Objective: to characterize the Traffic Accidents (TAs) treated in the emergency. Method: exploratory study, quantitative approach, retrospective and population based data. The data were collected from a registry book used by the epidemiology sector of a University Hospital and georeferenced by the Kernel method. Results: the city of Petrolina had the highest number of traffic accidents (83.6%). The Centro district had a higher frequency (8.5%), male predominance, male age range between 16 and 45 years old, with 78.1% of accidents. It was noticed a smaller occurrence on Saturday and Sunday, with 8.3% and 8.5% cases, respectively. Conclusion: the Kernel Contour identified two critical points for the traffic accident: the Center and the neighborhood of João de Deus, being a BR 401 a de major occurrence for the accidente de trânsito. Descritores: Accidentes de trânsito; Mapeamento Geográfico; Hospitais Públicos.

ABSTRACT

Objective: to characterize the Traffic Accidents (TAs) attended in the emergency. Method: exploratory, in a university hospital and georeferenced by the Kernel method. Results: the city of Petrolina had the highest number of traffic accidents (83.6%). The Centro district had a higher frequency (8.5%), male predominance, male age range between 16 and 45 years old, with 78.1% of accidents. It was noticed a smaller occurrence on Saturday and Sunday, with 8.3% and 8.5% cases, respectively. Conclusion: the Kernel Contour identified two critical points for the traffic accident: the Center and the neighborhood of João de Deus, being a BR 401 a de major occurrence for the accidente de trânsito. Descritores: Accidentes de tránsito; Mapas geográficos; Hospitales Públicos.
INTRODUCTION

The current situation in society demands, more and more, the evolution of emergency hospital services, in order to provide a good support in the care of these people, increasing their chances of survival. In this sense, it is emphasized that accidents and violence constitute public health problems of great magnitude and transcendence, with a strong impact on the morbidity and mortality of the Brazilian population.²

Considering that traffic accidents are considered as a public health problem, it was necessary to establish a specific care line that would address, in an interdisciplinary way, all the problems involved in the traffic accident, with the support of Inspection, safety and health. With that, was approved the Ordinance No. 1,365, of July 08, 2013, which approves and establishes the Trauma Care Line in the Network of Attention to Emergencies and Emergencies in Brazil, with the purpose of intervening in the reduction of morbimortality as a consequence of this aggravation.²

With the process of decentralization, regionalization and hierarchization of health care experienced in Brazil, with the creation of the National Policy of Attention to the Emergencies (2011), through ordinance nº 1,863, and considering that the municipalities of Petrolina / PE and Juazeiro / BA have the peculiarities of Decree 7.508 related to the creation of Health Regions in 2009, in the Valley of the Middle São Francisco, the first Interstate Network of Health Care was created in the country. A partnership signed between the governments of Pernambuco and Bahia, known as the PEBA Network.¹,⁴,⁵

More than six thousand urgent care and approximately 1,200 ambulatory visits are counted each month, according to a note published by the University Hospital Dr. Wahington Antônio de Barros (HU-WAB), which is a regional and interstate reference in Urgency , Traumatology, Neurology and Vascular, but, despite the large volume of care, there is still no official record that reports the magnitude of traffic accidents in the population, the degree of injuries and hospital deaths resulting from post complications -trauma.⁶,⁷

The precise determination of a point on the earth's surface is called georeferencing. This improved technique, which consists of making known coordinates in a given reference system adopted by the country, has been very widespread these days, due to the need to obtain real delimitation of a certain area, without running the risk of overlapping it. For this reason, there is a need to perform georeferencing in traffic areas as well as the clarification of accidents.⁸

There are, at least, two advantages to using the Kernel method for generating thematic maps: (1) there is no excessive concentration of points since in one area, one point represents several occurrences. In this way, the visual analysis is not impaired; (2) representation is not limited to predefined areas, such as polygons of neighborhoods and municipalities.

Considering the need for a scientific production on the dynamics of traffic accidents in this region, as well as a more in-depth knowledge about the areas at greatest risk for the event, the objective of this work was to characterize Traffic Accidents (TAs) HU-WAB in Petrolina-PE, with the purpose of georeferencing the Traffic Accidents (ATs) attended in the emergency; Determine the areas that showed the greatest risk to the accident and classify the traffic accidents according to sex, neighborhood, cities served, demand by city and week of care.

