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ENT Infections and Skin Infections Due to *Streptococcus pyogenes*: Prevalence and Antibiotic Sensitivity Profile of Strains Isolated at Albert Royer Children's Hospital, Dakar-Senegal

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Abstract

Background: *Streptococcus pyogenes* or Groupe A Streptococcus (GAS) infections constitute a real public health problem due to their frequency and the post-infectious complications they cause. Thus, it is necessary to update epidemiological data for better management. This study aimed to determine the prevalence of GAS in skin and ENT infections and to study their antibiotic susceptibility profile. **Methods:** It was a prospective study of *Streptococcus pyogenes* skin and ENT infections at Albert Royer Children's Hospital. Bacterial isolation and identification were performed using standard bacteriological techniques. Data were entered using Excel 2010 software and analyzed using Epi info 7.2 software. **Results:** A total of 245 patients were included, with a mean age of 5.49 years and a standard deviation of 3.9. The proportion of male patients was higher (51%), and the majority were aged from 0 to 3 years. The prevalence of GAS infection was 6.93%. *Streptococcus pyogenes* strains had good susceptibility to penicillin G (100%), cefotaxime (100%), ceftriaxone

(100%), ceftazidime (100%), chloramphenicol, and vancomycin (100%). The activity of erythromycin was good (87%), as well as that of ampicillin (86%), lincomycin (75%), rifampicin (71%) and pefloxacin (67%). However, poor activity was noted for cotrimoxazole (43%), norfloxacin (33%) and resistance to all strains for gentamicin. **Conclusion:** The prevalence of *Streptococcus pyogenes* infections was low. Antibiotic susceptibility was variable. Penicillin G, cefotaxime, ceftriaxone, ceftazidime, chloramphenicol, and vancomycin had very good activity. However, the activity of cotrimoxazole, norfloxacin, and gentamicin was low.

Keywords

GAS, ENT Infections, Skin Infections, Prevalence, Antibiotic

1. Introduction

Streptococcus pyogenes or Group A Streptococcus (GAS) is a strict human pathogen, sometimes found in oropharyngeal or cutaneous carriage [1]. It is responsible for infections, which can be complicated by autoimmune post-infectious pathologies, such as acute glomerulonephritis (ANG), acute rheumatic fever (ARF), rheumatic carditis, or various neuropsychiatric disorders [2]. There are more than 34 million cases and more than 350,000 deaths each year [3].

In 2018, the World Health Organization (WHO) highlighted the need to strengthen control strategies, including the development of a GAS vaccine [4]. Initial efforts to develop it focused on the M protein. This protein is not only involved in bacterial attachment but also allows microorganisms to escape phagocytosis by leukocytes [5]. This approach has been limited by two factors. First, more than 100 types of M proteins are described; second, similarities between the M protein and host proteins can trigger cross-reactivity [6]. Although the vaccine potential of this region is under investigation, interest in recent years has shifted to other GAS antigens such as cysteine protease and C5a peptidase [7]. Faced with these obstacles to vaccine prevention, antimicrobial resistance is nowadays a heavy burden [8]. Thus, it is necessary to monitor the behavior of GAS with respect to antibiotics. We conducted this study to determine the prevalence of GAS in skin and ENT infections and to study their antibiotic sensitivity profile.

2. Methodology

This was a prospective, descriptive study conducted in the Bacteriology and Virology Department of Albert Royer National Children's Hospital over a 9-month period from January 1st, 2024 to October 30th, 2024, in patients aged from 0 to 18 years, seen for consultation and with a dermatosis suspected of GAS infection (superficial skin infections or bacterial dermohypodermitis) or an ENT infection.

This study has been approved by the National Ethics Committee for Health Research (CNERS) of the Cheikh Anta Diop University of Dakar (CER/UCAD/AD/

MSN/034). Free and informed consent was obtained from the patient or guardian and a survey form was completed from the interview to collect patient information such as age, sex, address, mother's education level and antibiotic use before consultation. Samples were taken under strict aseptic conditions with sample processing according to standard bacteriology techniques. The isolation of GAS was done by inoculation on CVBA (Crystal Violet Blood Agar) and GSO (Ordinary Blood Agar), the identification took into account the demonstration of Gram-positive, catalase-negative cocci, grouped in a chain, the presence of beta hemolysis completed by a latex agglutination test with the Streptex™ kit and the antibiotics susceptibility was carried out according to the recommendations of CASFM 2020. The data were entered with Excel 2010 software and analyzed by Epi info 7.2 software.

