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Original Article

An Estimate of the Incidence of Influenza-Like Illness During the Influenza Pandemic of 2009☆

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ABSTRACT

Introduction: The influenza pandemic of 2009 had a great social impact. Many health resources were devoted to the care, prevention and surveillance of this disease. Epidemiological surveillance is based on the reporting of cases of influenza-like illness (ILI) and confirmed influenza cases. The objective was to estimate the true incidence of ILI during the influenza pandemic of 2009.
Methods: The capture–recapture method was applied during the month of highest influenza incidence in Castellón. Two notification systems were used: (i) electronic reporting of Notifiable Diseases (ND), and (ii) laboratory-based (LAB) data collection. Estimates were made by stratifying by age group and week. Independence coefficients were calculated for those strata.
Results: No dependence was found between stratification variables and the reporting system. A total of 7181 ND cases and 524 LAB cases were identified, of which 211 were recorded in both systems. The estimated total of cases was 17 785 in a single month. In the study period, almost 4% of people in the area suffered flu symptoms (cumulative incidence), with 1% being affected each day (daily prevalence). The sensitivity of the ND system was 40%, i.e., the percentage of patients seeking primary care.
Conclusions: To obtain an estimate of the actual incidence of influenza-like illness in the population during a pandemic period, the number of medical consultations should be multiplied by a factor of 2.5. This factor is lower than that estimated for periods without pandemic alert.

Estimación de la incidencia de síndrome gripal durante la pandemia de gripe de 2009

Palabras clave:
Síndrome gripal
Incidencia
Estimación
Captura-recaptura
Pandemia de gripe
Gripe

RESUMEN

Introducción: La pandemia de gripe de 2009 tuvo una gran repercusión social. Se dedicaron muchos recursos sanitarios a la atención médica, la prevención y la vigilancia epidemiológica. La vigilancia epidemiológica se sustenta en la notificación de casos de síndrome gripal y de casos confirmados de gripe. El objetivo fue la estimación de la incidencia real de síndrome gripal durante la pandemia de gripe de 2009.
Métodos: Sistema de captura-recaptura durante el mes de mayor incidencia en Castellón. Se utilizaron 2 sistemas de información: a) sistema electrónico de notificación de enfermedades de declaración obligatoria (EDO), y b) datos de laboratorio (LAB). Las estimaciones se han realizado estratificando por grupo de edad y semana. Se calculó el coeficiente de independencia en estos estratos.

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Resultados: En total se identificaron 7.181 casos EDO y 524 LAB, de los que 211 coincidían en ambos sistemas. La estimación total fue de 17.785 casos en un mes. Ello significa que en el periodo estudiado casi el 4% de las personas del área sufrieron un cuadro gripal (incidencia acumulada), y aproximadamente una de cada 100 personas estuvo diariamente afectada (prevalencia diaria). Acudieron a consulta de atención primaria (EDO) un 40% de los afectados (sensibilidad del sistema EDO).
Conclusiones: Para obtener una estimación de la incidencia real en la población durante la pandemia habría que multiplicar la cifra de consultas médicas por un factor de 2,5. Este factor es inferior al estimado en periodos sin alerta pandémica.

Introduction

Influenza is an acute viral respiratory tract disease. A large proportion of cases present with a syndrome known as influenza-like illness, with symptoms of fever, cough, headache, myalgia, coryza and prostration that resolve after a few days. Other forms of influenza presentation include upper respiratory tract disease, bronchiolitis and pneumonia. The risk of complications is greater in very young children and in the elderly. Influenza infection can also be asymptomatic, and if it is not identified in the laboratory, influenza-like illness can be indistinguishable from infections caused by other microorganisms.[1]

In our latitudes, the seasonal nature of influenza is well established. Occasionally, pandemics of unpredictable magnitude and severity occur; in Spain the most recent was in 2009. In April of that year, the first case of influenza A (H1N1)pmd09 virus infection was reported. In the 14 months between 11 June 2009 and 10 August 2010, health authorities were on maximum alert for an influenza pandemic declared by the World Health Organization, following worldwide identification and spread of this virus.[2] Certain aspects of this exceptional situation are still currently under investigation.[3–6]

