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ORIGINAL ARTICLES

Outbreak report

EPIDEMIC CONJUNCTIVITIS IN GERMANY, 2004

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Epidemic conjunctivitis can be associated with viral or bacterial pathogens, whereas epidemic keratoconjunctivitis is caused mainly by adenoviruses type 8,19 and 37. In Germany, the incidence of adenovirus conjunctivitis cases increased from 0.2 per 100 000 inhabitants (in 2001 and 2002) eventually to 0.5 in 2003 and 0.8 in 2004. The detection of adenovirus in conjunctival swabs is notifiable to the local health departments. Data about cases with positive conjunctival swabs are then transmitted to the Robert Koch-Institut. Quality control of data takes place and national surveillance data of confirmed cases with adenovirus conjunctivitis are published. From January to April 2004 the national surveillance system captured an outbreak with 1024 cases (131 laboratory confirmed). Analysis of the national surveillance data showed that in March 2004 the group primarily affected by epidemic keratoconjunctivitis was young men between 18 -29 years old followed by an increased number of notifications from women in the same age group. Meanwhile the German Armed Forces experienced an outbreak of conjunctivitis, almost exclusively without laboratory confirmation, affecting 6378 soldiers.

Despite the small number of laboratory confirmed cases it became clear from the analysis of the national surveillance data that person-to-person transmission between young men and similar age groups of the population did occur. Whether the outbreak started within the garrisons of the German Armed Forces or whether it was triggered within these accommodations, there is clearly a need for the national and the military public health institutions to work together on guidelines to handle future challenges.

Euro Surveill. 2006;11(7/8): 185-87 Published online July/August 2006
Key words: Adenoviridae, human adenovirus infections, epidemiology, military personnel, conjunctivitis, keratoconjunctivitis

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Introduction

Acute conjunctivitis is characterised by a red eye, discomfort, discharge and conjunctival injection [1]. A variety of bacterial and viral pathogens can cause acute conjunctivitis, including chlamydia, staphylococci, enterovirus, and herpes virus [2].

Epidemic viral keratoconjunctivitis is generally associated with adenovirus mainly type 8, 19 and 37.

Incubation period ranges from 5-12 days. Adenovirus infections of the eyes can present as epidemic keratoconjunctivitis (EKC), pharyngoconjunctival fever or follicular conjunctivitis. Keratoconjunctivitis disappears after 2-4 weeks, whereas keratitis (opacity of the lenses) may persist for longer. Patients with EKC are infectious during the first 2-3 weeks of infection and transmission occurs via smear infection. Infection routes can include contaminated towels or other contaminated articles of daily use in kindergartens, schools, clinics and swimming pools. To prevent transmission and outbreaks appropriate disinfection of hands and ophthalmological instruments should take place. Strict personal hygiene and revision of hygiene guidelines is recommended where outbreaks have occurred. No specific treatment is available [3].

Adenoviruses are endemic worldwide and are not only responsible for EKC but also for mild respiratory tract infections, atypical pneumonia, and gastroenteritis [4, 5]. Clearly identified risk factors for infection include contaminated ophthalmological solutions, ocular instruments, and insufficient hand hygiene [6-8]. Outbreaks with epidemic viral keratoconjunctivitis have been observed in military settings [9, 10].

In Germany, the number of confirmed adenovirus conjunctivitis cases was 132 in 2001 (0.2 per 100 000 inhabitants), 82 in 2002 (0.2), 397 in 2003 (0.5) and 652 in 2004 (0.8) [11]. The increase in 2003 was caused by an outbreak associated with two private ophthalmology practices in Saxony-Anhalt [12]. In 2004 an outbreak within the German Armed Forces (GAF) was responsible for an increased number of cases with adenovirus conjunctivitis cases picked up by the national surveillance system.

A description and analysis of the national surveillance data of adenovirus conjunctivitis cases for the years 2001-2004 are presented in this article.

