

Severe acute respiratory disease in health-care workers during the influenza H1N1 pandemic in Argentina

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Abstract

Introduction: During the 2009 influenza H1N1 virus pandemic, health-care workers were exposed to elevated risk of infection. The aim of this study was to estimate the risk for severe acute respiratory disease (SARD) in this population during the pandemic period in Argentina.

Methodology: we conducted a retrospective survey in which all members of the Argentine Society of Infectious Diseases were invited to answer an online survey providing information on health-care staff working at their hospital or health center, who were hospitalized for SARD, between May and August 2009. Results were compared to population-based SARD surveillance data obtained from the Ministry of Public Health.

Results: Fifty hospitals completed the survey. Out of a total population of 58,902 health-care workers, 41 were reported to have been hospitalized for SARD (hospitalization rate 69.6/100000), 19 of whom tested positive for H1N1 using real time polymerase chain reaction. Hospitalization rate in the general population during the same time period was 20.3/100000 ($p < 0.01$), thus indicating increased SARD hospitalization risk in health-care workers (OR 3.1 95% CI: 2.3 - 4.1; $p < 0.01$).

Conclusions: During the 2009 pandemic, health-care workers in Argentina suffered increased risk of hospitalization due to SARD compared to the general population. We recommend immunization of all personnel, as well as enforcing stricter infection control measures in hospitals to prevent future transmission of influenza H1N1 virus.

Key words: health-care workers; severe acute respiratory disease; influenza H1N1 virus

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Introduction

The 2009 influenza A H1N1 virus infection pandemic emerged in Southern California and Mexico toward the end of the 2008–2009 influenza seasons in the Northern Hemisphere [1]. In Argentina, the epidemic lasted from May through August 2009, the Southern Hemisphere winter months. As a result, dramatic impact on disease burden and number of consultations in hospitals and health-care facilities was observed across the country [2-10]. Health-care workers (HCWs) often suffer work environment exposure to the influenza virus. At the beginning of the pandemic viral transmission, the dynamics of the disease were unknown and prevention practices implemented in health-care settings were rooted in the best available evidence for protection based upon

proposed or known modes of disease transmission [11]. The respiratory route was subsequently recognized as influenza A H1N1 virus mode of transmission, as is the case for other influenza viruses [12].

Information regarding attack rates of influenza infections in HCWs in non-outbreak settings is scarce. During a period of mild influenza-like illness, *Loeb et al.* reported an attack rate of 23% in a cohort of nurses, most of whom were not immunized [13]. Health-care workers may acquire influenza infection at work as well as in the community. It was observed that during the pandemic, influenza H1N1 virus affected mostly young and middle-aged people and HCWs, usually fall within this age range.

As yet, risk of influenza-like illness and severe acute respiratory disease (SARD) in HCW during epidemics has not been well established.

The aim of this study was to estimate hospitalization risk due to SARD in HCWs during the H1N1 pandemic in Argentina and to compare it to hospitalization rates for SARD in the general population during the same period.

Methodology

A retrospective survey was conducted to determine the hospitalization rate for SARD in health-care workers during a period of high circulation of H1N1 in Argentina, between May and August 2009. All members of the Argentine Society of Infectious Diseases (SADI) working in public or private hospitals throughout the country were invited to participate in the survey by completing an online questionnaire. Data collected from members who voluntarily responded were assessed for the following variables: whether the hospital was public or private; total number of health personnel; job task description; and number hospitalized for SARD during the time period analyzed. In this last group, possible sources of infection were assessed, as well as adherence to preventive measures, including use of a surgical mask or N95 respirator when caring for patients with febrile respiratory illness; history of 2009 seasonal influenza immunization; and whether confirmation of H1N1 influenza infection by real-time polymerase chain reaction (RT-PCR) was performed in the National Reference Laboratory, Carlos Malbrán Institute.

We estimated the hospitalization rate due to SARD in HCWs and compared it to rates for the same cause

in the general population using population-based surveillance data obtained from the Ministry of Public Health during the same period [14]. Age-specific SARD rates during the peak of influenza activity were obtained from national registries.

