ORIGINAL ARTICLE

Epidemiology of Influenza A (H1N1) in the Triângulo Mineiro and high Paranaíba Regions, Minas Gerais – Brazil

Epidemiologia da Influenza A (H1N1) na região do Triângulo Mineiro e Alto Paranaíba, Minas Gerais – Brasil

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ABSTRACT

Introduction: Influenza A, commonly known as the flu, is an acute viral infection of the respiratory system, highly transmissible and of worldwide distribution. Four years ago, the pandemic Influenza A (H1N1) virus of 2009 emerged in Mexico and quickly spread worldwide, causing a major pandemia, underscoring the yearly extension of flu among humans. **Objective:** To determine the occurrence of the influenza A H1N1 virus in the Triangulo Mineiro and High Parnaíba regions, as assessed by the Regional Health Division of Uberlândia, Minas Gerais, Brazil. **Methodology:** Data were obtained from the Investigation of Human Influenza by new (pandemic) subtype Report Sheets via SINAN, from June 2009 to July 2010. We evaluated incidence rate, mortality and lethality, as well as the relative frequency of risk factors. **Results:** 12 cities in the region had cases of influenza A (H1N1), with an incidence of 9.14 cases per 100,000 inhabitants, with a higher frequency in women (65.4%), aged 20-49 years-old and mainly citizens of Uberlândia. There were 20 deaths, with a mortality rate of 1.2 cases per 100,000 inhabitants and a mortality rate of 23%. **Conclusion:** for the control of major epidemics such as influenza A (H1N1) several coordinated public health interventions are required, aimed at the prevention and control of diseases with pandemic trends.

Key words: Influenza, Human; Influenza A Virus; Influenza A Virus H1N1 Subtype; Epidemiology.

RESUMO

Introdução: *a influenza A, mais conhecida como gripe, é uma infecção viral aguda do sistema respiratório, altamente transmissível e de distribuição mundial. Há quatro anos o vírus Influenza A pandêmico (H1N1) 2009 surgiu no México e rapidamente se espalhou pelo mundo, provocando pandemia de grandes proporções, alertando para a extensão a cada ano da gripe sobre o ser humano.* ***Objetivo:*** *determinar a ocorrência de influenza A H1N1 na região do Triângulo Mineiro e Alto Paranaíba, administrados pela Gerência Regional de Saúde de Uberlândia, Minas Gerais, Brasil.* ***Metodologia:*** *os dados foram obtidos das fichas de Investigação de Influenza Humana por novo subtipo (pandêmico), via SINAN, no período de junho de 2009 a julho de 2010. Foi avaliada a taxa de incidência, mortalidade e letalidade, assim como a frequência relativa dos fatores de risco.* ***Resultados:*** *12 municípios na região apresentaram casos de influenza A (H1N1), com incidência de 9,14 casos para/100.000 habitantes, mais frequente em mulheres (65,4%) na faixa etária entre 20 a 49 anos e residentes principalmente em Uberlândia. Foram registrados 20 óbitos, com taxa de mortalidade de 1,2 casos/100.000 habitantes e letalidade de 23%.* ***Conclusão:*** *para o controle de grandes epidemias como a de influenza A (H1N1) são necessárias diversas e coordenadas ações de saúde pública voltadas para a prevenção e controle das doenças com tendências à pandemia.*

Palavras-chave: *Influenza Humana; Vírus da Influenza A; Vírus da Influenza A Subtipo H1N1; Epidemiologia.*

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INTRODUCTION

The swine flu virus contains genes of the human, swine, and avian Influenza A virus, in circulation among the swine population in North America and other regions for at least 80 years, as first identified in the United States in 1998.[1] It is a highly transmissible acute viral infection of the respiratory system and thus of worldwide distribution.[2]

Commonly known as the swine flu, the Influenza A (H1N1) virus is characterized by a unique combination of gene segments of the characteristically human virus and the swine virus, and the new pandemics was first identified between March and May 2009 in Mexico, Canada and other countries.[1] It was identified as the cause of a self-limited infection, with a two to seven-day incubation period, with no respiratory complications and symptoms similar to those of seasonal flu (coughing, sore throat, runny nose, headache and myalgia), with fewer cases involving vomit or diarrhea.[2,3]

A total of 642 humans cases were confirmed in the United States from April 15 to May 5, 2009, but this number is likely to have been underestimated.[1]

The influenza A virus belongs to the orthomyxovirus family, whose genome is formed by single-strand RNA. The H1N1 virus is a variant of the Influenza virus that likely emerged from mutations of the genetic materials of the human, swine, and avian viruses that had been infecting a swine population simultaneously. It can be identified by the types of enzymes located on its surface, namely hemagglutinin (H) e neuraminidase (N).[2,4]