3. Results

Sociodemographic Characteristics

A total of 245 patients (children and adults) were included, with a mean age of 5.49 years and a standard deviation of 3.9. The proportion of male patients was higher (51%) (**Table 1**). By age group, there was a predominance of patients aged from 0 to 3 years (40.69%), followed by those aged from 5 to 10 years (25.52%) (**Figure 1**).

Table 1. Sociodemographic characteristics.

Characteristics	N	%
Sex		
F	113	46.13
M	132	53.87
Age		
Mean	5.49	
Standard deviation	3.96	

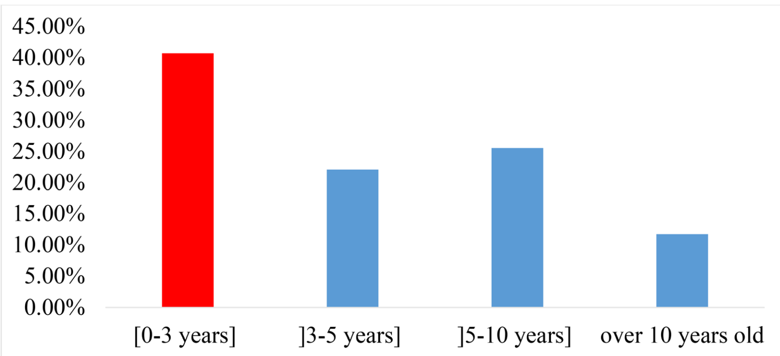

Figure 1. Distribution of the population according to age group.

Distribution by Origin

The proportion of individuals living in Dakar was the majority at 94.48%, or 232 individuals (**Figure 2**).

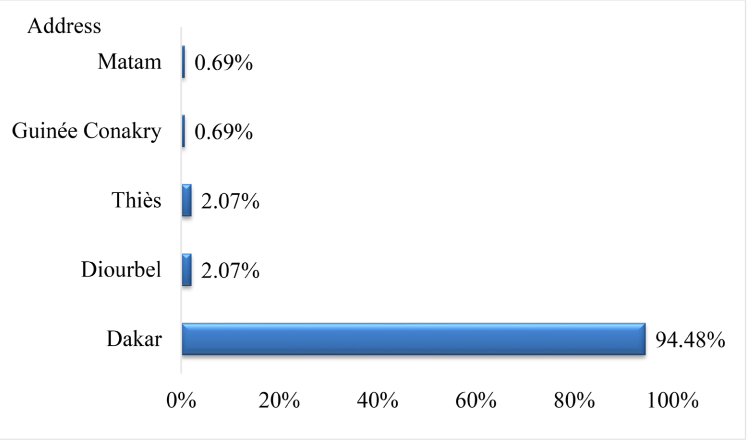

Figure 2. Distribution of the population by origin.

Ethnicity Distribution

Regarding ethnicity distribution, the Wolofs formed the majority, with 108 individuals (44.14%), followed by the Fulani (29.87%) (Figure 3).

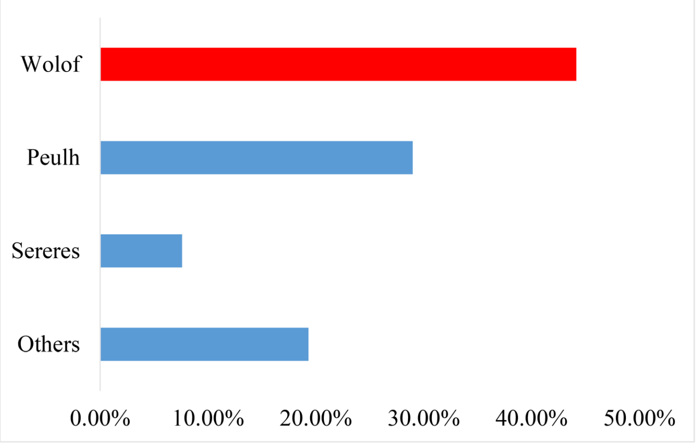

Figure 3. Population distribution by ethnicity.