METHOD

A descriptive study, with a quantitative approach, of retrospective and population-based data. To carry out this research, all norms and guidelines for research involving human beings established by Resolution 466/12 of the National Health Council - Ministry of Health were complied with. This work was approved by the Ethics and Deontology Committee on Studies and Research - CEDEP UNIVASF, under protocol no. 0009/200813 CEDEP / UNIVASF.

The data were collected through a logbook used by the epidemiology sector of Dr. Wahington Antonio Hospital de Barros University Hospital (UH-WAB), where all traffic accidents attended in said hospital between January and December 2014.

2,550 traffic accidents were totaled in 2014, however, the analyzes were performed with more than 90% of the information, which did not require an ideal minimum sample test.

As an inclusion criterion all legible and localized addresses were used. Some addresses were measured by approximation due to inaccuracy in the hospital's own registry or the location of the accident is outside the urban perimeter, which makes references difficult. The data excluded from the study were those that were incomplete, illegible or with an inaccurate location of the accident and / or residence address.
The data suitable for analysis were categorized and processed electronically through Excel 2007 Software. After this phase, a .txt file was generated to facilitate the reading and application of statistical techniques in the R-Statistics, program version 3.2, in addition to complementing the RgoogleMaps libraries, Rgdal, ks, sp, maps and mapproj.

The addresses were georeferenced through the students of the Administration course, where copies of the sheets of the accident record book were subdivided for each student and, in turn, using GoogleEarth, performed the geolocation in latitude and longitude of each event.

Spatial Statistic and the Kernel Estimator

The literature indicates that the Kernel estimator aims to identify spatial patterns in the arrangement of the geo-referenced points and, thus, to construct a curve or a contour that identifies, by statistical levels, the regions of greater concentration of the studied object, this makes possible the spatial analysis of the traffic accidents attended in the studied unit.9

The Kernel method is a technique that uses coordinate list scales for the detection of traffic clusters in a given space. In this way, the spatial pattern of occurrences was verified, verifying cases of high incidence. From the Kernel estimation, the density was obtained by region of the city (traffic accidents), which made possible the analysis of the behavior of a spatial process.9

Table 1 shows, the numerical distribution of the traffic accidents that occurred in the Interstate Macroregion and were referred to the HU-WAB. It can be noticed that the city of Petrolina had the highest number of traffic accidents (83.6%), followed by the city of Juazeiro, with a considerably smaller number (10.8%), and cities such as Lagoa Grande, Casa Nova, Sobradinho and Salgueiro did not contribute a percentage of statistical significance. The other cities that make up the macro regions did not have values considered important for the study.

Table 1. Distribution of the cities of occurrence of the traffic accident in the Interstate Macroregion attended in the HU-WAB. Petrolina (PE), Brazil, 2014.

<table>
<thead>
<tr>
<th>Neighbourhood</th>
<th>Number of accidents (n)</th>
<th>(%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Petrolina - PE</td>
<td>987</td>
<td>83.3</td>
</tr>
<tr>
<td>Juazeiro - BA</td>
<td>127</td>
<td>10.8</td>
</tr>
<tr>
<td>Lagoa Grande - PE</td>
<td>20</td>
<td>1.7</td>
</tr>
<tr>
<td>Casa Nova - BA</td>
<td>20</td>
<td>1.7</td>
</tr>
<tr>
<td>Sobradinho - BA</td>
<td>14</td>
<td>1.2</td>
</tr>
<tr>
<td>Salgueiro - PE</td>
<td>13</td>
<td>1.1</td>
</tr>
</tbody>
</table>

In table 1, 1393 appointments were recorded, but only 1187 were presented, since the other cities did not represent relevant indexes. Considering that more than 80% of the traffic accidents attended at the HU-WAB happened in the city of Petrolina, it was decided, to investigate in which neighborhood would be the largest number of these traffic accidents, represented in figure 1, which shows the number of victims (8.7%), João de Deus (6.5%), José e Maria (5.9%), and São Gonçalo (3.6%). Cohab Massangano (2.7%), Rural Area (2.5%), Pedra Linda (2.5%), N10 (2.5%), Cosme and Damião (2.5%), Vila Eduaro (2.3%), Gercino Coelho (2.3%), Antônio Cassimiro (2.3%), Maria Tereza Project (2%) and N7 (2%). In these percentages, the center of the city was highlighted as the point of greatest accident occurrence, which may be related to the large number of vehicles passing through the place every day.
Figure 1. Distribution of traffic accidents in the city of Petrolina, according to the neighborhood, between January and December, attended at HU-WAB Petrolina (PE), Brazil, 2014.

