

AN EPIDEMIOLOGICAL STUDY OF FIVE FAMILIES IN THE 1975 CONJUNCTIVITIS EPIDEMIC

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SYNOPSIS

An epidemiological study was carried out on 5 families during the 1975 conjunctivitis epidemic. The mean secondary attack rate was 48% and the incubation period 1-6 days. The clinical features were low grade fever (5.9%), upper respiratory signs and symptoms (17.6%), bilateral conjunctivitis (88.2%), unilateral conjunctivitis (11.8%), lid swelling (23.3%), mucopurulent discharge (11.8%), and preauricular lymphadenitis (17.6%). All recovered within 1-3 days. *Coxsackievirus A24* was isolated from the eye swabs of all the 5 index cases, 2 of whom also had positive throat swabs. Out of 20 family contacts on whom virus isolation was carried out, five (25%) had positive eye swabs and one (5%) also had a positive throat swab. Intimate contact appears to be necessary for transmission of infection. Spread of infection by droplets may also play a part.

INTRODUCTION

An epidemic of conjunctivitis occurred between the third week of June and third week of September 1975 with the peak in the first week of August, when a total of 10,626 cases was reported from the Government Outpatient Services for that week (Fig. 1). The causative organism was identified as an enterovirus, an antigenic variant of *Coxsackievirus A24*, the same virus which caused an epidemic of conjunctivitis in 1970 (Lim and Yin-Murphy, 1971; Epidemiological News Bulletin, 1975). An analysis of 363 cases seen at Queenstown Dispensary on 17.7.75 and 18.7.75 showed that 58.4% were school children and 48.2% of the patients contracted the disease at home.

EPIDEMIOLOGICAL STUDIES

This is an epidemiological study of the disease in 5 families carried out during the epidemic. The index case of each family was the first case attending the Queenstown Outpatient Dispensary with the following criteria:—

- (a) The case stayed in a Housing and Development Board flat;
- (b) There were at least 5 members in the family and
- (c) None of the family contacts were known to have had the infection previously.

One case was selected each day for 5 consecutive days. Eye and throat swabs for virus isolation, were

taken from the case and family contacts on the same day. None of the contacts had evidence of conjunctivitis at the time the specimens were collected. All members were followed up for 3 weeks, and home environmental conditions were studied.

VIRAL STUDIES

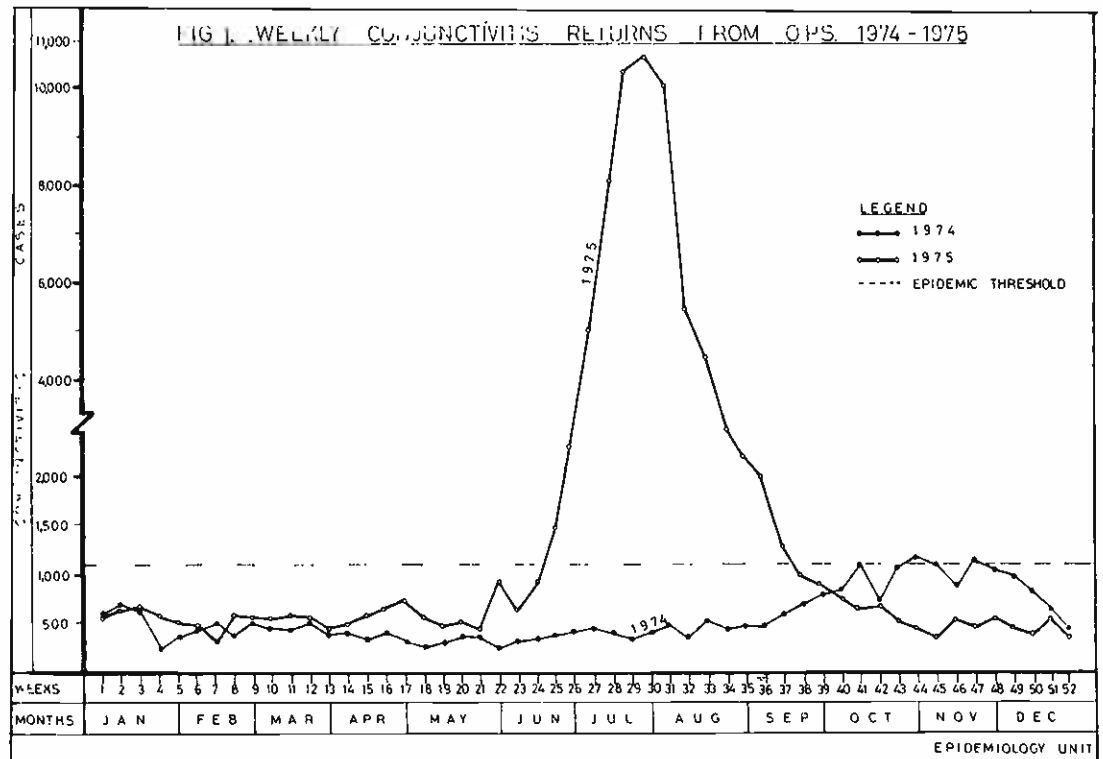
In this epidemic many patients had been observed to complain of upper respiratory tract symptoms in addition to conjunctivitis. Throat swabs as well as eye swabs were therefore collected for virus isolation from each person, both eyes being swabbed in each instance.

