Assessment of Adherence to Guidelines for Testing and Treatment of Pharyngitis Among Children in Palestine: A Retrospective Study

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Research

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Abstract

Background

Acute Pharyngitis is a common upper respiratory tract infection, and is considered to be one of the leading causes for paediatric outpatient visits. Bacterial pharyngitis is less common and is mainly caused by Group A Beta haemolytic streptococcus (GABHS), also known as *Streptococcus pyogenes*. Accurate diagnosis guided by appropriate diagnostic tools is essential in managing paediatric pharyngitis as antibiotics are indicated only for documented bacterial cases. This research aimed to assess the extent of physicians' adherence to clinical guidelines regarding the testing and management of pharyngitis among children in Palestine.

Method

A retrospective, observational study that was conducted at the Palestine Medical Complex (PMC). Data were collected from the emergency department between June and December 2019. The Modified Centor score was used to assess the extent of physicians' adherence to guidelines regarding pharyngitis testing and management among children 3 to 13 years old. It included assessing throat swab collection and antibiotics prescribing. SPSS was used for data analysis.

Results

A total of 290 cases were collected. 217 patients (74.8 %) had a Modified Centor score of ≥ 2 ; 126 of them received antibiotics and swab was taken for only 8 of them. On the other hand, 73 cases (25.2 %) had a Modified Centor score of < 2 ; 34 of them received antibiotics. Azithromycin was the most commonly prescribed antibiotic (41.3%), followed by Amoxicillin-clavulanic acid (38.1%). The frequency of empirical antibiotics prescribing was significantly higher among children with Centor score >2 , elder children and those presenting with fever.

Conclusion

Pharyngitis management should include appropriate swab collection and antibiotic selection. Prescribing antibiotics empirically early on for most patients with pharyngitis will hasten the development of bacterial resistance and will increase the cost of treatment without adding any benefit in terms of protecting patients from pharyngitis complications.

Background

Acute Pharyngitis is a common upper respiratory tract infection, and is considered to be one of the leading causes for paediatric outpatient visits[1]. Viruses contribute to the majority of cases[2].

Adenovirus, respiratory syncytial virus, influenza, parainfluenza and enteroviruses are some of the common viral causes of pharyngitis [3]. Bacterial pharyngitis is less common and is mainly caused by Group A Beta haemolytic streptococcus (GABHS), also known as *Streptococcus pyogenes* [3]. Throat culture remains the gold standard for diagnosing GABHS pharyngitis. Rapid antigen-detection test (RADT) is another available diagnostic tool [3]. Distinguishing between viral and bacterial pharyngitis is essential in guiding therapy. Viral pharyngitis, for instance, require supportive care only while early recognition of streptococcal pharyngitis and initiating the appropriate antibiotics is crucial in decreasing the risk of possible serious complications such as acute rheumatic fever (ARF)[4]. Yet, antibiotics should not be started empirically even if GABHS pharyngitis is suspected, because it could lead to antibiotics overuse especially that initiating antibiotics within 9 days of the onset of illness still can prevent ARF [3]. Once GABHS pharyngitis is confirmed, a 10-day course of penicillin should be the first line therapy. In penicillin allergic patients, alternatives include cephalosporins (preferably first generation), clindamycin and macrolides[3]

Since pharyngitis is a common cause of paediatric outpatient visits, poor adherence to guidelines could lead to a significant unjustified antibiotic overuse. This concern is supported by the findings of several previous studies. In Lithuania for instance, pharyngitis was found to be one of the three-most common indications for prescribing antibiotics in paediatric population [5]. Moreover, in a study conducted in the United States between 1997 and 2010, the antibiotic prescription rate was found to be 60% [6]. This is a high rate when considering that GABHS infection in school-age children is estimated to account only for 15-30% of cases [3]. In Boston, a retrospective cohort study found that over one quarter of patients aged 3–18 years were prescribed antibiotics for pharyngitis but did not require antibiotics according to guidelines [7]. Another observational retrospective study in Italy showed similar results as antibiotics were prescribed in 63.1% of the cases, while 56.5 % of them were non-GABHS pharyngitis or undefined pharyngitis[8]. According to a study that was conducted in Jordan, 61% of upper respiratory tract infections were treated with antibiotics, while antibiotics were unnecessary in 86% of these cases[9].

