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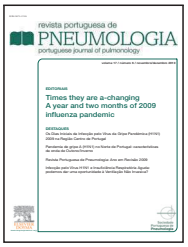

ORIGINAL ARTICLE

Pandemic influenza A (H1N1) in the North of Portugal: how did the Autumn-Winter wave behave?

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KEYWORDS
Influenza;
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Abstract
Introduction: In April 2009 the Centers for Disease Control and Prevention announced the identification of a novel influenza virus in two patients in California, called influenza A (H1N1) 2009. On 11 June 2009 the Director-General of the World Health Organization declared a pandemic of influenza A (H1N1). In Portugal the first case of pandemic influenza A (H1N1) was reported on 29th April and the Northern Region of the country registered the first cases soon after that.
Aim: This report pretends to give an overview of the characteristics of Autumn/Winter pandemic wave in the North of Portugal.
Results: A total of 64195 cases of influenza-like illness were registered in public health services in the region between week 40, 2009 and week 4, 2010. The cumulative attack rate of those cases was 17.1/1000 inhabitants. Most of the cases occurred in females and in the under 20 years. The peak of the Autumn/Winter wave was attained in week 48, but geographic and time distribution of the pandemic was heterogeneous in the region. Hospitalization rate for influenza-like illness cases in the population was higher for the under 10 years and decreased with age. Forty four deaths in pandemic influenza A (H1N1) laboratory-confirmed cases occurred in the region (mortality rate —1.2/100000) and the risk of death was lower in younger age groups. The peak of deaths occurred two weeks latter than the peak of cases.
Conclusion: We can assume that the Autumn/Winter pandemic wave impact was mild in the Northern Region of Portugal. We consider the importance of pursuing and reinforcing influenza surveillance in the region.
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PALAVRAS-CHAVE
Gripe;
H1N1;
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2009

Pandemia de gripe A (H1N1) no Norte de Portugal: características da onda de Outono/Inverno

Resumo
Introdução: Em Abril de 2009 o *Centers for Disease Control and Prevention* anunciou a identificação de um novo vírus influenza em dois doentes na Califórnia, o qual viria a ser designado como influenza A (H1N1) 2009. No dia 11 de Junho de 2009 o Director-Geral da Organização Mundial de Saúde declarou estarmos perante uma pandemia por vírus influenza A (H1N1). Em Portugal o primeiro caso de gripe por vírus influenza A (H1N1) foi registado no dia 29 de Abril de 2009, tendo na região Norte sido declarado o primeiro caso pouco tempo depois.
Objectivos: Neste artigo pretende-se dar uma visão global sobre as características da onda pandémica de Outono/Inverno no Norte de Portugal.
Resultados: Registaram-se 64 195 casos de síndrome gripal nos serviços públicos de saúde da região entre a semana 40 de 2009 e a semana 4 de 2010. A taxa acumulada de casos registados foi de 17,1 por mil habitantes. A maior parte dos casos ocorreu no sexo feminino e em menores de 20 anos de idade. O pico da onda de Outono/Inverno foi atingido na semana 48, mas a distribuição geográfica e temporal da onda pandémica foi muito heterogénea na região. A taxa de hospitalização por síndrome gripal na população foi mais elevada nos menores de 10 anos de idade e decresceu nos grupos etários mais velhos. Registaram-se 44 óbitos em casos confirmados de Gripe A na região (taxa de mortalidade —1,2/100000) sendo o risco de morrer mais baixo nos grupos etários mais jovens. O pico dos óbitos ocorreu duas semanas mais tarde do que o pico dos casos.
Conclusões: Admitimos que o impacto da onda pandémica de Outono/Inverno no Norte de Portugal foi reduzido. Consideramos, no entanto, a importância de prosseguir e reforçar a vigilância da gripe na região.
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Introduction

In April 2009 the Centers for Disease Control and Prevention (CDC) announced the identification of a novel influenza virus in two patients in California. The new virus, a triple reassortant of swine, avian and human influenza virus, had characteristics of a pandemic strain: could be transmitted from human to human, was virulent and humans were immunologically naïve to the virus.[1,2]

The number of human cases evolved rapidly and early in May a total of 642 cases had been reported in the United States of America, Mexico and Canada.[3]

Considering the existence of sustained community transmission of the novel virus in more than one region of the World Health Organization (WHO) on 11 June 2009 the Director-General of WHO declared a pandemic of influenza A (H1N1).[4]

According to the European Centre for Disease Prevention and Control (ECDC), Europe soon experienced the occurrence and spread of cases,[5] in July all the European Union countries had reported cases, of which only 13% were imported (travel-related). Spain and United Kingdom were the first European countries to report the occurrence of pandemic influenza A (H1N1) cases.[6]

Since the beginning of the pandemic risk groups were identified and comparing with seasonal influenza, important differences were found namely the occurrence of severe cases in infants and pregnant women and relative absence of cases in the elderly. In a cross-sectional serological survey performed in England to measure antibody age-specific titres against 2009 pandemic influenza A (H1N1) virus[7] pre-existing antibodies were found in 31.3% adults aged 80 years or older.

