An Outbreak of Hongkong Influenza in a Youth Camp in West Malaysia

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IN JULY, 1968, an epidemic of A2/Hongkong influenza occurred throughout West Malaysia and subsided towards January, 1969. However, it did not abate altogether but continued to appear in 1969 both sporadically, mainly among the urban population, and in small isolated outbreaks in institutions, including the University of Malaya. The causal agent in all the cases investigated in Kuala Lumpur was found to be the same Hongkong/68 influenza virus strain.

Towards the end of the first week of April, 1970, another outbreak of acute respiratory disease (ARD) was observed at the National Pioneer Youth Corps Training Centre at Dusun Tua, Ulu Langat, Selangor. The health authorities and the Institute for Medical Research (IMR) were called in to investigate and A2/Hongkong influenza was again confirmed as being responsible. Shortly after, the outbreak spread outside the camp limits to involve schoolchildren and their contacts in Selangor. The same virus was isolated again.

This paper describes in detail the investigation of the influenza outbreak in the Dusun Tua camp.

The National Pioneer Youth Corps Training Centre

The Dusun Tua camp is situated along the Langat River in a valley and is 16 miles by road from Kuala Lumpur. The river forms its western and southern boundaries and towards the north is a swamp and a padi field. There were rubber trees and jungle to the east but these were cleared in August, 1969 to enlarge the camp.

About 3,000 youths, aged between 16 to 25 years, are enrolled four times a year. The first batch was recruited in October, 1969. They come from all the states of W. Malaysia and stay in the camp for the whole duration of their training programme, which is three months. The staff, instructors and others form a separate group of about 200 individuals, most of whom come to the camp daily from Kuala Lumpur and Kajang.

Medical care for staff and trainees is provided for by one medical officer and four medical assistants. The personnel make full use of the facilities provided and it can be assumed that all affected by the influenza outbreak came forward for treatment.

Occurrence of the cases

The influenza outbreak started on 6 April, 1970, reached its maximum proportion within four days and was over in approximately three weeks. The attendance at the clinic more than doubled during the first week of the outbreak as is shown in **Figure 1.** The increase was due almost exclusively to acute respiratory disease. Prior to the epidemic only 3% of the population reported daily for various complaints.

FIGURE 1
CLINICAL ATTACK RATE OF INFLUENZA
AT THE DUSUN TUA YOUTH CAMP, APRIL 1970

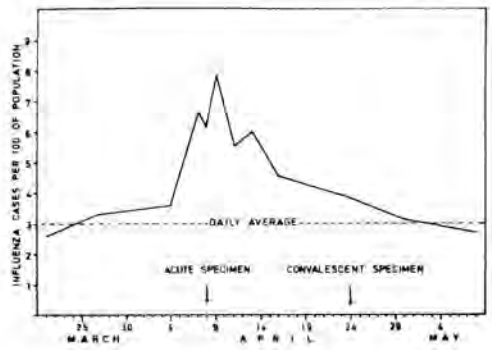

Fig. 1

During the first week of the outbreak, more than 6% with an influenza-like illness were seen daily. An estimated total of 2,800 persons was affected during the three weeks of the outbreak, giving a clinical attack rate close to 80%. More than 120 badly ill persons had to be hospitalized in the sick-bay for periods varying from two to seven days.

TABLE 1

Presenting symptoms of 200 patients with influenza at the Dusun Tua Youth Camp.

Symptoms	No. of patients	Rate %
Fever	180	90
Cough	150	75
Headache	90	45
Weakness/Malaise	40	20
Chills & Rigors	40	20
Chest-pain	39	20
Coryza	31	15
Giddiness	30	15
Sore-throat	28	15
Myalgia	24	12
Abdominal pain	12	6
Vomiting	10	5
Ocular pain	6	3
Profuse perspiration	5	3
Nausea	3	2
Arthralgia	4	2
Diarrhoea	1	0.5

On 13 April, when the epidemic was settling down, one patient turned up with typical 'flu-like symptoms. He was treated as an outpatient like all the other 'flu cases. Later, however, he developed neurological symptoms suggestive of meningo-encephalitis and went into coma III.