In events such as these, epidemiological surveillance systems are essential for monitoring the incidence of this disease. These systems collect information from patients seen in hospitals, emergency rooms or in primary care clinics, and both confirmed cases and influenza-like illnesses without microbiological confirmation are registered. Some patients, however, do not seek medical help, and these cases increase the disease burden in the community and contribute to the continuance and propagation of the virus. In England,[7] it has been calculated that only around 10% of patients with influenza-like illness seek medical care during influenza season, but during the 2009 pandemic, this figure rose to between 30% and 70%. To our knowledge, no such estimates have been published in Spain.

There are several fundamental issues underlying this study: epidemiological monitoring in almost all diseases, including influenza, is incomplete. These shortcomings have led to the development of mathematical tools for calculating disease incidences from different patient registries, and one such validated tool is the capture–recapture method.[8] To apply this method, we used the 2 epidemiological reporting systems for cases of pandemic influenza available in Castellón.

The aim of this study was to estimate the total number of cases of influenza-like illness in Castellón from data obtained from these 2 epidemiological surveillance systems: compulsory reporting of notifiable disease (ND) and microbiological surveillance from laboratory data. Estimates were made for total cases, by age group and week of notification in the month of highest incidence.

Methods

The study population comprised about 470 000 inhabitants, representing Castellón Health Departments 2 and 3. The study period focused on the month of November, weeks 44–47, of the year 2009. This was the time of peak influenza incidence in our area. The primary study variable was estimation of the total number of influenza-like illnesses. The secondary variable was calculation of the sensitivity of the ND system and daily prevalence.

Two data sources were used. The first was the ND system, which collects clinical diagnoses of influenza-like illness from primary care consultations. In our regional community, these data are computerized and include patient identification details (age, sex) and date and place of notification.

The second source, which we will call LAB, came from a laboratory data system set up during the pandemic to detect confirmed cases of influenza from requests for microbiological analysis received by the only laboratory in our area equipped to make this diagnosis. Techniques used included immunochromatography and RT-PCR (QUIAGEN®). All cases for which analysis was requested due to suspected influenza were included, whether the result was positive or negative. This approach was taken to equate the system with the ND system, in which reports are made exclusively on the basis of clinical suspicion, with no laboratory confirmation. However, calculations were made on the basis of positive, negative and overall LAB results, to identify differences between the 2 possibilities. Both the ND and the LAB systems are universal and encompass the whole study region.

To avoid intrasystem repetitions, patients appearing twice in the same registry, on the same date or in the same week were identified, in which case only the first visit of each patient was taken into consideration.

After intrasystem repetitions were excluded, a pooled database was created with data from both the ND and LAB registries, using SPSS software version 14. Intersystem repetitions (those registered in both systems) were then located. The total number of cases was then estimated using the capture–recapture method,[8,9] described below with examples from the data obtained in this study. Estimates per age (6) and week (4) strata were then calculated. Sensitivity of the ND system was calculated, defined as the ratio between the cases notified and the total estimated number of real cases in the community, expressed as percentage. Conversely, the multiplier factor, by which the number of notified cases would have to be multiplied to obtain an estimate of the real number of cases in the community, was also defined.

The Epi Info version 6.04[10] program was used for calculating the independence coefficient by strata. Overall reporting percentages were calculated for each age group and each week. The 2-tailed Chi-squared test was used for comparing the percentages of variables within the 2 systems. The populations listed by the local health authorities for 2009 were used to calculate accumulated incidence rates.

Finally, an estimate of the daily prevalence (average) over the study period was made using the approximation formula: Prevalence=Incidence×Duration.[11] For this calculation, disease duration was taken as a time fraction of 28 days, so that, in the formula, a duration of 7 days was 0.25 and a duration of 5 days was 0.18 (5/28).