The relationship between the socio-environmental problems of the twenty-first century and the Covid-19 pandemic

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ABSTRACT

COVID-19 is infectious, of zoonotic origin and rapid spread. Among the measures adopted to contain the advance of the disease, the interruption of human activities stood out, such as the closure of industries and transport, actions that proved to be positive for the environment and human health, reflecting in achievements such as the reduction of pollution and respiratory diseases. Several factors have been pointed out for the emergence/re-emergence, emergence and resurgence of infectious diseases, including population growth that intensifies the process of urbanization, globalization, loss of biodiversity, deforestation and land use change. This study aimed to verify the relationship between the socio-environmental problems of the twenty-first century, with a focus on deforestation and the change in land use with the emergence of the COVID-19 pandemic. This is a narrative review of the literature carried out in the databases of CAPES, SCIELO, PUBMED, GOOGLE SCHOLAR and national and international news sites and public organizations such as the World Health Organization and the Ministry of Health. The analysis of these studies allowed the creation of three categories, namely: 1) Advance of deforestation in Brazil and in the world; 2) Climate change; and 3) Human interference and COVID-19. Deforestation is a human activity associated with the emergence of zoonotic diseases, used to open and expand areas for agriculture and livestock. The practice has brought humans and domestic animals closer to wildlife, in this sense, it dialogues with another situation that is related to the theme expanded in this work, the illegal trafficking of wild animals. The highlighted conditions increase the risks of exposure to pathogens, which may favor the emergence of emerging diseases, such as COVID-19.

Keywords: Deforestation, Covid-19, Land use changes, "Zoonotic diseases", Environment, Coronavirus.

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INTRODUCTION

COVID-19 is an emerging infectious disease that emerged in the city of Wuhan, China, in late December 2019. The disease spread rapidly throughout the country and reached other continents, being recognized by the World Health Organization (WHO) as a new pandemic in March 2020 (WHO, 2020).

To contain the advance of the virus, all countries in the world, in different times, had to adopt measures that included the interruption of a set of educational, industrial, commercial, and people-moving activities. The main measure was social isolation, followed by the mandatory use of masks by the population (Spagnol et al., 2021).

Despite being strict measures adopted in an atypical situation, these actions proved to be positive for human health and also for the environment, since previously hidden landscapes reemerged clear and visually recovered. The interruption of tourism in the city of Venice, for example, resulted in an improvement in the water quality of the canals. In other cities, the shutdown of factories and the reduction of traffic powered by fossil fuels such as oil contributed to the reduction of air pollution and respiratory diseases (Souza, 2020; WHO, 2020 Carvalho, 2020; Nascimento et al., 2021).

However, even with the mobilization of national governments and international bodies, especially the World Health Organization (WHO), COVID-19 resulted in the death of about 15 million people worldwide (Grimley; Cornish; Stylianou, 2022).

In Brazil, as of May 29, 2024, 712,205 deaths from the disease had been recorded. The Southeast region ranks first in lethal victims, with 343,286 deaths. This was followed by the South (112,994), Northeast (136,849), Midwest (67,057) and, finally, the North region with 52,019 deaths (Coronavirus Panel, 2024).

In this sense, the very high number of people victimized by the virus brought an alert and a reflection to the constant human interference in nature and the consequent emergence of zoonoses, because COVID-19 is a zoonotic disease, which originated from bats and at the time of writing this work, there is no clarification about the species that acted as the intermediate hosts. It is believed, however, that the animal in question was among the wild species traded in a live animal market, in inadequate sanitary conditions, in the Chinese city of Wuhan (Nascimento et al., 2021; Morcatty, 2021; Liu et al., 2020).

It is estimated that each year an average of three new infectious diseases appear in humans and about 75% of them are of zoonotic origin. We haveas an example recent diseases that threaten human health: SARS (2002); Avian Influenza or Avian Influenza (2004); H1N1 or the Swine Flu (2009); MERS (2012); Ebola (2014-2015); the Zika Virus (2015-2016); West Nile Fever (2019) and SARS-CoV-2 (2020) (UNEP, 2020).

