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O uso dos recursos em saúde na pandemia do vírus H1N1

Use of health resources due to influenza A virus, H1N1 subtype infection in Brazil

Resumo: Introdução: *A infecção pelo vírus A H1N1 influenza emergiu no Brasil em maio de 2009 e atingiu 32,09% dos casos confirmados até o final de Dezembro, respondendo por 1632 mortes no Brasil e tornando o país o em segundo lugar no número de mortes.* **Objetivo:** *Analisar e avaliar a utilização de recursos de saúde no Brasil, considerando tanto financeiros como recursos operacionais, devido à pandemia causada pelo vírus A H1N1 influenza.* **Métodos:** *Foram pesquisados artigos publicados nas bases de dados Lilacs e Scielo e sites nacionais e internacionais de indicadores de saúde (OMS, OPAS, Ministério da Saúde e do DATASUS) para comparar os dados de 2008 a 2009. Existem muitos dos dados sobre a epidemiologia do vírus mas poucos sobre estratégias na utilização de recursos de saúde.* **Resultados:** *Houve um aumento significativo nas hospitalizações por influenza em 2009, quando comparado com o ano anterior. O número total de hospitalizações por influenza aumentou em 55% em 2009, quando comparado a 2008, enquanto os custos relacionados com o tratamento cresceram para 83%. O número total de dias de hospitalização por influenza foi maior em 2009, mas a média do tempo de permanência não variou neste período de dois anos.* **Conclusão:** *A pandemia no Brasil tem sido prontamente controlada, no entanto, há uma falta evidente de estudos para quantificar a utilização de recursos de saúde no país.*

Palavra-chave: *Influenza A vírus, subtipo H1N1; Custos e Análise de Custo; Recursos de Saúde.*

ABSTRACT | Introduction: Infection by the AH1N1 influenza virus emerged in Brazil in May 2009 and reached 32.09% of confirmed cases by the end of December, accounting for 1632 deaths in Brazil and making the country the second in number of deaths. **Objective:** The objective of this study was to analyze and assess the use of health resources in Brazil, considering both financial and operational resources due to the pandemic caused by AH1N1 influenza virus. **Methods:** We searched published articles in LILACS and SCIELO databases and national and international health indicator sites (WHO, PAHO, Brazilian Ministry of Health and DATASUS) to compare data from 2008 to 2009. Although plenty of data about the virus epidemiology was found along with strategies to fight it, the use of health resources was much less researched. **Results:** Indirect data from DATASUS shows that there was a significant increase in hospitalizations due to influenza in 2009 when compared to the previous year. The total number of influenza hospitalizations increased 55% in 2009 when compared to 2008, while treatment-related costs boomed to 83%. Total number of hospitalization days due to influenza was higher in 2009, but the mean LOS (length of stay) did not vary in this 2 year period. **Conclusion:** Our findings point to the fact that AH1N1 pandemic in Brazil has been promptly managed and plenty epidemiological data has been generated; however, there is a clear lack of studies quantifying the use of health resources in the country.

Keywords | Influenza A Virus, H1N1 Subtype; Costs and Cost Analysis; Resources Management.

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INTRODUCTION|

In March and April 2009, cases of acute respiratory syndrome related to the AH1N1 influenza virus were described in Mexico and the United States (USA), identifying a new influenza A virus[1,2].

Virus detection was based on exams conducted in two children in California, United States in 2009[3]. It was a new virus, with a different genotype from the other A viruses (aviary, swine or human AH1N1), being the latter responsible for the Spanish flu of 1918. The rapid spread in the Northern hemisphere in the following weeks, reaching Europe in May[4] and on June 11th, prompted the World Health Organization (WHO) to raise AH1N1 influenza AH1N1 to the highest level of alert (level 6), officially declaring that the world was facing a new flu pandemic[4].