Therefore, it is important to assess the local level of antibiotics prescribing for pharyngitis in an attempt to detect and improve malpractices. This is particularly important now as we live in an era where antibiotic resistance has become a major concern and is thought to become the leading cause of death in a couple of decades [10]. In this study we aim to assess and review the level of adherence to standard pharyngitis testing and antibiotics prescription in children aged 3 to 13 years in a central governmental hospital in Palestine.

Methods

This is a retrospective, observational study that was conducted at the Bahrain Paediatrics Hospital in the Palestine Medical Complex (PMC), a central governmental hospital in Ramallah, Palestine. This 45-bed hospital provides several services for children aged 1 day to 13 years. Pharyngitis cases that were encountered between June and December 2019 were collected. Exclusion criteria included patients who had suspension of lower respiratory tract infections or other sources of infections (e.g., urinary tract

infections), patients who were on antibiotics at the time of presentation, having other comorbidities (e.g., congenital heart disease), patients to be admitted and those who were discharged against medical advice. Patients less than 3 years old were also excluded because the presentation of GABHS is variable and appropriate management is less defined among this age category[11]. Only cases that were clearly documented in the detailed physicians’ notes as pharyngitis were included. More than 35,000 cases were registered at the emergency department during the study period, of which 537 cases had pharyngitis. After applying the exclusion criteria, a total of 290 cases were included and reviewed.

Two teams of a total of 4 researchers were responsible for data collection. All extracted data were double-checked. The extracted data from each file were the following: demographics (patient’s file number, gender, age, date of visit and presence of penicillin allergy), presenting symptoms (fever, cough, tonsillar swelling or exudate and swollen, tender anterior cervical nodes), and management (throat swab taken or not, antibiotic prescribed or not, and the type of antibiotic). Patient file numbers were kept private and used only to access the mentioned data. The Modified Centor score (or McIsaac score) was calculated for each patient using the indicators mentioned in Table 1[12]. Microsoft Excel was used to arrange data and the Statistical Package for the Social Sciences (SPSS) was used for data analysis.

Calculation of the Modified Centor score (McIsaac score):

The McIsaac score was used in this study as a clinical score to assess the likelihood of having GAS pharyngitis [13]. The clinical importance of this score stems from the fact that it has sensitivity up to 96.9% compared to physician care which has sensitivity of 70.6%. Moreover, specificity is similar to that compared to physician care. This score assigns points to certain clinical features to identify patients at higher risk for bacterial pharyngitis as shown in Table 1. In our study, if a patient's record indicated that they had a fever of more than 38 degrees, we deemed them to have fever. In most of the cases, fever was unspecified and the grade wasn’t mentioned, therefore the patient wasn’t assigned a point. Regarding the other parameters, patients scored the points according to the data documented in their files

Table 1: Modified Centor (or McIsaac) Score

Table 1: Modified Centor (or McIsaac) Score	
Criteria	Points
Temperature > 38°C (>100.5 °F)	1
Absence of cough	1
Swollen, tender anterior cervical nodes	1
Tonsillar swelling or exudate	1
Age 3 to 14 years	1

Results

A total of 290 cases were included this study. The majority of them were males (61.4%) and in the age range of 3-6 years (52%), Table 2. Around one third of the study sample (38%, n=180) were reported to have fever when they came to hospital. The majority of the cases did not complain of swollen cervical nodes (97%, n= 282), nor tonsils swelling (97.6%, n=283). For cough, half of the study sample was reported to have cough (n=145). More than two thirds of the cases (75%, n= 217) scored two or more on the Modified Centor Score Criteria (n = 217) Table 3, of which 58% received antibiotics (n= 126). For the 73 cases that had a Modified Centor score of < 2, 34 of them (46.6 %) received antibiotics and no swab was taken for any of them. Overall, it was found that more than half the study sample (55.2%, n = 160) were prescribed antibiotics. Azithromycin was found to be the most commonly prescribed antibiotic (23.4%, n = 68) followed by Amoxicillin/ clavulanic acid (20%, n = 58) Table 4. For throat swab, eight patients had their throat swab taken (2.8%), all of which had a Centor score of more than two, and 6 of them empirically received antibiotics. Out of the 160 cases that received antibiotics, only two patients had a documented penicillin allergy and were given azithromycin accordingly. Over the seven-month period, pharyngitis visits were most common in December, followed by September, with least number of cases in June (Figure 1). Among the included variables, it was found that there is a significant correlation between Modified Centor Score value and antibiotic prescribing ($r = 0.154$, $p = 0.009$). This indicates that the chance of receiving antibiotic was higher for those presenting with more signs and symptoms. Presence of fever was also found to be significantly associated with antibiotic prescription ($r = 0.204$, $p < 0.001$). Furthermore, age was found to be an important variable as more antibiotics were prescribed for elder children compared to younger children ($r = 0.189$, $p = 0.001$). Lastly, the rate of antibiotic prescribing was not found to be altered by the time of the year at which a case was seen (p value: 0.520)

Table 2. Demographics of cases (N = 290).

