ISSN: 2230-9926

Available online at http://www.journalijdr.com

IJDR

International Journal of Development Research
Vol. 10, Issue, 04, pp. 35033-35036, April, 2020

RESEARCH ARTICLE OPEN ACCESS

IMPACT OF FIRES ON TOCANTINS PUBLIC HEALTHQUALITY INDICATORS

***Geovane Rossone Reis, Daniela Santos do Nascimento, Waldecy Rodrigues, Mônica Aparecida da Silva Rocha, Ana Lúcia de Medeiros, Janne Marques Silveira, Rafaela de Carvalho Alves, Anny Piresde Freitas Rossone, Amanda Aguiar Barros, Vinicius Garcia Costa and Elizângela Sofia Ribeiro Rodrigues**

Physiotherapy, University of Gurupi-UNIRG, Avenue. Rio de Janeiro, N.1585 - Sector. Central., Gurupi, 77403-090, Tocantins, Brazil

ARTICLE INFO

Article History:
Received 11th January, 2020
Received in revised form
16th February, 2020
Accepted 20th March, 2020
Published online 29th April, 2020

Key Words:

Burned, Public Health, Public Policy.

****Corresponding author:*** **Geovane Rossone Reis**

ABSTRACT

The state of Tocantins develops a long annual period of low rainfall, with greater dominance of the mass of hot and dry air in the months of June, July and August, associated with the increase in forest fires, which becomes a common element in the landscape. The incidence of fires in the Brazilian territory presents a period of greater intensification in this season, especially in the states where the formation predominant plant is that of the Cerrado (savanna) biome in its territorial limits, as is the case of Tocantins. The fine particles resulting from the fires have a longer residence time in the atmosphere than the coarse particles and can be transported over long distances, which increases their dispersion capacity and, consequently, its impact on individuals. This research aims to investigate the relationship between the number of burnings in Tocantins and hospitalization rates, mortality, permanence and costs in public hospitals in the state, through a retrospective cross-sectional study of prevalence and correlation of data which will outline the number of fires that occurred in the state of Tocantins, the number of hospitalizations for respiratory diseases, the mortality rate, time length of stay and total costs during the period 2014 to 2019. It has been observed with the data so far partially analyzed, that there may be a significant correlation between the number of fires and the demand for public health services, which promotes the need for public policies for fire control and prevention in the state, a since it can contribute negatively to the quality of public health the Tocantins.

Citation: ***Geovane Rossone Reis, Daniela Santos do Nascimento, Waldecy Rodrigues et al.*** **2020.** "Impact of fires on tocantins public healthquality indicators*", International Journal of Development Research*, 10, (04), 35033-35036.

INTRODUCTION

The climate in Tocantins in the rainy season corresponds from October to March, with maximum values generally occurring in the months of December, January and February, representing 90% of the average annual precipitation that falls under a clearly tropical rain regime. However, winter is dry due to the greater dominance of the mass of hot air and drought in the months of June, July and August. This mass inhibits the formation of clouds, soon in this period the rains are rare (Fisch, 1998). In this period, the reduction in precipitation is associated with increases in forest fires, which becomes a common element in the Brazilian rural landscape, used to clear newly deforested areas and other types of land, such as pasture, often out of control and burning what does not should burn (NEPSTAD, 1999).

According to Aragão et al. (2018), the intensities of the dry seasons determine the occurrence of fire (ARAGÃO, 2018). These fires generate, among other negative effects, a form of externality to the economic system that refers to the damage caused to human health. Among these, diseases of the respiratory system arising from the inhalation of particulate matter contained in the smoke that appears as a by-product of this practice (DE MENDONÇA, 2001). In this context, it is important to know the impact of the effects of particulate matter emissions from fires on the quality indicators of public health in Tocantins, evaluating their influence on the behavior of the incidence of respiratory diseases and possible risk factors, enabling the establishment of a baseline for identifying trends, with analytical studies the effects of fires. Therefore, this research aims to investigate the relationship between the number of burnings in Tocantins and the rates of

hospitalization, mortality, permanence and costs in public hospitals in the state.

Theoretical Framework: The lung is the organ most vulnerable to infections and injuries in the external environment, due to the constant exposure to particles, chemicals and infectious organisms in the ambient air. Globally, at least two billion people are exposed to toxic smoke from biomass fuel normally burned inefficiently on stoves or fireplaces with insufficient ventilation. One billion people inhale pollutants from outside air, and one billion people are exposed to tobacco smoke (ARBEX, 2012). Although respiratory deficiency causes disability and death in all regions of the world and in all social classes, poverty, agglomeration, environmental exposures and, in general, poor living conditions increase vulnerability to this very large group of disorders (HURD, 2000). The incidence of fires in the Brazilian territory presents a period of greater intensification in the dry season, that is, in the months of August and September - as shown in Figure 1 - especially in the states in which the predominant plant formation is that of the Cerrado (savanna) biome in its territorial limits, as is the case of Tocantins (DE ARAÚJO, 2014).