On April 25th, 2009, when a Public Health Emergency of International Importance (PHEIC) was declared by WHO, the Brazilian government carried out a series of measures[5], such as follows:

- Setting up of the Permanent Bureau of Public Health Emergency, to monitor the situation and indicate the appropriate measures for the country;
- Provision of medicines for all the federal units;
- Creation and distribution of technical materials for the guidance of professionals, with simultaneous update from robust scientific evidence and WHO guidelines;
- Purchase of vaccines, medicines, personal protective equipment (such as masks and gloves), improvement of the care network, and communication (inserts on broadcast, Internet, newspapers, airports);
- Expansion of the diagnosis network by Real-time polymerase chain reaction (RT-PCR) in government laboratories;
- Provision of direct communication channels through the Health Hotline (0800 61 1997);
- Investment in research about the conditions of risk for complications (factors and groups);
- Production and purchase of vaccines against pandemic influenza (AH1N1) 2009.

Infection by the AH1N1 influenza virus emerged in Brazil in May 2009 and reached 32.09% of confirmed cases by the end of the same year. There were 86,767 diagnosed cases of SARS (Severe Acute Respiratory Syndrome), being 27,850 (32.09%) confirmed by the pandemic virus which accounted for 1,632 deaths in Brazil, the second country in number of deaths[5]. The main risk factors for death in Brazil were comorbidities and pregnancy, since they were present in 882 deaths (54%) and 155 (9.55%), respectively[5].

The peak of incidence of SARS cases occurred between epidemiological weeks 29 and 38, which correspond to the months of August to October of 2009, as shown in Table 1[5].

Of all these cases, more than 90% of the isolated influenza viruses during this period were positive for the pandemic virus AH1N1, as shown in Table 2[5].

The most affected region by the pandemic virus was the South region, followed by the Southeast region[5]:

In 2009, the incidence rate of SARS due to influenza AH1N1 in Brazil was 14.5/100,000 inhabitants, and the mortality rate was 0.85/100,000 inhabitants[5].

On August 10th, 2010, the WHO declared that the AH1N1 Pandemic Influenza 2009 reached the post–pandemic phase. In the same year, 9,473 SARS cases were reported and suspected patients were hospitalized in all five regions of Brazil. Of these, there were 801 (8.45%) confirmed cases of AH1N1 influenza and 104 (1.09%) deaths[6].

The aim of this study was to assess and analyze the use of health resources in Brazil, considering financial and operational resources as a result of the pandemic caused by AH1N1 in Brazil, from April 2009 to December 2010.

METHODS|

We searched the LILACS and SCiELO databases for articles dealing with the use of health resources in 2009 AH1N1 pandemic virus in Brazil, through the Virtual Health Library (VHL) portal. Health Sciences Descriptors (DeCS) used: influenza A (filter resource# cost#) and influenza AH1N1. A search was also carried out on the official government sites: http://portalsaude.saude.gov.br/ and http://www2.datasus.gov.br/DATASUS/index.php?area=02 to compare data from 2008 to 2009. Data from international health organizations such as WHO and Pan American Health Organization

(PAHO) were also searched. Access dates: February 26th, 2010 and November 25th, 2010 for LILACS and SCIELO and January 11th, 2011 for National Health System (DATASUS).

Variables searched on official government sites included: hospitalizations due to influenza/pneumonia both in 2008 and 2009, their length of stay and associated costs as well as the number of deaths in both years.

RESULTS |

In the VHL/ LILACS survey using Influenza A as DeCS, 560 matches were found. Using AH1N1 as DeCS, nine matches were obtained. When a filter for resource# or cost# was used, no matches were found.

In the VHL/ SCIELO search using Influenza A as DeCS, 336 matches were obtained. When we filtered by year (2009) and country (Brazil), the search delivered 21 matches. Seven matches were found for AH1N1, while LILACS search, using the resource# or cost# filter, did not deliver any matches.