Zoonotic diseases can be transmitted to humans by direct and indirect contact. In the direct mode, transmission occurs through secretions (saliva, blood, urine and feces) or by scratches or bites. Meanwhile, indirect contact occurs through the bite of mosquitoes, fleas, and secretions due to the consumption of food contaminated by etiological agents (Duarte et al., 2021).

Among the reasons given for the re-emergence / emergencies of infectious diseases, we highlight the population growth that intensifies the process of precarious urbanization and densification in vulnerable areas, migrations and displacements as displaced from the climate of human and non-human populations, armed conflicts that promote a situation of high unhealthiness, economic globalization, intensification of trade relations, extreme poverty, biodiversity loss, and species extinction, increasing ecological imbalance, as well as deforestation and land use change (Lima, 2020).

Studies point to the relationship between the emergence of diseases and environmental changes and human invasion of natural habitats with a low degree of anthropization or wild as a factor that increases contact between species and pathogens with domestic animals and humans (Nascimento et al., 2021; Rabello; Oliveira, 2020; Souza, 2020).

Human invasion in these areas occurs mainly through anthropogenic activities such as deforestation, logging, intensive cattle ranching, mining, and the increase of agricultural zones that encroach on forested areas, or even new urban areas (Rabello; Oliveira, 2020; Nascimento et al., 2021).

In this sense, this study aimed to verify the relationship between the socio-environmental problems of the twenty-first century, such as deforestation and land use change, with the emergence of the COVID-19 pandemic through a narrative review of the literature.

METHODOLOGICAL PATH

It is a narrative literature review research, which consists of the search and analysis of literature, publications in books, printed or electronic magazine articles. The choice of the method is justified by the possibility of individual interpretation and critical analysis of the researcher (Rother, 2007). Therefore, the following research question was elaborated: *Is there a relationship between deforestation and land use change with the emergence of the COVID-19 pandemic?*

The search for studies was carried out in national and international databases, namely: Journals of the Coordination for the Improvement of Higher Education Personnel (CAPES), Scientific Electronic Library (SCIELO), National

Library of Medicine (MEDLINE/PUBMED), GOOGLE SCHOLAR, and national and international websites with publications on the subject such as WHO, PAHO, BBC, and CNN BRASIL). The following keywords were used: "Deforestation"; "Covid-19"; "Changes in land use";

"Zoonotic diseases", "Environment" and "Coronavirus". with the combination of the Boolean operators AND and OR, without time frame.

For the screening stage, the titles and abstracts were read, and studies that did not answer the research question were excluded. In the eligibility stage, eligible studies were read in full. In the inclusion stage, the studies selected in the previous stage were data extraction and information categorization. From the analysis of the studies, the following categories were created: a) the advance of deforestation in Brazil and in the world; b) climate change; c) human interference in natural habitats and COVID-19.

INTERACTIONS BETWEEN THE ELEMENTS OF THE ENVIRONMENTAL CRISIS AND HUMAN HEALTH

THE ADVANCE OF DEFORESTATION IN BRAZIL AND IN THE WORLD

Anthropogenic changes in land use intensified in the nineteenth and twentieth centuries, especially in developing countries, where logging, deforestation, mining, the construction of hydroelectric dams, the opening of roads and highways, and the increase in agricultural production, which is linked to the agricultural-urban-industrial world system (Ahmed et al., 2019; Saccaro-Junior et al., 2015).

The uncontrolled use of the natural commons, treated from the dominant capitalist economic aspect only as natural resources, is evidenced by deforestation, mining, the reduction of biodiversity by agriculture and the construction or expansion of cities. Such situations harm and affect the existence of other living beings on the planet, taking away their living spaces (Tarazona; Ceballos; Broom, 2020).

Deforestation represents one of the greatest socio-environmental concerns today, being present in global agendas on land use. The preservation of the forest is important, as it is through them that the purification of air and water occurs, in addition to the practice of deforestation puts at risk the biodiversity of numerous animal species, leading them to extinction and unbalancing ecosystems (Ceolin, 2019); CNN Brasil, 2023).

