Research

Non-group A streptococci: are they pathogens in the throat?

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J Roy Soc Health, 1997, 117 (3); xx-xx

Key words
β-haemolytic streptococci; children; epidemiology; pharyngitis

Abstract A total of 3,184 paediatric patients with sporadic pharyngitis was studied at King Khalid University Hospital in Riyadh, Saudi Arabia. In addition, 478 children without pharyngitis who were matched for age and sex were included as controls. Group A β-haemolytic streptococci (βHS) were detected significantly more often among the children with pharyngitis than among the controls (8.4% vs 2.3%; p <0.0001). Incontrast, total non-group A and group C βHS were isolated at lower frequency from the sick than control children (0.9% vs 2.5% and 0.2% vs 1.2% respectively; p <0.01) while other non-group A βHS such as groups B, G and F were each isolated in similar frequency from both the sick and control children. We conclude that non-group A βHS appear not to be as important as aetiological agents of sporadic pharyngitis in these children.

Introduction

Pharyngitis ranks as an important clinical problem to general Practitioners (Cimolai *et al*, 1988). There are many infectious agents implicated in the aetiology of pharyngitis. Of these Lancefield group A β-haemolytic streptococci (βHS) are a well-recognised cause of pharyngitis and non-suppurative delayed sequelae such as acute rheumatic fever (ARF) and acute glomerulonephritis, especially in children. The recent resurgence of ARF and severe life-threatening group A βHS infections (including the toxic shock-like syndrome) has been reported from various parts of the world (Kaplan, 1991; Bisno, 1991; Chapnick *et al*, 1992). Streptococci from Lancefield groups other than A (non-group A) have been associated with outbreaks of pharyngitis (Hill *et al*, 1969; Benjamin and Perriella, 1976; McCue, 1982; Efstration, 1989), often with foodbourne spread, but the role of these non-group A organisms in causing sporadic pharyngitis in children is still unclear (Cimolai *et al*, 1988).

In view of this, our main aim was to find out whether non-group A organisms were more common in the throats of children with sporadic pharyngitis than among carefully matched controls without pharyngitis. In addition, we attempted to study the spectrum of infections caused by group A and non-group A βHS in sites other than the throat.

Patients and methods

A total of 3,184 paediatric patients with sporadic pharyngitis and 478 children without pharyngitis (controls) were studied during a period of one year from January to December 1994. Demographic data were recorded in a standard form from all paediatric patients and controls. Clinical data were collected from 267 children with pharyngitis from whom group A βHS were isolated from the throat and also from 30 children with pharyngitis from whom non-group A βHS were recovered from the same site. Throat swabs from each patient and control were sent to the laboratory in a transport medium and inoculated within six hours onto two sheep blood agar plates.

Table 3 Clinical manifestations of paediatric patients with pharyngitis from whom Lancefield group A and non-group A β-haemolytic streptococci were isolated from throat swabs

Symptom/sign	Group A n=267 No (%)	Non-group A n=30 No (%)	p value
Fever	243 (91)	25 (83)	NS
Sore throat	181 (68)	19 (63)	NS
Nausea/vomiting	75 (28)	6 (20)	NS
Headache	48 (18)	5 (17)	NS
Cough	53 (20)	7 (23)	NS
Abdominal pain	51 (19)	7 (23)	NS
Rhinorrhoea	16 (6)	5 (17)	NS
Arthralgia	13 (5)	1 (3)	NS
Congested tonsils with/without exudates	235 (88)	24 (80)	NS
Enlarged cervical lymph nodes	136 (51)	2 (7)	<0.0001
Erythematous skin rash	16 (6)	1 (3)	NS

growth on the primary plates showed that 77% of both group A and non-group A isolates gave either moderate or heavy growth.

The clinical features of 267 children from whom group A βHS were isolated compared with those encountered in 30 children from whom non-group A βHS were recovered are depicted in Table 3. Patients with non-group A βHS were much less likely to have enlarged cervical lymph nodes (2% vs 51%; p <0.0001) but the clinical characteristics of those two groups were otherwise not statistically different (p >0.05).

Table 4 shows various sites other than the throat from which group A βHS were isolated. A total of 43 isolates of group A βHS were recovered from these patients, having mostly skin lesions, otitis media and wound infections. The majority of these children (51.2%) belonged to the age group <1 year; the distribution of isolates for other age groups was very similar (9.3% - 13.9%), except for the 12-14 years age group where isolation rates were low (2.3%).

Among the non-group A βHS, group B streptococci were isolated from four children: three had umbilical discharges, all being aged less than one year, with the fourth being from a seven year old child with an infected wound. One isolate of group E was obtained from an intraabdominal abscess from a child aged less than one year. No group C or group G streptococci caused infections in sites other than the throat.

Discussion

In the present study, the isolation rate of non-group A βHS in patients with sporadic pharyngitis was either lower than or similar to age-and-sex-matched controls. This is in contrast to the situation with group A βHS where isolation was much higher in patients with pharyngitis than in controls. These findings do not support the hypothesis that non-group A βHS play a causative role in sporadic pharyngitis in children (Hayden *et al*, 1989). The clinical features of our patients with non-group A βHS pharyngitis did not differs significantly from those with group A. This may be due to the effect of concomitant infections by other agents such as viruses and mycoplasma which may confuse the clinical presentation by causing similar features to the group A βHS infection.

Much of the evidence that some non group A βHS may cause pharyngitis has been derived from reports of food-borne outbreaks of illness (Hiller *et al*, 1969; Benjamin and Perriella, 1976; McCue, 1982. Hill *et al* (1969) described a food-borne outbreak in which group A βHS were isolated from throats of 64% of college students with pharyngitis compared to 23% of randomly selected controls. In contrast, most epidemiological studies of sporadic pharyngitis have found little difference in the isolation rate of non-group A βHS in ill as compared to healthy persons. This subject has been extensively reviewed by Cimolai *et al* (1988).

