

ORIGINAL ARTICLE

SPATIAL ANALYSIS OF RAPE AGAINST ADOLESCENTS: CHARACTERISTICS AND IMPACTS

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ABSTRACT

Objective: To analyze the correlation between raw rates of rape and year of occurrence, and spatial patterns of notified cases of rape against adolescents.

Method: This was an ecological study, with a temporal trend, carried out based on notifications made between 2009 and 2014 of cases of rape against adolescents residing in the state of Pernambuco, Brazil, collected by the municipality through the Violent Crimes Notification Information System. The data were analyzed using TerraView software version 4.2.2. based on the municipal digital cartographic databases of Pernambuco and the population size provided by the Brazilian Institute of Geography and Statistics.

Results: There was a positive linear correlation between raw rates and year of occurrence and spatial association among municipalities.

Conclusion: Combating this violent crime requires changes in cultural conceptions and government support to effectively implement intersectoral health actions.


DESCRIPTORS: Spatial Analysis; Violence; Adolescent; Rape; Public Health.


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ANÁLISE ESPACIAL DO ESTUPRO EM ADOLESCENTES: CARACTERÍSTICAS E IMPACTOS

RESUMO

Objetivo: analisar a correlação entre as taxas brutas de violência por estupro e ano de ocorrência e o padrão espacial da ocorrência dos casos notificados de violência por estupro contra adolescentes.

Método: estudo ecológico com tendência temporal, constituído a partir das notificações no período de 2009 a 2014, referentes aos casos de violência por estupro contra adolescentes residentes no estado de Pernambuco, coletados por município pelo Sistema de Informação de Agravos de Notificação. Os dados foram analisados com o auxílio do programa TerraView versão 4.2.2, por meio das bases cartográficas digitais dos municipais de Pernambuco e quantitativo populacional disponibilizado pelo Instituto Brasileiro de Geografia e Estatística.

Resultados: constatou-se a correlação linear positiva em relação às variáveis representadas pelas taxas brutas e ano de ocorrência e associação espacial entre os municípios.

Conclusão: o enfrentamento deste agravo requer mudanças de concepções culturais e suporte governamental para efetivação de ações intersectoriais de saúde.

DESCRITORES: *Análise Espacial; Violência; Adolescente; Estupro; Saúde Pública.*

ANÁLISIS ESPACIAL DE LA VIOLACIÓN EN ADOLESCENTES: CARACTERÍSTICAS E IMPACTOS

RESUMEN:

Objetivo: Analizar la correlación entre tasas brutas de violencia por violación, año de ocurrencia y estándar espacial de ocurrencia de los casos notificados de violencia por violación contra adolescentes.

Método: Estudio ecológico con tendencia temporal, constituido por las notificaciones entre 2009 y 2014 referentes a casos de violencia por violación contra adolescentes residentes en Pernambuco, Brasil, divididos por municipio, recolectados del Sistema de Información de Enfermedades de Notificación. Datos analizados utilizando el programa TerraView versión 4.2.2, además de bases cartográficas digitales de los municipios de Pernambuco y cuantificación poblacional brindada por el Instituto Brasileño de Geografía y Estadística.

Resultados: Se constató correlación lineal positiva respecto de las variables representadas por las tasas brutas y año de ocurrencia, y asociación espacial entre los municipios.

Conclusión: Para enfrentar este estigma se requieren cambios en las concepciones culturales y soporte gubernamental que garantice la ejecución de acciones intersectoriales de salud.

DESCRIPTORES: *Análisis Espacial; Violencia; Adolescente; Violación; Salud Pública.*

INTRODUCTION

Violence is a serious public health problem that results in biopsychosocial harm expressed through societal relational dynamics. It is a complex phenomenon that needs to be considered within the specific context, culture, and historical period in which it occurs⁽¹⁾. The World Health Organization (WHO) classifies violence into three categories according to who commits the act, whether self-directed, interpersonal, or collective, and further divides this definition into physical, sexual, psychological, and privation and neglect⁽²⁾.

Rape is considered one of the most aggressive forms of human interactions. There are several explanations for this act, which basically involves feelings of anger, power, eroticized cruelty, and opportunistic intercourse⁽³⁾. Around the world, this crime is intrinsically associated with social determinants and situations of vulnerability, which, coupled with the perpetuation of societal norms, implicit in stereotypes, enhances unequal power relationships⁽⁴⁾. The UN's goals to face violence, fight crime and terrorism are included in the 2030 Agenda, as part of the sustainable development goals, with the goal of establishing peaceful societies, free of violent extremism⁽⁵⁾.

In Brazil, an estimated 527,000 rape attempts or cases occur every year, of which 10% are reported to the police. According to the data from the Violent Crimes Notification Information System (SINAN), in 2011, 12,087 rape cases were notified in Brazil, and of these cases, 88.5% of victims were female, and most were younger than 13 years old, and 51% self-declaring black or brown, and with a higher prevalence among children, corresponding to 70% of cases⁽⁶⁾.