Variable	N	%
Gender		
Male	178	61.4%
Female	112	38.6%
Age		
3 – 6 years	151	52%
7 – 10 years	87	30%
11 – 13 years	52	18%

Table 3: Modified Centor Score (MSC) Results

Variable	N	%
MCSC*		
1	73	25.2%
2	166	57.2%
3	50	17.2%
4	1	0.3%
* MCSC: Modified Centor Score Criteria.		

Table 4. Prescribed Antibiotics (N = 290).

Antibiotics	N	%
No antibiotics	130	44.8%
Azithromycin	68	23.4%
Amoxicillin	25	8.6%
Amoxicillin/Clavulanic Acid	58	20%
Cefixime	2	0.7%
Ceftriaxone + Amoxicillin/Clavulanic Acid	2	0.7%
Cefdinir	1	0.3%
Cefuroxime	1	0.3%
Penicillin	2	0.7%
Cefadroxil	1	0.3

Discussion

This is the first objective study to assess antibiotics prescribing and physicians' adherence to clinical guidelines regarding the management of pharyngitis in paediatric population in Palestine. The results revealed that throat swabs are not used routinely in the studied setting which led to expected overprescribing of antibiotics. Moreover, inappropriate antibiotic selection was observed as well. As indicated by the results, around three-quarters of the cases had a Modified Centor score of ≥ 2 . According

to clinical guidelines, a Modified Centor score of ≥ 2 necessitates testing for GABHS pharyngitis using throat swab or RADT, as the likelihood for GABHS pharyngitis in patients having a Modified Centor score of 2 is estimated to be 20.5% and increases as the score increases[14]. Antibiotic therapy should be started once GABHS pharyngitis is documented by RADT or throat culture. However, only 8 throat cultures were obtained, yet 160 patients (55%) received antibiotics empirically, without any confirmatory test for the presence of bacterial pharyngitis. Throat swabs are an essential part of pharyngitis management, and their use is encouraged in various clinical guidelines to properly guide therapy and decrease unnecessary antibiotics use [15].

Our findings revealed that 74.8% of patients had a score of ≥ 2 , and more than half of them received antibiotics without having any confirmatory tests for GABHS pharyngitis (throat culture was ordered only for 8 of them). This is an alarming finding and would lead to significant overuse of antibiotics. As previous studies showed that only 25% of patients with a Centor score of ≥ 3 had a documented positive throat culture for GABHS pharyngitis [16]. On the other hand, even patients having a score < 2 , half of them received antibiotics, while no throat swabs were ordered for these patients. However, it was found that the higher the Centor score is the higher the chance of antibiotic prescribing ($r = 0.154$, $p = 0.009$). This indicates that the more signs and symptoms the child experience, the more likely physicians will attribute it to bacterial causes. This emphasizes the vital role of throat cultures, as a certain diagnosis can't be made relying only on clinical features. Moreover, in the absence of a positive throat culture or RADT, overestimation of bacterial pharyngitis and the associated antibiotic use remain a true concern.

In this study fever was found to be the most common complaint occurring in one third of the study sample and was significantly associated with antibiotics prescribing. This finding is in agreement with other studies where fever was reported to be the most common clinical feature in confirmed bacterial cases [16]. However, fever is also seen in viral pharyngitis and decisions made solely based on the presence of fever might lead to antibiotics overuse.

In pharyngitis, similar to other infections, there might be certain alarming information demanding and justifying the use of empirical antibiotics before obtaining swab results. These include limited conditions where a patient has a high suspicion of GABHS pharyngitis; i.e. having a diagnosis of scarlet fever, a symptomatic child having a household member with documented GABHS infection or in cases where the patient (or a family member) has a history of ARF [3].

