Detection and evaluation of *Streptococcus pyogenes* (Group A) as a superior infectious agent of acute pharyngitis among school age children

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Abstract:

**Background:** *Streptococcus pyogenes* Group A -(GAS), is a bacterium has gram-positive coccoid shaped, that appears in chains, and produces a small colonies with color like white to greyish, produces a clear zone of type β-hemolysis when cultivate within blood agar. GAS causes severe human disease mostly by three mechanisms include: the suppuration, as in cases pyoderma, and pharyngitis, immune-mediated inflammation and toxin elaboration. Causes respiratory tract infections, with acute pharyngitis, are common through childhood and adolescence. And that occur most commonly and frequently among the children between (5 and 15) years of age. **Objective:** This study for searching about infection of Iraqi children at school age with Streptococcal pharyngitis by *Streptococcus pyogenes* Group A (GAS). **Patients and methods:** Collection of (60) samples from school children at age between (6-12) years suffered from acute pharyngitis, from many schools in different regions in Baghdad city, with (20) healthy children for control, from period January to April 2019. Two swabs were collected from each child, Swabbing the posterior pharynx and tonsils, for both the rapid antigen-detection test and culture, with dimension of serum antibodies to Streptolysin-O. **Results:** Results of Culture on Blood Agar for genus *Streptococcus* were in 32 (53%) patients were mostly in age group (6-8) years: 23(38%), was in males (10), in female (13), with total Medical history of infection (14) while in control total (4). Also specific result by rapid antigen-detection test, *Streptococcus pyogenes* detection were in: 25 (42%), mostly in age group (6-8) years, was 19 (32%), in male (8) and in female (11) with total Medical history of infection (7) while in control were (1) in total. **Conclusion:** In school age patients with signs and symptoms, revealing of streptococcal pharyngitis, a specific diagnosis should be determined by substitute a throat culture, or a rapid antigen-detection test with execution a throat culture, if the rapid antigen-detection test be negative, as a minimum in children in school age. But if the rapid antigen-detection test was positive, a throat culture will not desirable for diagnosis, nor is necessary after treatment, if symptoms were resolved.

**Keywords:** *Streptococcus pyogenes* (Group A), acute pharyngitis, school age children

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Introduction:

*Streptococcus pyogenes* Group A - (GAS), is a synonym of *Streptococcus pyogenes*, that single species inside this group (β-hemolytic streptococci). GAS is type of the prima pathogenic bacteria, which is infect children and adolescents, is related with a wide range of infections states and diseases. *Streptococcus pyogenes* Group A- (GAS) is a gram positive bacterium in coccoid shaped that appears in chains. GAS, develop slight white to grey colored colonies, produce a clear zone of β-hemolysis, when cultivates on the blood agar. Uncommon strains of GAS are not cause hemolysis [1]. GAS is eminently from other β-hemolytic streptococci groups, by a - specific polysaccharide-C group that located on the bacterial cell wall, and by the Lancefield method for Serologic grouping is accurate, but group A organisms, also can be identified promptly by the enzyme immunoassay, any type of latex- agglutination, or co-agglutination techniques [2]. In pathogenesis of GAS disease, the first step involves prosperous colonization mucosa of the upper respiratory tract or skin of human host. Many of adherence factors for extracellular GAS and epithelial cells have been delineated, including M protein, lipoteichoic acid, pili, and fibronectin-binding proteins [3]. GAS causes many serious human diseases by three ways of these mechanisms: Suppuration, as in pharyngitis and Pyoderma, immune-mediated inflammation and toxin elaboration [4]. There no comprehensive description yet for the preference of sealed body locations for the infection by (GAS), nor for the strains capability of such of M -types to induce a pharyngitis and a pyoderma [5]. A great number of adherence factors, for extracellular (GAS) and epithelial cells, have been defined, with Sfb1 and SOF. GAS biofilm formation facilitates persistence by the human host [6]. GAS also produces a diversity of the respiratory tract infections including retropharyngeal abscess, acute pharyngitis, otitis media, peritonsillar abscess, sinusitis, and mastoiditis of the soft tissues and skin [7], peritonitis, empyema, neonatal sepsis, suppurative arthritis, puerperal sepsis, myositis, osteomyelitis, and surgical wound contaminations [8]. (GAS) infections imputable different of common M types, through adolescence and childhood. Anti-M antibodies, remain for many years, may for life, for defensive against invading of infection, but not product against pharyngeal bearing [9]. Patient with (GAS) pharyngeal infection practically has these characteristics: Throat sore, Caring anterior cervical adenopathy, Tonsillitis with or without headache, exudate, History of fever and/or abdominal pain [10]. *Streptococcus pyogenes*, is responsible for about (5 to 15%) of cases of pharyngitis happen in adults and (20 to 30%) of cases in children [11]. And Streptococcal pharyngitis most frequently occurs among children between (5 and 15) years of age. In climates, moderate the incidence is maximum occurring in winter, and also in early spring [12]. The aptness of (GAS) to produce severe infection also in healthy children, and even in healthy adults, appears a capacity of the resistance of the pathogen to innate clearance mechanisms of host that normally affair to prevent microbial dissemination [13]. This study search and evaluate for the range of GAS present as a causative agent in acute pharyngitis in Iraqi children at school age.

