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Concurrent outbreaks of influenza A and influenza B

By D. W. SPELMAN* and C. J. McHARDY
Alfred Hospital, Commercial Road, Prahran, Victoria 3181

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SUMMARY

During the winter of 1982 concurrent outbreaks of influenza A and influenza B occurred. The epidemiology and clinical features of 151 cases referred during this time are described, and patients are discussed according to age and presenting clinical syndrome: croup was the commonest presentation in young children, a typical influenza syndrome predominated in young adults, while older patients were more likely to have lower respiratory tract infection. There was no significant difference between the clinical features of influenza A and influenza B. Unusual clinical features include rash, exudative tonsillitis and the need for myringotomy during the course of influenza.

INTRODUCTION

Influenza outbreaks have occurred regularly in our community (Donaldson *et al.* 1978). Unlike some other potentially epidemic infections, influenza epidemics have not been controlled by immunization (Evans, 1982).

Prior to 1982, the last major outbreak of influenza in Victoria occurred in 1976, with influenza A/Victoria/3/75 (H3N2) (Donaldson *et al.* 1978). During 1982 concurrent outbreaks of influenza A and influenza B occurred. This provided an excellent opportunity to study the clinical features and epidemiology of these diseases. Furthermore, because Fairfield Infectious Diseases Hospital, Melbourne, admits patients of all ages, we were able to study patients from the very young to the elderly. This paper reports a retrospective study of patients with influenza who were admitted to Fairfield Hospital during 1982.

METHODS

We made a retrospective study of the case histories of all patients with influenza admitted to Fairfield Hospital in 1982. Only patients in whom a diagnosis was confirmed by virus isolation or serological testing have been included. The clinical features and epidemiology were analysed in detail.

For the purpose of this study, the patients were divided into the following age groups: (1) pre-school children, 5 years or younger; (2) school-children, 6 to 14 years; (3) young adults, 15 to 30 years; (4) older and middle-aged adults, 31 to 60 years; and (5) those patients over 60 years of age.

* Formerly at Fairfield Infectious Diseases Hospital, Fairfield, Victoria 3078.

Table 1. *Occurrence of influenza in various age groups during the outbreak*

Age (years)	Total patients	Influenza A	Influenza B
0–5	23	17	6
6–14	33	14	19
15–30	25	6	19
31–60	37	27	10
Over 60	33	16	17
Totals	151	80	71

These patients were studied according to their clinical presentation. We divided them into the following four clinical syndromes: (1) croup; (2) predominantly upper respiratory tract symptoms of sore throat, nasal discharge/blockage, dry cough and hoarseness (URTI); (3) lower respiratory tract involvement (LRTI); patients were included in this group if they had clinical signs of lung crepitations or rhonchi and/or abnormal transient radiological findings and/or copious sputum production; (4) predominantly fever, headache and myalgia.

RESULTS

The outbreak

During 1982, 151 patients with virologically confirmed influenza were admitted to Fairfield Hospital. There were 74 males and 77 females. Eighty patients had influenza A and 71 had influenza B. All age groups were represented, as shown in Table 1. The average age was 33·3 years (range 5 weeks to 92 years).

This combined outbreak occurred between June and September (Fig. 1) with the peak number of admissions occurring in late July. The peak of influenza B occurred in early July and that of influenza A occurred in early August, i.e. about five weeks later.

The time of presentation during the course of the outbreak according to age group is shown in Fig. 2. The peak admission rate for patients aged 6 to 14 years was reached in the week ending 26 June, whereas peak admission rates for the other four age groups were achieved at least four weeks later.

Clinical presentation

More than 90 % of these patients were admitted to hospital within 7 days of the onset of their symptoms: one-third presented within the first 2 days and another third presented on day 3 or 4. Children aged from birth to 5 years generally presented early (on average, day 3) in the course of their illness. Patients aged over 60 years presented later (on average, day 6). Of the 15 patients who presented after day 7 of their illness, 7 described a biphasic course to their illness.