Knowledge about the occurrence, adequate forms of approaching each case, and the preparation of professionals who work in areas related to health, education and others to identify (frequency and distribution), notify, and map rape cases are of utmost importance. Geoprocessing is a valuable tool to provide information for plans to implement integrated and intersectoral public policies to minimize the numerous consequences of this type of violence.

Mapping rape cases against adolescents in a given space helps identify the frequency, distribution, and importance of different factors that contribute to the high rates of this type of violence. The goal of the present study was to analyze the correlation between raw rates of rape and year of occurrence, and the spatial occurrence of notified rape cases against adolescents.

METHOD

This was an ecological study, with a temporal trend, carried out in the state of Pernambuco, Brazil, in 2018. It was based on secondary data about notified cases of rape against adolescents between 2009 and 2014.

The population consisted of 2,020 notified cases of rape against adolescents, between 10 to 19 years of age, according to WHO classification⁽⁷⁾, who resided in the state of Pernambuco, Brazil. All data recorded in this period was provided by the Unified Health System's Department of Informatics (DATASUS), based on the Violent Crimes Notification Information System (SINAN/SVS/MS)⁽⁸⁾.

The study was developed in three stages: 1. Obtaining vector files to gather information from the digital cartographic databases, by municipal grids relative to the state of Pernambuco and then producing spreadsheets that corresponded to the total population size between 10 to 19 years old residing in the state, during the studied period, as provided by the Brazilian Institute of Geography and Statistics (IBGE); 2. Gathering data and creating spreadsheets of rape notifications against adolescents residing in Pernambuco, as provided

by the SINAN/SVS/MS⁽⁸⁾; 3. Formatting, organizing, and spell checking spreadsheets.

Data analysis was based on the calculation of raw rates of rape against adolescents by municipality of residence and by year of occurrence, between 2009 and 2014. The data were tabulated according to two aspects: territorial expression and temporal progression in the studied period. Territorial evaluation underpinned the spatial association through Moran's Global and Local Indexes. A Bayesian tool was applied to smooth the values in consonance with empirical statistical criteria relative to the influence of territorial proximity. Temporal progression was analyzed by testing the linear correlation between the dependent variable (raw rates) and the independent variable (year of occurrence).

The data were run on TerraView software version 4.2.2 to create thematic maps of the smoothed rates using the empirical Bayesian technique and spatial association via Moran's index (LisaMap)⁽⁹⁾, based on the dependent variable rape rates, by Bayesian smoothing, per 100,000 inhabitants. This type of analysis minimizes possible biases due to instability of the results because of random fluctuations from the raw rates, considering that the estimates in municipalities with small population sizes tend to reveal events by mere chance⁽¹⁰⁾.

A priori, the analysis inferred the construction of thematic maps using the Global Empirical Bayesian estimator. This type of analysis considers the weighted mean of the raw local rate and the global rate of a given region. Next, thematic maps based on local Bayesian rates were created. This process reveals the local estimate based on the rates of the geographic neighborhood of the estimated area⁽¹⁰⁾.

Next, the significance of the LisaMap (Local Indicator for Spatial Autocorrelation) Moran I was assessed. This local indicator, when significant, presents the spatial correlation between neighboring municipalities. This type of analysis produces a comparison of local values, randomization and permutation of the rates of neighboring municipalities and can be categorized into greater than 0.05, which means low significance. Furthermore, their areas are classified into five different levels of significance: no significance, 0.05 (95% confidence level), 0.01 (99% confidence level), 0.001 (99.9% confidence level) and 0.0001 (99.99% confidence level)⁽¹¹⁾.

The significance level of the local Moran's index was calculated because of the vastness of the studied territory, which would result in diverging spatial associations, and thus, it was important to analysis the clusters of areas in relation to the neighborhood⁽¹¹⁾.

Rapes statistics were visualized using the following clustering method: equal intervals. The difference between the maximum and minimum value was divided into five equal allowed for a better interpretation of the rates on the map with reference to the color scale⁽¹²⁾.

Consequently, exploratory data analysis revealed concealed information and atypical behaviors, based on the correlation coefficient. The determination correlation that defines the strength of the linear association, in which a coefficient equal to zero indicates the nonexistence of correlation between two variables and a correlation coefficient equal to 1 indicates a perfect linear correlation, classified as ρ^2 (0.1 – 0.3) weak; ρ^2 (0.4 – 0.6) moderate; and ρ^2 (0.7 – 1) strong⁽¹³⁾.

The study sample was composed using secondary data, available to the public via the Violent Crimes Notification Information System/DATASUS-TABNET and IBGE. These systems gather information relative to health services, organized in spreadsheets, charts, maps, and texts for research purposes. Because they are publicly available, the investigation did not need to be submitted to a Research Ethics Committee.