According to the Health Protection Agency[8] children and young adults had highest estimated clinical attack rates, clinical manifestations were mainly mild and infants, elderly and persons with chronic medical conditions had increased risk of hospitalization.

In Portugal the first case of pandemic influenza A (H1N1) was reported on 29th April 2009 and one month later 13 imported cases were reported. On the 14th July the first one hundred cases had been reported of which 16 were not travel related and during the second half of August community transmission was responsible for the majority of reported cases.[9]

In the North of Portugal the first case was identified on 31st of May and two months later there were 61 confirmed cases, 97% of which were imported. By the end of the containment period, in the first two weeks of August, in-country transmission of pandemic influenza A (H1N1) was occurring. Cases had spread to the whole region and some outbreaks were notified. The majority of those cases were less than 30 years old (72%) and 10% of the cases were hospitalized.[10] During that period cases were intensively investigated, both epidemiological and laboratory, and close contacts were traced and given prophylaxis. Because of the mild severity of disease, most of the infected people did not contact health services, so it was not possible to

quantify the extent of the Spring/Summer wave. A few weeks after school opening cases in schoolchildren began to occur contributing to the spread of the infection in the community.[11]

In Portugal pandemic response was organized in accordance with the national pandemic plan.[12] This report pretends to give an overview of the characteristics of Autumn/Winter pandemic wave in the North of Portugal.

Methods

Portugal, a country of about 10 million inhabitants is divided in five health regions and two autonomous regions. The Northern Health Region with 3.7 million inhabitants represents about 35%of the country's population. After a recent health reform primary health care (PHC) services were organized in 26 units,[13] each one covering between 80000-200000 inhabitants.

Several influenza and influenza-like illness (ILI) surveillance systems were available in the Northern Region of Portugal both in primary health care and in hospital emergency services. More than 95%of PHC Centres in the North of Portugal have computerized information systems which allow the great majority of general practitioners to register morbidity data. Influenza-like illness cases, defined as cases of fever associated with respiratory symptoms were classified as R80 according to International Classification of Primary Care, Second Edition (ICPC-2). All the public hospitals in the region have computerized information systems installed in emergency services allowing the registration of morbidity data according to the International Classification of Diseases, Ninth Revision, Clinical Modification (ICD9-CM). For pandemic surveillance purposes cases of ILI were classified as 487 code of ICD9-CM. Information about ILI cases was extracted on a daily basis at the regional data centre.

Laboratory pandemic influenza A (H1N1) PCR technique was implemented in a network of public laboratories specially created for the pandemic, responding to patients from the community and from hospital settings. During mitigation the General-Directorate of Health recommended laboratory testing for severe cases of disease and for certain risk groups[14]. In the Northern Region laboratory results were reported by the hospitals to Regional Health Administration on a daily basis.

Following recommendations from the National Health Authority pandemic influenza deaths were reported immediately by the clinicians to the national and the regional health services.

Data originated in the described systems were analysed by the Public Health Department of the Regional Health Administration using Microsoft Excel 2007® and ArcMap 9.1® software.

To analyse ILI occurrence we calculated regional cumulative incidence rate of ILI cases that contacted public health services per 1000 inhabitants and for seven defined age groups (0-9, 10-19, 20-29, 30-39, 40-49, 50-59 and ≥ 60 years old). For each PHC population unit we calculated weekly clinical incidence rate per 100000 inhabitants. For influenza-like illness hospitalizations analysis we calculate the cumulative hospitalization rate for the region and for each of the defined age groups per 100000 inhabitants. For mortality data, considering that we had small number of deaths in children, we defined three age groups (0-29, 30-59 and ≥ 60 years old) and calculated the age specific mortality rate (per 100000 inhabitants) and 95%confidence intervals (CI).

Considering that surveillance of seasonal influenza usually starts on week 40, we decided to analyse data since that week until week 4, 2010, except for pandemic deaths for which the period under study began with WHO pandemic declaration until week 4, 2010.