Swabs were suspended in Hank's Balanced Salt Solution containing 10% Foetal Bovine Serum, 200 units Penicillin, 200 ug Streptomycin, and 0.5 ug Amphotericin B per ml. After centrifugation, 0.2 ml of this solution was inoculated into each of two tubes of HeLa cells (Rhinovirus sensitive strains of HeLa cells). This line was found to be very sensitive to the *Coxsackievirus A24* and superior to HEp-2 cells and Human Embryonic Lung Fibroblasts for isolation. The virus did not produce any cytopathogenic effect in Primary Cynomologous Monkey Kidney cell cultures.

Inoculated tubes were rolled at 33°C and examined daily for CPE. In the HeLa line CPE developed in 1-4 days; where no CPE developed by the 7th day, the culture usually remained negative after that. Once observed, the CPE was rapidly progressive, becoming generalised sometimes within 6 hours. Positive isolates were identified by the tube neutralisation test, using specific anti-serum against *Coxsackievirus A24* prepared in monkeys and supplied by Dr. M. Yin-Murphy. To save serum, each isolate was diluted 1/100 and tested against serum

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diluted 1/40. This serum had a titre of 640 or 1,280 against the homologous virus. Tubes were read after 24 and 48 hours.

ANALYSIS OF RESULTS

Attack Rate

The study group consisted of 5 index cases and 25 family contacts. Two of the index cases reported contact with cases in schools; one, with cases in the office; and one, in the factory. In one case the source was unknown. Twelve of the family contacts subsequently developed conjunctivitis giving a secondary attack rate of 48% (Table I).

Incubation Period

The interval between the day of appearance of conjunctivitis in the index case and the onset of conjunctivitis in the first family contact affected (serial interval) was 1 day. The incubation period was between 1-6 days (Fig. 2).

Age and Sex Distribution of cases

There were more females than males and 41.2% of the cases were in the 15-24 years age group (Table II).

TABLE I
SECONDARY ATTACK RATES AMONGST FAMILY CONTACTS

Family	No. of Contacts	No. Infected	Secondary Attack rate (%)
I	4	0	0
II	4	1	25
III	4	2	50
IV	9	5	55.6
V	4	4	100
All	25	12	48

Clinical Features

The eye infection was mild with involvement of the conjunctivae mainly. The patients complained of sore and itchy eyes, excessive tearing, but no blurring of vision. Examination showed simple conjunctivitis and in 2 cases (11.8%), mucopurulent discharge. There was no loss of corneal brightness. Three patients (17.6%) had upper respiratory signs and symptoms (Table III). All of them recovered in 1-3 days. They were given "Hydrocortisone et Neomycin" eyedrops.

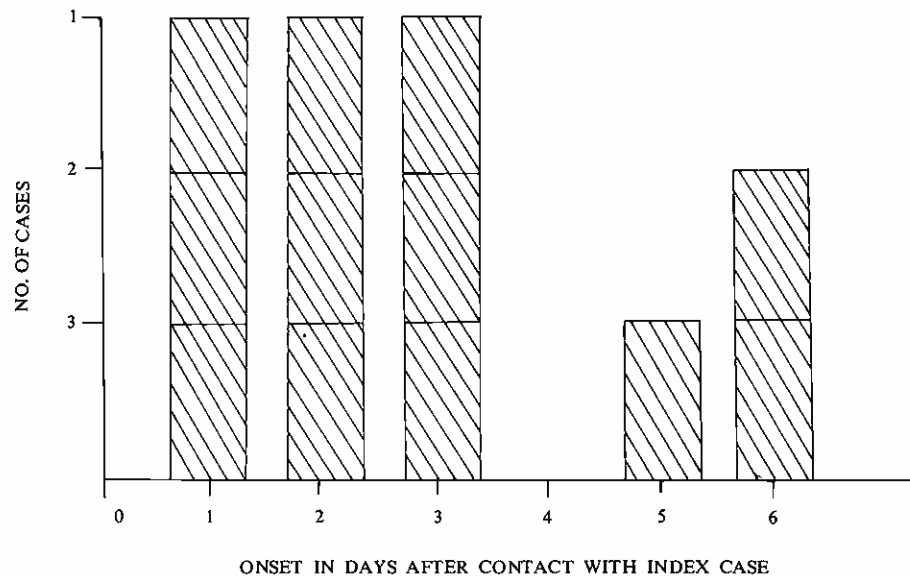


Fig. 2. Time chart showing the onset of conjunctivitis in days amongst family members after contact with the index case.