Six patients acquired influenza as in-patients, including the only two in this series who had received influenza vaccine: both contracted influenza A 10 weeks after vaccination with vaccine containing the following types: A/Philippines/2/82 (H3N2), A/Victoria/186/82 (H3N2) and B/Singapore/222/79. About one-third of the patients reported a contact, most often a family member, who also had an acute

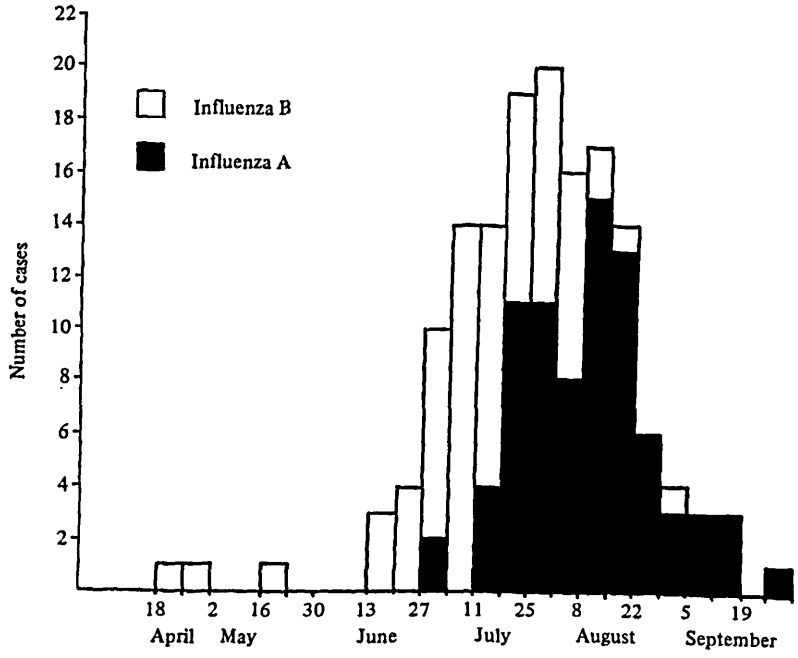

Fig. 1. Number of cases of influenza according to week of presentation.

respiratory tract illness. One-third had received antibiotics prior to admission, and 20 patients gave a past history of either asthma or emphysema.

The commonest symptoms reported were fever (83 %) and cough (76 %). Other common symptoms were headache (56 %), sore throat (48 %), myalgia (33 %), nasal discharge (33 %) and vomiting (31 %). Only 19 % of patients reported chills, 26 % gave a history of sputum production and 9 % had diarrhoea. A biphasic illness was reported by 20 patients (13 %).

Physical findings

One hundred and forty-two patients (94 %) had fever which was either reported in the history or observed whilst in hospital. Eighty-four per cent of patients had fever documented in hospital and in over three-quarters of these the fever was about 38 °C. The average duration of fever in hospital was 2·5 days. Only three patients had fever documented for more than seven days, namely an eight-year-old boy and two middle-aged women, one of whom was on immunosuppressive therapy following renal transplantation.

Other common physical findings were pharyngitis (68 %), palpable cervical nodes (50 %), lung crepitations (28 %) and rhonchi (18 %). In 13 % of patients, examination revealed inflamed or bulging tympanic membranes. Stridor was present in 13 % (i.e. 24 patients), and 9 % had meningism. Of the 12 patients who gave a past history of asthma only 3 had acute asthma on presentation.

Clinical syndromes

The patients presented with a number of different clinical syndromes, i.e. (1) croup, (2) upper respiratory tract infection, (3) lower respiratory tract infection,