Patients and Methods:

1-Sampling: Collection of (60) samples from school children in many schools in different regions in Baghdad city at age between (6- 12) years suffered from acute pharyngitis were diagnosed in central teaching hospital for children, from period January to April 2019, with (20) healthy children for control. Two swabs were collected from each child. Swabbing taken from the latter pharynx and tonsils, but not the tongue, buccal mucosa or lips, to increases the sensitivity of both the rapid antigen-detection test and culture, measurement of serum antibodies, for streptolysin- O [14]. All were investigated in many laboratories in Baghdad.
2- Bacteriology method:
**Throat Culture for *Streptococcus pyogenes***: The collected (throat swabs) were inoculated on a blood agar media containing (5–7%) defibrinated sheep blood, then incubated for (24 h) at (37°C) and placing under an atmosphere containing about (5–10%) CO2. Applied bacitracin sensitivity test (0.04 units/disc) carried out on isolation of b-haemolytic streptococci. Bacitracin sensitive isolation were further examined for Lancefield grouping with antigen prepared by Fuller’s form amide method. A routine using of holdup throat cultures for those children with a negative result, Rapid *Streptococcus pyogenes* Antigen Test (RADT) was done [12].

3- Serological method:
**Rapid *Streptococcus pyogenes* Antigen Test:**
Wiping the throat for swab, and testing for (GAS) pharyngitis, by rapid antigen detection test (RADT) and culture achieved and the clinical features were distinguished between (GAS) and viral pharyngitis, when obvious viral features like rhinorrhea, oral ulcers, cough, are present. In children and adolescents, negative RADT tests backed up by a throat culture (strong high), positive (RADTs) did not essential for a back-up culture, because they are highly specific, elevated or increasing serum anti-streptococcal antibody titers and this providing the most reliable diagnosis [11].

Results:

1- **Study group with Age, Gender and Medical history:**
The result of study group had most infected children included in Age group (6-8) years they were (36 from 60), mostly were in male gender (32); with (14) patients had medical history of infection, most of them were in same mentioned age group.

<table>
<thead>
<tr>
<th>Age groups</th>
<th>N= 60 pharyngitis</th>
<th>Gender</th>
<th>Medical history of infection</th>
<th>Healthy N=20 control</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>n</td>
<td>%</td>
<td>M</td>
<td>F</td>
</tr>
<tr>
<td>(6-8) years</td>
<td>36</td>
<td>60</td>
<td>19</td>
<td>17</td>
</tr>
<tr>
<td>(9-12) years</td>
<td>24</td>
<td>40</td>
<td>13</td>
<td>11</td>
</tr>
<tr>
<td>Total</td>
<td>60</td>
<td>100</td>
<td>32</td>
<td>28</td>
</tr>
</tbody>
</table>

Table (1): Study group with Age, Gender and Medical history with control
2- Culture on Blood Agar:

The results of culture of samples on Blood Agar appeared high numbers of samples with genus *Streptococcus* infection (32 from 60) most of them were in Age group (6-8) years and mostly in female (13). While were in control group totally (4) had this genus of bacteria.