Throat swabs and paired sera were taken for investigation. No influenza isolate was obtained from the throat specimen, neither was the patient positive for influenza, serologically. Subsequently, however, arbovirus studies proved him to be a case of Japanese encephalitis.

Clinical Observations

The onset of the disease was abrupt in most cases with headache, nasal stuffiness and fever as the prodromal symptoms. The duration of the illness was from three to five days in uncomplicated cases. In others, it lasted up to ten days. The clinical features were studied in 200 patients. Half of these were the acutely ill cases which were hospitalised and the other half consisted of 100 outpatients selected at random. An analysis of the main symptoms is given in **Table 1.**

The most frequently encountered feature noted in 90% (180) of the cases was fever and this was associated with chills and rigors in 20% (40) of the cases. The temperature on admission ranged from 100° F to 103° F and the highest recorded during the first two days of the illness was 105°F. The fever subsided within three days in most cases but lasted up to one week in those with complications. Although cough was the second most frequent symptom affecting 75% (150) of the cases, it was mild and non-productive. About 20% (39) had sub-sternal chest pain accentuated by this dry cough. Almost 50% (90) had headache, mainly frontal, although a few had retro-orbital pain made worse by upward and lateral movements of the eye-ball. Sore-throat and coryza did not feature very prominently in this outbreak. Diffuse myalgia was more common than arthralgia. Many complained of faintness and giddiness – some actually collapsed and fainted on the field during physical training.

On examination, a large proportion presented with flushed faces and a hot dry skin but a few perspired profusely. Watery eyes with conjunctival injection

was a common feature. Some had injection of the pharyngeal wall and tonsils as well. Evidence of bronchiolitis and pnuemonitis, in the form of scattered rhonchi, wheezes and moist rales was found in 35–40% (77) of the cases. A few had clinical evidence of pulmonary consolidation. These chest complications accounted for almost half of the cases admitted. No other complications were noted and there were no fatalities.

Recovery was complete in three to four days in uncomplicated cases. Antibiotics were used for cases with secondary chest-infection. Recovery in these cases took almost ten days. Convalescence was prolonged by post-infection asthenia, malaise, anorexia and depression.

MATERIALS AND METHODS

Collection of specimens

Two throat swabs were taken from each of 8 acutely ill patients during the early phase of the disease and placed in 5 ml. of chilled Hartley's broth containing a final concentration of 625 units of penicillin and 125 ugm. of streptomycin per ml. Paired (acute and convalescent) sera were collected from 6 patients for serological investigation by haemagglutinin-inhibition (HI) tests. Two patients were bled during the acute phase of the disease but were not available when the convalescent specimen was due. All the specimens were transported in thermos flasks containing ice.

Virus isolation and identification of isolates

Each throat swab specimen was inoculated into six 10-day-old embryonated chicken eggs. The volume of inoculum was 0.2 ml., about 3/4 of which was introduced into the amniotic and 1/4 into the allantoic cavity. Allantoic and amniotic fluids were collected after three or four days of incubation at 35 C and tested for the presence of haemagglutinating (HA) agents by a spot test. This consisted of 0.25 ml. of 0.5% fowl RBC added to 0.25 ml. of amniotic or allantoic fluid. A cell control made up of 0.25 ml. of the fowl RBC and 0.25 ml. of 0.85% phosphate buffered saline was also set up. Readings were taken after the mixtures were allowed to stand at room temperature for 45–60 minutes when the control cells had settled to a button.

Specimens with a negative spot test were given one more amniotic/allantoic passage before they were disregarded. Those showing a positive spot test were titrated by the HA test. Further passages were performed to increase low titres.