Table 2 shows the distribution according to the age of the TA victims (1,892) treated in the UH-WAB, where the predominance of male victims is remarkable, in relation to the female sex. The most significant male age ranged from 16 to 35 years, coinciding with the female age range, where both represented 59.1% of the cases.

Table 2. Distribution of traffic accidents by age, according to sex, attended at HU-WAB Petrolina (PE), Brazil, 2014.

<table>
<thead>
<tr>
<th>Age</th>
<th>Male (%)</th>
<th>Female (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>0-5</td>
<td>2</td>
<td>3.4</td>
</tr>
<tr>
<td>6-10</td>
<td>1.8</td>
<td>3.6</td>
</tr>
<tr>
<td>11-15</td>
<td>4.9</td>
<td>4</td>
</tr>
<tr>
<td>16-20</td>
<td>16.1</td>
<td>13.8</td>
</tr>
<tr>
<td>21-25</td>
<td>17</td>
<td>16.8</td>
</tr>
<tr>
<td>26-30</td>
<td>13.5</td>
<td>16.4</td>
</tr>
<tr>
<td>31-35</td>
<td>12.5</td>
<td>12.1</td>
</tr>
<tr>
<td>36-40</td>
<td>10.9</td>
<td>8.6</td>
</tr>
<tr>
<td>41-45</td>
<td>8.2</td>
<td>7.7</td>
</tr>
<tr>
<td>46-50</td>
<td>5.1</td>
<td>4.5</td>
</tr>
<tr>
<td>51-55</td>
<td>3.1</td>
<td>3.8</td>
</tr>
<tr>
<td>56-60</td>
<td>2</td>
<td>2.6</td>
</tr>
<tr>
<td>61-65</td>
<td>1.1</td>
<td>1.3</td>
</tr>
<tr>
<td>66-70</td>
<td>0.8</td>
<td>0.9</td>
</tr>
<tr>
<td>71-75</td>
<td>0.6</td>
<td>0.6</td>
</tr>
<tr>
<td>76-80</td>
<td>0.2</td>
<td>-</td>
</tr>
<tr>
<td>81-85</td>
<td>0.1</td>
<td>-</td>
</tr>
<tr>
<td>86-90</td>
<td>0.1</td>
<td>-</td>
</tr>
</tbody>
</table>

Figure 2 shows the assessment of the occurrence of an accident per day of the week. There is a lower occurrence on Saturday and Sunday, with 8.3% and 8.5%, respectively. The second and the Thursday show the largest share of these accidents, with 18.3% and 17.8%, respectively, corresponding to 730 cases.
Figure 2. Distribution of traffic accidents, according to the day of the week, attended at HU-WAB Petrolina (PE), Brazil, 2014.

Figure 3 shows the spatial distribution of points related to traffic accidents in the Interstate Macroregion that were referred to the UH-WAB. Each triangular Point found in the graph represents a georeferenced traffic accident. From this, an outline of probabilities is defined to delimit the minimum area in which the event can occur.

The surface of the following figure shows a pattern of point distribution with a strong concentration in the center of the city of Petrolina and decreasing toward the more distant neighborhoods. The outline of probabilities points to a percentile of risk in the area. In this case, points to a greater risk to the traffic accident, with a 90% chance in the center of Petrolina.
The number of violent deaths in the world is alarming. According to the World Health Organization (WHO), around the world, approximately 1.2 million people die each year. Also around 50 million suffer non-fatal injuries. From such numbers, nations joined in approving the World Report on the Prevention of Traffic Injuries, which suggests actions to reduce the number of deaths caused by this aggravation and improve road safety. 11

The increase in the fleet of vehicles in cities, recklessness, speeding and poor road quality, lack of supervision, among other factors, contributed to the large number of accidents in the country. It is also worth mentioning that motorcycle drivers are the main victims of these circumstances. 12

Ordinance No. 1,365, of July 08, 2013 approves and establishes the Trauma Care Line in the Emergency and Emergency Attention Network and has the purpose, among others, of reducing morbidity and mortality due to trauma in Brazil through surveillance, Prevention and health promotion and implementation of the Trauma Care Line in the Emergency Care Network (ECN). Thus establishing the Hospital Attention Network to Trauma, aiming to broaden and qualify the humanized access and the integral attention to the traumatized patient, as well as to establish and implement the Trauma Care Line and to enable Trauma Centers, to perform the hierarchical and referenced care. 2