Results

Between 5 October 2009 (week 40) and 1 February 2010 (week 4) the number of ILI cases registered in the Northern Region of Portugal was 64195. The cumulative attack rate of those cases was 17.1/1000 inhabitants. Figure 1 shows the weekly evolution of Autumn/Winter pandemic wave (number of ILI cases and influenza A H1N1 number of deaths). The initiation phase occurred between week 40 and week 43, the acceleration phase and peak between week 44 and week 48 and the decline phase between week 49 and week 52. The peak corresponded to weeks 47 and 48.

Male to female ratio of cases was 0.9. According to Figure 2 most of the ILI cases occurred both in the under 10 and in the 10-19 years old. Overall during the pandemic Autumn/Winter wave the number of cases decreased with growing age. The acceleration phase began one or two weeks later in the older ones. The peak of the curve occurred in week 48 in all age groups except for 10-19 years old for which the peak occurred in week 47.

The cumulative ILI incidence rate by age group is shown in Table 1. The highest values were observed in the under 10 years old (53.5) and in the age group 10-19 (40.8). The incidence rate decreased with age.

Considering the catchment population of each of the PHC units the risk of ILI was not homogenously distributed. Figure 3 shows the time and space evolution of weekly

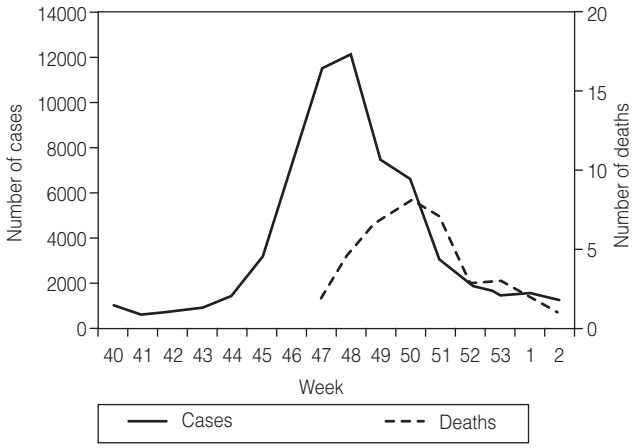

Figure 1 Weekly evolution of influenza-like illness number of cases and influenza A (H1N1) number of deaths in the Northern Region of Portugal. Week 40, 2009 —week 4, 2010.

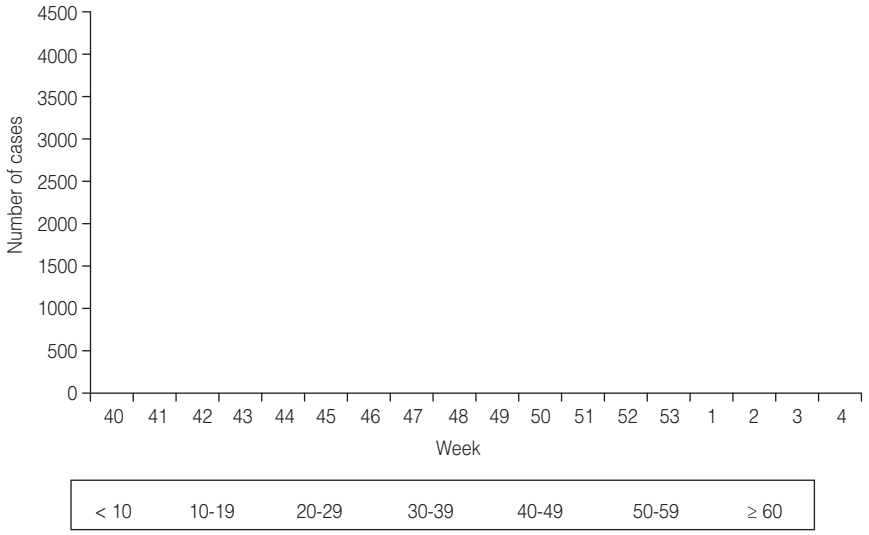

Figure 2 Weekly evolution of influenza-like illness number of cases by age group in the Northern Region of Portugal. Week 40, 2009 —week 4, 2010.

Table 1 Clinical incidence rate (/1000) of influenza-like illness by age group in the Northern Region of Portugal. Week 40, 2009 —week 4, 2010

Age group	Clinical incidence rate (/1000)
< 10	53.5
10-19	40.8
20-29	16.3
30-39	11.8
40-49	9.0
50-59	6.9
≥ 60	3.4
Total	17.1

Figure 3 Weekly influenza-like illness clinical incidence rate in the population served by the Primary Health Care services in the Northern Region of Portugal. Week 40, 46, 48 and 50, 2009 and week 4, 2010.

clinical incidence rate of ILI. During the peak (week 48), the clinical attack rate varied between 50 and 470 per 100000 inhabitants.