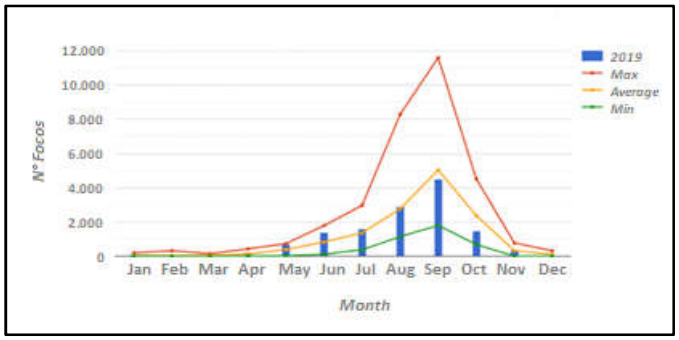

Figure 1. Comparison of monthly fires outbreaks in Tocantins in 2019. Source: National Institute for Space Research

All over the world, there is evidence of the impacts caused by the burning of the environment on human health, showing a consistent increase in respiratory and cardiovascular diseases and in general and specific mortality associated with exposure to pollutants present in the atmosphere, especially in the most susceptible groups, which include children under five and individuals over 65 years of age (RODRIGUES, 2013). In 1985, a bulletin from the World Health Organization (WHO) already questioned what would be the severity and extent of the damage caused by air pollution as a result of combustion of biomass in rural areas of developing countries (SAÚDE, 1994 and SOUZA, 2013). According to Pope et al. (2002), air pollution is characterized as an important public health problem in large urban centers, with the outcome of the increase in hospital admissions and the increase in mortality (POPE III, 2002). The fine particles resulting from the fires have a longer residence time in the atmosphere than the coarse particles and can be transported over long distances, which increases their dispersion capacity and, consequently, its impact on individuals. They are deposited in the respiratory system through the terminal bronchi and in the alveoli, aggravating respiratory problems and cause premature deaths (IBALD-MÜLLI, 2002). Among the impacts on human health caused by air pollution, those related to diseases of the respiratory system, such as asthma and acute bronchitis, pneumonia and chronic obstructive pulmonary disease are more evident (FRANÇA, 2009). In a survey carried out by Do Carmo (2009) in the municipality of Alta Floreta - MT, 494 hospital admissions of children (39% of total admissions in the period) and 159 of elderly (22% of total admissions) were observed for all respiratory causes in health units related to fires, which represented the first and second reason for hospitalization with 39% and 22% of total hospitalizations, respectively (DO CARMO, 2009). De Araújo & Miziara (2014) published data related to costs of the unified health system in 2010 for the treatment of respiratory diseases in the Municipalities of The Goianos, analyzing an expense of BRL 8,842,214.10 million, and morbidities respiratory resources that most demanded financial resources for the treatment of patients were bronchitis and emphysema (55% or BRL 4,873,399 million), asthma (41% or BRL 3,593,024 million) and the upper respiratory tract (4% or BRL 375,791,000), respectively (DE ARAÚJO, 2014). Environmental factors and hospitalizations in minors are associated with hospitalizations of asthmatic children, in Botelho et al. (2004) conducted a study aimed at evaluating the association of some environmental factors with the need for hospital treatment in children aged 0 to 5 years with a diagnosis of asthma in the city of Cuiabá (BOTELHO, 2004). After being analyzed, the medical records of the municipal emergency department of Cuiabá and the variables temperature, air humidity, number of hot spots (fires) were collected and compared with the number of hospitalizations. It was concluded, in the study, that the period considered as dry is associated with the hospitalizations of children with asthma studied.

MATERIALS AND METHODS

Retrospective cross-sectional study of prevalence and correlation of data, outlining the number of burnings that occurred in the state of Tocantins, the number of hospitalizations for respiratory diseases (Chapter X of ICD-10), the mortality rate, length of stay and total costs during the period 2014 to 2019. The number of fires in Tocantins was extracted from the INPE (National Institute for Space Research) website, available at http://www.inpe.br/. The data related to the aforementioned indicators of quality in public health are available on the website of the Department of Informatics of the Unified Health System, DATASUS, in http://datasus.saude.gov.br/. Initially, data were tabulated for initial analysis and subsequent correlation. Regarding the statistical analysis, the correlation data between the quality indicators on hospital admissions for respiratory diseases, mortality rate, permanence and total costs will be analyzed by Pearson and/or Staverman coefficient in order to assess the degree of linear association. After validation, they will be compared by the Student's t-test paired using the software SPSS® for parametric variables and for non-parametric variables, the chi-square with a significance level of 5%. The values will be demonstrated by means of tables and graphs generated by the STATA®, considering the significance level of $p < 0.05$ or 5%.