Distribution by Maternal Education Level

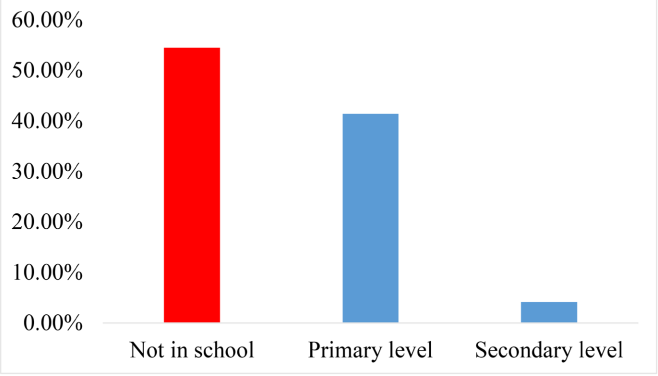

Figure 4. Distribution by mother's education level.

The population constituted mainly of patients whose mothers were not in school (54.48%) (Figure 4).

Distribution of Patients by Sample Type

Skin samples were more numerous (135; 55.11%) than ENT samples (Table 2).

Table 2. Distribution by sample type.

Type of swab	N	%
Tonsil swab	110	44.89
Skin swab	135	55.11
Total	245	100

Distribution by Treatment Concept before Consultation

The majority of patients (44.14%) had not received any antibiotic treatment before the consultation. Only 20.00% were receiving antibiotic therapy (Figure 5).

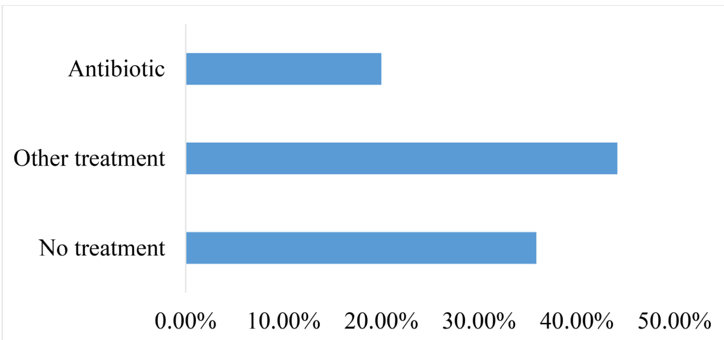

Figure 5. Distribution of patients according to antibiotic use before consultation.

Prevalence of *Streptococcus pyogenes* Infections

Among the 245 patients included, 71.43% (175) had a bacterial infection, and GAS was present in 17 subjects, for a prevalence of 6.93% (17/245) (Table 3).

Table 3. Prevalence of GAS infections.

Characteristics	N	%
Streptococcus pyogenes infection	17	6.93
Absence of Streptococcus pyogenes infection	228	93.07
Total	245	100

Germ Distribution

The distribution of isolated germs shows a predominance of *Streptococcus spp* (41.29%) followed by *S. aureus* (27.96%), *Streptococcus pneumoniae* (8.60%) and *Streptococcus pyogenes* (6.93%) (Figure 6). Are included in *Streptococcus spp*, all the streptococci that could not be grouped or identified.