The intensity and the timeliness of transmission varied in different geographic units. In Figure 4 we present three examples of different epidemic curves. In Aveiro Norte a rapid increase in ILI cases began in the same week as in the region but the dissemination was quicker (peak in week 46). In Póvoa de Varzim/Vila do Conde the acceleration was detected latter and the peak occurred in week 49. In Nordeste we observed that the curve was flattened.

During the period under analysis 2024 ILI cases were hospitalized representing 3.2%of the total cases registered in public health services. The highest number of hospitalizations by age group was observed in children less than 10 years old. The hospitalization rate per 100000 population was higher in children under 10 years, followed by adults aged 20-29 and then decreased with age (Table 2).

During the period under study 5690 laboratory-confirmed cases of pandemic influenza A (H1N1) were reported in the Northern Region. Figure 5 shows the time evolution of the proportion of positive results for pandemic influenza A (H1N1). The proportion of positive results evolved in a similar way as reported ILI cases and the highest values

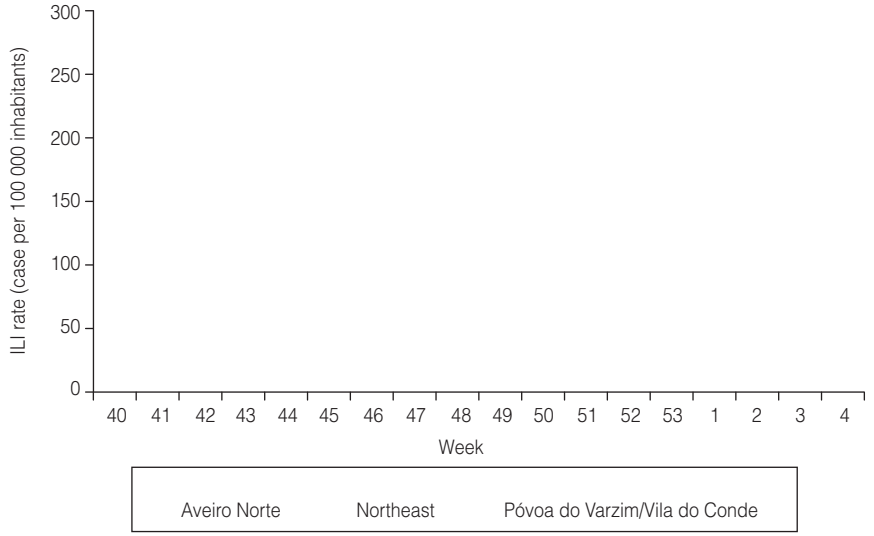

Figure 4 Three different epidemic curves of influenza-like illness in the Northern Region of Portugal. Week 40, 2009 —week 4, 2010.

Table 2 Number of hospitalized cases of influenza-like illness and hospitalization rate (/ 100000) by age group in the Northern Region of Portugal. Week 40, 2009 —week 4, 2010

Age group	Number of hospitalized cases	Hospitalization rate (/ 100000)
< 10	498	130.8
10-19	233	55.1
20-29	416	80.3
30-39	320	53.9
40-49	230	40.1
50-59	155	32.2
≥ 60	172	22.2
Total	2024	54.0

were observed during week 47 and 48 corresponding to the peak of the epidemic curve (Figure 1).

Age group distribution of positive results shows that the majority occurred in individuals less than 20 years of age.

Forty four deaths in pandemic influenza A (H1N1) laboratory-confirmed cases occurred between June 2009 and February 2010, resulting in a mortality rate of 1.2/ 100 000 inhabitants. The median age of deaths was 49.5 years and male to female death ratio was 1.6. Death was registered in all age groups (Table 3). Data from Table 3 indicates that mortality was significantly lower in the under 30 years of age than in the region. Time distribution of deaths shows that the peak occurred two weeks latter than the peak of ILI cases (Figure 1). Fifteen per cent of deaths had no known risk factors.