Machado[7] was the first author to publish an article on AH1N1 Influenza virus infection in Brazil, in May 2009 when the first cases of infection were diagnosed in the country. The article draws attention to the new infection and describes how to recognize, diagnose and treat cases[7].

In June 2009, an article by Carmo and Oliveira[8] from the Health Surveillance Secretariat, Ministry of Health, was published even before the pandemic was officially declared, describing the characteristics of the infection: prevalence in children and young adults and a low mortality (<1%), predominantly mild to moderate flu-like illness symptoms and a higher frequency of deaths in patients with underlying chronic illnesses. The article also outlined the main strategies set up by the Health Ministry to fight the epidemics: the structuring and strengthening of public health services for early detection and effective response to public health emergencies[8].

Another study by Duarte et al.[4] conducted in State of Paraná showed that among the 63 patients over 12 hospitalized due to AH1N1 influenza in a 45 day period, 39.7% evolved to death. In this same period, 11% of admissions to Intensive Care Units (ICUs) were due to AH1N1. In at least one of the hospitals included in the study, a special unit was created to take care of AH1N1patients. Moreover, as a strategy of the health system, measures were taken to reduce the number of elective surgeries in public hospitals in the state, trying to temporarily reduce some indications of ICU admissions[4].

A study conducted at Hospital das Clínicas, University of São Paulo, by Schout et al.[9], comments on the establishment of a crisis committee in the service to receive AH1N1 patients, comprising strategies for prevention, epidemiological surveillance, availability of rapid diagnostic tests, antiviral treatment, and training of hospital staff, including a specialized intensive care unit and ward. Among the 210 patients admitted to the hospital due to AH1N1 influenza, most of the cases (86 patients - 41%) were admitted to the Central Institute of Hospital das Clínicas with an average length of stay of 9.4 days. At Instituto da Criança, 64 children were admitted (30% of the 210 patients hospitalized) with an average length of stay of 5.7 days. The same service published a guideline for the management of the pandemic[10].

Verrastro et al.[11] published an article on the radiological manifestations caused by AH1N1virus in chest computerized tomography[11].

In another article[12], the Minister of Health of Brazil in 2009, José Gomes Temporão, reported the measures taken by Sistema Único de Saúde (SUS) in the country, in accordance with states and municipalities, for effective action in combating the pandemic including:

- Monitoring and surveillance activities;
- Notifications of cases;
- Monitoring of ports, airports and borders;
- Recommendations to travelers;
- Assistance to cases and contacts;
- Disclosure to the media;
- Structuring of health networks;
- Acquisition of materials and treatments;
- Development of capacity for the production of the vaccine against influenza A (AH1N1) virus.

In this article, the Minister refers to the National Network for Influenza Diagnosis, introduced in Public Health Central

laboratories in all states and the Federal District, and also in the 53 hospital referral units for monitoring and treatment of patients with influenza AH1N1 infection, with 1,270 beds reserved by the State Departments of Health[12].

To combat the 2009 - 2010 pandemic, the federal government purchased 113 million doses of the pandemic vaccine in early 2010, with a total cost of US$ 180 million arising from an interim measure, including expenses for the operation of the campaign. This campaign was conducted in 36,000 vaccination sites around the country, under the responsibility of the State Departments of Health[13].

The measures taken in different health services were in accordance with the guidelines for combating the pandemic of São Paulo State Department of Health, as published in the Journal of Public Health (*Revista de Saúde Pública*)[14].

Ercole et al (2009) also carried out a literature review on national and international databases about swine flu. Forty publications were found, with 18 forming the basis for an article about the infection, its etiology, epidemiology, prevention and treatment strategies. None of the articles mentioned by the author made reference to the use of health resources during the pandemic[15].

In addition to the literature review a search in DATASUS was conducted on infection by AH1N1 influenza virus. There is no information on hospitalization, checkups or use of drugs resulting from infection by the pandemic virus. The survey of hospital admissions for influenza (not typed) occurred in all age groups, and in all regions of the country in 2009 added up to 42,869 cases, 55% more than the numbers reported in 2008 (27,583)[16].