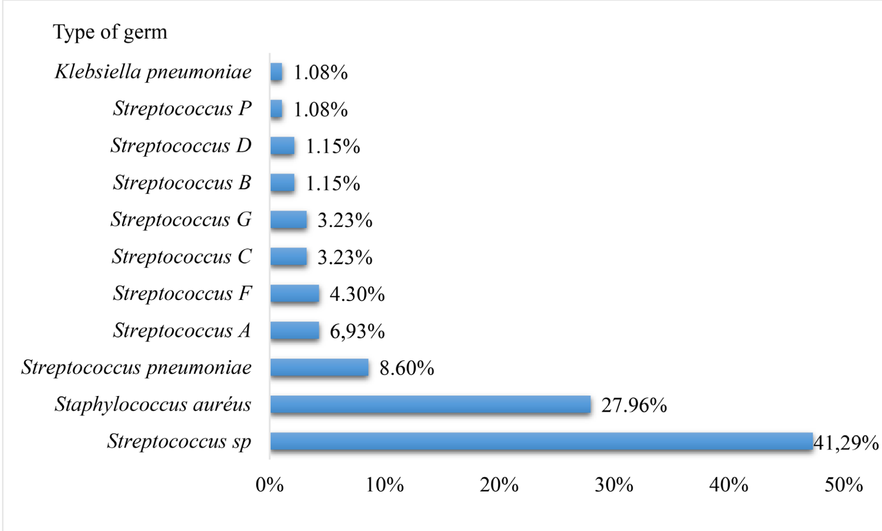

Figure 6. Frequency of bacteria isolated in skin infections.

Distribution of GAS Strains by Clinical Form

According to the clinical form, *S. pyogenes* strains were found most frequently in impetigo (47.05%), followed by tonsillitis (23.52%) (**Table 4**).

Table 4. Distribution of SGA strains according to clinical form.

Infections	N	%
Tonsillitis	4	23.52%
Impetigo	8	47.05
Folliculitis	3	17.64%
Abscess	2	11.76%
Total	17	100%

Antibiotic Susceptibility Profile of GAS Strains

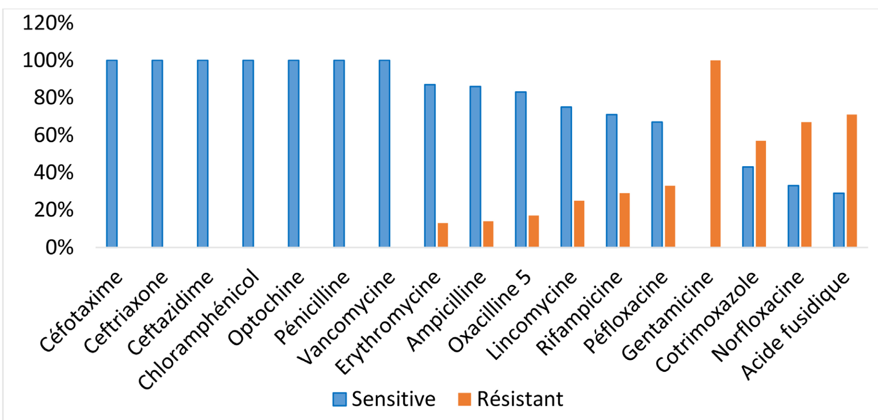

Figure 7. Sensitivity of SGA strains to the antibiotics tested.

We noted very good susceptibility of *Streptococcus pyogenes* strains to penicillin G (100%), cefotaxime (100%), ceftriaxone (100%), ceftazidime (100%), chloramphenicol, and vancomycin (100%). Erythromycin activity was good (87%), as was that of ampicillin (86%), lincomycin (75%), rifampicin (71%), and pefloxacin (67%). However, poor activity was noted for cotrimoxazole (43%), norfloxacin (33%), and resistance to gentamicin was observed in all strains (**Figure 7**).

4. Discussion

This study assessed the role of *Streptococcus pyogenes* in the infectious etiologies of pediatric skin and ENT diseases at the Albert Royer Children's Hospital. It included 245 patients with a mean age of 5.49 years, predominantly male. The majority of our study population residing in Dakar (92%) were Wolof and had uneducated mothers (54.48%). We found a prevalence of GAS infection of 6.93%. This prevalence is lower than noted in 2015 among schoolchildren in Bamako with a rate of 22.3% [9]. Another study carried out in Ethiopia had reported a prevalence of 10.6% [10]. Still, a higher prevalence (17.1%) was found in India in 2014 among children aged from 5 to 15 years with acute tonsillopharyngitis [11].