Treatment of Influenza A (H1N1) infection requires general care, high calorie and normoproteic diet, and airway hydration by frequent intake of fluids and use of fogging and misting.[5] Symptom treatments include administering analgesic and antipyretic medications. Neuraminidase inhibitors (oseltamivir and zanamivir) are the standard drugs for the prophylaxis and treatment of influenza. Oseltamivir should be considered the first therapeutic choice, while Zanamivir should be reserved for treating patients with resistant virus or for those who present adverse reactions to Oseltamivir.[6] Use of these antivirals can prevent clinical manifestations of the disease if taken within 48 hours after the infection is installed and maintained for another 10 days.[2]

In Brazil the first cases of the disease were reported in April 2009 and it soon spread to several states, including Minas Gerais, where the first cases of pandemic Influenza A (H1N1) occurred in May of that same year.[2] The three first cases were confirmed by the Minas Gerais Regional Health Office of Uberlândia in June 2009 in the city of Uberlândia.

In 2009, the majority of the Brazilian cases were reported in the South and Southeast regions, with frequencies of 22.6 and 42.8%, respectively. Most confirmed cases were found in the 15-49 years age group and predominantly among women (58%).[7] In Minas Gerais, in the same period, there were 1,642 registered cases.[8]

The Influenza A (H1N1) is considered an important public health concern considering the high number of victims and the easy dissemination of the infectious agent. This Influenza pandemic gave rise to the National Influenza Surveillance System, which included the disease among those of mandatory reporting. Based on these concerns, the aim of this study is to determine the incidence and the epidemiologic profile of Influenza A (H1N1) in the Triângulo Mineiro and Alto Paranaíba Regions of the state of Minas Gerais, according to reports by the Regional Health Office of Uberlândia.

MATERIALS AND METHODS

This study analyzed notification forms for Influenza A (H1N1) in the Notifiable Diseases Information System (SINAN) in the Triângulo Mineiro and Alto Paranaíba regions, submitted to the Regional Health Office of Uberlândia (GRS-Uberlândia), in the city of Uberlândia, Minas Gerais, from June 2009 to July 2010. The whole region includes 18 municipalities: Uberlândia, Patrocínio, Abadia dos Dourados, Araguari, Araporã, Cascalho Rico, Coromandel, Douradoquara, Estrela do Sul, Grupiara, Indianópolis, Irai de Minas, Monte Alegre de Minas, Monte Carmelo, Nova Ponte, Prata, Romaria and Tupaciguara.

From July 2009 on, cases were notified as Severe Acute Respiratory Syndrome (SARS) in the online SINAN, using the Individual Surveillance Sheet and the Influenza-like Illness reported as "Outbreak" in SINAN-NET.

All confirmed cases of human infection by Influenza A (H1N1) virus were submitted to laboratory confirmation by one or more RT-PCR and/or cell culture tests, specifically for Influenza A (H1N1) virus. All unconfirmed, unmonitored or merely suspected cases were discarded.

The following variables were considered for this study: age group, sex, pregnancy, education, town and area of residence, anti-pneumococcal vaccination and against seasonal flu, contact with suspected or confirmed case, signs and symptoms, including comorbidities, and hospitalization. Frequency, incidence, mortality and lethality rates were then calculated.

This research was approved by a Research Ethics Committee and by the Minas Gerais State Department of Health prior to start.

RESULTS

Between June 2009 and July 2010, 93 cases of Influenza A (H1N1) were reported to and confirmed by the GRS-Uberlândia, six of which were excluded from this study because patients resided in regions outside the scope of the GRS-Uberlândia. With a population of 87 cases we found an incidence of 9.1 cases per 100,000 inhabitants. Only 12 of the 18 municipalities managed by GRS-Uberlândia reported cases of the disease, particularly the cities of Uberlândia (60.3%), Patrocínio (11.5%) and Araguari (8.0%), with the highest incidence in Abadia dos Dourados, Douradoquara and Monte Alegre de Minas, with 59.0, 52.3 and 21.1 cases per 100,000 inhabitants, respectively. The lowest incidences were found in Coromandel and Prata, with 3.6 and 3.8 per 100,000 inhabitants, respectively (Table 1).

Confirmed cases of Influenza A (H1N1) predominated in the female population, corresponding to 57 cases (65.5%), 11 (19.3%) of which were pregnant women. The age group most affected by the Influenza A (H1N1) was that of 15-39 year-olds (57.5%), followed by those over 40 years (28.7%) of age (Table 2). Among children, there were seven confirmed cases aged less than four years and five aged 5-14 years, to a total of 12 (13.8%).

