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Effect of influenza vaccine status on winter mortality in Spanish community-dwelling elderly people during 2002–2005 influenza periods

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Abstract

This study assessed the relationship between the reception of conventional inactivated influenza vaccine and winter mortality in a prospective cohort that included 11,240 Spanish community-dwelling elderly individuals followed from January 2002 to April 2005. Annual influenza vaccine status was a time-varying condition and primary outcome was all-cause death during study period. Multivariable Cox proportional-hazard models adjusted by age, sex and co-morbidity were used to evaluate vaccine effectiveness. Influenza vaccination was associated with a significant reduction of 23% in winter mortality risk during overall influenza periods. The attributable mortality risk in non-vaccinated people was 24 deaths per 100,000 persons-week within influenza periods, the prevented fraction for the population was 14%, and one death was prevented for every 239 annual vaccinations (ranging from 144 in Winter 2005 to 1748 in Winter 2002).

Keywords: Influenza vaccination; Effectiveness; Mortality; Elderly; Influenza

1. Introduction

Immunisation against influenza is generally considered a very effective preventive means and vaccination of elderly people and other persons at risk for complications from influenza is a key public health strategy for preventing associated morbidity and mortality in many countries [1–3].

Many observational studies have demonstrated the effectiveness of influenza vaccination to prevent hospitalisation and death in high-risk individuals, and meta-analyses concluded that influenza vaccination reduces winter mortality risk by approximately 50% in elderly people [4,5]. However, some recent historical cohort studies have suggested that vaccine effectiveness in preventing all-cause mortality in the general elderly population could have been overestimated in previous studies and meta-analyses [6,7].

The effectiveness of influenza vaccination in preventing vaccine-related morbidity and mortality had been extensively studied in severe influenza seasons, institutionalised patients and high-risk individuals. However, few large studies have systematically evaluated the clinical benefit of annual vaccination in the general elderly population over the medium or long term [6–10], and little is known about the effectiveness of the annual vaccination programmes in generally healthy elderly people living in the community.

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This study assessed the relationship between the reception of conventional inactivated influenza vaccine and winter mortality in Spanish community-dwelling elderly individuals from January 2002 to April 2005.

2. Methods

2.1. Design, setting and study population

We conducted a prospective cohort study including 11,240 community-dwelling individuals 65 years or older assigned to eight Primary Health Care Centers (PHCC) in Tarragona (Catalonia, Spain). Cohort members were followed from when the study started (January 1, 2002) until enrolment from the PHCC ceased, the occurrence of death or until the end of the study (April 30, 2005).

In the Spanish Health Care System, as in the study area, all persons are assigned to a PHCC, and their General Practitioner files relevant medical details on patients during primary care visits. Every year a specific influenza vaccination campaign is carried out from October 15 to November 30, and a free conventional inactivated influenza vaccine are offered in PHCCs for all elderly subjects and some adults or children with predefined high-risk conditions.

When the study started, the Health District of Tarragona had 12 PHCCs with an overall assigned population of 134,232 inhabitants. The selection of the eight participating PHCCs was not randomised and they were chosen taking into account the existence of electronic clinical registries working since 1998 or before. The other four PHCCs in the Health District were not included because they had computerised clinical records more recently. The present study included all community-dwelling persons aged 65 years or older when the study started, who were assigned to 8 of the 12 PHCCs and who had at least 1 year of recorded database history prior to the start of the study. Thus, the eligible population included 11,240 persons 65 years or older on January 1, 2002

The study was conducted in accordance with the general principles for observational studies set out by the Catalan Health Institute.

2.2. Sources of data

All participating PHCCs have an institutional computerised clinical record system which contains registries of immunisations, laboratory tests, medication prescription, diagnoses associated with outpatient visits and chronic diseases coded according to the International Classification of Diseases, 9th Revision, Clinical Modification (ICD-9). The electronic records of each cohort member were used to identify whether the individual had received or not the influenza vaccine in each influenza vaccination campaign, and it was also used to identify the presence of co-morbidity and other medical conditions.

2.3. Outcome measure and definitions

Influenza seasons were considered on the basis of surveillance data obtained from the Communicable Disease Report National System. In Spain, a country with 40 million people, the influenza epidemic activity was low in the 2001–2002 season (708,457 cases reported of influenza-like illness) [11], in the 2002–2003 season (682,219 cases) [12], in the 2003–2004 season (353,722 cases) [13], and it was high in the 2004–2005 season (1,217,574 cases) [14]. Influenza seasons within this study were characterized by the mixed circulation of the A and B influenza viruses, the beginning of the epidemic wave in December, higher incidences between January and February, and the disappearance of the epidemic wave during March–April. There was a good match between vaccine and circulating virus strains each year [11–14].

In the study area, according to data provided by the Communicable Disease Unit of Tarragona, the absolute number of influenza-like illness reported from the eight participating PHCCs between January 2002 and December 2005 was 5797 cases, of which 4268 (75.5%) were reported within weeks 1–18. Appendix A shows the weekly distribution of influenza-like cases reported in the study area during 2002–2005. According to this data, the influenza period was considered from January 1 to April 30, whereas July–August (weeks 26–34) was considered as a reference non-influenza control period throughout the study.

Primary outcome was all-cause death. Deaths were initially identified in the Institutional Demographic Database (which is monthly updated with administrative data about deaths occurred, patients moved or new patients assigned to a PHCC. Afterwards, a review of the reference Civil Registry Offices of the eight PHCCs were used to identify those deaths occurred in cohort patients who had not been registered in the Institutional database and they were also used to validate the exact date of death in all cases. According to this date, deaths have been classified as occurring within January–April (influenza period), July–August (control period) or the overall study period (January–December). Finally, a review of clinical records was used to identify specific cause of deaths.

2.4. Exposure to influenza vaccination

For each year, information on the influenza vaccination status before the outcome seasons was retrieved by a computerised search on the clinical records of all cohort members. Influenza vaccine status was considered as a dichotomic (vaccinated or unvaccinated) time-varying condition throughout the study period (for example, in the analysis covering overall study period, the same person was considered unvaccinated in 2002, vaccinated in 2003 and unvaccinated in 2004 according to the reception or not of the influenza vaccine in each respective prior Autumn). Those persons who had received a dose of influenza vaccine were considered as vaccinated from 14 days after the reception of the vaccine until the beginning