Acute epiglottitis in children and adults in Sweden 1981-3

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Abstract

In a retrospective study of the incidence of acute epiglottitis in Sweden, 485 children and 356 adults fulfilled the following criteria: (a) red and swollen epiglottis visualised at laryngoscopy; (b) stridor or difficulties in swallowing own saliva or water; and (c) temperature $\geq 38^{\circ}\text{C}$. The age specific incidence in children (0-14 years) was 10 and in adults (≥ 15 years) 1.8/100 000/year. These incidence rates were higher than the incidence of *Haemophilus influenzae* meningitis in the same population. Blood cultures were obtained from 290 children (60%) and 185 adults (52%). *H influenzae* was isolated from 267 blood cultures (92%) from children and 98 blood cultures from adults (53%). Other organisms were isolated from six adults (3%). An artificial airway was established in 352 children (73%) and in 68 adults (19%); the remainder were treated conservatively. Six children and two adults died.

Sweden has a high incidence of acute epiglottitis in children and the disease also occurs in adults. The importance of *H influenzae* in the aetiology of epiglottitis in all age groups is confirmed, but in adults many cases occur without septicaemia. The mortality is currently very low.

Meningitis and epiglottitis are the most common and serious manifestations of invasive *Haemophilus influenzae* type b infections. The incidence of *H influenzae* meningitis in children has been thoroughly studied in the United States and some western European countries. The age specific incidence in the most susceptible age group 0-4 years has been reported to vary between 11 and 70/100 000/year.¹⁻⁹ The variations can partly be explained by racial and socioeconomic factors. Certain high risk populations, North American Indians and Alaskan Eskimos, with incidence rates of 136 to 409/100 000/year have also been identified.¹⁰⁻¹²

Almost no data are available on the incidence of acute epiglottitis in children. An estimate of its importance can, however, be made from studies of invasive *H influenzae* infections, in which the number of epiglottitis cases can be compared with the number of *H influenzae* meningitis cases. According to all these studies meningitis is more common than epiglottitis. In two studies including all cases of epiglottitis based on clinical diagnosis, the epiglottitis cases numbered 62 and 65% of the *H influenzae* meningitis cases, respectively.^{13 14} In other studies epiglottitis cases have been included

only if the aetiology has been verified by isolation of *H influenzae* from the blood, and it has not been stated how often blood cultures are obtained from children with epiglottitis. In such studies the numbers of epiglottitis cases have been 3 to 38% of the numbers of *H influenzae* meningitis cases.^{5 15-17}

In contrast to all these studies, the incidence of epiglottitis in children was higher than the incidence of *H influenzae* meningitis in the Göteborg area in Sweden during 1971-80.¹⁸ In this population based study, including all cases of epiglottitis based on strict clinical criteria in the age group 0-15 years, the ratio between the epiglottitis and *H influenzae* meningitis cases was 1.44:1.

The aim of the present study was to calculate the incidence of acute epiglottitis in children in all Sweden in 1981-3 (population 8.3 million) and to compare the results with a previous study of *H influenzae* meningitis during the same period,⁹ to see if the unique relation between the two *H influenzae* manifestations reported from Göteborg¹⁸ is common to the whole country. Further aims of the study were to evaluate the importance of acute epiglottitis in adults and to study the mortality of the disease.

Patients and methods

The study is based on retrospective analyses of case records from patients admitted to hospitals in Sweden between 1 January 1981 and 31 December 1983 with a diagnosis at discharge of acute epiglottitis. Letters were sent to all departments of otorhinolaryngology, paediatrics, and infectious diseases and to certain intensive care units at small rural hospitals with a request that all patients with a discharge diagnosis of acute epiglottitis during 1981-3 and January 1984 should be identified and copies of the case records sent to us. A request was also sent to all departments of medicolegal medicine, where necropsies are performed on individuals dying outside hospital. From all 132 departments the requested information was made available.

Patients were included in the study if it was clearly documented that they fulfilled all of the following criteria: (a) a red and swollen epiglottis visualised at indirect laryngoscopy; (b) inspiratory stridor or difficulties in swallowing their own saliva or water; and (c) temperature $\geq 38^{\circ}\text{C}$. Patients with concurrent tonsillitis, peritonsillitis, and certain other conditions were not included.