Table 2 - Distribution of confirmed cases of influenza A (H1N1) in the GRS - Uberlândia, 2009 – 2010

Variables	N° of cases(%)
Sex	
Male	30 (34,5)
Female	57 (65,5)
Age	
1 - 14 years	12 (13,8)
15 - 39 years	50 (57,5)
40 years or more	25 (28,7)
Quarter	
June-Aug. (09)	55 (63,2)
Sept-Nov. (09)	22 (25,3)
Dec. (09)-May (10)	10 (11,5)
Comorbidities	
Cardiopathy	4 (4,6)
Pneumopathy	8 (9,2)
Smoker	6 (6,9)
Others	36 (41,4)
Contact with confirmed or suspect cases	**15 (17,2)**
Previous vaccination for seasonal influenza	**3 (3,4)**
Hospitalization	**56 (64,4)**

Source: SINAN NET (2009/2010).

The month of August showed the highest number of notifications, 42, representing 48.3% of cases. In 2010, only the months of January and May show notifications of confirmed cases of Influenza A (H1N1), one in January and two in May (Table 2).

Table 1 - Confirmed cases of influenza A (H1N1) by city of residence and sex, in the GRS - Uberlândia, 2009 – 2010

City	Notifications (%)	Sex		Incidence/100,000
		M	F	
Abadia dos Dourados	4 (4,6)	1	3	59,0
Araguari	7 (8,0)	0	7	6,3
Araporã	1 (1,2)	0	1	15,6
Coromandel	1 (1,2)	0	1	3,6
Douradoquara	1 (1,2)	1	0	52,3
Indianópolis	1 (1,2)	0	1	15,3
Monte Alegre de Minas	4 (4,6)	2	2	21,1
Monte Carmelo	3 (3,5)	2	1	6,6
Patrocínio	10 (11,5)	3	7	11,7
Prata	1 (1,2)	0	1	3,8
Tupaciguara	1 (1,2)	1	0	4,2
Uberlândia	53 (60,9)	20	33	8,5
Total (%)	**87 (100,0)**	**30 (34,5)**	**57(62,5)**	**9,1**

Source: SINAN NET (2009/2010).

The majority of affected individuals lived in urban areas (94.3%) and had not received anti-pneumococcal vaccination or against seasonal flu (72.4%), probably because those affected were over 15 years old and vaccination was not recommended for that age group. The main signs and symptoms were: fever, cough, and myalgia, at 85.4, 93.1 and 67.8%, respectively. Conjunctivitis and diarrhea were the least reported symptoms, at 8.0 and 14.9%, respectively.

Out of the total confirmed cases, 54 (62.1%) had pneumopathy (9.2%), metabolic disease (8.0%), and smoked (6.9%). A few were pregnant, had systemic arterial hypertension, obesity, Diabetes *mellitus*, all in a small number. There were 56 (64.4%) cases of hospitalization and 16.1% of patients had contact with suspected of confirmed cases of human influenza 10 days prior to the onset of their own signs and symptoms.

We were unable to determine the type of treatment adopted for the affected population or the length of hospitalization. The majority of ILI cases were cured (n=52, 59.8%) and there were 20 (23.0%) deaths by the infection, a mortality rate of 2.0/100,000 inhabitants. Mortality rates were higher in the towns of Abadia dos Dourados with 29.5/100,000 inhabitants and Patrocínio with 4.7/100,000 inhabitants (Table 3). Lethality rates for Influenza A (H1N1) cases between June 2009 and July 2010 at the GRS-Uberlândia reached 23% (20/87), mostly among women (63%) who were not pregnant and aged 20-39 years (50%).

Table 3 - Notified deaths and mortality rates per city of residence in the GRS-Uberlândia, 2009 – 2010

Cities	N° deaths (%)	Mortality Rate/ 100,000 inhabitants
Abadia dos Dourados	2 (10,0)	29,51
Coromandel	1 (5,0)	3,54
Monte Carmelo	2 (10,0)	4,36
Patrocínio	5 (20,0)	4,69
Uberlândia	10 (50,0)	4,20
Total	**20 (100,0)**	**1,96**

Source: SINAN NET (2009/2010).

DISCUSSION

The incidence rate of Influenza A (H1N1) in the GRS-Uberlândia (9.14/100,000 inhabitants) was lower than the national average, which reached 23.3/100,000 inhabitants[9], but similar that recorded in the state of Minas Gerais in the same period of the study (9.21/100,000 inhabitants).[8]

According to Neumann[10], the low number of confirmed cases is often due to operational difficulties in detecting the virus in samples, losses in the notification process or, more often, because patients fail to seek health care or experience asymptomatic infection. No isolated cases of ILI were reported, with or without other risk factors, including those who received antiviral treatment, possibly leading to an underestimation the total number.