RESULTS

The present study analyzed the spatiality of rape cases against adolescents residing

in the state of Pernambuco. The population consisted of 2,020 notified cases. The thematic map relative to the smoothed rates of cases obtained via the Global Empirical Estimator in the studied period revealed the municipalities with higher global Bayesian rates in darker colors, with emphasis to the municipality of Petrolina, with a rate of 89.68, as shown in Figure 1.



Figure 1 - Thematic Map of the smoothed Global Empirical Bayesian rates of rape against 10- to 19-year-olds, per 100,000 inhabitants, in the municipalities of the state of Pernambuco. Recife, Pernambuco, Brazil, 2018

Figure 2 depicts local Bayesian rates, with the municipality of Petrolina presenting a rate of 90.67.



Figure 2 - Thematic Map with smoothed Local Empirical Bayesian rates of rape against 10- to 19-year-olds, per 100,000 inhabitants, in the municipalities of the state of Pernambuco. Recife, Pernambuco, Brazil, 2018

Moran's index analysis presented significance for age group and studied crime, obtaining a p-value equal to 0.002 and an index value equal to 0.280864. The linear correlation between raw rates of notified rape cases against adolescents residing in Pernambuco between 2009 and 2014 presented a positive statistical correlation. Furthermore, the strength of association was strong, which allowed the researchers to forecast the evolution of rape rates until 2016, as seen in Figure 3.

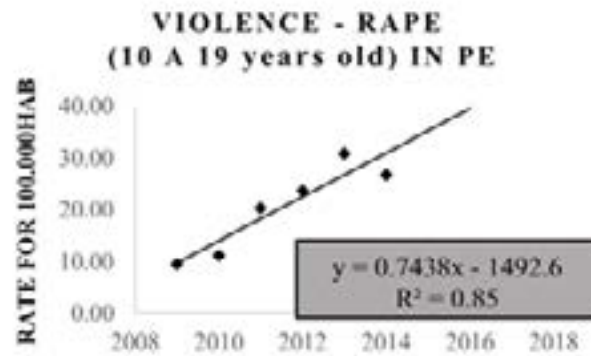


Figure 3 - Linear Correlation, between 2009 and 2014 and projection until 2016 of cases of rape against adolescents, per 100,000 inhabitants, residing in the state of Pernambuco. Recife, Pernambuco, Brazil, 2018

DISCUSSION

The global and local empirical Bayesian estimators for the period 2009 to 2014 showed municipalities with higher rates of rape against adolescents. Spatial dependence of the cases was observed, according to Moran's index, considering that neighboring municipalities with high/moderate or low raw rates of rape against adolescents presented the same pattern. The epidemiological profile of rape against adolescents in the state of Pernambuco revealed that in the studied group, this crime was more evident in the São Francisco mesoregion.

Linear correlation was positive between the occurrence of rape against adolescents residing in Pernambuco. The expressive growth in number of cases over the years showed a linear trend for this type of violence. In light of this finding, it is important to reflect on the social health determinants that influence this growth to create intersectorial strategies that minimize the biopsychosocial impacts caused by this type of assault and that can result disorders over the course of victim's lives.

Rape is a type of assault that involves sexual acts that are imposed, coerced, or relative to power relationships without the victims' consent. The damage caused goes beyond the violation of basic human rights, incurring deep imbalances in the physical, sexual, reproductive, emotional, mental, and social wellness of victims, which can result in significant underestimates of the actual levels of its occurrence⁽¹⁴⁾.

With its territorial vastness, Brazil presents considerable economic, social and cultural inequalities. The lack of preparation and skills of health professionals in the face of violence cases may be an indication of underreporting and lack of support to victims⁽¹⁵⁾. There are many groups that are vulnerable to several types of violence, among these rape; however, children stand out due to the peculiar characteristics of this phase⁽¹⁶⁾.

In Brazil, between 2009 and 2014, the SINAN registered 64,080 cases of rape against children 10 to 19 years old⁽¹⁷⁾. A study carried out in the state of Missouri, USA, with 192 female university students, revealed that one out of 20 university students reported having experienced rape, and of these, 41.5% reported the assault. Thus, teaching settings are important locations for the development of health education actions for both students and professors, so as to provide listening skills and strategies to encourage victims to express their feelings. More than two-thirds of the victims interviewed in the study said they had told at least one person about the assault; however, most of the times, these individuals were part of their informal support network, such as family and friends⁽¹⁸⁾.

The Northeast region presents 14.873 recorded cases of rape, with a predominance of female victims (74%). This region ranks as the second Brazilian region with the most cases of rape⁽¹⁷⁾. The state of Pernambuco presents a similar epidemiological profile nationally, ranking in second place among the states of the Northeast, with a higher percentage of rape cases among female victims, representing 3,215 (85%) of the total number of registered cases.

