Clinical presentations and epidemiology of β-haemolytic streptococcal bacteraemia: a population-based study

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Abstract

In this population-based study, all 314 episodes of β-haemolytic streptococcal bacteraemia in adult patients in the Pirkanmaa area, Finland, during the 10-year period 1995–2004 were retrospectively reviewed. Altogether, 92 cases of bacteraemia caused by Lancefield group A β-haemolytic streptococci (GAS), 76 caused by group B β-haemolytic streptococci (GBS), 18 caused by group C β-haemolytic streptococci (GCS) and 128 caused by group G β-haemolytic streptococci (GGS) were identified. The most important finding was that the incidence of GGS increased during the study period. Disruption of the cutaneous barrier was a very common predisposing factor in GAS and GGS bacteraemias. Skin infections were the presenting clinical manifestations in two-thirds of GAS and GGS bacteraemias.

Keywords: Bacteraemia, β-haemolytic, clinical presentations, epidemiology, streptococci

Original Submission: 11 April 2008; **Revised Submission:** 21 July 2008; **Accepted:** 29 July 2008
Editor: P. Tassios

Clin Microbiol Infect 2009; **15**: 286–288
10.1111/j.1469-0691.2008.02672.x

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Lancefield group A streptococci (GAS), group B streptococci (GBS), group C streptococci (GCS) and group G streptococci (GGS) are part of the normal flora of the pharynx, skin, intestinal tract and vagina [1] but also cause a variety of invasive and non-invasive infections. This study focuses on the estimation of the incidence of bacteraemia caused by GAS, GBS, GCS and GGS and the determination of the predisposing factors, underlying diseases, presenting clinical manifestations and outcome of these diseases during a 10-year period.

The medical records of all adult (over 16 years of age) patients in the Pirkanmaa Health District (HD), Finland with one or more blood cultures positive for GAS, GBS, GCS or GGS from January 1995 to December 2004 were retrospectively reviewed. Pirkanmaa HD (460 000 inhabitants) harbours one tertiary-care hospital (Tampere University Hospital) and four other hospitals, including Hatanpää City Hospital and the district hospitals in Valkeakoski, Vammala and Mänttä. Laboratory records were screened to identify all blood cultures positive for β-haemolytic streptococci during the study period. The case definition included all patients with a positive blood culture for GAS, GBS, GCS or GGS combined with a clinical picture compatible with septicaemia.

An infectious disease specialist (SR) reviewed all of the patient records. Cellulitis included infections of skin and underlying tissue (erysipelas and deeper non-necrotizing soft tissue infections).

The routine blood cultures were drawn into aerobic and anaerobic bottles. During the study period, the BACTEC NR 730 (only in 1995) and BACTEC 9240 (BD Diagnostic Systems, Sparks, MD, USA) (1996–2004) blood culture systems were used. In the district hospitals, the signal blood culture system (Oxoid, Cambridge, UK) was used until 2003. The Lancefied serogroups were determined by latex agglutination using the Streptex latex test system (Remel Europe Ltd, Dartford, UK). All isolates were also identified biochemically using the Rapid ID 32 STREP system (bioMérieux SA, Marcy-l'Etoile, France).

The categorical data were analysed using the chi-square test or Fisher's exact test as appropriate. The non-parametric data were analysed by Mann–Whitney *U*-test. Change in incidence was analysed by Poisson regression. A two-sided p-value <0.05 was regarded as statistically significant.

β-Haemolytic streptococci grew in 314 cultures, distributed as follows: GAS, 92 cases (29%); GBS, 76 cases (24%); GCS, 18 cases (6%); and GGS, 128 cases (41%). All GAS were identified as *Streptococcus pyogenes*, all GBS as *Streptococcus agalactiae*, and all GGS as *Streptococcus dysgalactiae* subsp. *equisimilis*. Six of the GCS were confirmed to be

Streptococcus equi subsp. *zooepidemicus* and 12 to be *S. dysgalactiae* subsp. *equisimilis*. Positive blood cultures were obtained from 309 patients. Six patients had recurrent β-haemolytic bacteraemia within the study period (two GBS and four GGS).