As a result of these factors, in May 2011, was launched by WHO, the action plan of the decade of traffic safety. On the same date, the Ministry of Cities and the Ministry of Health launched the National Pact for Traffic Accident Reduction - Pact by Vida, which aims to stabilize and reduce the number of deaths and injuries resulting from land transport accidents for the next ten years. 13,14

With the process of decentralization, regionalization and hierarchization of health care experienced in Brazil, with the creation of the National Policy of Attention to the Emergencies (2011), through ordinance nº 1,863, and considering that the municipalities of Petrolina / PE and Juazeiro / BA have the peculiarities of Decree 7.508 related to the creation of Health Regions in 2009, in the Valley of the Middle São Francisco, the first Interstate Network of Health Care was created in the country. A partnership signed between the governments of Pernambuco and Bahia, known as PEBA Network. 3-5

This network comprises an interstate macro-region comprised of border cities of the two States and is subdivided into two major macro-regions of health - Macrorregion of Petrolina and Juazeiro, made up of 53
municipalities, covering about 1.9 million inhabitants. According to the results presented, most of the traffic accidents occurred in the Interstate Macrorregion between Pernambuco and Bahia, the PEBA Network, and that were referenced to the HU-WAB, occurred within the limits of the city of Petrolina itself. This fact can be seen in the HU-WAB Service Units, with emphasis on the Orthopedics and Traumatology sector, which is constantly overcrowded.

These cases have been following the national reality of large cities since the 20th century. But, nowadays this fact is not restricted to these regions only, becoming part of cities considered averages, thus contributing to the difficulty of planning improvements in road quality through the transit organs of the country. Although not the subject of this study, revision work points to overcrowding as a global phenomenon. It ultimately indicates poor performance of the health system as a whole and of the hospital in particular, and induces poor quality of care.

One of the characteristics that can be highlighted in the road network of Petrolina and that may contribute to traffic accidents is that there has been a significant increase in the vehicular fleet in recent years, with emphasis on the use of motorcycles, due to the economic development of the regions involved and Traffic. Data from Detran-PE point to a growth in the vehicular fleet in Petrolina in the order of 117,040 vehicles (March, 2015) and development data point to a growth in Petrolina, as Gross Domestic Product (GDP) of R $ 3,310.55 (2011 ) and the Economic Development Index (EDI) of 0.697, since the per capita value of Petrolina is high in relation to other cities in Brazil, Justifying the fact that educational and preventive measures in transit should be encouraged and implemented, through Education Centers, for the prevention of traffic accidents.

Regarding the age of TA victims, the predominance of males is still significant. In the research the rates between 16 and 35 years were approximately 60% in 2014, but it is possible to observe that the rates among males Extends up to 90 years of age, also with greater expressiveness than women. Andrade and Mello Jorge (2000) consider that all these data lead to the conclusion that male superiority is a strongly characteristic feature of this type of event, once again, signaling the fact of the greater exposure of men to situations of danger, besides behavior More aggressive behavior of this group in traffic. It must also be considered that social and cultural determinants crystallized in the notion of gender expose them to greater risks in the driving of vehicles, such as excessive speed, risky maneuvers and alcohol consumption.

Similar to this, females had a statistically significant percentage of TAs from 15 to 45 years of age, representing more than 75% of accidents in this age group. However, it presents a much lower frequency. Regarding the participation of women in TA’s, Waiselfisz studying the victims of transport accidents involving women, noticed the remarkably stable character of female participation in mortality from 1980 to 2012, observing a decline in female participation in transportation accidents. In contrast, Andrade and Jorge believe that there may be a change in this situation due to the insertion of women in the labor market and financial rise. In this way, they will be able to participate more actively in the driving of motor vehicles, thus leading to greater exposure to risk in TA’s.

When analyzing the sample in relation to the age group, a predominance was observed in the number of young victims, between the ages of 20 and 30 (33.2%), as shown in table 2. The vulnerability of this population is confirmed in this study and evidenced in other studies related to traffic accidents.