RESULTS AND DISCUSSION

The collected data were initially tabulated for simple analysis. According to Table 1, the information classified by year is observed, relating the general data of hospitalizations, days of stay, number of total deaths and costs due to diseases of the respiratory system in public hospitals in Tocantins during the period 2014 and 2019. The last line of the same table shows the total number of fires in the same period in this state.

Table 1. Comparison of monthly outbreaks of burning in Tocantins in 2019. Source: Prepared by the Author

Year	2014	2015	2016	2017	2018	2019	Total
Hospitalizations	10398	8761	6473	7663	6437	5316	36695
Days of Stay	52953	47281	36957	44189	38370	34158	253908
Deaths	538	500	413	470	420	402	2743
Total Cost (BRL)	9.234.347	8.411.580	6.606.794	7.514.109	6.455.733	5.693.176	43.915.739
Burned	14074	15705	14494	15673	8033	13774	81753

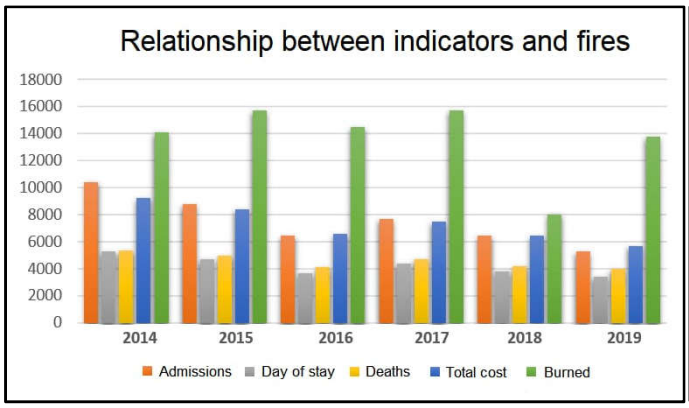

Figure 2. Relationship between health indicators and fires in Tocantins. Source: Elaborated by the Author

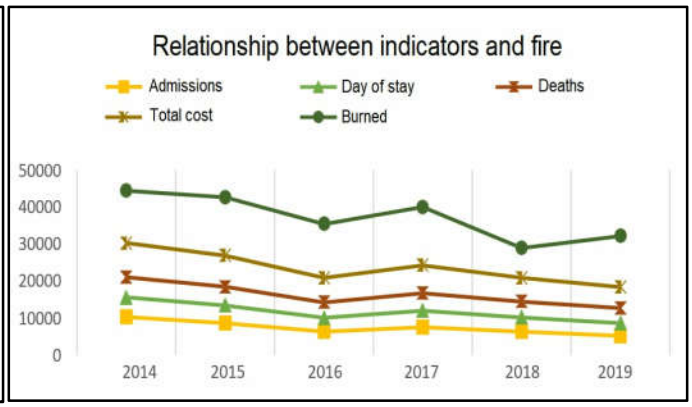

Figure 3. Relationship between health indicators and fires in Tocantins. Source: Elaborated by the Author

It is observed that the year in which there was a greater focus of fires was 2015, followed by 2017, with 15705 and 15673, respectively, and that, invariably, were the years in which there were the 2nd and 3rd largest number of hospitalizations within the investigated period. At the same time, they were the 2nd and 3rd year with the highest cost, mortality and length of stay in public hospitals in Tocantins. Through Figures 2 and 3 - graphs in columns and lines - it is possible to visualize the correlation between the number of fires in Tocantins and the quality indicators. In Figure 2, there is slight monitoring of the columns of the indicators when compared to the columns of the fires foci, which corroborates with the studies of Araújo&Miziara (2014) and Do Carmo (2009) which describe the direct relationship between air pollution and respiratory diseases and the number of fires (DE ARAÚJO, 2014 and RODRIGUES, 2013). Figure 3 shows, in a more plastic way, the relationship between the data in Table 1, where, in a linear way, there is an intense correlation between the number of fires and the indicators related to diseases of the respiratory system. It has been observed with the data so far partially analyzed, that there may be a significant correlation between the number of fires and the demand for public health services, which promotes the need for public policies for fire control and prevention in the state, a since it can contribute negatively to the quality of public health the Tocantins.

Conclusion

Evidence shows that the adoption of management based on technical knowledge and the application of preventive environmental measures can have a direct correlation in public health indicators, corroborating with better quality indicators for the population, since there was greater hospitalization, cost and permanence of patients in years with the highest number of fires, which indicates a lower supply of beds for the population. However, the lack of systematic technical protocols for analysis, prevention and action may be directly affecting the quality of care and the reproduction of data collected for analysis.