For the purpose of this analysis, we defined HCWs as all persons engaged in activities that involve contact with patients or contaminated material in a health-care facility or clinical laboratory setting. These activities involve a wide range of occupations which include direct provision of patient care and other tasks such as housekeeping or dietary services. According to the definition provided by the Centers for Disease Control and Prevention US, “health-care personnel” refers not only to hospital staff directly involved in patient care but also students, trainees, volunteers, administrative staff and all other workers who have the potential for exposure to patients with influenza [15]. SARD was defined as the sudden onset of fever $\geq 38^{\circ}$ C with cough or sore throat and tachypnea which requires hospitalization.

Data were analyzed by chi-square tests. Hospitalization risk was expressed as odds ratio (OR) and 95% confidence interval (95% CI). Statistics were performed using SAS Version 9.1 (SAS Institute, Cary, NC, USA) City, Country). A *P* value ≤ 0.05 was considered statistically significant.

Results

Fifty hospitals (26 public and 24 private) from across the country responded to the questionnaire. Out of a total population of 58,902 HCWs, 41 were hospitalized suffering SARD in the period from May through August 2009, corresponding to a hospitalization rate of 69.6/100000 (Table 1). During

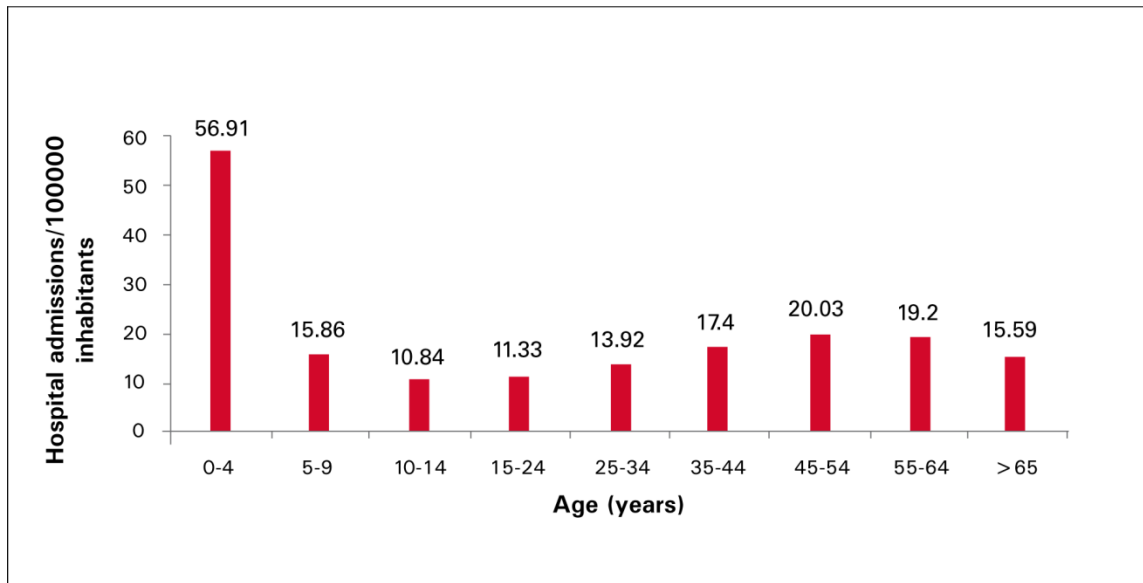
Table 1. Number of public and private hospitals participating in the survey, population of health-care workers and hospitalization rates due to severe acute respiratory disease

	Overall	Hospitals		OR (95% CI)	<i>P</i>
		Public (%)	Private (%)		
N of hospitals participating in survey	50	26 (52)	24 (48)		
Hospitals admitting HCWs* for SARD†	21	14 (67)	7 (33)		
Population of HCWs	58902	34081 (58)	24821 (42)		
HCWs hospitalized due to SARD	41	25 (62)	16 (38)		
Hospitalization rate	69.6/10 ⁵	73.4/10 ⁵	64.5/10 ⁵	1.14 (0.612-2.13)	0.63

*Health-care workers

† Severe Acute Respiratory Disease

Figure 1. Hospitalization rates for severe acute respiratory disease in Argentina in non-health-care workers



Source: Ministry of Public Health¹⁴

the same time period, national registries reported 8,962 patients from the general population hospitalized due to SARD, indicating an average population-based hospitalization rate of 20.3/100000 with age-related variations (Figure). Health-care workers showed a higher risk of SARD compared to the general population (OR 3.1, 95% CI 2.3 - 4.1; $p < 0.01$). Among the different groups of health staff assessed, nurses presented statistically significant increased risk of hospitalization (Table 2).