TABLE II
AGE-SEX DISTRIBUTION OF CASES

Age Group	Male	Female	Both Sexes (%)
0 - 4	1	1	2 (11.8)
5 - 14	1	—	1 (5.9)
15 - 24	2	5	7 (41.2)
25 - 34	1	1	2 (11.8)
35 - 44	1	2	3 (17.6)
45 - 54	—	1	1 (5.9)
55 - 64	—	1	1 (5.9)
All	6	11	17 (100)

Laboratory Findings

Coxsackievirus A24 was isolated from the eye swabs of all 5 index cases and 2 of them also had positive throat swabs. Amongst the family contacts, 5 had positive eye swabs and one also had a positive throat swab (Table IV). All family contacts with positive eye swabs developed conjunctivitis within 1-2 days. Two of the 3 cases with positive throat swabs had pharyngitis.

Environmental Factors

To account for the difference in attack rates in the five families, the home environment was studied. Three of the families lived in flats with 2 bedrooms each; the other two, in flats with one bedroom each. Members of all the five families did not share bath or face towels with one another.

Family I lived in a one-bedroom flat. The index case, a 44 year-old technician and his two sons slept in the bedroom. The father slept on one bed while the two sons shared another bed. His wife and daughter slept in the living room. None of the family contacts developed conjunctivitis.

In Family II, the index case, a 35 year-old school teacher slept in the same bedroom as her husband and 10 year-old son. However, she slept alone in one bed, while her husband slept on another bed with the son. She had another 4 year-old daughter who slept in a cot in a second bedroom with her grandmother. Only the daughter contracted the infection, three days after her mother. The index case spent most of the time after work looking after her daughter, who also repeatedly used a pair of sunglasses belonging to the mother.

In the third family, the index case, a 22 year-old girl, shared a bed with her mother and sister. Both contacts (who gave positive eye swabs) developed conjunctivitis 2 days later. Two brothers who slept in the living room, remained well.

In Family IV the index case was a 44 year-old housewife. Her husband and 3 daughters shared the same bedroom with her, but did not sleep on the

TABLE III
CLINICAL FEATURES OF 17 CASES IN THE STUDY GROUP
COMPARED WITH THOSE SEEN DURING THE 1970 EPIDEMIC

Clinical Features	No. of Cases	%	1970* Epidemic (%)
Fever (37.5°C)	1	5.9	Not recorded
Upper respiratory symptoms	3	17.6	23
Gastro-intestinal symptoms	0	0	Not recorded
Conjunctivitis			
Bilateral	15	88.2	70
Unilateral	2	11.8	30
Lid swelling	4	23.5	45
Mucopurulent discharge	2	11.8	40
Sub-conjunctival haemorrhage	0	0	11
Keratitis	Not looked for	—	11
Iritis	Not looked for	—	5
Pharyngitis (mild)	3	17.6	Not recorded
Preauricular lymphadenitis	3	17.6	51

* Based on the analysis of 55 cases seen at the Eye Clinic, SGH (Lim and Yin-Murphy, 1971).

same bed. None of the contacts in this bedroom developed the infection. In a second bedroom, there was a double-decker bed and a single bed. Three sons shared the double-decker bed while two daughters aged 14 years and 26 years slept on the other bed. The first family contact to develop the infection was the 14 year-old daughter who gave a positive eye swab. This girl's duties included the making of beds for all the family. She probably infected herself when rolling up her mother's mattress every morning. She in turn infected her 26 year-old-sister, who slept in the same bed with her and developed infection 5 days later. Although her three brothers slept separately on the double-decker bed, all of them developed conjunctivitis subsequently. It was found that one of the brothers who was unemployed and spent most of the time at home, often slept on his sisters' bed during the day. He developed the infection 1 day after the 14 year-old girl and was probably infected by contaminated bedding. He then infected his two brothers by sharing the double-decker bed with them. These two developed the infection 3 to 4 days after the brother.

In the last Family (Family V), the index case was a 15 year-old girl. She shared a bedroom with her mother and one year-old nephew, the girl sleeping on a bed, the mother on the floor, and the baby in a cot.