Research shows that about 95% of deforestation is due to illegal practices. This process has been aggravated in the state of Amazonas, with the extraction of timber and activities related to agriculture (Constantino, 2023; Nassif; Raciunas, 2023; BBC, 2023). In Mato Grosso, it is estimated that 80% of the deforestation that occurred in the Cerrado biome was illegally practiced. These changes have an impact on the Pantanal biome, as the Cerrado is home to springs that supply the region's rivers, contributing to the worsening of water crises (Ghaouri, 2023). In the case of Mato Grosso, deforestation in the Amazon has also been a growing and continuous practice from the 1970s to the present.

However, if the situation is very visible in the context of the Brazilian Amazon, it also exists in other forests present in Bolivia, Indonesia, Asian countries, Peru, and the Democratic Republic of Congo (BBC News Brasil, 2021; Morens et al., 2020). Bolivia and Peru together contributed more than 5 million hectares to forest clearance (BBC News Brasil, 2021).

During the pandemic period, the deforestation rate recorded in Brazil in 2020 was considered the highest in more than a decade (BBC News Brasil, 2021). This year, deforestation jumped from 63% to 136% when compared to the previous year (2019), this increase may be related to the application of isolation measures that aimed to contain the spread of Coronavirus and that reduced monitoring and inspection actions (Brancalion et al., 2020).

The states with the highest deforestation rates in Brazil in 2020 are Pará with (33%) of the alerts and 26% of the deforested area, Mato Grosso with (5%) of alerts and 12.86% of deforested area, and finally the state of Maranhão with (12.08%) of deforested area in the country, and the main cause responsible for deforestation is agriculture, other causes are mining, mining, natural cause, urban expansion and others (Azevedo et al., 2020).

In addition, the pandemic also favored the approval of political actions, which aimed to weaken environmental protection policies in Brazil. These acts included environmental deregulations that weakened environmental stewardship and enforcement through less stringent standards and procedures. Although research indicates an increase in deforestation rates, there was a reduction in the application of fines (Vale et al., 2021).

CLIMATE CHANGE AND FIRES

According to the Intergovernmental Panel on Climate Change (IPCC), about 23% of the world's greenhouse gas emissions are due to human activities, including fires (Levin; Parsons, 2019). The consequences of climate change on human health can be perceived in two ways: direct, through heat waves or other events such as hurricanes and/or floods; or indirect, which occurs through environmental changes, such as modifications in ecosystems and biological cycles, which can lead to the emergence or reappearance of emerging and reemerging diseases (Barcellos et al., 2009).

Currently, the planet is facing strong heat waves, severe droughts, and forest fires in several countries around the world, such as the United States, Australia, the Siberian Arctic, and including Brazil (Silva et al., 2021). The number of fire outbreaks that occurred on Brazilian soil in 2020 in the Pantanal region broke records: 4,611 fire outbreaks were recorded, triple the rate in the previous year (2019; 1,534), considered the highest record in 22 years (Fiocruz, 2020; Bronze, 2020; Borges, 2020).

The consequences of uncontrolled fires include the loss of natural vegetation, reduced biodiversity, and damage to human health (Silva et al., 2021; Fiocruz, 2022). This practice emits

gases that are harmful to human health, causing damage to the respiratory system, reducing lung capacity, contributing to the increase in hospital admissions due to respiratory diseases, generating unnecessary expenses for public health systems (Gonçalves et al., 2012; Silva et al., 2020; Hacon et al., 2021; Fiocruz, 2022).

The effects of fires on human health can be felt even at a distance from the places where fires are located. This is due to the speed and direction of the wind, which spreads the toxic components and atmospheric particles present in the smoke (Alvin, 2020).

HUMAN INTERFERENCE IN NATURE AND COVID-19

It is estimated that the world population is currently approximately 7.8 billion inhabitants. The population increase is pointed out as an intensifying agent of the urbanization process, which occurs in most cases, in a disorderly and precarious way. In association with the high demand for food, energy, food and rapid transport of people, globalization and human activities such as deforestation, there are factors that contribute to the emergence, introduction and spread of diseases (Thoradeniaya; Jayasinghe, 2021).

In addition, it should be noted that tropical forests are natural environments that provide shelter for various species of animals. On the other hand, they are places "rich" in viruses, which can be enhancers of pandemic diseases (Vale et al., 2021; Ilacqua et al., 2021).