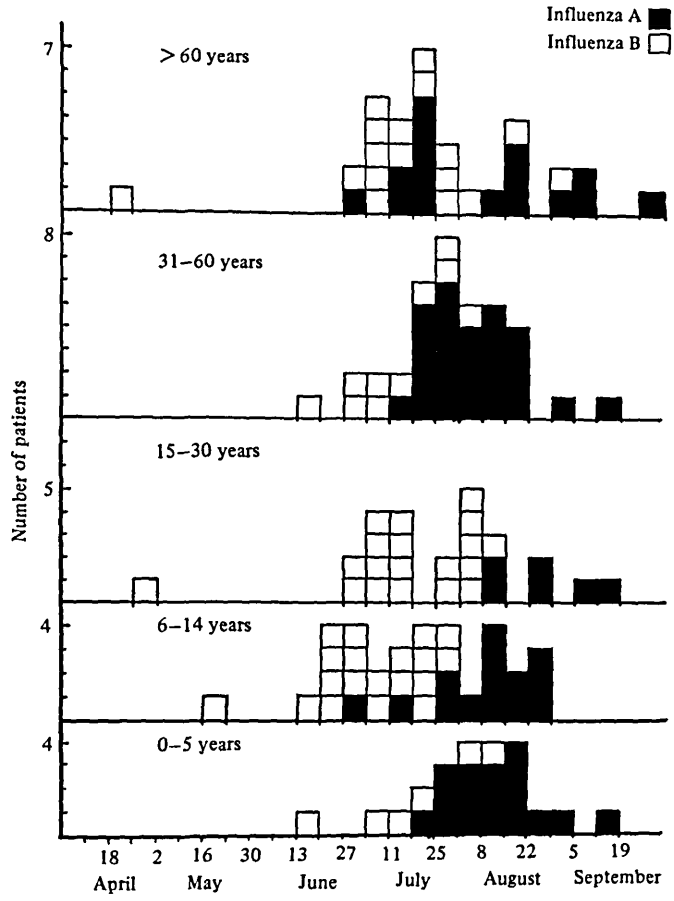

Fig. 2. Number of cases of influenza according to age and week of presentation.

(4) fever, headache and myalgia (Table 2). The 'incidental' group included patients whose presentation was such that isolation of influenza virus was unexpected, namely patients referred with diarrhoea, fits, florid rash, or with possible encephalitis and polyneuritis. Table 2 outlines the occurrence of each clinical syndrome in different age groups. Certain clinical features deserve special mention in each specific age group, as follows.

Birth to five years. The predominant clinical syndrome in this age group was croup (see Table 2). Of the 10 children with croup, one required tracheostomy – a 21-month-old child whose tracheostomy was performed on the seventh day of his illness. A nine-month-old child was admitted with croup due to influenza only three weeks after an admission for croup due to respiratory syncytial virus (RSV).

Vomiting was twice as common in this age group as in patients 15 years and over. Two children presented with febrile convulsions. A rash was present in three cases, and in two of these patients, aged 18 months and three years, the rash was so florid that the referring diagnosis was measles. One of these children had influenza B and the other influenza A. Neither had any other apparent cause of a rash, i.e. medication or other infection. Two children in this age group had lumbar punctures performed to exclude meningitis.

Table 2. *Clinical syndrome of influenza virus infection in different age groups*

Clinical syndrome	Percentage of patients in age groups with syndrome				
	0–5*	6–14	15–30	31–60	60+
Croup	44	34	4	3	3
URTI	22	24	60	30	15
LRTI	13	15	12	45	70
Fever, Headache, Myalgia	4	27	24	22	3
Incidental	17	0	0	0	9
	100	100	100	100	100

URTI denotes upper respiratory tract infection and LRTI, lower respiratory tract infection.
* Age in years.

A second virus was isolated from six children in this age group, namely RSV (two patients, including an 8-month-old baby with bronchiolitis), rotavirus (1), adenovirus (2) and herpes simplex virus (1).

Six to 14 years. Of the 11 patients with croup, 8 were 8 years of age or less, and not one required a tracheostomy. As with the previous age group, vomiting was twice as common as in patients 15 years and older. Five patients reported a biphasic course to their symptoms. Uncommon clinical features were an exudative tonsillitis in 2 patients, and a convulsion in 1 patient. In 9 of the patients in this age group a lumbar puncture was performed to exclude meningitis. A 7-year-old boy with a florid rash was referred with a provisional diagnosis of measles. Influenza B was confirmed and no other cause for his rash was found.

15 to 30 years. As shown in Table 2 the commonest syndrome in this age group was an upper respiratory tract infection. Clinical pharyngitis was found in 96% of the patients. Unusual presentations included a patient with an exudative tonsillitis, a recently returned overseas traveller with fever, and a 17-year-old man with jaundice and anaemia who had spherocytosis. Five of the patients in this age group underwent lumbar puncture to exclude meningitis.

31 to 60 years. In this age group there was evidence of lower respiratory tract involvement in 45% of patients. One patient had diffuse viral pneumonia with evidence of moderately severe adult respiratory distress syndrome. She recovered without the need for ventilation. Chills were reported three times more commonly in this age group than in other patients. Eight patients described a biphasic illness and a 35-year-old woman presented with croup.

