

## **EPIDEMIOLOGICAL PROFILE OF RAPID INFLUENZA TESTS IN BRAZILIAN HOSPITALS AND OUTPATIENT UNITS: INSIGHTS FROM THE DIAGNOSTIC MEDICINE AND HEALTH NETWORK BETWEEN 2019 AND 2023**

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**Abstract:** The coexistence of viral agents in the post-covid-19 period has attracted the attention of specialists in different regional outbreaks. In this work, we evaluated rapid test requests that simultaneously screen for Influenza A, B and A (H1N1) in patients in hospital and outpatient units treated by a nationwide diagnostic and healthcare company. Using an internal database without individual identification, we analyzed medical requests for rapid influenza testing for serotypes A/B/H1N1 (Ag A/B/A-H1N1) comparing findings from January 2019 to April 2023. We analyzed the number of tests, regions, gender, age, positive cases and seasonality. We also evaluate the profile of test applicants over time. During the period evaluated, we had 4257 tests carried out in 27 cities in Brazil. The general average age in the period was 26.8 years old, with the female gender being the main one - an exception in 2020 and 2021 (47.6% and 43.6%). The prevalence of positivity was constant without significant difference over the period, with an average of 8.6% over the five years evaluated. In 2023 we detected a prevalence of 10.6%, the highest in the study. We jumped from 8 to 239 positive tests comparing 2019 and 2023, which demonstrates greater circulation of the virus due to measures to relax social isolation in the post-covid-19 period. Among influenza serotypes, we had a prevalence of group A in all years with the exception of 2023, where group B was prevalent (58.1%). H1N1 cases were detected in 0.1% of tests. Lower demand for the test coincided with the peak periods of Covid-19 and greater requests from the first quarter of 2022. Test applicants grew annually, showing interest from other specialties in the topic, with a total of 12 prescribing medical specialties in the period. The data shows the expansion of surveillance by specialties in the post-covid period and reinforces rapid testing as a screening tool in urgent and emergency

situations.

**Keywords:** influenza, flu, virus, coexistence

## INTRODUCTION

Respiratory viruses are the causative agents of important diseases worldwide, with a relevant impact on mortality and morbidity<sup>1</sup>. In clinical importance in Brazil, influenza viruses are divided into groups A and B. Group A, were the causative agents of all influenza pandemics in the world and in their surface structure, consist of hemagglutinin (HA) and neuraminidase molecules (NA), which coats the core of the virus particle, possible targets for diagnostic tests and therapeutic drugs<sup>2</sup>. The influenza B virus is the type of flu that also causes inflammation in the upper respiratory tract, but unlike type A, it has only two variants: Victoria and Yamagata. Group A, in turn, has the A/H1N1 subtype, which is an eventual agent of the respiratory system and is the product of natural genetic recombination of the influenza virus from humans, swine and birds. In 2009, an H1N1 variant was responsible for the first global threat pandemic of this century<sup>3</sup>. The structural and genetic evolution of influenza over time has aroused the curiosity of researchers from different specialties for early diagnosis and treatment around the world. More recently, protective measures against Covid-19, especially social isolation, have reduced the circulation of influenza and other respiratory viruses, the incidence of which has decreased considerably. In Brazil, with the subsequent relaxation of health measures, linked to low vaccination coverage against influenza, these were determining factors that contributed to the return of influenza infections with a greater number of cases and leading people to seek care. In the laboratory, there are different tests for researching the virus, where immunochromatography techniques are the ones most chosen by applicants as they deliver

a result in minutes, although they exhibit lower sensitivity when compared to molecular ones<sup>4</sup>. Here, we evaluate test requests that simultaneously search for Influenza A, B and A (H1N1) in patients in hospital and outpatient units treated by a nationwide diagnostic and healthcare company.

## MATERIAL AND METHODS

The data for this work came from a nationwide private Brazilian laboratory, founded in 1984, made up of more than 7,000 employees, who served over 7 million customers in 2023 in 350 service units in 13 states in Brazil and the Federal District. The network is a reference in quality and certified by CAP (American College of Pathologists) and PALC (Clinical Laboratory Accreditation Program of the Brazilian Society of Clinical Pathology/Laboratory Medicine)<sup>5</sup>. The information studied was extracted from the shift system through a database from which data extraction, collection and processing were carried out, which were anonymized for individual identification, respecting the general data protection law in force in Brazil. The patients were hospitalized and outpatients treated by the laboratory health service. We analyzed requests for the rapid influenza test, an immunochromatographic test called the rapid influenza test (Ag A/B/A-H1N1) comparing findings between the years January 2019 to April 2023. We analyzed the number of tests, regions, gender, age, prevalence of positive cases and seasonality. We used as a parameter for analysis, medical requests for rapid testing as well as the number of positive cases for influenza A, B and H1N1 in the period.