The cost of hospitalizations for influenza mentioned above was US$ 19,044,259.99, approximately three times the value from the previous year, 2008, US$ 7,748,282.34, as shown in Table 1[16].

When analyzing the number of hospitalization days due to influenza in 2009, we found that they reached 202,672 days, while in 2008 this number was 135,435 days, a 49% increase. When we looked at the average length of stay of each individual hospitalized for influenza, there was a small difference between the two years (average stay of 4.9 days in 2008 and 4.7 days in 2009).

It is important to note that the peak of admissions coincided with the months of largest circulation of the pandemic virus, as seen in Table 2.

Table 1 - Basic information and cost of AH1N1 virus pandemia in Brazil in 2008 and 2009

Information	Years		Δ 2009/2008 (%)
	2008	2009	
Total cost of hospitalizations (US$)	7,748,282.34	19,044,259.99	145%
# of cases	27.583	42.869	55%
Mean hospitalization cost (US$)	278.99	441.65	58%
Total LOS (days)	135.435	202.672	49%
Mean LOS (days)	4,9	4,7	-5%
# of deaths	755	1.426	88%

Source: DATASUS, 2008-2009.

Table 2 - Hospitalization expenses in Brazil in 2008 and 2009.

Expenses	Years		Δ 2009/2008 (%)
	2008	2009	
# of AIH	760.729	867.105	13%
Total Cost (US$)	230,209,670.52	391,109,579.60	70%
Mean AIH value (US$)	302.61	451.05	50%

Source: DATASUS, 2008-2009.

Regarding the number of deaths due to influenza, there was a considerable increase from one year to another, 1,426 deaths in 2009 versus 755 in 2008 (88% increase).

Data from DATASUS on hospitalizations for pneumonia or flu showed that in 2009 867,105 Hospital Admission Authorization (AIH) were generated for the treatment of pneumonia/flu with a total cost of approximately US$ 391,109,579.60, which means an increase of US$ 160,899,909.00 in relation to the previous year. There was an increase of 70% in costs in 2009 compared to the U$ 230,020,9670.00 spent in 2008 for the treatment of pneumonia/ flu (with a total of 760,729 AIH). The mean AIH value increased from US$ 302.61 in 2008 to US$ 451.05 in 2009[17] (a 50% increase in the average cost per hospitalization for pneumonia/flu from 2008 to 2009).

The search in the same site for information on outpatient service showed that there was only availability of data on outpatient visits per year, without specific diagnosis, making it impossible to determine whether the AH1N1 influenza pandemic represented an increase in outpatient care or emergency services in country.

In the beginning of year 2010, the Ministry of Health of Brazil issued a technical note on the strategy for AH1N1 vaccination program:

- A credit of US$ 80,978,635.42 and US$ 1,206,064,782.91 billion was earmarked for the purchase of vaccines, medicines, personal protective equipment (such as masks and gloves), improvements in health care network and communication;

- Eighty-three million doses of monovalent pandemic vaccine (AH1N1) were purchased by the government for vaccinating priority groups starting in March 2010, according to the analysis of more severe cases occurring in the country. The aim of the campaign was to maintain the functioning of health services involved in the response to the pandemic and to reduce morbidity and mortality associated with the virus.

The following groups were chosen to be vaccinated in order of priority:

- Health professionals;
- Indigenous population;
- Pregnant women;
- People with chronic diseases;
- Children aged six months to two years;
- Adults aged 20 to 39.

The elderly group was not primarily affected by the pandemic virus, so they were to receive the bivalent vaccine against seasonal influenza, which does not contain the AH1N1/California/7/2009 virus, unless they presented comorbidities[18].

DISCUSSION|

Reviewing available data on AH1N1 pandemic in Brazil, it is clear that prompt measures were taken by the Ministry of Health to address that emergency situation in the country, as well as the concern of medical writers to describe the clinical findings of infection in the assisted population in the country.