Based on these observations, and with the data and partial results, there is a strong perspective that the results should guide that interventions based on this evidence can improve the quality indicators in health care in the state, improving the level of assistance to society, increasing the availability of beds and, consequently, reducing costs.

REFERENCES

ARAGÃO, L.E.O.C.; ANDERSON, L.O.; FONSECA, M.G.; ROSAN, T.M.; VEDOVATO, L.B.; WAGNER,F.H.; SILVA, C.V.J.; SILVA JUNIOR, C.H.L.; ARAI, E.; AGUIAR, A.P.; BARLOW, J.; BERENGUER, E.;DEETER, M.N.; DOMINGES, L.G.; GATTI, L.; GLOOR, M.; MALHI, Y.; MARENGO, J.A.; MILLER, J.B.; PHILLIPS, O.L.; SAATCHI, S. 21st Century drought- related fires counteract the decline of Amazon deforestation carbono emissions. Nature Communications volume 9, article number: 536, 2018.

ARBEX, M. A., SANTOS, U. D. P., MARTINS, L. C., SALDIVA, P. H. N., PEREIRA, L. A. A., & BRAGA, A. L. F. Air pollution and the respiratory system. *Jornal Brasileiro de Pneumologia,* v. 38, n. 5, p. 643–655, 2012.

BOTELHO, C.; SALDANHA, C. T.; DA SILVA, A. M. C. Environmental factors and hospitalizations in children under five with asthma. *PULMÃO RJ*, v. 13, n. 4, p. 4, 2004.

DE ARAÚJO, F. M.; MIZIARA, F. Analysis of the occurrence of respiratory morbidities and their relationship with the incidence of burnt areas for the state of Goiás. *Boletim Goiano de Geografia,* v. 34, n. 1, p. 111–131, 2014.

DE MENDONÇA, Mário Jorge Cardoso. Estimation of Human Health Damage Due to the Use of Fire in the Amazon. In: *Anais do XXIX Encontro Nacional de Economia[Proceedings of the 29th Brazilian Economics Meeting]*. ANPEC - 2001.

DO CARMO, C. N., HACON, S., MOURÃO, D., LOUZANO, F., LONGO, K., FREITAS, S., & ARTAXO, P. Burning of biomass and respiratory diseases in the

Amazon region: an application of generalized additive models. Pesquisa Operacional na Gestão do Conhecimento, Escola Nacional de Saúde Pública, Fundação Oswaldo Cruz. XLI SBPO, 2009.

FISCH, G.; MARENGO, J. A.; NOBRE, C. A. A general review of the climate in the Amazon. *Actaamazônica,* v. 28, n. 2, p. 101–101, 1998.

FRANÇA, D.; AGUIAR, D.; RUDORFF, B. Relationship between sugarcane burning and health: preliminary study in municipalities in the Administrative Region of Araçatuba – SP. Trabalho apresentado no XIV Simpósio Brasileiro de Sensoriamento Remoto, Natal, p. 7537–7544, 2009.

HURD, S. The impact of COPD on lung health worldwide: epidemiology and incidence. *Chest,* v. 117, n. 2, p. 1S–4S, 2000.

IBALD-MÜLLI, A., WICHMANN, HE., KREYLING, W., & PETERS, A. Epidemiological evidence on health effects of ultrafine particles. *Journal of Aerosol Medicine*, v. 15, n. 2, p. 189–201, 2002.

NEPSTAD, D. C.; MOREIRA, A. G.; ALENCAR, A. A. The burning forest: origins, impacts and fire prevention in the Amazon. Programa Piloto para a Proteção das Florestas Tropicais do Brasil. Conservation Biology, 1999b. Brasília: Banco Mundial, 1999.

POPE III, C. A., BURNETT, R. T., THUN, M. J., CALLE, E. E., KREWSKI, D., ITO, K., & THURSTON, G. D. Lung cancer, cardiopulmonary mortality, and long-term exposure to fine particulate air pollution. Jama, v. 287, n. 9, p. 1132–1141, 2002.

RODRIGUES, P. C. DE O.; IGNOTTI, E.; HACON, S. DE S. Spatio-temporal distribution of fires and hospitalizations for respiratory diseases in children under five years of age in Rondônia, 2001 to 2010. *Epidemiologia e Serviços de Saúde,* v. 22, n. 3, p. 455–464, 2013.

SAÚDE, O. M. DA. CID-10: Classificação Estatística Internacional de Doenças Vol. 1. Edusp, 1994.

SOUZA, A. DE; FERNANDES, W. A.; PAVAO, H. G. Respiratory diseases and fire risk, a spatial analysis. InterfacEHS-Revista de Saúde, Meio Ambiente e Sustentabilidade, v. 7, n. 3, 2013.

****