As the number of Influenza A (H1N1) cases grew, knowledge about viral epidemiology became more available and health education work was required so as to reduce anxiety among the population and to dispel misconceptions regarding the disease.

The present work found that the epidemiological profile of Influenza A (H1N1) victims in the cities of the Triângulo Mineiro e Alto Paranaíba regions, under the administration of the GRS-Uberlândia, was similar to that presented by the Brazilian Ministry of Health, with a higher frequency among women, with 65.5% and 64% nationwide, respectively.[9] The intervention period was different from the contention phase, since in the first phase there was a predominance in females and in the latter in males.[11]

The swine flu, caused by the virus Influenza A, subtype H1N1, has been proven to cause more complications and deaths among pregnant women because of immune and physiological changes that affect the cardiovascular and pulmonary systems, including increased heart rate, blood volume, oxygen consumption and reduced lung capacity.[10] The study found notification for only one case of a pregnant woman, who recovered after medical care.

The town of Patrocínio recorded a single death – a child – and Uberlândia the death of an elderly patient (over 60 years old). No deaths were recorded for pregnant women. According to the Ministry of Health[12] and the Minas Gerais State Department of Health[11] the groups most at risk for SARS and ILI complications are children (under four years) and adults over 60 years, representing 12.6% (11/87) of the cases in this study. Neumann[10] also states that children are more susceptible to Influenza A (H1N1) contagion than adults, due to their immunological immaturity and lesser ability to manage own secretions.

Findings showing that around 60% of those affected by Influenza A (H1N1) were under 18 years of age suggest that children and teenagers are more susceptible to infection. They also suggest that the elderly may have some degree of cross-protection

against the virus, possibly through preexisting antibodies against Influenza A.[1]

The clinical characterization of suspect cases must ascertain the existence, within the affected group of patients, of those at a greater risk for developing complications such as low immunity, cardiovascular and lung diseases, liver failure, chronic kidney and neurological diseases, metabolic diseases, age and whether the patient belongs to indigenous populations.[12]

Compared to other infectious and contagious diseases, this illness has a low mortality rate but it is easily disseminated and at a high risk of becoming pandemic. It did indeed become pandemic despite the availability of active antivirals for Influenza. This set of medications has been recommended for early infection treatment and to reduce transmission.[13]

Faced with the severity of the disease in some patients, the *Center for Disease Control and Prevention* recommended in May 2009 that therapy with neuraminidase inhibitors be prioritized for hospitalized patients with suspected or confirmed infection and for patients at a high risk of complications from seasonal flu.[1] We were unable to retrieve data on the prescribed drugs for treatment, even though this research was carried using only data from confirmed cases and hospitalization reached 64.4% of cases.

Knowing which periods represent a greater risk for infection, as defined by months with more reported cases, is important not only to prepare the health care centers and professionals, but also to implement better control strategies. The higher number of cases in August can be understood in the context of this disease fast dissemination and because the population was unprepared and lacked information on risks, as well as in delays in confirming the diagnosis. Moreover, the disease is highly associated with crowded spaces, given that it spreads through contact with saliva droplets of infected individuals.

The best way to control the flu is through preventive measures, easily implemented in every local health care unit. However, popular acceptance and adherence to these measures depended largely on how people perceive such a threat.[14] Hand hygiene with soap and water before meals, before touching the eyes, mouth, and nose, and after coughing, sneezing or using the bathroom is the most important measure to be adopted. Additionally, individuals with suspected or confirmed infection should avoid contact with susceptible people, as well as crowds and indoor spaces.[15]

A specific vaccine offering diminished risk of transmission was made available in March 2010 to help control the H1N1 virus.[16,17] The monovalent vaccine was composed by the inactivated strain of the pandemic H1N1 virus of 2009, with an average effectiveness of over 95%.[6] Seasonal flu vaccines are distributed in Brazil and manufactured from a selection of viral subtypes such as Influenza A H1N1 and H3N2 and Influenza B.[8,12]

Evidence suggests that the pandemic Influenza virus (H1N1) of 2009 had a transmission dynamics similar to that of seasonal influenza. Obtaining more accurate, objective and thorough information about notifiable diseases such as influenza A (H1N1) is needed to better understand the cases and to monitor evolution and vaccination, since epidemiological information is required to develop studies leading to more consistent public health interventions in attempts to prevent new pandemics.

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