Table (2): Results of Culture on Blood Agar for genus *Streptococcus*

<table>
<thead>
<tr>
<th>Age groups</th>
<th>N= 32</th>
<th>Gender</th>
<th>Medical history of infection</th>
<th>Healthy N=20</th>
<th>control</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>n</td>
<td>%</td>
<td>M</td>
<td>F</td>
<td></td>
</tr>
<tr>
<td>(6-8) years</td>
<td>23</td>
<td>38</td>
<td>10</td>
<td>13</td>
<td>8</td>
</tr>
<tr>
<td>(9-12) years</td>
<td>9</td>
<td>15</td>
<td>4</td>
<td>5</td>
<td>6</td>
</tr>
<tr>
<td>Total</td>
<td>32</td>
<td>53</td>
<td>14</td>
<td>18</td>
<td>14</td>
</tr>
</tbody>
</table>

Figure (2): Results of Culture on Blood Agar for genus *Streptococcus*

3- **Specific Bacteria *Streptococcus pyogenes***:

The results of Specific Bacteria *Streptococcus pyogenes* that done by serological tests showed significant appearance (25), highly in age group (6-8) years were (19) while in age group (9-12) years were (6), most of them in female (14) were also in age group (6-8) years.

Table (3): Results of Specific Bacteria *Streptococcus pyogenes* by serological tests

<table>
<thead>
<tr>
<th>Age groups</th>
<th>N= 28</th>
<th>Gender</th>
<th>Medical history of infection</th>
<th>Healthy N=20</th>
<th>control</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>n</td>
<td>%</td>
<td>M</td>
<td>F</td>
<td></td>
</tr>
<tr>
<td>(6-8) years</td>
<td>19</td>
<td>32</td>
<td>8</td>
<td>11</td>
<td>4</td>
</tr>
<tr>
<td>(9-12) years</td>
<td>6</td>
<td>10</td>
<td>3</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>Total</td>
<td>25</td>
<td>42</td>
<td>11</td>
<td>14</td>
<td>7</td>
</tr>
</tbody>
</table>
Discussion:

The diagnosis of streptococcal pharyngitis among Iraqi school age children were significantly appear in Results of Culture on Blood Agar for genus *Streptococcus* were in 32 (53%) patients were mostly in age group (6-8) years: 23 (38%), was in males (10), in female (13), with total Medical history of infection (14) while in control total (4). Also specific result by rapid antigen-detection test had significantly appear in Results of diagnosis of the bacteria *Streptococcus pyogenes* and detection were in (42%) from patients with pharyngitis among children with streptococcal pharyngitis, mostly in age group (6-8) years, was 19 (32%), in male slightly less than in female with total Medical history of infection (7) comparing with results in control. The diagnosis of streptococcal pharyngitis on numerous clinical estates is publicly unreliable, because of “Variability of signs, and symptoms for the severity of disease ranges from slight alone throat discomfort to typical pharyngitis with exudative and high fever, and fatigue” but the diagnosis of laboratory culture of streptococcal source, and by specific diagnosis of *Streptococcus pyogenes*, by rapid antigen-detection test (RADT) were identified the most consistent cause of pharyngitis [14]. The diagnosis has additional complicated by the detail that infection because of many other agents might be indistinguishable clinically from the streptococcal pharyngitis, [15]. The possibility of positive results of diagnosis in a throat culture or a rapid antigen detection test, were (42%) in patients with no evocative clinical principles to approximately reach (53%) in those with all of them were agree with [16, 17]. Clinical prediction rules founded on these measures have been validated in both adults and children to help identify patients in whom evaluation with a throat culture or rapid antigen-detection test is warranted [18]. Children with a positive rapid antigen-detection test or throat culture overall rates of bacteriologic treatment. However, among patients classified clinically [19, 20]. Without management, streptococcal pharyngitis is related with persistence of positive throat cultures for up to (6) weeks in about (50%) of patients [21]. In contrast, treatment with an active antibiotic, results in negative throat cultures within (24) hours in about (52%) of patients [22].

These results may important for suggested that children obtain treatment for streptococcal pharyngitis for (24) hours before they coming back to school because shorter breaks are related with a higher rate of positive cultures [23].
**Conclusions:**

In school age children patients, have signs and symptoms revealing of streptococcal pharyngitis, with a specific diagnosis, should be strong-minded by acting a throat culture or by a rapid antigen-detection test, with execution a throat culture if the rapid antigen-detection test is negative. But if the rapid antigen-detection test has positive, a throat culture method will not be required for diagnosis, nor is essential after treatment, if symptoms were determined.

**References:**