Methods

All German laboratories that identify adenoviruses from conjunctival swabs are required to notify these results to the local health departments (LHD). Cases are then relayed via the state health departments to the national public health agency, the Robert Koch-Institut (RKI). At the RKI, quality control of data is performed. Cases are confirmed and accepted for analysis and publications if the following requirements are fulfilled:

A laboratory confirmed case with EKC is defined as a case with reddening of the conjunctiva and laboratory confirmation (detection of adenovirus from either cell culture, nucleic acid reaction or from immune fluorescence testing or enzyme immunoassay).

An epidemiologically confirmed case with EKC is defined as a case with reddening of the conjunctiva and a proven epidemiological link to another laboratory confirmed case [13].

A cluster is defined as a group of two or more cases that are epidemiologically linked. In this presentation of the data we count clusters and meta-clusters. A meta-cluster is defined as two or more clusters that are epidemiologically linked.

Results

A total of 94 clusters was reported in 2004, 18 of which were meta-clusters consisting of up to 197 cases. Ninety one of these clusters (97%) occurred from January to April 2004 (week 3-18). The majority of clusters consisted of 2-5 cases (70%). However, while restricting analysis to cases which met the definition described above, only 33 clusters could be confirmed for the year 2004. In Table 1, clusters from 2001-2004 with at least two confirmed cases are shown.

In January 2004 the GAF noticed the first cases with keratoconjunctivitis in some of its garrisons. Within four weeks, the number of cases - exclusively defined by the clinical symptom 'reddening of the conjunctiva' - increased from several hundred to several thousand. By the end of March 2004, 6378 cases had been registered, according to the GAF. Overall, 197 barracks had reported at least one case of conjunctivitis. Thirteen barracks were completely closed down and 28 barracks partially so between February and April 2006. Several control measures were implemented, such as disinfection of rooms and instruments and a quarantine period of 21 days for soldiers with conjunctivitis. The sensitive case definition used by the GAF was not changed to a more specific definition until mid-March (at least two of the following diagnostic findings: reddening of the conjunctiva, swelling of the plica semilunaris conjunctivae, swollen prae-auriculaer lymphnodes, petechial bleeding of the conjunctivae or opacity of the lenses and at least three of the following symptoms: sudden onset, one sided symptoms, itching, foreign body sensation or photophobia), and thus a rapid decline of cases was observed. The GAF reported taking 1300 eye and nose swabs for virology and antibody assays. Of these, 47 (3.6%) were positive for adenovirus, but only two were positive for the serotypes 8 and 17 [14-16].

From January to April 2004 (week 3-18) 1024 cases were reported to the RKI. Of these, 436 could not be confirmed according to data quality control and were excluded from further analysis. Of the 588 cases accepted for analysis, 115 were laboratory confirmed and 473 were epidemiologically confirmed; 551 cases (95%) were epidemiologically linked to a case diagnosed with EKC. Two hundred cases within three clusters (one meta-cluster included) could be linked to kindergartens and schools (26 cases with clinical and laboratory confirmation included), and 343 cases within 22 clusters (11 meta-clusters included) could be linked to the GAF (51 cases with clinical and laboratory confirmation included). Of 13 clusters, the LHDs reported a link between kindergartens or schools and the GAF. Table 2 shows all clusters with their links for the whole year 2004.

From week 10 to 14 (March 2004), young men between 18 -29 years old were the group primarily affected by EKC. An increased number of notifications from women of the same age group were registered between one and two weeks later. During week 14 the reported number of children (0-17 years old) of both sexes increased [FIGURE].

Of the 1024 cases with civilian and military background that were reported to the RKI 131 cases were confirmed by civilian laboratories. Seven cases (5%) were specified as serotype 8, and were all linked to two clusters from the GAF. The remaining samples were positive for adenoviruses but their types were unknown.

Conclusions

The clinical picture of EKC is not very specific and identical or similar syndromes may result from different causes such as infectious, allergic, toxic or physical irritation. The procedure of taking a conjunctival swab containing sufficient material for testing requires experience and can be very unpleasant for the patient [16]. Therefore laboratory confirmation of the diagnosis EKC may not always be carried out.

There may be further reasons for the low number of positive results, for example, that the samples were taken at a late stage of disease development or that samples were inadequately stored.