Two patients required urgent myringotomies during the course of their influenza; both were middle-aged women who developed acute ear pain and deafness, and had straw-coloured middle-ear effusions. Nine patients in this age group had lumbar punctures.

Over 60 years. Seventy per cent of patients had lower respiratory tract involvement. Cough was reported by 96% of patients and crepitations, rhonchi and breathlessness occurred in 64%, 42% and 33% respectively. One patient had severe influenza A pneumonia in 1971 and again in 1982; on both occasions he had marked hypoxaemia (partial pressure of oxygen < 50 mmHg).

One patient presented with a septicaemia-like illness with acute renal failure, requiring short-term peritoneal dialysis. Another patient with long-standing chronic active hepatitis and a past history of encephalopathy presented with influenza and signs of hepatic encephalopathy. The only death occurred in a 67-year-old past poliomyelitis patient who had previously required assisted (tank) ventilation. She developed upper respiratory tract symptoms, needed to be put back into a tank respirator and died suddenly on the seventh day of her illness.

Influenza in compromised hosts

Within this series there were 10 'compromised' patients, namely 3 patients on immunosuppressive therapy following renal transplantation, 3 patients receiving steroids for asthma or hepatitis, 2 patients on maintenance haemodialysis, 1 patient with agammaglobulinaemia and 1 patient who had had a splenectomy. Two of these patients described, on presentation, a biphasic course to their symptoms. Only one patient had a significantly prolonged course, i.e. a middle-aged woman on immunosuppressive therapy following renal transplantation. She had fever in hospital for 11 days, as well as diffuse opacities on chest X-ray, and was treated with broad-spectrum antibiotics before eventually recovering.

Comparison of influenza A and B

The clinical features (i.e. presentation, physical signs and clinical course) of patients with influenza A were compared with those patients with influenza B. No statistically significant difference was found between the two groups.

Investigations

In 26 patients a lumbar puncture was performed and the cerebrospinal fluid (CSF) protein was elevated in only four of these, the highest value being 545 mg/l (normal, 100–400 mg/l). There was no case of CSF pleocytosis.

The results of liver function tests were abnormal in 23 of the 44 patients in whom they were performed. The commonest abnormality was a mild elevation in aspartate aminotransferase level.

In 13 patients the level of this enzyme was between 40 and 100 Karmen units (normal 10 to 40 Karmen units) and in a further four patients the level was above 100 Karmen units. Six of these 17 patients had another possible cause of elevated hepatic enzymes, i.e. co-existent acute hepatitis A, chronic active hepatitis, chronic hepatitis B carriage, congestive heart failure or drug hepatotoxicity. Creatine phosphokinase was estimated in 10 patients and elevated in 5 of these.

One hundred and six patients had normal total white cell counts. Of the remainder, 43 patients had leucopenia (lowest count $2{\cdot}1 \times 10^9$/l) and 2 patients had leucocytosis (12·0 and $18{\cdot}0 \times 10^9$/l). The erythrocyte sedimentation rate (ESR) was measured in 30 patients and was elevated in 12 cases. Only two patients had an ESR greater than 50 mm in one hour.

Virological studies

One hundred and thirty-five patients (89 %) were positive for influenza virus by culture and/or immunofluorescence on nasopharyngeal aspirates (NPA). In 115 patients the NPA was taken during the first seven days of the illness, and in a

further 13 cases the NPA was taken during the second week of illness. The remaining seven patients gave a history longer than two weeks before the NPA was taken. The average age of those patients who had a positive NPA after day 7 of their illness was 44 years.

Influenza was cultured from a throat swab in 47 patients (31 %). Nose and throat swabs are routine procedure on admission to Fairfield Hospital.

All influenza B isolates were identified as influenza B/Singapore/222/79. All except nine of the influenza A isolates were identified as influenza A/Bangkok/1/79 (H3N2). The other nine isolates were identified as influenza A/Victoria/186/82 (H3N2).

Serial tests for influenza complement-fixing antibodies were positive in the 14 patients in whom this was performed. Serological testing was the only means of diagnosis in six patients. The virology of this outbreak is discussed in more detail elsewhere (Kennett *et al.* 1984) and the methods used for virus isolation, identification and serology have been previously described (Donaldson *et al.* 1978).