## RESULTS AND DISCUSSION

### SEARCH FOR THE QUICK TEST

When we evaluate the demand for and performance of tests, we had 4257 tests carried out on patients from 27 cities and 13 states in Brazil between 2019 and 2023, with a predominance of requests in the State of Mato Grosso (MT) representing 37.9% of total requests, followed by Amazonas (AM) with 15.4% and Minas Gerais (MG) with 8.2%. The peaks of requests were at different periods in each State, with the first quarter of each year predominating in 2019, 2021 and 2022, with the exception of 2020, where the predominance of requests occurred in the second quarter of the year, coinciding with the beginning and middle of autumn. Evaluating the scenario year by year, 2023 presented a significant difference in relation to the other years with a higher request profile than the other years. However, between 2019 and 2023, there was increasing demand for the test year after year. The average age of patients in the 5 years evaluated was 26.8 years, 54.5% were female and 45.5% male with no difference between them when we evaluated year by year, with the exception of 2022 where 61.6% were women seeking the service. From 2019 onwards, an increase in test requests for different specialties was also noticed, demonstrating greater interest in the search for the researched agents (figure 1).

### PREVALENCE AND POSITIVITY

When we evaluated positive cases, they represented 8.6% of the tests carried out with no statistical difference between men and women (47.3 and 52.7% respectively). Regarding the types of influenza found, 4.5% were identified as group B, 3.9% as group A and 0.04% as H1N1. Group B represented 52.7% of positive cases, compared to 46.6% of group A and 0.5% H1N1. In the same way as the demand for the service, greater positivity has gradually increased since 2019, reaching its highest number in 2023 with 288 positive cases in absolute numbers. The average age for positive cases was 23.5 years, no difference from the 26.8 years of the total number of patients who sought the test. Interestingly, for positive cases, we had different average ages year by year: 2019 (average of 20 years); 2020 (55 years); 2021 (42 years); 2022 (34 years old) and 2023 (19 years old) and in some situations, the positivity did not coincide with the months of greatest demand for the test, for example, in 2019 (higher positivity in the 3rd quarter versus the 1st quarter of demand) and 2022 (second highest positivity in the 4th quarter versus the 1st quarter of demand). When we evaluated the regions of positive cases, these were verified in 8 States: Amazonas, Distrito Federal, Minas Gerais, Mato Grosso do Sul, Mato Grosso, Pará, Roraima and São Paulo. In 42.6% of cases, they came from MT and 9.3% from AM.

When we evaluated the classification of serotypes year by year, we had a prevalence of group A in all years, with the exception of 2023, where group B was prevalent (58%). Cases of H1N1 were detected (0.1% of tests). During Covid and especially post-Covid-19, the increase in influenza virus infections (figure 1) has attracted the attention of scientific communities, generating outbreaks across the country driven by a reduced circulation of serotypes in 2019 and 2020, due to low

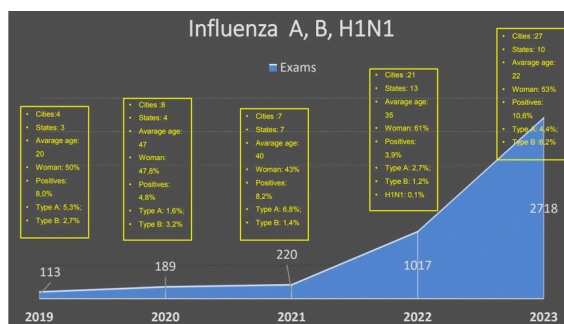
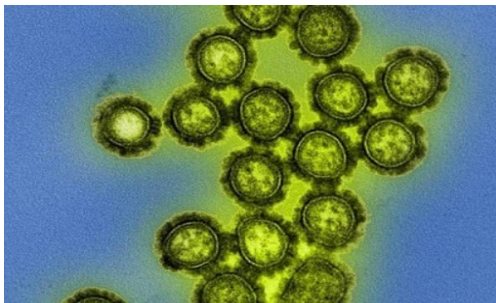


Figure 1: Year-by-year analysis of data found in influenza prescriptions

adherence to campaigns vaccination and the introduction of one or more new strains over time<sup>6,7,8</sup>. Influenza type A (figure 2) is classified into subtypes, such as the clinically important A (H1N1) and A (H3N2). Type B is divided into two lineages: Victoria and Yamagata. Our tests used here were able to differentiate H1N1, A and B separately and, therefore, allowed the epidemiological assessment of this patient's search for health services over time, providing a scenario of possible strains circulating in the regions evaluated. Although they have genetic differences, all types can cause similar symptoms, such as high fever, cough, sore throat, headaches, fatigue, body and joint pain and chills.