Isolates were identified by the HI test (Davenport and Minuse, 1964) using 8 haemagglutinating units of virus. Each isolate was tested against the following hyperimmune rooster sera, some of which were supplied by WHO and some prepared in this laboratory from virus seeds also supplied by WHO:

Polyvalent A	A2/Taiwan/1/64
Polyvalent B	A2/Malaya/302/54
A2/Hongkong/8/68	B/Singapore/3/64
A2/Malaysia/1/68	

Serology

Paired sera of the 6 patients were tested for rise in HI antibodies. All sera were inactivated at 56 C for 30 minutes prior to treatment with Receptor Destroying Enzyme (RDE) to remove non-specific inhibitors. The method adopted was that recommended by the WHO International Influenza Center for the Americas.

The sera were tested in the HI test against the following virus strains:

The respective patient's isolate	A2/England/878/69
A2/Malaysia/1/68	A2/Taiwan/1/64
A2/Hongkong/8/68	B/Switzerland/265/67

RESULTS

Identification of the isolates

HA agents were isolated from all the eight throat swabs collected and high HA titres were attained by all the isolates after the first or second amniotic/allantoic passages.

The eight isolates were identified as Influenza Type A2 viruses and were found similar to the 1968 Hongkong strain (Table 2).

Antigenic comparison of a representative Dusun Tua strain (F2/70) with other A2 strains showed that of the current (1968–69) viruses, F2/70 is more closely related to A2/Hongkong/68 and A2/Malaysia/68 strains than to A2/England/69 strain, which has been reported by Dr. H.G. Pereira of WHO World Influenza Centre as representing a "drift" from the prototype Hongkong strain in its antigenic characteristics **(Table 3).**

TABLE 2

Typing of Influenza Isolates of the Dusun Tua patients, by HI test

Rooster Antisera	HI Titre* and Antigen							
	F1/70	F2/70	F3/70	F4/70	F/5/70	F6/70	F7/70	F8/70
A2/Mal/1/68	160	80	80	160	160	160	80	320
A2/HK/8/68	640	160	320	320	320	640	160	320
A2/TW/1/64	<10	<10	<10	<10	10	<10	<10	10
B/S'pore/3/64	<10	<10	<10	<10	<10	<10	<10	<10
A2/Mal/302/54	<10	<10	<10	<10	<10	<10	<10	<10
Polyvalent A	1280	320	640	640	640	1280	320	640
Polyvalent B	<10	<10	<10	<10	<10	<10	10	<10
HA units used	8	8	8	4	4	8	8	4

* Titre expressed as reciprocal.

TABLE 3

Antigenic Comparison of the Dusun Tua Isolates with other A^2 Influenza Strains

Virus	HA Units used	Rooster Antisera				
		A2/TW/1/64	A2/HK/8/68	A2/Mal/1/68	A2/Eng/878/69	F2/70
A2/TW/1/64	8	*640*	<10	10	40	<10
A2/HK/8/68	8	<10	*640*	160	80	640
A2/Mal/1/68	8	<10	640	*320*	80	640
A2/Eng/878/69	8	<10	80	80	*320*	80
F1/70	8	<10	640	160	80	320
F2/70	8	<10	160	80	80	320
F3/70	8	<10	320	80	80	320
F4/70	4	<10	320	160	80	320
F5/70	4	<10	320	160	80	320
F6/70	8	<10	640	160	80	640
F7/70	8	<10	160	80	40	160
F8/70	4	<10	320	320	80	320

Serological findings

Paired (acute and convalescent) sera obtained from six patients who yielded influenza isolates were tested for rises in HI antibody titre. The remaining two patients with isolates were not tested, because only single serum specimens were obtained from them. The paired sera of the patient (M.N.) initially suspected as an influenza case, but later found to be suffering from Japanese encephalitis, were also tested for influenza antibody rises.

