

Seroprevalence of pandemic influenza A (H1N1) 2009 infection among pregnant women in New Caledonia, 2009

Introduction

In New Caledonia (245,580 inhabitants according to a 2009 estimate by New Caledonia's Institut de la statistique et des études économiques [ISEE]), the first case of an infection by the A (H1N1) 2009 virus, imported from Australia, was confirmed on 25 June 2009. The first local case without any documented connection with an imported case was recorded in week 29 (13 to 19 July) and probably marked the beginning of local transmission. The peak in the outbreak took place in week 33 (10 to 16 August) and New Caledonia's health authorities announced the end in week 37 (7 to 13 September) [1].

It was estimated that 16–18% of the population experienced flu syndromes during the outbreak, i.e. 40,000–45,000 people, including 114 people who were hospitalised for laboratory-confirmed influenza A (H1N1) and 10 deaths [1]. The purpose of this study was to estimate seroprevalence of specific 2009 pandemic A (H1N1) virus antibodies in pregnant women at the end of the outbreak in New Caledonia.

Materials and methods



Preparation of a RT-PCR plate for the research of influenza A(H1N1) 2009 virus – Photo: IPNC.

This was a descriptive cross-sectoral observational study of a population of pregnant women in New Caledonia who had blood tests analysed by the Pasteur Institute of New Caledonia (IPNC) as part of their prenatal care.

The study covered all blood samples from pregnant women collected by IPNC at least one week after the declared end of the outbreak, i.e. from 19 September 2009 through 27 November 2009. These blood samples, stored at -20°C, were sent to the WHO Collaborating Centre for Reference and Research on Influenza in Melbourne, Australia for specific antibody testing using indirect hemagglutination assay (IHA).

The antigen used for these tests came from A/California/7/2009 strain. A person was considered to have been infected by the 2009 influenza A (H1N1) virus if his/her IHA antibody titre was \geq 40, a titre that is supposed to give protective immunity in more than 50% of cases. The seroprevalence reported here is the percentage (with a confidence

interval [CI] of 95%) of those blood samples that tested positive (titre \geq 40) out of all the samples tested. Statistical analysis was carried out with the software Stata® 11 (Stata Corporation, College Station, Texas, USA). This study was approved by New Caledonian health authorities.







Results

In all, 189 blood samples from pregnant women were tested. For these samples, 2009 A (H1N1) antibody prevalence after the pandemic was 46% [CI 95%: 38.9–53.2]. The median age of the women was 24.8 [min.: 15.6 – max.: 47].

For 68 of the 189 women, we were able to find and analyse additional blood samples taken as part of their prenatal care before the first case of 2009 A (H1N1) was detected in the territory. Of the 68 pre-pandemic blood samples tested, 2009 A (H1N1) antibodies were found in 6 of them, i.e. 8.8% [CI 95%: 1.9–15.7]. Of these 68 women who had both pre- and post-pandemic samples, 2009 A (H1N1) antibody seroconversion was found in 34, i.e. 50% [CI 95%: 37.8–62.2].

If we accept the assumption that the risk of infection by the 2009 influenza A (H1N1) virus is the same for pregnant women as for all males and females aged 15 to 44 in New Caledonia (115,774 people according to ISEE's 2009 estimate) and that the prevalence in pregnant women was 46% [CI 95%: 38.9–53.2], the virus would have infected 53,256 [CI 95%: 45,036–61,592] adults aged 15 to 44.

Discussion

The results of this study showed a 2009 A (H1N1) antibody seroprevalence of 46% in a population of pregnant women at the end of the pandemic in New Caledonia. The flu's attack rate at the end of the epidemic was estimated at 16–18% by health authorities and covered those people who had experienced flu-like syndromes. The percentages of people who had no symptoms or did not go to see a doctor were probably very high, as described in a wide number of studies.

Our study revealed the percentage of infected individuals independent of their clinical symptoms, which could explain the difference found for the attack rate in people with symptoms reported by epidemiological surveillance.

It is difficult to extrapolate the results of our study to the overall population of New Caledonia. Nevertheless, these seroprevalence data allow us to suppose that the spread of the flu virus to the population during the 2009 epidemic was very high. Other studies, carried out on the general population, have given a seroprevalence rate of 22% for 779 blood donors in Australia [2], prevalence rates of 13.8% in China [3], 46% in Canada [4] and 28.4% in New South Wales, Australia [5]. The percentage of cases without symptoms was often high.

People who have been infected but have no symptoms – and so are invisible to conventional surveillance systems – probably play a major role in the transmission of such flu viruses and the spread of an epidemic. Quantifying the transmission of a virus with epidemic potential at the time it is first introduced to a population that is not immune is initially undertaken by formulating an estimate based on data from epidemiological surveillance. Seroprevalence studies conducted at the end of the outbreak make it possible to refine these estimates and assess the percentage of infected people who had no symptoms.

Our seroprevalence study confirmed the wide spread of the 2009 influenza A (H1N1) in the population of New Caledonia, especially among young adults.







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Bibliography

[1] Barboza P., Baudon C., Cherie-Challine L, Gastellu-Etchegorry M., Gueguen J., La Ruche G., et al. Influenza A (H1N1) 2009 in the French Pacific territories: assessment of the epidemic wave during the austral winter. Clin Microbiol Infect. Apr;16(4):304-8.

[2] McVernon J., Laurie K, Nolan T., Owen R., Irving D., Capper H., et al. Seroprevalence of 2009 pandemic influenza A (H1N1) virus in Australian blood donors, October - December 2009. Euro Surveill.15(40).

[3] Deng Y., Pang X.H., Yang P., Shi W.X., Tian L.L., Liu B.W., et al. Serological survey of 2009 H1N1 influenza in residents of Beijing, China. Epidemiol Infect. Sep 21:1-7.

[4] Skowronski D.M., Hottes T.S., Janjua N.Z., Purych D., Sabaiduc S., Chan T., et al. Prevalence of seroprotection against the pandemic (H1N1) virus after the 2009 pandemic. Cmaj. Oct 18.

[5] Gilbert G.L., Cretikos M.A, Hueston L., Doukas G., O'Toole B., Dwyer D.E. Influenza A (H1N1) 2009 antibodies in residents of New South Wales, Australia, after the first pandemic wave in the 2009 southern hemisphere winter. PLoS One.5(9):e12562.