This is also in accord with Hayden and Murphy (1989) who recently isolated non-group A βHS from 17% of patients with pharyngitis and 21%

Table 1 Age distribution of paediatric patients with throat cultures positive for various β-haemolytic streptococcal groups

Strepto-coccal group	Total positive	Age group (years)				
		< 3	3-<6	6-<9	9-<12	12-14
A	267	14	70	98	68	17
B	3	2	1	0	0	0
C	7	0	2	4	1	0
F	3	0	0	3	0	0
G	17	3	4	2	6	2
Total	297	19	77	107	75	19

Table 2 Isolation rate of b-haemolytic streptococci Lancefield groups from throat cultures of 3,184 children with pharyngitis and 478 controls without pharyngitis

Streptococcal group	Patients No (%)	Controls No (%)	p value
A	267 (8.4)	11 (2.3)	<0.0001
Non-group A (total)	30 (0.9)	12 (2.5)	<0.01
B	3 (0.1)	1 (0.2)	NS
C	7 (0.2)	6 (1.2)	<0.01
F	3 (0.1)	1 (0.2)	NS
G	17 (0.5)	1 (0.2)	NS
Culture negative	2857 (89.7)	446 (93.3)	<0.02
Total	3184 (100.0	478 (100.0)	

NS Not statistically relevant

After inoculation, one plate was incubated aerobically and the other anaerobically in an atmosphere of 5-10% CO^2. The plates were examined after 18-24 hours for the presence of β-haemolytic colonies; negative plates were incubated for an additional 24 hours and re-examined.

Streptococcal growth on primary plates was scored a 'few' (less than 10 colonies), 'moderate' (10-100 colonies) or 'heavy' (>100 colonies/confluent growth).

Lancefield grouping of β-haemolytic colonies were determined by a commercial latex-agglutination test (Streptex, Murex Diagnostic Ltd, Dartford, UK). Swabs obtained from sites other than the throat (Table 4) were similarly tested. As regards the statistical analysis, the data of both patients and controls were compared using either Chi-square or Fisher's exact test and a p value of <0.05 was considered significant.

Results

The age of the 3,184 children with pharyngitis ranged between one and 14 years (mean 6.8); 62% were males. The age of all the 478 controls ranged between one and 14 years (mean 6.7); 58% were males. β-haemolytic streptococci were recovered from 9.3% (297/3,184) of patients. The majority (87.2%) of the culture-positive cases belonged to the age group 2-<12 years. Only 6.4% belonged to the age group <3 years; a similar percentage were of the age group 12-14 years (Table 1). Group A βHS were isolated from throat swabs of 267 (8.4%) patients with pharyngitis and from 11 (2.3%) of controls (p <0.0001) (Table 2). In contrast, non-group A βHS were recovered from 0.9% of patients and from 2.5% of controls (p <0.01). The serogroups of non-group A βHS in patients were either lower or similar to those in the controls. The isolation rate of groups B, C, F and G varied between 0.1% and 1.2% in both patients and controls (Table 2).

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Table 4 Sites other than the throat from which group A streptococci were isolated in different age groups of paediatric patients

Site	Age group (years)						
	< 1	1-<3	3-<6	6-<9	9-<12	12-14	Total
Skin	9	2	5	2	5	0	21
Ear	7	2	1	0	0	0	10
Wound	1	2	1	1	0	1	5
Umbilicus	3	0	0	0	0	0	3
Nose	0	0	0	1	1	0	2
Eye	2	0	0	0	0	0	2
Total	22	5	5	4	6	1	43

of controls using sensitive anaerobic cultures. However, some investigators have reported higher isolation rates of non-group A βHS from patients with sporadic pharyngitis than in controls without pharyngitis (Glezen *et al*, 1975; Putto, 1987; Meier *et al*, 1990). Recently Cimolai *et al* (1991) found an association between heavy growth of β-haemolytic 'large colony' group C and G streptococci and sporadic pharyngitis in a paediatric population. Serological investigations may clarify these conflicting results. However, usual serological tests for group A βHS (antistreptolysin O titre (ASO)) may not provide conclusive results for infections with other groups. One study (Benjamin and Perriella, 1976) showed that the ASO titre could not distinguish between group C βHS culture positive symptomatic and asymptomatic patients. This may be due to the fact that the extracellular products of many non-group A βHS are either different from those of group A βHS or unknown (Glezen *et al*, 1975). Therefore, more definitive serological documentation of infection with non-group A βHS must await detailed analysis of cellular and extracellular products of these organisms with the development of suitable serological procedures.

Similarly, whether antibiotic therapy is useful in children with pharyngitis due to non-group A βHS must remain uncertain (Cimolai *et al*, 1988; Hayden *et al*, 1989). In this study the majority of infections caused by group A βHS were responsible for a small minority of infections in these sites. The majority of these infections caused by group A and non-group A βHS occurred in the age group less than one year. In contrast, the majority of pharyngitis cases occurred in the age group three to less than 12 years and only 6% of cases belonged to the age group less than three years.

We conclude that isolation of non-group A βHS was not higher from patients with sporadic pharyngitis than in age-and-sex-matched controls. Clarification of the role, if any, of non-group A βHS in the pathogenesis of the pharyngitis in children in its sporadic form will require more work in the development of diagnostic methods and therapeutic regimens. Group A βHS cause a variety of infections in sites other than the throat, such as otitis media, skin and wound infections, while non-group A βHS were responsible for a small minority of infections in these sites.

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