Seroprevalence study of pandemic strain influenza A H1N1 (pH1N1) in Wellington children: the usefulness of testing children in a hospital setting

During the first wave of the H1N1 pandemic in the winter of 2009 Wellington Hospital experienced high hospitalisation rates with pH1N1 infections when compared to elsewhere in New Zealand.\(^1,2\) This suggested a high degree of circulation of the virus in the community but it was important to assess influenza seroprevalence in children to prepare for a potential second wave expected in the winter of 2010. This study was designed to inform clinical decision-making with regard to contingency planning, and we also wished to trial a method of recruitment targeting children already requiring blood tests in a hospital setting.

Children having blood tests taken for any clinical indication (both acutely and in the outpatient department) at Wellington Children’s Hospital were tested opportunistically for influenza antibodies. This approach was taken due to the difficulty in obtaining blood for testing in younger children, who seldom have blood taken in general practice. With the parent’s consent, blood was taken for H1N1 serology in addition to other clinically indicated blood tests. Serum was analysed at the Institute of Environmental Science and Research laboratory using a standard haemagglutination inhibition assay. Titres of \(\geq 1:40\) were considered to indicate immunity.\(^3\) The study was terminated when it became apparent that a second wave of pH1N1 hospitalisations had begun.

Of approximately 680 children aged 0-16y undergoing routine blood testing between 16th April and 30th June 2010, 100 children were enrolled in the study. Two children were excluded due to insufficient residual blood for testing and 16 reported prior pH1N1 immunisation. Of the remaining 82 patients, 47 (57%, 95% confidence interval 47-67%) demonstrated immunity to pH1N1—a prevalence higher than many comparative studies.\(^4-6\)

Low numbers prevented the detection of any statistically significant differences in seroprevalence by ethnicity, age, number in the household, history of prior influenza immunisation and parental report of an influenza-like illness in the winter of 2009. There was a trend towards higher positive rates in Pacific Island (71%) and New Zealand Maori (67%) than New Zealand European children (53%), which mirrored Wellington hospitalisation data.\(^1\) None of the study patients with symptoms of febrile respiratory illness tested positive for influenza by PCR.

Undertaking research that requires blood tests in younger children is difficult, but is made easier if the child is already undergoing a blood test. Testing only children who were already having bloods taken was an attempt to address ethical and consent issues, as well as to recruit participants rapidly and provide data for healthcare planning. In retrospect the relatively low recruitment rate might have been improved by a greater level of engagement with the clinical staff involved in assessment and
The study provided timely results and was relatively inexpensive, with the only significant cost being the serological testing.

The preliminary results of this study confirmed our suspicion that the Wellington child population had been extensively exposed to the first wave of pHINI, and suggested that paediatric hospital services were less likely to be so hard hit in 2010. Fewer Wellington children were in fact hospitalised with pH1N1 in the second wave that occurred in the winter of 2010 (after the study was concluded) when compared to areas of New Zealand that were relatively spared in the first wave (Figure 1). As predicted the areas with high hospitalisation rates in 2009 generally had lower rates in 2010.

**Figure 1. Comparison of New Zealand District Health Board hospitalisations, 2009 vs 2010**

A nationwide New Zealand seroprevalence study conducted between November 2009 and March 2010 recruited volunteers from general practitioner patient registers. Using the same laboratory assay, the national study found overall community seroprevalence of 26.7%, with rates in children 5–19y of 46.7%, and 1-4y of 34.3%. Given that the surveillance data were so variable throughout the country, it is reasonable to expect a higher local level of immunity in harder hit areas, as our study found.

In conclusion, the findings of this study confirm that the likely explanation for the high paediatric admission rate in the Wellington region with pH1N1 in the winter of 2009 was the high rate of the virus circulating in the community. The method of enrolment provided relevant, low cost and timely data, and is likely to be useful in the future.
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