

Pandemic influenza:

Risk factors and effectiveness of preventive measures

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Background and aims: The emergence and pandemic spread of a new strain of influenza A (H1N1) virus in 2009 resulted in a serious alarm in clinical and public health services all over the world. We investigated: 1) factors associated with severity and the effectiveness of treatment with neuraminidase inhibitors according to the precocity of administration; 2) effectiveness seasonal influenza, pandemic influenza and polysaccharide pneumococcal (PPV) vaccines in preventing hospitalization and 3) effectiveness of nonpharmaceutical measures in reducing hospitalization due to the pandemic virus.

Methods: We performed a multicenter matched case-control study in 36 Spanish hospitals from seven Spanish regions. Cases and controls were recruited between July 2009 and February 2010. We selected patients hospitalized for >24h with influenza virus A (H1N1) 2009 infection confirmed by RT-PCR and four matched controls for each case. Two controls were patients with unplanned hospital admission for reasons other than influenza-like illness, septic shock or multiple organ failure. A third outpatient control was selected from patients attending primary health care centres (PHC) for any reason other than influenza-like illness. A fourth outpatient control was selected from patients attending PHC with RT-PCR confirmed influenza.

Results: We recruited 1525 patients hospitalized with H1N1 influenza, 2956 hospitalized controls, 1406 outpatient controls and 1360 outpatient cases. The variables significantly associated with a poor outcome (ICU admission or death) were diabetes (OR=2.21; 95% CI, 1.21–4.02), corticosteroid therapy (OR=3.37; 95% CI, 1.39–8.20) and use of histamine-2 receptor antagonists (OR=2.68; 95% CI, 1.14–6.36), while the use of neuraminidase inhibitors (OR=0.57; 95% CI, 0.34–0.94) was protective. Neuraminidase inhibitors within the first 2 days after the influenza onset reduced hospital stay by a mean of 1.9 days (95% CI, 4.7–6.6).

The main risk factors for hospitalization were obesity (OR=14.27; 95% CI, 1.67–91.7), hematological neoplasia (OR 10.71; 95% CI, 1.95–58.87), chronic heart disease, (OR 5.16; 95% CI, 1.98–13.45) and neurological disease (OR 4.0; 95%CI 1.24–12.9. Low education level was found associated to hospitalization.

Vaccine effectiveness (VE) of the pandemic vaccine in the ≥ 18 yrs was 74.2% (95% CI, 29–90) and that of the influenza seasonal vaccine 15.0% (95%CI, –34 to 43). The adjusted VE of the pandemic vaccine in the ≥ 65 yrs was 78.2% (95% CI, 1–98). VE of PPV in preventing hospitalization was 41% (95% CI, 8–62) in all patients and 43% (95% CI, 2–78) in patients ≥ 65 yrs. The VE of dual PPV and influenza vaccination was 81% (95% CI, 65–90) in all patients and 76% (95% CI, 46–90) in patients ≥ 65 yrs.

Hand washing 5-10 times per day (OR=0.65; 95% CI, 0.52-0.84) and >10 times (OR=0.59; 95% CI, 0.44-0.79) and handwashing after contact with contaminated surfaces (OR=0.65; 95% CI,

0.50-0.84) were protective factors and were dose-responsive ($p < 0.001$). Alcohol-based hand sanitizers were associated with marginal benefits (OR=0.82; 95% CI, 0.65-1.02).

Conclusions: The use of neuraminidase inhibitors decreases the length of hospital stay and admission to intensive care. Pandemic Influenza vaccination prevented influenza cases and hospitalizations. In elderly people and adults with chronic illness, pneumococcal vaccination reduced hospitalization. In patients vaccinated with both the influenza and pneumococcal vaccines, the benefit in hospitalizations avoided was greater than in those vaccinated only against influenza. Frequent handwashing should be recommended to prevent influenza cases requiring hospitalization.