accidents in 1994. This serious situation is linked to the significant increase of the number of fatalities during this period (From 3410 to 4022 dead), in front of a reduction in the number of accidents (ranging from 29493 accidents to 20141 accidents)

-In the second period (1995-2000), the rate of gravity decreased from 18 deaths per 100 accidents to 11 deaths per 100 accidents.

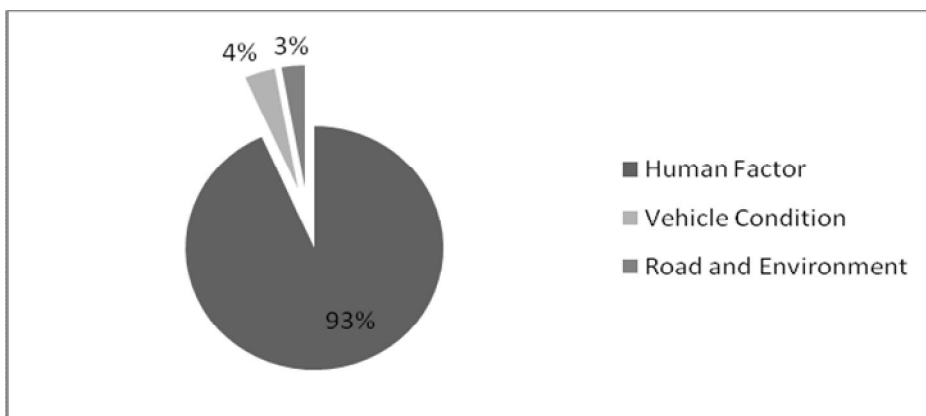
-The third period (2001-2006), where we note a relative stabilization of this rate which is the turn of 10 killed per 100 accidents.

-In the fourth period (2007-2014), is marked by a relative stabilization of the gravity rate which turns out to 11 dead per 100 accidents except for the year 2014 which shows a slight increase of 1 dead / 100. For the morbidity rate, there has been a successive increase since 1990 with 125 wounded per 100 accidents until 2010 with 160 wounded/100.

1.4 Direct causes of road accidents in Algeria:

On the basis of the CNPSR statistics (graph 05), the causes of the accidents that occurred during 2014 show that all accidents recorded at the national level are due to the human factor with 93.29% of the total accidents, 3.8 % returned to the condition of the vehicle and 2.91% related to the environment and the condition of the roads.

Graph 05 : Main causes of accidents at national level

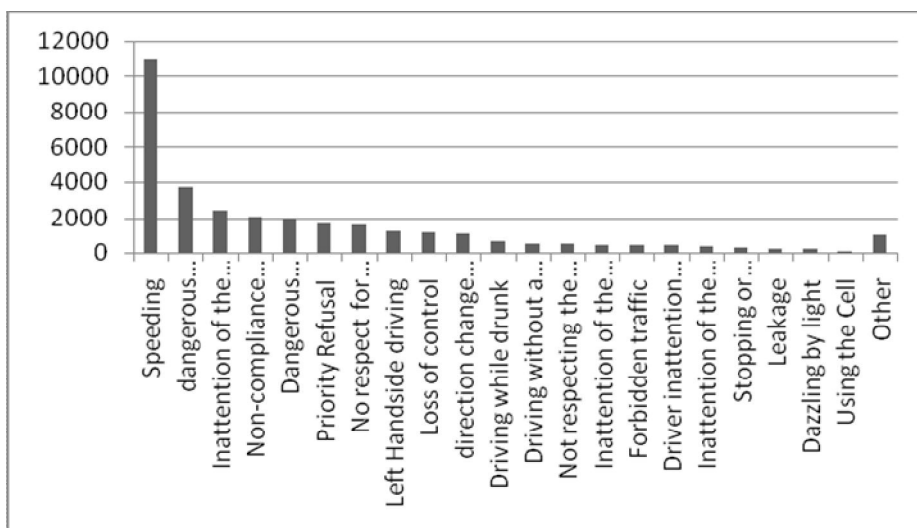


Source: developed on the basis of CNPSR data

1.4.1 Causes linked to man

graph 06 below represents the share of causes related to the human factor, it is clear that this factor represents 81.91% of accidents, speeding is the most important cause with a share of 27.31 % of accidents recorded, followed by dangerous overrun with 9.21%, inattention of the driver in the carts with 5.95%, failure to observe the safety distance with 5.05%, dangerous overtaking with 4, 89%, the refusal of priority with 4.25% and non-compliance of the warning sign with 3.94%. Other causes related to the human factor together account for 21.31% of accidents.

