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IMPACT OF VACCINATION AGAINST COVID-19 BASED ON DIAGNOSTIC TESTS IN THE ELDERLY POPULATION THROUGH A NETWORK OF LABORATORIES IN BELÉM-PARÁ

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ABSTRACT

The pandemic context has brought countless uncertainties to health systems around the world. However, in the midst of so many doubts, hope emerges: vaccination. Conducting a broad vaccination program, prioritizing population groups at risk – such as the elderly, should be the main tool. However, despite the unquestionable relevance of vaccines against vaccine-preventable diseases, especially in the elderly population, many elderly people still do not adhere to this policy. Thus, it is essential to comparatively analyze the confirmed cases of SARS-CoV-2 in the elderly before and after the start of the vaccination process in one of the Brazilian states with a public health system that is most congested by COVID-19. Thus, this study aims to demonstrate the impact caused by vaccination on the standards of diagnostic tests, in the studied group, before and after vaccination in Belém-PA. This will be possible from the analysis of the results obtained by a laboratory, making it possible also observe characteristics of the patients submitted to the tests, such as age, gender, presence of symptoms during the test and associated conditions. Data will be analyzed and expressed through of graphs and tables, with the help of Microsoft Word 2016, Excel 2016 and Biostat 5.3 software.

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INTRODUCTION

The impact of COVID-19 in the state of Pará, along with other Brazilian states, was very significant. According to data from the Secretariat of Public Health (SESPA – PA, 2021), by the beginning of May 2021, more than 480,000 cases had been confirmed. The Metropolitan Region of Belém was one of the most affected, having to stay under a black flag regime – highly rigorous restrictive measures – for a few weeks (SEGUP – PA, 2021). Among several existing diagnostic ranges for COVID-19, the RT-PCR method is considered the gold standard in matters of sensitivity and specificity. The analysis methodology of the diagnostic test consists, firstly, in the reverse transcriptase reaction, followed by the polymerase chain reaction. From this, the virus can be identified (GARG *et al*., 2021; SULE and OLUWAYELU, 2020). Individuals of all age groups, sexes, races and physiological conditions are equally susceptible to the virus (GIESECKE, 2020). Furthermore, elderly and immunosuppressed individuals with other comorbidities such as diabetes, hypertension, cancer, asthma and cardiovascular anomalies are more severely affected with a higher case fatality rate (LIU *et al*., 2020). Therefore, it shows a high prevalence in the elderly. In the Pará scenario, the age group that most evolved to death was those over 60 years old, with 73.8% lethality among registered deaths, demonstrating the need to devise strategies that protect this group (SESPA - PA, 2021). The elderly are the Brazilian nucleus with the greatest growth in recent years and in the coming ones as well. Studies claim that in the next three decades they will be almost 30% of the population, confirming the constantly rapid and continuous Brazilian population aging (IBGE, 2016). Thus, in 2006, the World Health Organization (WHO) warned about the implications that the increase in the number of elderly people can generate for global public health (BALDONI; PEREIRA, 2011). In addition, there are several alterations in the body associated with the aging process, especially those suffered by the immune system, since its susceptibility and vulnerability to infections, compared to adults and young people, is considerably greater, as the elderly are less able to respond physiologically and immunologically to invading microorganisms (SBGG, 2016). What makes this population vulnerable to SARS-CoV-2 infection. Amidst the chaotic scenario provided by the pandemic, hope emerges: vaccination. And, on January 18, 2021, vaccination began in the state (SECOM – PA, 2021). From then on, the problem arises of what will be the impact of vaccination on the current situation of cases, especially in Belém and the Metropolitan Region. One factor that expresses doubt about the

effectiveness of vaccination in the elderly is based on the prerogative that the number of B cells remains more consistent with age, but, due to a reduced expression of selected proteins in older age, fewer functional antibodies are produced (FRASCA *et al*., 2016). With that, immunologically, vaccines are probably a little less effective in older people (POLAND *et al*., 2020).

A study carried out in Israel analyzed the dynamic modeling of COVID-19 after an efficient vaccination program, one of the most advanced in the world. It was noted that, in a scenario of vaccination coverage greater than 80% among people over 60 years of age, there was an observable change in the dynamics of the disease, with a decline in the number of cases, mainly moderate to severe ones (DE-LEON *et al*., 2021). Another study that corroborated the positive efficacy of vaccination was carried out in the United Kingdom, which showed that Pfizer's immunizer reduced the appearance of COVID-19 symptoms in older people by around 60% and AstraZeneca's by up to 73% (BERNAL *et al*., 2021). Accordingly, another analysis model was created based on the US vaccination system. In it, it was possible to observe a reduction in the disease attack rate, among individuals over 65 years old, between 54 and 62%, within a similar epidemiological period. In addition, a reduction in attack rates of unvaccinated age groups was noted, explaining a likely change in viral circulation from then on (MOGHADAS *et al*., 2021). In view of this, it is clear that there is a need to immunize the elderly population, and the great clash originates from the time of prospecting studies, as vaccines against SARS-CoV-2 entered clinical trials within a remarkable period of just 6 months, compared to the typical 3 to 9 years required for other vaccines (HEATON, 2020). Different types of diseases, with high mortality rates and rapid contagion, demanded studies and an accelerated action in search of control or cure, thus providing the advancement of medicine, mainly the discovery of new vaccines, which represent the intervention strategy with the best cost-benefit relation applied in public health until today (DINIZ; FERREIRA, 2010).