In the other bedroom, her brother and sister-in-law shared the same bed. The first contact to develop the infection was the baby, one day after the girl and she probably infected him when looking after him and playing with him. All other members of the family contracted infection 1-2 days after the baby, probably through close contact with him. As the brother-in-law developed the infection one day before his wife, he probably infected her as they shared the same bed.

DISCUSSION.

In this study, the conjunctivitis caused by the *Coxsackievirus A24* was mild. The study was carried out on the assumption that infection in family members was contracted from the index cases only, and not from sources outside the families. It was observed that contacts who slept on the same bed with the cases contracted the infection, whereas sharing of bedrooms without the sharing of beds did not result in the direct transmission of infection. Carrying and fondling (between mother and daughter, Family II, and between members of the family and the one year old baby in Family V) also resulted in the spread of infection. Thus intimate contact appears to be necessary before infection can occur. Where no close contact could be

TABLE IV
VIRAL ISOLATION FROM THE EYE AND THROAT SWABS OF
INDEX CASES AND FAMILY CONTACTS

Family I		Age	Sex		
L.C.Y.	CASE	44	M	Eye swab	<i>Coxsackievirus A24</i>
				Throat swab	Negative
C.Y.C.	Contact	35	F	Eye swab	Negative
				Throat swab	Negative
P.L.	Contact	12	M	Eye swab	Negative
				Throat swab	Negative
L.C.T.	Contact	11	M	Eye swab	Negative
				Throat swab	Negative
K.L.	Contact	6	F	Eye swab	Negative
				Throat swab	Negative
Family II					
T.S.H.	CASE	35	F	Eye swab	<i>Coxsackievirus A24</i>
				Throat swab	<i>Coxsackievirus A24</i>
F.A.K.	Contact	64	F	Eye swab	Negative
				Throat swab	Negative
H.F.W.	Contact	10	M	Eye swab	Negative
				Throat swab	Negative
H.W.	Contact	4	F	Eye swab	Negative
				Throat swab	Negative
H.J.H.	Contact	40	M	Eye swab	Negative
				Throat swab	Negative
Family III					
E.J.R.	CASE	22	F	Eye swab	<i>Coxsackievirus A24</i>
				Throat swab	Negative
I.R.	Contact	21	F	Eye swab	<i>Coxsackievirus A24</i>
				Throat swab	Negative
D.R.	Contact	54	F	Eye swab	<i>Coxsackievirus A24</i>
				Throat swab	Negative
V.R.	Contact	26	M	Eye swab	Negative
				Throat swab	Negative
C.R.	Contact	24	M	Eye swab	Negative
				Throat swab	Negative
* Family IV					
C.L.Y.	CASE	44	F	Eye swab	<i>Coxsackievirus A24</i>
				Throat swab	Negative
L.W.P.	Contact	20	M	Eye swab	Negative
				Throat swab	Negative
L.H.M.	Contact	4	F	Eye swab	<i>Coxsackievirus A24</i>
				Throat swab	Negative
L.H.K.	Contact	9	F	Eye swab	Negative
				Throat swab	Negative
L.A.K.	Contact	16	F	Eye swab	Negative
				Throat swab	Negative
Family V					
L.S.L.	CASE	15	F	Eye swab	<i>Coxsackievirus A24</i>
				Throat swab	<i>Coxsackievirus A24</i>
C.G.E.	Contact	55	F	Eye swab	Negative
				Throat swab	Negative
L.T.L.	Contact	26	M	Eye swab	<i>Coxsackievirus A24</i>
				Throat swab	Negative
L.E.W.	Contact	1	M	Eye swab	<i>Coxsackievirus A24</i>
				Throat swab	<i>Coxsackievirus A24</i>
K.K.H.	Contact	22	F	Eye swab	Negative
				Throat swab	Negative

* For Family No. IV viral isolation was attempted in only 4 out of 9 contacts.

demonstrated (as in Family IV) contaminated fomites probably caused the spread of infection.

Transmission by the direct inoculation of eye discharge from the infected person is probably the commonest mode of spread. The conjunctivitis causes irritation and excessive tearing—constant rubbing would therefore facilitate the spread of infection to others. In three patients, two index cases and one contact, the virus was isolated from the throat. It is probable that droplet infection may also be involved. Transmission by contaminated fomites such as sunglasses, and bedding must also contribute to spread, but no attempt was made in this study to isolate the virus from these sources. In 5 virus positive contacts, virus was isolated from the eyes and in one from the throat, one to two days before the onset of clinical conjunctivitis. This indicates that the condition is infectious for at least one to two days before the onset of clinical features.

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