**Figure 2:** Influenza virus seen by electron micrograph (National Institutes of Health site <https://www.niaid.nih.gov/diseases-conditions/influenza>, acesso 11/03/2024)

The Influenza A virus, with the highest prevalence in the study in most years, remains one of the main causes of the common flu and colds and is easily transmitted between people through droplets released into the air when a person with the flu coughs or sneezes. Because it is a respiratory virus, just like the one that causes Covid-19, prevention occurs in a similar way, such as physical distancing, wearing a mask and correct hand hygiene. Updated vaccines from the current year are another important prevention tool, as they protect against circulating variants of Influenza viruses types A and B. Our data showed a greater number of cases in 2023 and

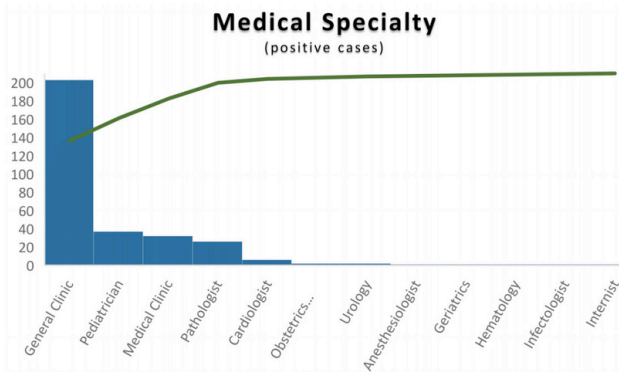
it is worth highlighting here that during the incubation period or In cases of asymptomatic infections, the patient can also transmit the disease up to one day before the onset of symptoms<sup>9,10</sup>.

Different authors point out that even with a lower lethality rate than Covid-19, some types of influenza A, such as H3N2, have greater morbidities in risk groups (children, the elderly, pregnant women and individuals with comorbidities).<sup>11,12</sup>mainly linked to the spread of the virus due to low flu vaccination coverage and the easing of restriction and prevention measures adopted against Covid-19 over the years<sup>6,7,8</sup>.

In our study, understanding the number and prescription patterns of influenza tests in hospital units and outpatient clinics, linked to clinical suspicions and strains circulating throughout the studied municipalities, were of fundamental importance for the assistant physician to monitor this issue in an assertive manner. patient. For example, studies conducted<sup>13</sup> demonstrated an association between media coverage and increased use of healthcare during the 2009/2010 H1N1 pandemic, bringing greater public awareness and awareness of different medical specialties in diagnosis and treatment. Corroborating these findings, here we see greater awareness and support from the press and written, spoken and digital media in the consequences of covid and post-covid, with information about other “dormant” viral agents that would begin to circulate again after the measures were relaxed. of covid. In our results, among the positive cases, there was an increasing increase over the years, of unusual medical specialties requesting influenza tests such as geriatrics, gynecology, urology, cardiology, making a total of 12 specialties (figure 3) over the five years assessment, which demonstrates more interest, dissemination and concern from professionals from other areas in caring



for their patient.



**Figure 3:** Requesting medical specialties between 2019 and 2023

Another important fact related to the growing number of requests is the non-specificity of influenza symptoms, which may overlap with those caused by other viral diseases.<sup>14,15,16,17,18</sup> in addition to the low sensitivity of the clinical diagnosis of influenza<sup>19,20,21,22,23</sup>. It is a fact that the availability of tests can assist in diagnosis and are clinical decision makers in the emergency room, and during acute phases of the disease, resulting in fewer prescriptions for unnecessary laboratory tests, less use of antibiotics and shorter hospital stays.<sup>24,25,26</sup>

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## FINAL CONSIDERATIONS

Finally, influenza infection is prevalent among children, adults and the elderly, and in many cases, these groups need to go to the emergency room with important but non-specific symptoms such as fever, respiratory symptoms, among others. The continued development of tests with greater sensitivity and specificity are useful in recommendations for the diagnosis and management of influenza for control and prevention. Here, our data brought the epidemiology of rapid influenza test requests over 5 years of evaluation, and portrayed, since COVID-19, the growing need for a differentiated look by the medical community and by different specialties in clinical suspicion and differential diagnosis of symptomatic patients who seek clinical help. The prevalence of relevant positivity presented in the period evaluated corroborates the concern and need for diagnosis of this and other viral agents that coexist at seasonal times of the year, in addition to reinforcing the relevance of a simple, quick test that can be used as a screening tool in urgencies and emergencies.

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