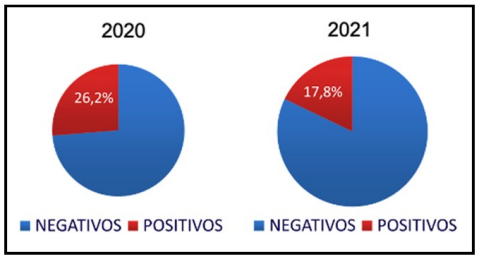
In Brazil, the National Immunization Program (PNI) coordinates the national vaccination policy for the Brazilian population and aims to control, eradicate and eliminate vaccine-preventable diseases, with emphasis on the implementation of vaccines against COVID-19 this year (BRASIL, 2021). However, despite the unquestionable importance that vaccines have in disease prevention, especially in old age, many elderly people do not understand their relevance for quality of life in this period, or even fail to be vaccinated due to the most different factors, ranging from the level social and economic aspects of the country to related causes, superstitions, myths and religious beliefs. In this context, the risk of harm to the patient's clinical condition increases, such as the risk of death and/or sequelae due to vaccine-preventable diseases (APS, L. *et al*., 2018). In addition, in 2013, hospital care for the elderly population accounted for 31.6% of public spending on hospitalizations. This scenario reinforces the need to increase investment in health promotion and disease prevention actions, in order to avoid or delay chronic diseases and disabilities in the health of the elderly, given that this population profile is constantly growing (MIRANDA *et al*, 2014). In this regard, given the current epidemiological scenario that COVID-19 presents itself in the state of Pará, there is a need to maintain high and homogeneous vaccination coverage. Therefore, it is essential to describe the patterns of diagnostic tests against SARS-CoV-2 in the elderly population before and after the start of immunization in the Metropolitan Region of Belém, as well as to analyze the impact of vaccination of the elderly compared to the incidence of the virus in unvaccinated populations. In this way, the data obtained and their interpretations will be made known to the scientific and academic community. Solving, with this, doubts and questions about the affected population. The objective of the present study is to describe the patterns of diagnostic tests against SARS-CoV-2 in the elderly population before and after the start of vaccination in the Metropolitan Region of Belém. As specific objectives, we have: To analyze the impact of vaccinating the elderly on the incidence of the virus and compare it with unvaccinated populations and compare the percentage of elderly people affected by the disease with other age groups.

METHODOLOGY

A cross-sectional, observational, retrospective study was carried out, with descriptive and analytical analysis based on the number of elderly people who underwent the RT-PCR diagnostic test for SARS-CoV-2, in a laboratory linked to LACEM, in two moments: before the period of state vaccination (August to December 2020) and after it (August to December 2021) – due to the vaccination in two doses for the age group being carried out between January and June 2020. All patients who, for any reason, were excluded. reason (legal or ethical) it was not possible to access the reports of your exams. Data collection from the exams was carried out using the clinic's own data storage software, which made it possible to observe the results of each patient who underwent the exam on site. Participating patients had their names safeguarded, so that only the registration number in the laboratory's medical record was accessed, as authorized by the person in charge of the clinic. The researchers had no contact with the form and other patient data. Data collection to form the database was carried out from September 2021 to January 2022 at the Ruth Brazão Laboratory, after approval by the ethics and research committee. The quantitative analysis of the study was carried out using chi- square and odds ratio, with level a: 0.05 (5%) and 95% confidence interval via Bioestat software version 5.3, in addition to preparing tables and graphs, using Microsoft Word 2016 and Excel 2016 software. classified the data according to certain variables related to the analysis of the tests of the population studied, such as the patient's age (separating by age groups), their gender, the presence of symptoms during the test and associated conditions - variables present in the Data Sheet Investigation of Influenza Syndrome Suspected Coronavirus Disease 2019. All subjects of the future study were analyzed according to the precepts stipulated by the Declaration of Helsinki and the Nuremberg Code, respecting the s Norms for Research Involving Human Subjects (Res. CNS 466/12) of the National Health Council, through the signature of the Term of Consent for the Use of Data, developed by the researchers in accordance with the Manual for the Elaboration of Scientific Papers of the University of the State of Pará, by the participants, with appropriate language to the population, and the adequate qualification of the researchers to carry out the research. Furthermore, the study was only carried out upon acceptance by the advisor and was authorized by the head of the Ruth Brazão Laboratory, the director of the Center for Biological and Health Sciences at the University of the State of Pará and the Research Ethics Committee (CEP) via Plataforma Brasil.