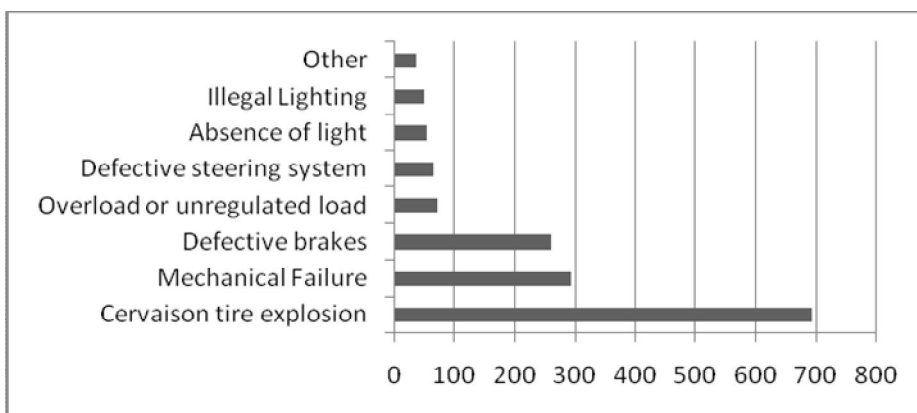
Graph 06 : Causes linked to human factor



Source: developed on the basis of CNPSR data

1.4.2 Causes related to vehicle

Graph 07 : Causes linked to vehicle factor

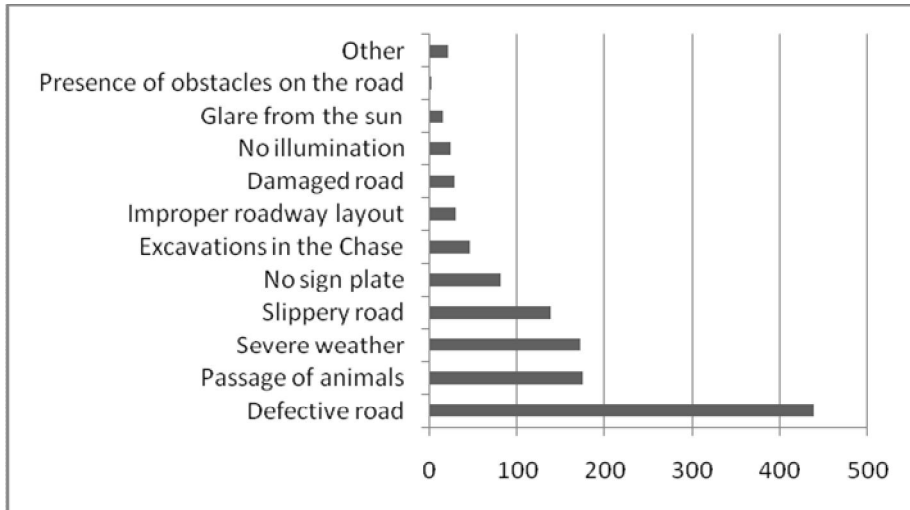


Source: developed on the basis of CNPSR data

The cervaision tire explosion occupy the first place with 692 accidents, with 1.72%, followed by mechanical failure with 293 accidents, representing a rate of 0.73%, defective brakes occupies the third position by causing 260 accidents, representing 0.65% of all crashes.

1.4.3 Causes related to environment

Graph 08 : Causes linked to environment factor



Source: developed on the basis of CNPSR data

Through this graph, we note that the defective road ranks first in all accidents linked to environment with 439 cases, representing a rate of 1.09%, followed by the passage of animals causing 175 accidents with 0.44%, in third place the severe weather with 172 accidents such as 0.43%.

It is concluded that the causes of accidents related to the human factor are estimated at 81.91%, which proves that man is primarily responsible for the tragedies we experience daily on our road.

2. Road accidents in Algeria: Principal Components Analysis

In order to determine the different correlations between the accident factors and the total number of road accidents in Algeria, the Principal Component Analysis (PCA) method was applied to the following variables: HF: Human Factors, VF: Vehicle Factors, EF: Environment Factors, and NA: Number of Accidents. Individuals are presented with a period of 36 months, from January 2012 to December 2014.

2.1 Analysis and interpretation of results

2.1.1 Interpretation of the correlation matrix:

The matrix of correlations allows us to visualize the nature of the existing linear relationships between the variables.

Tableau 01 : The correlation matrix

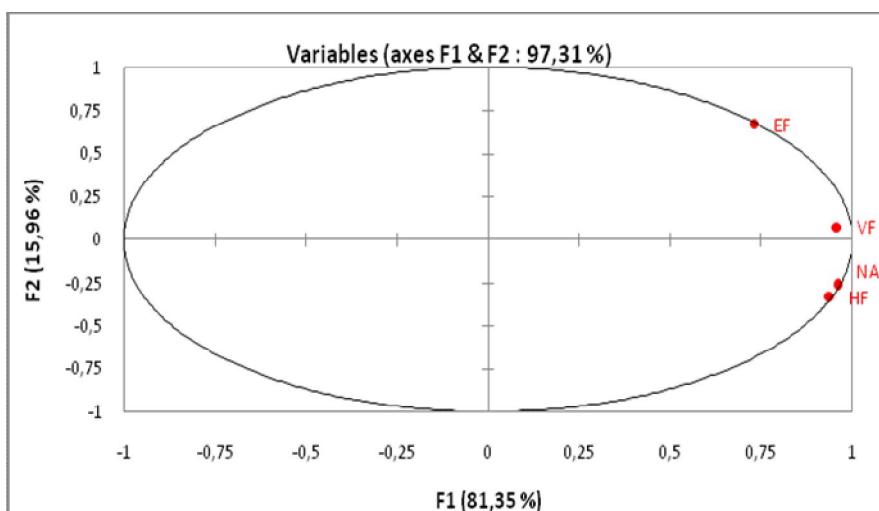
	HF	VF	EF	NA
HF	1	0,845	0,475	0,997
VF	0,845	1	0,717	0,879
EF	0,475	0,690	1	0,532
NA	0,997	0,879	0,532	1