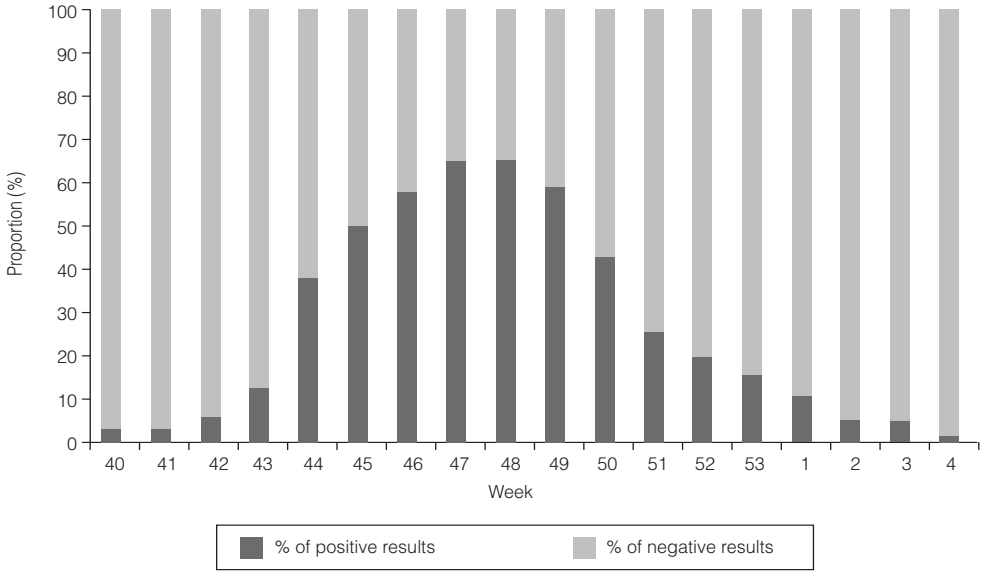

Figure 5 Weekly evolution of the proportion of positive and negative laboratory results for pandemic influenza A (H1N1) in the Northern Region of Portugal. Week 40, 2009 —week 4, 2010.

Discussion

Surveillance in a pandemic is a very difficult task.[15] As previously stated surveillance for pandemic in the North of Portugal included several information systems and the different datasets obtained and partially described here confirmed the consistency of data analysed in this study.

Differences in the health care seeking behaviours and in the accessibility to public health care services can lead to reporting biases of ILI cases.[7] In Portugal during the pandemic patients with ILI were strongly recommended to stay home and to follow the recommendations of a national call centre, contributing to diminish the demand for medical care. This recommendation also contributed to decrease the number of confirmed cases. We admit that data presented in this study represent only a fraction of total cases of pandemic influenza A (H1N1) and so we cannot dimension the real burden of Autumn/Winter pandemic wave in the Northern Region of Portugal. We considered that reported ILI cases could illustrate the evolution of pandemic influenza A (H1N1) situation. The option for the period under study was made in order to guarantee that the whole Autumn/Winter pandemic wave was analysed.

The overall results of data presented in this report are similar to those found in other European countries, namely in what concerns the shape and duration of Autumn/Winter wave, as well as age distribution.[16-18] Space and time course of epidemic curve was heterogeneous in the Northern Region, reflecting different geographic population distribution and dynamics.

Comparing with previous influenza seasons, ILI weekly notification rate described in this study was higher than the highest value observed in Portugal in the last five influenza seasons (163.1/100 000). Other features distinguish this epidemic from previous ones: the earlier rise in influenza activity and the higher incidence in younger age groups and lower in the elderly. The mild characteristics of disease can be illustrated by the proportion of hospitalized cases described here, as observed in the South Hemisphere.[19] The first pandemic data published, namely in Canada in June 2009, indicated a low proportion of hospitalized cases.[20] In the present study we found a risk of ILI hospitalization which indicates that, probably, the true risk of Influenza A (H1N1) hospitalization in our region would not be higher than the maximum value observed in some regions of New Zeeland.[21] We admit the hypothesis that preliminary available pandemic data about risk groups could have influenced the clinical decision for hospitalization of younger patients.

As referred elsewhere[22] the high proportion of laboratory-confirmed influenza A (H1N1) cases in processed samples during the peak of Autumn/Winter wave indicates that pandemic virus was the major causative agent of influenza during that phase.

The mortality rate observed is similar to the value found in some European countries and in Australia.[23,24]

In the Northern Region of Portugal Autumn/Winter pandemic wave behavior was similar to that observed in other regions of the world. This report provides valuable insight into the epidemiology of the disease. Despite the mild characteristics of the pandemic, it's important to proceed with influenza surveillance.

Table 3 Number of deaths and mortality rate (/100000) of pandemic influenza A (H1N1) by age group in the Northern Region of Portugal. June 2009 —February 2010

Age group	Number of deaths	Mortality rate (95%CI)
< 30	5	0.378 (0.368; 0.389)
30-59	27	1.638 (1.619; 1.657)
≥ 60	12	1.547 (1.520; 1.575)
Total	44	1.175 (1.164; 1.186)

Conflict of interest

Authors state they don't have any conflict of interests.

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