RESULTS AND DISCUSSION

Between 08/01/2020 and 12/31/2020, 1320 elderly people underwent the RT-PCR test, 770 women and 550 men, totaling 192 positive results in women and 155 in men. In the second moment, between 01/08/2021 and 31/12/2021, 1550 elderly people underwent the RT-PCR test, 1033 women and 517 men, totaling 258 positive results in women and 19 in men. Thus, in the pre-vaccination period there was a positivity of 26.2% and, in the post-vaccination period, 17.8% of the results were positive, considering an increase of 17.4% in the number of tests.



Graphics 1 and 2. Percentage of positive tests in the two different periods

Total number of RT-PCR

Positive results the elderly

Negative results the elderly

	Total de Testes RT-PCR em idosos	Resultados Positivos	Resultados Negativos
August to December 2020 — Agosto a Dezembro 2020	1320	347	973
August to December 2021 — Agosto a Dezembro 2021	1550	277	1273

Tabela 1. Quantitativo e resultado de testes RT-PCR em idosos no período estudado.

The elderly are the Brazilian nucleus with the highest growth in recent years (IBGE, 2016). In 2006, the World Health Organization (WHO) warned about the implications that the increase in the number of elderly people can generate for global public health (BALDONI, A.; PEREIRA, L, 2011). This fact was verified with the advent of the new corona virus, in 2019, which highlighted the fragility of our Unified Health System (SUS) in the face of a pandemic that mainly affected the elderly. These represent a population more vulnerable to infection, since the greater the age and presence of comorbidity, the worse the evolution of the case (BERNAL *et al*., 2021). Thus, vaccination emerged as the main tool to combat the virus, as it provided greater protection, reducing the impact of hospitalizations and mortality (VASILEIOU, 2021). However, even so, some factors led to a lower vaccination rate in elderly individuals, mainly the adverse effects of the vaccine, such as nausea, vomiting, headache, myalgia, arthralgia and local pain, with emphasis on the Astra Zeneca vaccine (VASILEIOU, 2021). In this case, the vaccine schedule with CoronaVac in the State of Pará was chosen. This had an average efficacy of 41.6% after the second dose. However, this protective effectiveness decreases with advancing age (BRASIL, 2021). In addition, it is added to the fact that many elderly people do not understand its relevance for the quality of life in this period, or even fail to be vaccinated due to the most different factors, ranging from the social and economic level of the country to related causes, to superstitions, myths and religious beliefs (APS, 2018). In view of the results obtained, it is possible to verify the positive impacts of vaccination against the SARS-CoV-2 virus. The drop in the test positivity rate pointed to lower transmission of the virus, as an effect of vaccination, which reached 26.2% of the study population in 2020 and 17.8% in 2021.

The present study is in line with others if we analyze the vaccine dynamics in Brazil. In Manaus, Orellana *et al*. (2022) identified a global reduction in the rates of hospitalization and death from the disease in the elderly, especially among those aged 60-69 years, following a pattern with substantial reductions in the vaccinated groups of 2021, compared to the non-vaccinated ones of the de 2020. Furthermore, an ecological study carried out in Curitiba found that as the prevalence of elderly people vaccinated for COVID-19 increases in the city, the mortality rate caused by the SARS-CoV-2 virus tends to decrease (DA SILVA *et al*., 2022). Equally important, there is a growing need to follow up on the vaccination schedule, even as disease variants spread throughout the country. Ranzani *et al*. (2021) confirm this need by identifying that the two-dose schedule of CoronaVac was 47% effective in the symptomatic prevention of COVID-19, with greater effectiveness against severe clinical outcomes, among elderly people aged ≥ 70 years in an environment with extensive transmission of the gamma variant. Vaccination is an essential measure to protect the elderly from morbidity and mortality resulting from vaccine-preventable diseases. However, immunosenescence and inflammaging significantly interfere with the way the immune system responds to diseases and vaccine components, explaining the need to implement more doses for COVID-19 in the elderly's vaccination schedule.

On the other hand, in general numbers since its implementation in Brazil, vaccination coverage for COVID-19 with two doses has been below the level necessary to protect the elderly. Vaccination is an essential measure to protect the elderly from morbidity and mortality resulting from vaccine-preventable diseases. However, immunosenescence and inflammaging significantly interfere with the way the immune system responds to diseases and vaccine components, explaining the need to implement more doses for COVID-19 in the elderly's vaccination schedule (KOBAYASHI *et al*., 2015). For example, there was an increase in the death rate from COVID-19 among individuals aged 80 and over, followed by the 70-79 and 60-69 age groups, between January and mid-April 2021 (KUPEK, 2021). In this sense, there is a growing alert to intensify public policies to encourage adherence to vaccination campaigns, as well as the use of collective health measures, such as the adoption of masks and alcohol gel during flu-like symptoms.

CONCLUSION

Thus, the importance of vaccination in a positive outcome in the reduction of positive cases for SARS-CoV-2 was noted. The present study appears as a starting point for further research involving the much-feared disease caused by SARS-CoV-2, especially in its moment of pandemic apex, corresponding to the development of this research. Amid so many uncertainties and afflictions, the emergence of the vaccine served as a possible escape valve to overcome this scenario that we are still experiencing. In this way, the scientific analysis of the impact of COVID-19, between the pre and post vaccination periods, also appears as a hope for better days in the future.

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