Awareness raising campaigns and guidance were conducted by the Ministry of Health throughout the country, and containment measures were taken.

There is much information available about the epidemiology of the disease in the country, number of cases, most affected region, the profile of patients who died, as well as data on how the country got prepared to face the pandemic.

However, little information was found in government technical notes and on DATASUS site about costs and number of beds available for the treatment of patients affected by the pandemic virus and so far we have not found a single study quantifying the use of health resources for the management of the pandemic in the country.

In the analysis of DATASUS information, the findings are related to influenza infection and not specific to AH1N1 virus infection. Even in the absence of specific data on the pandemic virus, a way to analyze its impact on the use of health resources in the country was to compare the number of hospitalizations due to influenza in the year 2008 to admittances in 2009, which showed a 55% increase. This increase accounted for an 83% rise in the cost of hospitalizations due to influenza in the year 2009 when compared to the previous year.

Although DATASUS information on hospitalizations due to influenza are not classified by type of virus, in 2009 more than 80% of circulating influenza viruses had been identified as the pandemic virus; thus, it may be assumed that this increase in the number and cost of hospitalizations due to influenza is largely due to the pandemic virus.

An increase in the cost of hospitalization for pneumonia/influenza in 2009 versus 2008 is also observed in DATASUS (26% increase in the total cost), and although this diagnosis includes both bacterial and viral cases, we may also infer that the pandemic virus has played an important role in this increase.

Another aspect analyzed in DATASUS was the length of hospital stay due to influenza, which in 2009 was 49% higher than the previous year. This may very well indicate that the influenza virus circulating in 2009 was more morbid than the virus circulating in 2008. However, we should point out that no statistical analysis was performed in this study and that the influenza subtype causing hospitalization was not diagnosed in either year.

The number of deaths among individuals hospitalized due to influenza was 88% higher in 2009 when compared to 2008 (1,426 vs. 755 deaths), but since the number of hospitalizations due to influenza was also considerably higher in 2009 and no statistical analysis was performed, it is not possible to determine whether the difference in the total number of deaths in 2009 is statistically significant (3.32% in 2009 vs. 2.73% in 2008).

Ercole et al.[15] published an article using a similar methodology to that used in this paper. Although his literature search was broader, no cost evaluations of AH1N1 virus infection were mentioned. Until the end of the research, no study had been published on the use of financial and operational resources as a result of the pandemic caused by the AH1N1 virus in Brazil.

Besides searching the available literature in Brazil, this study proposed the analysis of DATASUS information on influenza and pneumonia/influenza in 2008 and 2009, when the pandemic occurred. This analysis attempted to assess the social and economic impact of the pandemic in Brazil and although we cannot make strong assumptions about it, since the influenza subtype that led to hospitalization was not diagnosed. However, it seems quite logical to credit the increase in number of hospitalizations in 2009 to the pandemic virus, as it accounted for around 80% of isolated influenza virus in 2009 during the peak of influenza season.

Studies that seek to measure the impact on the use of health resources resulting from situations such as the pandemic are relevant to the country, as the scarce resources available should be applied efficiently. This body of knowledge, by affecting the perceptions of agents regarding health costs and benefits, can help promote strategies for the prevention and control of the diseases affecting the country.

CONCLUSION |

While we may say that AH1N1 pandemic in Brazil was promptly managed and many epidemiological data has been generated, there is no study quantifying the use of health resources in the country. In the few Brazilian articles on the topic, pandemic virus infection was mentioned as an important cause of ICU hospitalizations and length of hospital stay was described in some patients with AH1N1 infection.

These indirect analyses suggest that AH1N1 pandemic represented an increase in health resources use in Brazil, both financial and operational, but there is room to plan and develop health economic studies in the country with the aim of evaluating a proper way of using the scarce resources in the most effective manner.

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