Wildlife spaces are getting smaller and smaller, cornering most species that may be possible hosts for zoonotic diseases (Lacy-Niebla, 2021). Therefore, the loss of biodiversity hinders the natural stability of viruses and pathogens that tend to concentrate in certain species. It is observed that this instability, in turn, can lead to the emergence of emerging and reemerging diseases (Rabelo; Oliveira, 2020).

For Silva and Aleixo (2020), the preservation of biodiversity can "protect ecosystems and minimize the occurrence of virus spread among the human species". In the meantime, we highlight the paramount role played by biodiversity in regulating natural ecosystems and the global biosphere (Junges, 2020). Likewise, Junges considers that the decrease in diversity affects the adaptations of living beings to disturbances.

Focusing on the context of the Brazilian Amazon, deforestation has resulted in several environmental and social problems such as conflicts between indigenous peoples and miners, exposing many people to contact with hosts and various pathogens (Souza, 2020; Santos, Severo, Hoefel, 2020; Vale et al., 2021).

In addition, anthropic practice is related to contact between humans and animals that host unknown diseases, and consequently, the emergence of pandemic diseases. Therefore, the pandemic of the new coronavirus alerts us to the indirect effects of deforestation (Pierro; Jacobi, 2021) and

annihilation of wild environments. The number of zoonoses increases every year, many of them are the result of the removal of wild animals from their natural habitats, as well as their commercialization (Ilacqua et al., 2021). Such removal is for food purposes, sale of species for exotic breeding, removal of skins and other animal parts for medicines and illegal research.

Illegal wildlife trafficking is considered the third most lucrative activity in the world, second only to drug and arms trafficking (Duarte et al., 2021). In this scenario, Brazil is considered one of the main suppliers of animals and it is believed that the illegal market moves around one billion euros per year (Duarte et al., 2021; Alvarenga, 2016). There is a very serious situation of environmental and ecological crimes, with enormous potential for causing human health crises.

According to Ribeiro et al. (2020) the COVID-19 pandemic has contributed to an increase in the illegal trade in animals, because when legal suppliers are unable to meet consumer demand for exotic pets, illegal traders become the most viable option.

According to Junges (2020), most viruses that can reach the respiratory tract, as well as SARS-CoV-2, have a zoonotic origin, and bats are the main carriers. This is because in the processes of agricultural and urban expansion, places inhabited by humans are increasingly closer to bat habitats. The author also points out that animal feedlot farms (cattle, pigs and poultry) that meet the demand for meat have favored the creation and spread of viruses that affect the respiratory tract.

The study by Souza (2020) also points to this relationship between animal production and management practices as a risk factor for the emergence of zoonotic diseases. For the author, livestock acts as a carrier of pathogens, since animals assume the position of vector (host) of pathogen transfers from wild animals to the human population.

FINAL CONSIDERATIONS

The results of this study indicated that deforestation and the reduction of biodiversity have contributed to the emergence and transmission of zoonoses. This occurs due to the interactions between species and the removal of forest cover, which lead to modifications in these interactions.

The studies revealed that in Brazil and other countries, the intensification of agriculture and livestock has brought humans closer to wildlife, increasing the risk of exposure to pathogens. In addition, the studies warn about the consequences of deforestation with the water crisis, since forest deforestation can compromise the supply of rivers and influence the population's shortage.

Another consequence is forest fires, practices that not only intensify the greenhouse effect, but also destroy wildlife spaces, causing the death and extinction of several species. Regarding the effects on human health, its association with an increase in respiratory diseases stands out. In addition, studies highlight the dangers of wildlife trafficking to human health. This practice exposes humans to

the risk of disease specific to the animal, which can favor the emergence of emerging diseases such as COVID-19.

When dealing with COVID-19, studies point out that the disease may have arisen from man's constant exposure to animals sold in markets that sold live and dead animals. Therefore, it is important for environmental, animal and human health to provide guidance to the population about the potential risks related to these practices, as well as to institute permanent public policies for monitoring and control. In addition, it is necessary to strengthen existing environmental legislation and carry out stricter ways of enforcement.

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