The distribution of clinical forms shows a predominance of impetigo (47.05%) followed by tonsillitis (23.5%). In another study conducted by Coulibaly *et al*., in 2012, impetigo has been the most observed affection [12]. However, the results of Teclessou *et al*., 2022 in Togo showed a predominance of folliculitis [13]. In our study, GAS infections were more frequent in children aged from 5 to 10 years. This could be explained by the fact that this is the school age group with promiscuity and frequent contact between children. Paradoxically, other studies on *Streptococcus pyogenes* skin infections had shown a predominance in children aged from 2 to 5 years [14]. GAS infections were also more common in males, with a rate of 61.54%. The same observation was noted in studies conducted in Mali (2000) and in Burkina Faso (2002) [8] [10].

We noted that 20% of patients were already receiving antibiotics before their presentation, and only one of them had a GAS infection. This low frequency of GAS infections in patients receiving antibiotics may be due to the decapitation of the infection, but also to the fact that they are a minority in the study population.

The distribution of isolated micro-organisms shows a predominance of *Streptococcus spp* (41.29%), followed by *S. aureus* (27.96%), *Streptococcus pneumoniae* (8.60%), and *Streptococcus pyogenes* (6.93%). The results of a study on microbial etiologies in a community setting in India showed a clear predominance of *S. aureus* (73%) followed by Streptococci (12%) [15].

Regarding antibiotic susceptibility, we noted a good activity of penicillin G and third-generation cephalosporins (3GC) with 100% susceptibility rates of GAS strains. These results are similar to those of Camara *et al.* in a study on the antibiotic susceptibility of *Streptococcus pyogenes* where all strains were susceptible to penicillin, amoxicillin and cephalosporins [16]. Another study on the susceptibility of *S. pyogenes* showed a good susceptibility to beta-lactams [17].

Regarding glycopeptides, all strains were susceptible to vancomycin. A similarity is noted with the results of Camara *et al.*, who found a 100% susceptibility rate to vancomycin and teicoplanin [16].

Macrolide activity was also good: 87% of strains were susceptible to erythromycin. Gashaw *et al.* found an activity rate of 87.75% of erythromycin on GAS strains in a study on the carriage rate of *Streptococcus pyogenes*, associated factors, and antimicrobial susceptibility profiles in urban and rural schoolchildren in Gondar City, northwest Ethiopia [18]. A higher activity, 98%, was noted in a study on antimicrobial resistance and epidemiological profile of *Streptococcus pyogenes* in Türkiye [19].

Regarding fluoroquinolones, we noted a fairly good activity for pefloxacin (67%), in contrast to that of norfloxacin, which was low (33%). These values are lower than those of the results of Beyala *et al.*, 2021 in Yaoundé, who noted 96.4% of susceptibility to pefloxacin and norfloxacin and 100% to levofloxacin [20].

All *Streptococcus pyogenes* isolates were sensitive to chloramphenicol. A similarity is noted with the results of a study on the antimicrobial susceptibility of invasive *Streptococcus pyogenes* isolates in Germany between 2003 and 2013, with a susceptibility of 99.1% of strains to chloramphenicol [21]. Similarly, a value close to our results was found in an Ethiopian study with a susceptibility rate of 95.5% [22]. In an Indian study investigating the prevalence and antibiotic susceptibility of *Streptococcus pyogenes* strains isolated from pyoderma in a tertiary care hospital, 76.9% of *S. pyogenes* isolates were susceptible to chloramphenicol [23].

5. Limitations

This single-center, cross-sectional study includes potential selection bias (cultured patients may not represent all clinical cases), limited sample size, lack of molecular resistance characterization (e.g., resistance genes, emm typing), incomplete control for prior antibiotic exposure, and reliance on phenotypic susceptibility testing without MIC data. These constraints limit generalizability and causal inference; we recommend cautious interpretation and prospective, multicenter studies with integrated genomic analysis to validate and extend these findings.

6. Conclusion

We noted a low prevalence of *Streptococcus pyogenes* infections (6.93%). Good antibiotic susceptibility was noted for beta-lactams, chloramphenicol, and macrolides. However, fluoroquinolone activity remained low.

Conflicts of Interest

The author declares no conflicts of interest regarding the publication of this paper.

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