After exclusion of six non-Swedish residents and five patients whose case records could not

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be found, a total of 1101 patients with a date of admission during the three year period and a discharge diagnosis of acute epiglottitis were identified. Of these, 197 adults and 63 children were excluded as they did not fulfil the inclusion criteria. The most common reasons for exclusion were insufficient documentation of difficulties in breathing or swallowing ($n=70$), concurrent tonsillitis or peritonsillitis ($n=85$), normal temperature ($n=50$), temperature not recorded ($n=11$), or epiglottitis not visualised ($n=10$).

Population data from Sweden and its 24 counties for 1981–3 were obtained from official statistics.¹⁹

Results

CHILDREN ≤ 14 YEARS

Of the 485 children fulfilling the criteria for epiglottitis, 286 (59%) were boys and 199 (41%) girls. The age distribution is shown in the figure. The mean age was 3.7 years; 39 children were younger than 18 months and the three youngest were 3 to 5 months old.

Blood cultures were obtained from 290 children (60%) evenly distributed in different age groups (figure). *H influenzae* was isolated from 267 of them (92%) and 23 cultures (8%) were negative. One hundred and thirty nine of the isolates were serotyped; all were type b.

The age specific incidence of epiglottitis in five year groups is shown in the table. There were no significant differences in the incidence between the 24 counties nor between south and north Sweden nor between counties with mainly urban and rural population.

In three counties (population age 0–14 years

Age distribution and performance and results of blood cultures in 485 children and 356 adults with acute epiglottitis.

Age specific incidence (cases/100 000/year) of acute epiglottitis in Sweden 1981–3

Age (years)	Mean population	No of cases	Age specific incidence
0–4	477 461	353	24.6
5–9	530 926	101	6.3
10–14	563 927	31	1.8
0–14	1 572 314	485	10.3
≥ 15	6 752 610	356	1.8
All ages	8 324 924	841	3.4

148 094) blood cultures had been obtained from as many as 52 of 54 children and yielded *H influenzae* in 49 cases. The incidence in these three counties was 12.2 if all cases were included and 11.0 if only cases verified by culture were included.

The cases were evenly distributed between the three years studied and there was no noticeable seasonal variation. Eleven children had concurrent conditions: neurological disorders ($n=3$), Down's syndrome ($n=2$), congenital heart disease ($n=2$), diabetes mellitus, coeliac, asthma bronchiale, and leukaemia. Twenty five children had other concurrent manifestations of *H influenzae* infections: pneumonia ($n=18$), otitis or sinusitis, or both ($n=6$), and arthritis ($n=1$). All children had had symptoms for less than 24 hours before admission to hospital.

The mean duration of hospitalisation was four days (range 1–15). An artificial airway by intubation or tracheotomy was established in 352 of the children (73%) while 129 were treated conservatively. Children treated conservatively were evenly distributed in all age groups. Blood cultures were obtained from 68 children treated conservatively and 57 yielded *H influenzae*.

Six children died. Four of them died at home or were dead on arrival at hospital. The other two arrived at hospital deeply comatose with respiratory arrest and convulsions, respectively.

ADULTS ≥ 15 YEARS

Of the 356 adults, 192 (54%) were men and 164 (46%) women. The age distribution is shown in the figure. The incidence in adults was 1.8/100 000/year (table). The incidence did not vary significantly between the 24 counties.

Blood cultures were obtained from 185 (52%) of the adult patients. *H influenzae* was isolated from 98 of them (53 type b, 45 serotype unknown), from four *Streptococcus pneumoniae*, and from two *Bacteroides* spp. Blood cultures from 81 patients (44%) were negative. As shown in the figure routines for obtaining blood cultures and isolation of organisms were not dependent on the age of the patient.

The adult cases were evenly distributed over the three years of study and there was no seasonal variation. Forty adults had concurrent diseases—for example, diabetes mellitus, cardiovascular and malignant diseases, chronic bronchitis, and chronic alcoholism. Four women were pregnant or had been delivered within hours before onset of symptoms. Fifty one adults had had symptoms for two to five days before they sought medical attention; the others presented within 24 hours. Twelve adults concurrently had other manifestations of *H influenzae* infections: pneumonia ($n=9$), sinusitis ($n=2$), and meningitis ($n=1$).

Only 68 adults (19%) required an artificial airway; the remainder were treated conservatively. Blood cultures were obtained from 142 of the 288 patients treated conservatively; 72 cultures were positive. Mean time of hospitalisation was five days (range 1 to 21 days). Two adults died.