In the present study, there was the striking presence of rape in two extreme territories in the state of Pernambuco: The Metropolitan Region of Recife and the São Francisco mesoregion, the latter with an estimated population of 478,117 inhabitants⁽¹⁹⁾. The municipality of Petrolina is located in the last mesoregion, which stood out with respect to the other municipalities in the region.

The economic, demographic and geographic characteristics of this municipality is that of an important area of industrial and trade development, interconnected by highways and an airline, which can be an explanation for the phenomenon. This hub attracts a migratory population in search of better job opportunities. Another possibility is that the network that cares for rape cases is better equipped in this area and, therefore, is able to take in more reports and notifications.

In municipalities such as Petrolina, with high rates of rape, the victim profile was of female adolescents (98.7%) of brown race or skin (35%). In terms of the profile of perpetrators, 24% of the cases identified the perpetrator, with emphasis to boyfriends (10.5%), strangers (8%) and stepfathers (4.5%)⁽¹⁷⁾.

These findings suggest that this type of assault against women can be related to the rape culture, which perpetrates the hierarchy of male sexual power over females. Studies have presented similar victim profile, with the majority female, below the age of 13, and with brown or black skin color. Regarding the profile of perpetrators, the same studies show a preponderance of stepfathers and one study emphasized this abuser as users of alcohol and other drugs^(6,21).

The findings of the presents study corroborate the predominance of this type of violence against the female sex⁽²²⁾, probably because of the historic condition of women in society that that is complacent with the different forms of violence related to the persistence of the patriarchal system⁽²³⁾. This system is perpetrated by and intrinsic to male culture, regardless of the age of the aggressors⁽²¹⁾.

When boys are the victim of rape, there is a higher demand for intermediate and high complexity health services, or emergency services, in detriment to specialized social and legal support services⁽²²⁾. Furthermore, the high proportions of boys who are victims of rape cannot be dismissed, especially starting at six years of age. The underreporting of these cases possibly refers to cultural factors, and prejudices and stigmas related to male sexuality⁽²³⁾.

A study conducted in the US associated the use of sexual media (films, music, television, and games) with increased sexual violence. The representation of sexual practices, disseminated by communication media, must be considered as regards the possible influence it may exert on behavior. Therefore, research on the media impact on youth is required⁽²⁴⁾.

Territorial resources and spaces must be used to develop educational actions such as debates about the patriarchy, gender equality, sex, and fighting against rape culture. Additionally, social responsibility that encourages reports and embraces and protects victims are essential processes to demystify the feeling of guilt and provide alternatives for rape prevention and overcoming the trauma⁽²⁵⁾.

Nurses stand out as health educators in health promotion activities via the National Primary Health Policy (PNAB), to develop strategies together with support centers in terms of clinical-assistance and technical-pedagogical dimensions, and through the Health in

School Program (PSE), providing care for the population part of the network within the area covered by Family Health Strategy.

Schools are privileged spaces nurses to work in, because they facilitate the coupling of education and health, addressing the vulnerabilities that can hinder the full development of children and adolescents in education. Nursing care must consider the resources of the territory to fight against this form of violence, especially among socially vulnerable people.

A limitation of the present study includes the possible underreporting of rape cases among adolescents in Pernambuco. The operationalization of the Violent Crimes Notification Information System by different municipal units can differ and result in loss of information. Data production depends on the identification of suspected cases by health services, the diagnosis, reporting and organization of digitized data, essential steps to conducting a consistent epidemiological study of this crime.

The contribution of this study lies in the identification of areas with the highest number of rape cases among the adolescent population to underpin strategies to fight this crime at the community level. Thus, the present study can be a starting point for others to produce knowledge about factors that correlate the social oppression of adolescents with sexual violence.

CONCLUSION

The analysis of the correlation between raw rape rates and year of occurrence, and the spatial pattern of notified rape cases against adolescents presented a positive linear correlation and spatial association among the municipalities.

The vulnerability of adolescents to coercive sex, evident in certain regions of Pernambuco, reveals the need for actions by social and health managers and civil society to fight against rape. The overview of rape rates in the state based on geoprocessing enables the recognition of risk areas in the territory, and thus, the present study can underpin other studies and contribute with interventions, at the three levels of government: federal, state and municipal, to develop social protection policies and strengthen public health actions.

The leading role of nursing in the fight against vulnerabilities requires demands a professional commitment to citizenship. Preventing sexual violence requires social participation to culturally demystify rape in society. This effort demands territorial recognition so that the resources available in the community can be used and health education strategies developed to provide adolescents with comprehensive care.

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Agreement to be accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved - PDA, ZCS, FPSL, TNC, ECA, CBS, EMRV