Source: output of XL-STAT programme

According to the correlation matrix, we found that the NA variable is strongly positively correlated with the FV and FH variables (87.9% and 99.7%, respectively) and weakly positively correlated with FE (47,5%). However, It can be said that factors related to man and vehicle are the main causes of the accidents in Algeria during the study period.

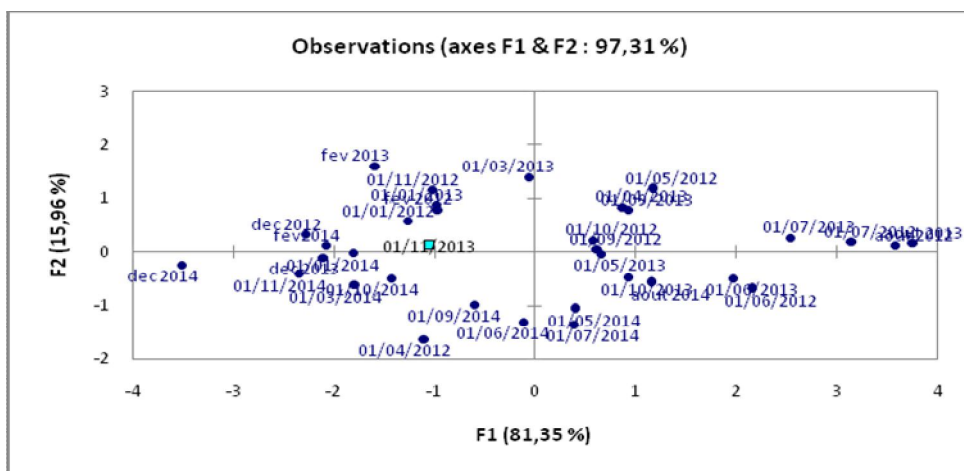
1.2 Interpretation of the factorial plane:

The correlation circle allows us to confirm the results obtained from the correlation matrix and the table of variables and principal components.

Fig. 01: Representation of variables (accident factors)

Source: output of XL-STAT programme

From Fig. 01, which represents the first factorial plane, which accounts for 97.30% of the total inertia, it is found that there is a strong correlation between the variables NA, HF and VF, in addition that they are well Represented on the axis F1, also, these variables are very close to the circumference, which allows us to deduce that they are well represented on this factorial plane.

Fig. 02: Representation of individuals (months/years)

Source: output of XL-STAT programme

We note that the years are divided into three periods, each period perhaps reflecting the results of government involvement through the application of the new road traffic reforms.

We note that this axis is strongly correlated positively of September 2012 and October 2012 and May2013, it is also strongly correlated negatively with January 2013 and 2014.

This axis is strongly correlated positively with March 2013, and strongly correlated negatively with June 2014, and moderately correlated either positively or negatively with the other individuals.

Biplot (axes F1 & F2 : 97,31 %)

F2 (15,96 %)

F1 (81,35 %)

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According to this fig. 03, the individuals of September and October of 2012, and May of 2013 are strongly correlated with the variables HF, VF and NA. The variable EF is moderately correlated with April and September of 2013.

The objective of this PCA was to determine the main causes of accidents, and their correlations with the number of accidents during the period (Jan 2012-Dec2014). The results showed that the HF is the main cause of traffic accidents, with an involvement rate of 81.91%, the rest is shared between the environment and the vehicle. The principal component analysis shows that the number of accidents is strongly correlated with the variable HF and moderately correlated with the variable VF.

Conclusion

The answer to the posed question is that the human factors is the main cause of road accident in Algeria. Dangerous overtaking and non-compliance of the warning sign are the sub-factors of the human factor.

Recommendations

Many solutions have been suggested to reduce the number of accidents and victims but studies tend to show that the true solution to this problem lies in the change of behavior of each one, and the consciousness and permanent awareness of the driver.

References :

1. Centre National de Prévention et de Sécurité Routière (Link : <http://www.cnpsr.org.dz/files/download/12%20mois%202014.pdf>, date de visite: 14/01/2017), P 02.
2. Insécurité routière en Algérie et dans le monde, (Link : <http://www.cna.dz/Documentation/Travaux-du-CNA/Publications-du-CNA/Bulletin-des-assurances-n->

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