Table 1

Number of clusters with confirmed cases with epidemic keratoconjunctivitis, Germany, 2001-2004

Year of notification	2-5 cases		6-10 cases		11-50 cases		>50 cases	
	Number of:		Number of:		Number of:		Number of:	
	Clusters	Cases	Clusters	Cases	Clusters	Cases	Clusters	Cases
2001	0	0	0	0	3	61	0	0
2002	3	7	0	0	0	0	0	0
2003	1	2	2	17	1	31	1	262
2004	17	51	5	38	9	235	2	269

Table 2

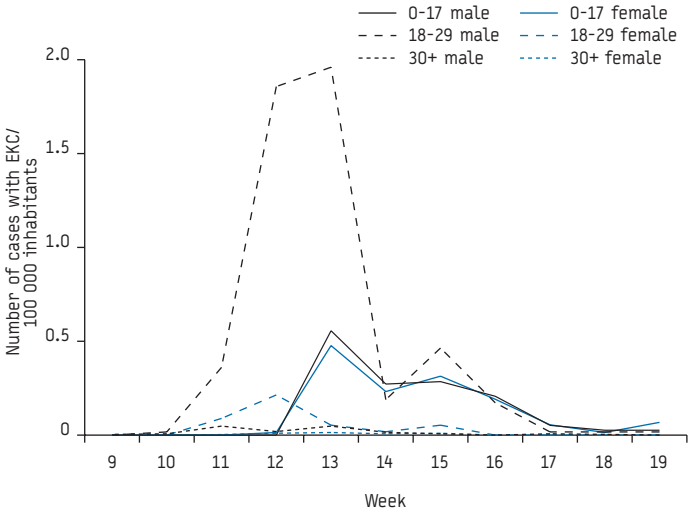
All clusters with confirmed cases with epidemic keratoconjunctivitis according to their link, Germany, 2004

Link	Number of clusters	Number of cases	Number of laboratory confirmed cases		Number of epidemiologically confirmed cases	
	N	N	N	%	N	%
Kindergartens/schools	4	212	27	13	174	87
German Armed Forces	27	372	53	14	319	86
Other*	2	9	3	33	6	67

*Including one residential home and one household

FIGURE

Incidence of confirmed epidemic keratoconjunctivitis (EKC) cases by age group (years) and sex in Germany, 2004



Nevertheless, this outbreak highlights the importance of receiving early laboratory confirmation for suspected cases. For the interpretation of diagnostic tests, basic knowledge of the meaning of sensitivity and specificity is essential, as well as the correlation of prevalence and the positive predictive value of a test. If it is assumed that a performed test has a sensitivity of 99% and a specificity of 95%, then a higher prevalence of a disease can affect the positive predictive value of a test profoundly. Thus a rise of the prevalence from 1% to 5% only can result in a change of the positive predictive value from 17% to 51%.

During this outbreak it became clear that a large but unidentifiable number of soldiers did not have EKC. Because of the small number of specified adenoviruses it can be assumed that a 'population' was tested with a low prevalence of adenovirus infections. Hence the positive predictive value was low and a number of tests delivered false positive results.

Our data clearly show that the population outside of the GAF was also affected [FIGURE]. The hypothesis that the outbreak began within the GAF and then spread to the civil population is supported by the chronological order of EKC affecting young male adults first, then young women, and finally children. Person-to-person transmission apparently took place when the young men were sent back to their own homes outside the garrisons. It is also possible that GAF was affected by the occurrence of conjunctivitis in the civilian population Germany, and that transmission was simply facilitated within the environment of the garrisons.

This is relevant with regards to the strategy for dealing with outbreaks of infectious disease within the military service. On the one hand, keeping infected soldiers confined to barracks may increase the risk of infection for other soldiers. On the other hand, sending affected military personnel home may result in the spread of the disease to the civil population. While the burden of disease seems to have been limited in this particular situation, the consequences in outbreaks caused by other pathogens could be more severe. In the outbreak reported here, the GAF and RKI cooperated closely from the outset, and successfully limited the impact on the civilian population. However, to prepare for future challenges, public health institutions within the GAF and at national level should formulate guidelines and common control strategies to enhance cooperation.

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