The concern grows when it is found that this violence continues to have as our main actor and victim, our youth. It is in this age group, that of young people, that two out of three deaths originate in violence, be it homicide, suicide or transport accident. (Waiselfisz, 2011)

Accidents involving young people can affect their productivity, which leads to a loss of activity in the labor market, taking into account that when they are victims of this type of setback, when they acquire post-traumatic sequelae, they eventually move away from the trade, sometimes, for a long time or indefinite time.

The assessment of the occurrence of an accident per day of the week (Figure 2) showed a lower occurrence on Saturday and Sunday, with the second and Thursday the largest share of accidents. The data above are dissonant from other epidemiological studies related to traffic accidents, such as the study on fatal traffic accidents in the city of São Paulo in 2013, which points to a prevalence in accidents with a fatal outcome between Friday, Saturday and Sunday.

After analyzing the spatial distribution of the points related to traffic accidents that...
occurred in the Interstate Macroregion and were sent to the HU-WAB, a probability outline, called the Kernel Contour, was plotted in figure 3. This figure is in harmony with the figure 1, that characterizes the region of the Center and the neighborhood of João de Deus with greater incidence of accidents, noting that figure 1 also identifies the Center and João de Deus as prominent regions in the occurrence of this event.

In relation to the neighborhoods with the highest AT’s, the most notable are: Centro, João de Deus and José and Maria, respectively, these being the places of greatest occurrence in 2014, being very populous neighborhoods with a great commercial movement. Moraes (2013), in his study on the analysis of traffic in commercial area in the center of Caruaru, verified that the great occurrence of flow in the stretch of the road is due to the concentration of the commercial activities and the provision of services in that region.

In Caruaru, as in other Brazilian cities, some of the drivers do not usually observe speed limits, safety bands or traffic lights. This situation favors congestion because of disruptions along the road and increases the risk of accidents and run-ins.

The geo-referencing of the accidents indicated the avenues and highways as sites generating victims of traffic accidents. BR 407 (Honorato Viana Avenue) is one of the most frequent sites for traffic accidents and, noted that the density lines 40 and 50 pass over the referred avenue, which is the legal responsibility of the Federal Highway Police.

The points represented by the symbol contained in figure 5 refer to the occurrence of the event, not necessarily its numerical frequency of the number of persons injured. Point A also covers the areas with the highest vehicular traffic in the city, passing through the city entrance - Viaduto dos Barranqueiros, Federal University of São Francisco Valley, Parque Josefa Coelho and Shopping. In particular, the viaduct was identified in absolute numbers, its prominence, which is also in harmony with the Kernel curve, line 90.

Point B marks the high intensity of accidents in the neighborhood of João de Deus. The figure also shows a high concentration at the intersection of HGU Hospital and 24H Emergency Care Unit (UPA), at Honorato Viana Avenue. Finally, there is a high vehicular concentration in the vicinity of the center. When all traffic accidents are added from January 2014 to December 2014, it can be seen that the largest concentrations are located in the center of the region, which shows that These sites are at high risk for new occurrences of TA.

The accidents that occurred in neighborhoods and housing complexes far from the center, neighborhood José and Maria and João and God, have little concentration, tending to isolated and random accidents.

The increasingly evident arrival of new technologies, meant that the distance between people decreased, significantly changing the profile of small and medium-sized cities, thus, improving quality of life and displacement. But education and traffic surveillance are slow, to follow this development, and often end up blaming the victims for the fact and not the organs responsible for the control and reduction of the diseases, bringing drastic consequences to society, such as increased mortality from external causes.

CONCLUSION

It was possible to verify that most of the traffic accidents occurred in the city of Petrolina. The most affected neighborhoods were Centro, João de Deus and José and Maria, probably, because they are shopping centers, which requires more accurate studies in loco to propose measures and reduce occurrences.

The techniques applied, in this study, were effective in analyzing the distribution of traffic accidents and in identifying patterns of intensity, since this technique indicated accident-critical sites, which represents a starting point for further studies.

It is noteworthy that in the present study it was noticed an underreporting of the data, besides other data being lost due to the illegible letter, since these notifications are filled manually, which made it difficult to collect complete data.

This study is of significant relevance in harm reduction and can serve as a basis for the bodies responsible for regulating traffic laws, as well as the Public Authorities, to verify the distribution of accidents. It is notorious that educational measures, at all levels, need to be taken. The risks of new accidents in the same places that this study presented are very high. For further studies, it is proposed to visit in loco to evaluate infrastructure and signaling aspects that justify the high index.

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