All the six influenza patients did not show any residual antibodies to A2/HK/68 virus in their acute specimens but showed marked antibody rises (16– to

TABLE 4

Rises in Haemagglutin-Inhibiting Antibody among Influenza Cases at the Youth Training Camp, Dusun Tua

Patient	Serum	Patient's Isolate		HI Titre* and Antigen									
				A2/Mal/1/68		A2/HK/8/68		A2/Eng/878/69		A2/Taiwan/1/64		B/Switz/265/67	
		Titre	Rise	Titre	Rise	Titre	Rise	Titre	Rise	Titre	Rise	Titre	Rise
Z.A.	Acute	<10	128	<10	128	<10	>512	<10	128	20	64	<10	1
	Conv.	640		640		>2560		640		1280		<10	
S.G.	Acute	<10	16	<10	32	<10	16	<10	16	20	8	20	1
	Conv.	80		160		80		80		160		20	
C.T.	Acute	<10	32	<10	64	<10	64	<10	64	<10	64	20	1
	Conv.	160		320		320		320		320		20	
Y.B.	Acute	<10	64	<10	32	<10	64	<10	32	20	16	10	2
	Conv.	320		160		320		160		320		20	
Y.A.	Acute	10	32	<10	64	<10	64	<10	64	40	8	<10	1
	Conv.	320		320		320		320		320		<10	
M.B.	Acute	10	32	<10	32	<10	32	<10	32	10	8	<10	1
	Conv.	320		160		160		160		80		<10	
M.N.	Acute	No		40	1	40	0	20	0	20	1	<10	1
	Conv.	Isolate		40		20		10		20		<10	
H.K.	Units Used	8		8		8		8		8		8	

* Titres expressed as reciprocal, (+) Case of laboratory-confirmed Japanese encephalitis

greater than 512-fold) against their own isolate, A2/Mal/1/68, A2/HK/8/68 and A2/Eng/878/69 viruses **(Table 4)**. The rise against A2/TW/64 virus was less marked (8– to 64-fold). No significant rises were detected against the B virus. M.N. did not show any rise at all to any of the influenza strains and was therefore not similarly infected as his fellow inmates of the camp.

Discussion

From past experiences, when a significant antigenic change in the current influenza virus strain takes place, resulting in a new variant, major epidemics occur but soon after, because of acquired immunity to the new virus, the outbreaks peter out and usually do not make their reappearance until another "shift" occurs.

In W. Malaysia, the Hongkong 'flu virus caused a nationwide epidemic in August, 1968. All age-groups were affected but the majority of the patients were adults, both young and old.

Unlike previous epidemics, however, where the new variant strain ceased to be active after a few months, the Hongkong 'flu virus persisted in the general population, especially in Kuala Lumpur, for more than two years after the 1968 epidemic. The serological results **(Table 4)** of the infected youths in the Dusun Tua camp showed that none of the influenza patients had any appreciable residual HI antibody to A2/HK/68 virus prior to the infection in 1970, and preliminary findings of a post-Hongkong influenza survey (still in progress in this laboratory) seem to indicate poor antibody response to the A2/HK/68 virus in the general population. However, this does not necessarily explain the continued presence of the infection in the country as it has been found (Rapmund et al., 1959) that circulating antibodies in the blood are not a reliable index of protection from clinical disease, as persons possessing little or no demonstrable antibody may escape infection to which others with relatively high antibody titres are susceptible.

Antibodies produced locally at the site of infection (e.g. those found in saliva, sputum and nasal washings in respiratory diseases) have been shown to reflect better the extent to which an individual is protected against infection (Mann et al., 1968; Cate et al., 1966 and Smith et al., 1966). As it is not known whether or not those infected after the 1968 epidemic in Malaysia had antibodies in their respiratory secretions, the reasons for the persistence of the A2/HK/68 virus in the Malaysian population remain obscure.

Summary

This paper describes an influenza outbreak in April, 1970, at the National Pioneer Youth Corps Training Centre, Dusun Tua, Selangor (16 miles from Kuala Lumpur). A2/Hongkong virus, closely related to the prototype strain, was isolated from all the eight patients investigated and was serologically proved responsible for the infections.

The outbreak represented yet another of the several minor outbreaks in Kuala Lumpur caused by the same virus which had persisted for more than two years after the initial epidemic in 1968. No obvious reasons for this could be given.

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