The presenting clinical manifestations associated with bacteraemia are given in Table 1. In all cases, the causative microbe was susceptible to the empirical antibiotic therapy given. The 30-day mortality was 13%, being highest in patients with GCS (22%); mortality was 15% in patients with GAS, 7% in those with GBS, and 15% in those with GGS.

The incidence of GGS bacteraemia increased from 1.8 cases per 100 000 population in 1995 to 4.3 cases per 100 000 population in 2004 (Fig. 1); this was a statistically significant increase (p 0.013). The incidence of GAS or GBS bacteraemia fluctuated over time (Fig. 1). The number of blood cultures taken increased during the study period. However, the incidence of positive blood cultures (all cases of bacteria included) increased from 279/100 000 in 1995 to 368/100 000 in 2004 (1.3-fold), and the incidence of GGS increased from 1.81/100 000 to 4.32/100 000 during the same period (2.4-fold).

There were no changes in laboratory methodology during the study period, which could explain the increase in the incidence of GGS. An outbreak caused by *S. equi* subsp. *zooepidemicus* associated with consumption of unpasteurized goat cheese occurred in 2003 (six cases), and has been reported elsewhere [2].

Alcoholism (an alcohol-related medical or social problem) was common in patients with GAS bacteraemia (26%), and diabetes was common in patients with GBS (32%) and GGS

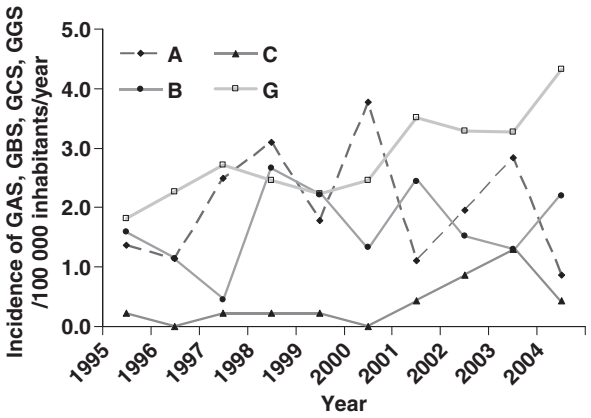

FIG. 1. Incidence/100 000 inhabitants/year of bacteraemia caused by Lancefield group A streptococci (GAS), Lancefield group B streptococci (GBS), Lancefield group C streptococci (GCS) and Lancefield group G streptococci (GGS) in Pirkanmaa Health District 1995–2004.

(23%) bacteraemia. Malignancies were common in patients with GBS being higher than in previous studies [3,4] (38%) bacteraemia.

Disruption of the cutaneous barrier was more common in patients with GAS (58%) or GGS (53%) bacteraemia than in those with GBS (32%) bacteraemia (p 0.001 and p 0.003, respectively). Twenty-six per cent of all patients had chronic eczema or skin erosion, 4% psoriasis, 13% chronic ulcer, 10% traumatic wounds and 3% operation wounds as a probable or possible portal of entry. A trauma during the previous month was a common predisposing factor in cases of GAS bacteraemia (27%). A history of previous cellulitis that was treated in a hospital or in an outpatient clinic at least 1 month prior to the current episode of bacteraemia was

TABLE 1. Comparison of the presenting clinical manifestations of β-haemolytic streptococcal bacteraemias by Lancefield group