DISCUSSION

The patients described in this study were all in-patients at Fairfield Infectious Diseases Hospital, whose admissions generally reflect the incidence of influenza in the community. Simultaneous outbreaks of influenza A and influenza B have not previously been observed at Fairfield Hospital in the 25 years in which influenza virus isolation has been performed by Fairfield's virology department. To our knowledge, this is the first occasion that large co-existent outbreaks of influenza A and influenza B have been documented in this country. Double outbreaks have been reported from elsewhere (Hope-Simpson, 1984; Stuart-Harris & Schild, 1976; Foy, Cooney & Allan, 1976).

The duration of these almost simultaneous outbreaks was about 14 weeks, which is similar to the duration of previously described outbreaks of a single influenza type (Donaldson *et al.* 1978; Hope-Simpson, 1984). The peak of the influenza B outbreak occurred five weeks before that of the influenza A outbreak. The group of patients most apparent early in the course of the influenza B outbreak was the school-age children, i.e. those aged 6 to 14 years. This supports the concept that this age group may play an important role in the early dissemination of influenza virus throughout a community (Glezen & Couch, 1978).

It was possible to separate four clinical syndromes. Although there is some overlap between these syndromes we found this to be a useful method of comparing the different groups within this outbreak.

The ages of patients ranged from the very young to the elderly, and the predominant clinical syndrome varied with the age of the patient. Forty-four per cent of children, aged 0–5 years, presented with croup and 60 % of young adults, aged 15–30 years, presented with a typical upper respiratory tract influenza syndrome. Older patients were much more likely to have lower respiratory tract infection, e.g. 70 % of those patients aged 60 years or over.

The overall incidence of lower respiratory tract infection was 34 %. In some previous reports this incidence has varied from 4 % to 40 % (Stuart-Harris, 1965). It should be emphasized that patients described in this report were hospitalized

patients and therefore may not accurately reflect the clinical spectrum of influenza in the general community.

The relationship of different clinical features with age has been referred to in a previous paper from this hospital (Bennett, 1973). In that paper the clinical aspects of 333 patients were described: these patients presented over a four-year period and most (i.e 93 %) had influenza A. In contrast, our patients were admitted during one outbreak and were evenly divided between influenza A and B.

The majority of our patients presented during the first week of their illness. Compared with adults, children generally presented earlier in the course of their illness. Possible reasons for this include higher peak temperatures in children (Jordan *et al.* 1958), parental concern and the fact that croup, an important indication for hospitalization, occurs most commonly in the young.

There were 24 patients with croup. Of these, 18 were aged eight years or less and only one patient required tracheostomy. This tracheostomy rate of 4 % is much the same as the overall tracheostomy rate for croup in this hospital of about 5 %.

Twenty patients (13 %) reported a biphasic illness on presentation. The incidence is less than in other reports (Stuart-Harris, 1965), although in many cases it is difficult to know whether the initial peak of illness was due to influenza or another pathogen. Ten of these patients had evidence of lower respiratory tract involvement and 12 were aged over 30 years.

Four patients presented with a rash. In three of these cases the rash was so florid that the referring diagnosis was measles. As no other possible cause for a rash was found, it is possible that influenza was the cause of the rash in these children. Other clinical features uncommonly attributed to influenza but occurring in our patients were exudative tonsillitis and the need for urgent myringotomy during the course of influenza. Vomiting (31 % of patients) and diarrhoea (9%) were also more common in this series than in some previous reports (Stuart-Harris, 1965).

The majority of our patients were diagnosed by immunofluorescence or culture of NPA specimens. Previous studies of viral shedding in influenza have found that the virus is no longer isolated after 5–10 days (Mandell, Douglas & Bennett, 1979), although longer duration of viral shedding has been documented in infants (Hall & Douglas, 1975). In our patients diagnostic specimens were taken on or soon after admission and no attempt was made to take routine follow-up specimens. We found that 20 patients had positive NPA specimens after one week of illness, and in 7 of these patients the duration of illness before the NPA was at least two weeks. Therefore, in a situation where influenza is a possible diagnosis an NPA may still be of use even late in the illness.

In some past reports it has been suggested that the clinical illness of influenza B is milder than that of influenza A (Mandell, Douglas & Bennett, 1979). However, in the series reported here, influenza A and B outbreaks coincided and clinical observations were made by the same group of clinicians, and there was no significant difference between the clinical features of influenza A and influenza B.

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