Nineteen of the 41 HCWs tested positive for H1N1 by RT-PCR, and the remaining patients had either negative results or were not tested. Of the 19 patients with confirmed H1N1 infection, 14 (74%) had cared for hospitalized patients with respiratory infections, one (5%) had been exposed to a person with flu-like illness outside the hospital setting and in the remaining 4 cases (21%) the source of infection could not be established.

Use of surgical masks or N95 respirators when caring for patients with potential influenza infection was reported by 35 of the 41 cases, while 12 (34%) said they always used respiratory protection devices and 23 (66%) said they used respiratory protection devices only sometimes. Twenty-three (56%) patients had received the 2009 seasonal flu vaccine, including 12 who always used respiratory protection.

Three out of 41 patients with SARD died, two had confirmed H1N1 infection, and one was a probable

case. In all three cases who died, ventilator-associated pneumonia was the cause of death.

Discussion

This study suggests that HCWs could face an increased risk of respiratory complications from H1N1 influenza. We found that during the 2009 H1N1 pandemic SARD hospitalizations in HCWs tripled compared to general population figures, and we assume that this difference may be attributed to occupational exposure. Among all health personnel, nurses were the most affected. Although all hospitals had guidelines for respiratory protection, compliance with use of respiratory protection devices was less than optimal; only one third of HCWs with SARD said they used them all the time, and with respect to influenza vaccination, only half had been immunized. Even though the seasonal vaccine did not offer protection against the pandemic strain, this vaccination coverage level showed that acceptance of protection measures was limited.

In the general population SARD hospitalizations involved subjects of all ages although children had the highest rates of hospitalization. During the pandemic, not all individuals with flu-like symptoms were subjected to diagnostic testing; RT-PCR tests for influenza were performed only in patients with severe respiratory illness or in immunocompromised hosts. For this reason, we selected hospital admissions for SARD as the surrogate marker for severe respiratory

Table 2. Risk of hospitalization for severe acute respiratory disease in health-care workers according to job description

Job task	HCWs (%)	HCWs with SARD (%)	OR (95% CI)	P
Physicians	18259 (31)	10 (24)	0.72 (0.35-1.46)	0.36
Nurses	15904 (27)	17 (42)	1.92 (1.03-3.57)	0.03
Administrative staff	11780 (20)	6 (15)	0.69 (0.29-1.63)	0.39
Other	12959 (22)	8 (19)	0.86 (0.40-1.86)	0.70
Total	58902	41		

*Health-care workers

† Severe Acute Respiratory Disease

H1N1 infection, both in the community and in health-care personnel.

Other studies have also assessed 2009 H1N1 influenza risk in health-care personnel, Wise *et al.* reported that 50% of 70 HCWs with H1N1 infection were considered to have been infected in health-care settings through patient-to-HCW or HCW-to-HCW transmission [16]. Interestingly, two studies in Australia and Singapore did not find higher seroprevalence for 2009 H1N1 in HCWs than in the general population [17,18]. This difference can be explained by the fact that both studies were conducted in a context of low impact of pandemic influenza; in Australia, data collection commenced after the peak of the outbreak, whereas in Singapore findings were based on data from just one hospital and overall seroconversion rates in that cohort were low.

Our study has several limitations. First, because of the retrospective nature of data collection, we were unable to distinguish between community- and hospital-acquired influenza infections. Second, all HCWs with SARD were included even though over 50% were considered to be probable H1N1 cases in which RT-PCR tests were either negative or were not performed. Third, we lack national-level data on rates of seasonal influenza vaccination in HCWs. Before 2009 some reports showed low coverage levels of less than 33% [19,20]; however, during the pandemic immunization, rates reached 76% at university hospitals [21]. A fourth limitation is that information regarding PCR tests for H1N1 in non-health-care workers with community-acquired severe respiratory illness is not available.

Despite these limitations, we found that during the 2009 pandemic, hospitalization rates for severe acute respiratory disease in HCWs were three times higher than rates in the general community. These results suggest that HCWs may be at risk for occupational acquisition of H1N1 infection. Thus hospitals and other health-care facilities should implement stricter control

measures, including immunization of all personnel, to prevent influenza transmission within the health-care setting.

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