Presenting clinical manifestation[a]	GAS *n* = 92 *n* (%)	GBS *n* = 76 *n* (%)	GCS *n* = 18 *n* (%)	GGS *n* = 128 *n* (%)	All *n* = 314 *n* (%)	Overall p-value
Skin/soft tissue infection	65 (71)	34 (45)	10 (56)	88 (69)	197 (63)	0.002
Cellulitis	36 (39)	26 (34)	8 (44)	73 (57)	143 (46)	0.006
Fasciitis	7 (8)	0	0	1 (1)	8 (3)	0.008
Infected wound or eczema	24 (26)	12 (16)	1 (6)	23 (18)	60 (19)	0.15
Deep abscess[b]	10 (11)	5 (7)	0	2 (2)	17 (5)	0.02
Pneumonia	16 (17)	3 (4)	2 (11)	12 (9)	33 (11)	0.04
Urinary tract infection	1 (1)	7 (9)	0	1 (1)	9 (3)	0.008
Puerperal sepsis	7 (8)	6 (8)	0	4 (3)	17 (5)	0.27
Arthritis (all)	5 (6)	3 (4)	1 (6)	11 (9)	20 (6)	0.58
Prosthetic joint infection	0	3 (4)	0	6 (5)	9 (3)	0.14
Osteomyelitis	4 (4)	5 (7)	0	6 (5)	15 (5)	0.83
Meningitis	3 (3)	0	0	1 (1)	4 (1)	0.34
Endocarditis	1 (1)	3 (4)	1 (6)	2 (2)	7 (2)	0.30
Bacteraemia without defined focus	10 (11)	21 (28)	8 (44)	21 (16)	61 (19)	0.002

GAS, Lancefield group A β-haemolytic streptococci; GBS, Lancefield group B β-haemolytic streptococci; GCS, Lancefield group C β-haemolytic streptococci; GGS, Lancefield group G β-haemolytic streptococci.
[a]One patient may have one or more clinical manifestations.
[b]Included empyema in five patients, intra-abdominal abscess in three, epidural abscess in two, psoas abscess in one, femoral abscess in one, abscess of operation region in one.

found more often in patients with GBS (20%) or GGS (29%) bacteraemia than in those with GAS (4%) bacteraemia (p 0.002 and p <0.001, respectively).

The most important finding here was the increasing incidence of GGS bacteraemia during the study period. A similar trend in the incidence of GGS bacteraemia has also been noted in some other geographical areas [5]. However, the population-based data concerning the incidence of GGS bacteraemia are limited [5–7]. The reason for the continuous increase in GGS bacteraemia remains unclear, although prolonged survival of adults with underlying diseases (e.g. diabetes mellitus, cancer and heart disease) may be one contributing factor [8]. However, this cannot be the only explanation, as no significant difference in age, presence of diabetes or cardiovascular diseases was found among patients with GGS bacteraemia as compared with those with GBS or GCS bacteraemia (data not shown). In addition to a change in the host factors, GGS virulence factors may have a role [9]. The average annual incidence and the fluctuating pattern of invasive GAS infections were in concordance with those in previous reports [5,10–13].

The important new finding was that a disruption of the cutaneous barrier was a very common predisposing factor in GAS and GGS bacteraemia, occurring more frequently than previous reports would imply [5,11,14–16]. As described elsewhere, skin infections were the most common clinical manifestation in all groups [3,5,8,10,15–20]. Skin infections were the presenting clinical manifestations in two-thirds of GAS and GGS bacteraemias. It is known that GAS and GGS share virulence factors. This may be one explanation for the similar spectrum of disease that they cause. A new finding was that a history of previous cellulitis was very common in GBS and GGS bacteraemia.

It is concluded that the incidence of GGS bacteraemia is increasing in Pirkanmaa HD, Finland. Disruption of the cutaneous barrier as a predisposing factor and skin infections as a presenting focus of infection were found very commonly in patients with GAS and GGS bacteraemia.

Acknowledgements

We would like to thank E. Väyrynen for the language revision of the manuscript.

Transparency Declaration

This work was supported by the EU Fifth Framework Research Programme (QLK2.CT.2002.01 398) and a grant from the Medical Research Fund of Tampere University Hospital. S. Rantala, J. Vuopio-Varkila, R. Vuento, H. Huhtala and J. Syrjänen declare no potential conflicts of interest.

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