Acute haemorrhagic conjunctivitis (AHC) is a viral infection of the conjunctiva caused by Enterovirus type 70 but can occasionally be caused by Coxsackie virus type A-24. This article reports an epidemic of AHC which is the first outbreak caused by Enterovirus type 70 in the eastern province of Saudi Arabia. A total of 12 patients with AHC were examined (six (50%) male and 6 (50%) female). The most common characteristic findings of this illness were subconjunctival haemorrhages in ten (83%) patients, and preauricular lymphphadenopathy in seven (58%) patients. An Enterovirus type 70 was isolated from one conjunctival scraping specimen. Successful isolation of the virus could be due to the fact that conjunctival scrapings were taken at a very early stage of the disease (within 48 hours).

Acute haemorrhagic conjunctivitis (AHC) is an acute viral infection of the conjunctiva caused by Enterovirus type 70 but can occasionally be caused by Coxsackie virus type A-24. The incubation period is short (8-48 hours). The illness is chiefly characterized by severe bilateral subconjunctival haemorrhage, pain, photophobia, foreign body sensation, copious tear production, redness and lid oedema. Fortunately, it is a self-limiting disease and treatment is supportive. However, rare complications such as facial palsy, radiculomyelitis and encephalitis have been reported.

An epidemic of AHC caused by Enterovirus type 70 was first recognized in Ghana in 1969 and subsequently spread throughout Africa and Southeast Asia to affect millions of people.

The main objective of this study is to report on an epidemic of AHC that occurred for the first time in the eastern province of Saudi Arabia.

**Patients and Methods**

**Patients**

Twelve patients were examined on 6 October 1988 at the eye clinic of Qatif General Hospital in theQatif area of the eastern province of Saudi Arabia. These patients were selected consecutively from patients presenting to
Table 1

<table>
<thead>
<tr>
<th>Clinical data of 12 patients with acute haemorrhagic conjunctivitis</th>
<th>No. of patients</th>
<th>(%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pain</td>
<td>6</td>
<td>(50)</td>
</tr>
<tr>
<td>Tear production</td>
<td>4</td>
<td>(33)</td>
</tr>
<tr>
<td>Redness</td>
<td>11</td>
<td>(92)</td>
</tr>
<tr>
<td>Lid oedema</td>
<td>6</td>
<td>(50)</td>
</tr>
<tr>
<td>Subconjunctival haemorrhage</td>
<td>10</td>
<td>(83)</td>
</tr>
<tr>
<td>Preauricular lymphadenopathy</td>
<td>7</td>
<td>(58)</td>
</tr>
</tbody>
</table>

the eye clinic with symptoms of red eye at the time of outbreak of the disease.
A detailed history was taken from each patient followed by a complete ocular and general medical examination including palpation for enlarged lymph nodes mainly in the submandibular and preauricular areas.

Conjunctival specimens
Conjunctival scrapings were obtained from both upper and lower palpebral conjunctivae using topical 0.4% benoxinate and a sterile Kimura spatula and were inoculated into a virus transport medium. Samples were kept at a temperature ranging between −20 °C and −70 °C and transported to the Virology Department at the College of Medicine in Riyadh for inoculation within 24 h. A total of ten conjunctival scrapings for viral isolation were collected from ten patients.

Virus isolation
The cell lines used were MRC-5 (human embryonic lung fibroblast Whittaker M.A., Bioproducts, USA), Hep-2 (human carcinoma of larynx; Flow Laboratories, England), and Vero (African green monkey kidney; Flow Laboratories, England). Approximately 0.5 ml of the specimen was inoculated into each tissue culture flask which had previously been washed twice with serum-free Eagle’s minimal essential medium (MEM) and then drained. The inoculum was allowed to absorb for 1 h at 37 °C and then 5 ml of serum-free MEM as a maintenance media was added to each flask. Flasks were incubated at 37 °C and were observed daily for the development of cytopathic effects (CPE).

Electron microscopy
Conjunctival scraping specimens were put on a carbon-coated grid and stained with phosphotungstic acid. The morphology as well as the clumping patterns were observed by transmission electron microscopy.