Discussion

Even though there are virtually no studies available on the incidence of acute epiglottitis in children, several studies from North America, Europe, and Australia have shown that this condition is less common than *H influenzae* meningitis. Population based studies from England and Australia including all clinical cases have shown the ratio between epiglottitis and *H influenzae* meningitis to be 62 to 65%.¹³⁻¹⁴ Several studies including only epiglottitis cases with positive blood cultures have shown lower ratios.⁵⁻¹⁵⁻¹⁷ In Alaskan Eskimos and Navajo Indians the incidence of *H influenzae* meningitis is extremely high: 153-409/100 000/year in the age group 0-4 years, but acute epiglottitis is rare or non-existent.¹⁰⁻¹² Virtually all cases of *H influenzae* meningitis in these two populations occur in children younger than 18 months. Eskimo children above this age have high levels of antipneumococcal serum antibodies,¹⁰ and it is therefore not surprising that epiglottitis is rare among them as epiglottitis usually occurs after this age as shown in the present study and previously.¹³⁻¹⁸

In contrast to all these studies, the present study identified more children with acute epiglottitis (485) than with *H influenzae* meningitis (470) in Sweden in 1981-3.⁹ The true difference between epiglottitis and meningitis cases is probably even larger for the following reasons. (1) In the meningitis study cases were identified both from files of hospital discharge diagnosis and laboratory records of cerebrospinal fluid cultures. Three per cent of all cases were found only from the second source. Epiglottitis cases could only be identified from one source, the hospital discharge diagnosis. (2) The criteria for inclusion of cases in the epiglottitis study were very strict. Several of the patients excluded may have had epiglottitis, but were excluded because of insufficient documentation or less pronounced symptoms. (3) Some case records from children with epiglottitis were not found while all records from meningitis patients were found. Thus the study confirms the previous study from Göteborg, Sweden, which also showed a higher incidence of epiglottitis than *H influenzae* meningitis in children.¹⁸

As a possible reason for the high incidence of epiglottitis in Swedish children we suggest that the socioeconomic situation with small families, no overcrowding, and little use of day care centres before the age of 18-24 months, may be important. This may lead to less chance of exposure to *H influenzae* type b during the first years of life when invasive *H influenzae* infections are more likely to manifest as meningitis than as epiglottitis. It may also lead to a fairly large proportion of non-immune children after the age of 18-24 months when the disease is more likely to manifest as epiglottitis.

In view of the development of vaccines against invasive *H influenzae* type b infections it is important to evaluate the impact of invasive *H influenzae* infections on morbidity and mortality in children. The combined incidence of *H influenzae* meningitis⁹ and epiglottitis (present study) in Sweden in the whole child

population 0-14 years was 20/100 000/year. The risk for an individual child to develop either of these two disease manifestations before the age of 15 years can be estimated to one in 330.

H influenzae type b infections have been considered to occur almost only in children, but during the last three decades several reports have appeared describing acute epiglottitis and other invasive *H influenzae* type b infections in adults.²⁰⁻²⁶ To our knowledge only one population based study (from Rhode Island) of the incidence of acute epiglottitis in adults has been performed.²⁶ In this study the incidence was 0.97/100 000/year. In the present study a higher incidence in adults, 1.8/100 000/year, was found, even though we applied more rigid criteria for inclusion, for example, a temperature $\geq 38^{\circ}\text{C}$. During the same time period the incidence of *H influenzae* meningitis in adults in Sweden was only 0.15/100 000/year.⁹

The present and previous studies show that *H influenzae* is also the most common cause of acute epiglottitis in adults.²³⁻²⁶ In our study 53% of all blood cultures obtained from adults yielded this organism. Other organisms, notably pneumococci, can, however, also cause epiglottitis in adults.²⁵⁻²⁷ The clinical presentation was less dramatic in adults than in children. Artificial airway was established in only 19% of adults compared with 73% of the children, and 14% of the adults came to hospital more than 24 hours after onset of symptoms.

In conclusion, this study has shown a remarkably high incidence of acute epiglottitis in both children and adults in Sweden. The importance of *H influenzae* in the aetiology of the condition was confirmed in all age groups, but many adult patients have negative blood cultures. The case fatality rate is very low in all age groups.

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