Results

Clinical findings
The study included 12 patients with acute haemorrhagic conjunctivitis (AHC), six of whom were males. Eight (67%) patients were under the age of 18 years. The estimated incubation period was determined between the time of contact with an affected person until the time symptoms appeared. The incubation period for all patients was within 24 h and ranged from 6 to 24 h with a mean of 14 h. The family history indicated that ten (83%) patients had relatives who were affected by the same disease. Ten (83%) patients admitted to the use of the same belongings or sleeping in the same room. Redness was the most frequently encountered symptom and was found in 11 (92%) patients followed by pain in six (50%) patients, lid oedema in six (50%) patients and successive tear production in four (33%) patients. None of the patients had any associated systemic symptoms.
A subconjunctival haemorrhage was the most characteristic finding of this acute illness and was present in 10 (83%) patients. The cornea was not affected in any patient. Preauricular lymphadenopathy was found to be present in seven (58%) patients.

Virus isolation
A virus was isolated from one conjunctival scraping specimen; MRC-5 was the most susceptible cell line for isolation of the virus.
The isolate was identified as an enterovirus on the basis of its cytopathic effects (CPE) in tissue culture, and as Enterovirus type 70 on the basis of the neutralization test and immune electron microscopy (IEM).

Electron microscopy
Electron microscopy showed a typical picornavirus morphology and size (diameter approximately 28 nm). Immune electron microscopy (IEM) demonstrated clumping of virus isolates with anti-Enterovirus type 70 only.

Discussion
This article reports the first known outbreak of acute haemorrhagic conjunctivitis caused by Enterovirus type 70 (EV-70) in the eastern province of Saudi Arabia. A similar epidemic of AHC occurred in the same month in the Giza area on the South Western coast of Saudi Arabia. Although these two areas are far from each other geographically they have great similarities in weather and in the size of population. This epidemic of AHC is similar to that which occurred in Giza and to previous epidemics of AHC reported in Taiwan, Nigeria, India, Central America, and southern USA and other countries. In all these epidemics where virus isolation was attempted, Enterovirus type 70 has been found to be the aetiological agent. The first reported isolation of Enterovirus type 70 was in September 1971 in Japan. The success rate of the isolation of the virus causing the acute haemorrhagic conjunctivitis is very low. Many reports showed unsuccessful virus isolation. The successful isolation of the virus from one patient among the few examined in this epidemic could be due to the fact that conjunctival scraping was obtained and inoculated in the tissue culture media at a very early stage of the disease (within the first 2 days). The specimen that showed positive culture result in this study was from a patient who was examined only a few hours after being affected by the disease (within 12 hours).
This study suggests that tissue culture cell line MRC-5 is a most susceptible cell line for the isolation of Enterovirus type 70 and scraping at the very acute stage as well as early inoculation of the specimen will yield successful isolation. Fifty-eight percent of the patients examined were under the age of 18 years. This suggests that the epidemic was spread among school children. Many schools were closed to help prevent the spread of the disease. The spread of the infection through hand–eye contact was clear from this study, as 11 (92%) patients gave a history of hand–eye contact after being in contact with an affected person. Ten (83%) patients indicated that they had been in contact with a person with a history of red eyes. This study was not meant to evaluate all the patients who caught the disease in the area. Person-to-person contact was a significant factor in spreading the acute haemorrhagic conjunctivitis. Crowding, some unhygienic practices, particularly sharing of belongings, or sleeping in the same room, were obvious factors in spreading the epidemic; 83% of patients had shared their belongings with other members of their household.

Acute haemorrhagic conjunctivitis is a self-limited disease, but rare complications which can result from this disease such as cranial nerve palsies have been reported. However, all the patients examined had no such complications.

Acute haemorrhagic conjunctivitis (AHC) can cause serious epidemics and health problems. Public education is essential to help prevent the spread of such epidemics. Also when the public know the benign nature of this disease, this will avoid serious side-effects of folk remedies and save effort, time and money which are spent in seeking different ineffective modalities of treatment. Surveillance and health education efforts should be directed to all people and in particular toward tropical coastal areas when crowded conditions occur. The public should specifically be advised against sharing beds and fomites.

Acknowledgement

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References