However, if none of the mentioned criteria is present, diagnosis should always be confirmed using throat culture or RADT prior to antibiotic initiation [3]. This is a safe practice even when MCS is >2 (i.e GABHS is suspected) since starting antibiotics in bacterial pharyngitis within 9 days of symptom onset can still prevent the development of complications (mainly rheumatic fever) [3, 17].

Regarding antibiotic selection, there was an obvious inappropriate antibiotic selection, similar to previous findings involving paediatric patients [18]. In a study that was conducted in Canada, for example, antibiotics were prescribed inappropriately in 85% of cases in preschool children having pharyngitis [8]. Another study from the United states showed that over a quarter of children received antibiotics for

pharyngitis, although they weren't indicated according to treatment guidelines[7]. This indicates that antibiotic overprescribing is a global issue facing the healthcare sector, not only in our studied setting. Oral penicillin V or amoxicillin are recommended in treating GABHS pharyngitis and should be selected as first line agents for patients without penicillin allergy. These agents have a narrow spectrum of activity, few side effects and are of reasonable cost [19]. Macrolides and cephalosporins can be used as alternatives for type I and II penicillin allergies, respectively [3]. However, as shown by Table 4, azithromycin was prescribed for 66 patients (41%) whereas only 2 patients had a documented penicillin allergy. These findings are similar to other studies' findings where macrolides use in pharyngitis was reported to be substantially increasing against the recommendations of treatment guidelines [18]. Physicians are advised to adhere to clinical guidelines regarding antibiotic selection as there is no evidence that macrolides are clinically superior to penicillin in the absence of penicillin allergy [20].

Pharyngitis cases can be seen anytime throughout the year, but peak seasons depend on the causative agent, and it is generally during winter[3, 21, 22]. This matches our results (Fig. 1), as the highest incidence was in December. However, pharyngitis cases due to viral causes, are usually seen in summer [2, 21]. This could explain the gradual increase of visits from June to September as shown in Chart 1. However, when it comes to antibiotics prescribing, the rate of antibiotic prescribing was not found to be altered by the time of the year at which a case was seen (p value: 0.520). This could indicate that little attention is being paid to viral pharyngitis as a possible and common cause for pharyngitis especially in summer season. Another interesting finding is that antibiotic prescribing rate was significantly higher in elder children than younger children which might be out of fear of developing serious complications such as ARF. Overall, the results of this study highlight the need for enforcing committing to guidelines in the management of pharyngitis.

Conclusion

The results of this study strongly emphasize the need for reviewing and adhering to clinical guidelines. It was noticed that throat swabs are not used routinely in the studied setting which led to expected overprescribing of antibiotics. Moreover, inappropriate antibiotic selection was observed as well, necessitating modifying the usual prescribing patterns using evidence-based medicine. Rationalizing the use of antibiotics has become one of the main health related goals in the past years. While it is still challenging to do so in some medical departments or for some critical cases for which treatment is not yet standardized, it is essential to adhere to clinical guidelines for those infectious diseases for which treatment has been well established. Pharyngitis management should include appropriate swabs collection and antibiotics selection. Prescribing antibiotics empirically early on for most patients with pharyngitis will hasten the development of bacterial resistance and will increase the cost of treatment without additional benefit in terms of protecting patients from severe pharyngitis complications.

Strengths And Limitations Of This Study

Strengths: The study was conducted in a central governmental hospital where most of the nearby population receives medical help. The hospital hosts paediatric residency program, so the study reflects the practice of current and future paediatricians.

Limitations: Only 7 months were included since ICD-10 codes were not properly used and cases collection through electronic search was not feasible. Data were collected manually through reviewing all ER cases and it is therefore subjected to human errors.

Abbreviations

Beta haemolytic streptococcus (GABHS), Rapid antigen-detection test (RADT), Acute Rheumatic Fever (ARF), Palestine Medical Complex (PMC)

Declarations

Ethics approval

The study was approved by the IRB committee at Faculty of Graduate Studies, Health Informatics Program, Health Sciences Department, Arab American University.

Consent for publication

Not applicable.

Data Availability:

Data available from the corresponding author upon reasonable request.

Competing interests

The authors state that they do not present any conflict of interests in the present research

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Authors' contributions

All authors have made valuable contributions to this study. SN designed the study, planned and supervised the work, review –editing, HF, HS designed the study, did the literature search, drafted the manuscript, participated in data analysis, editing, MD, analyzed the results, editing, RA, MM, collected the data, HN, review, editing, and submission of the article. All co-authors approved the final version of the manuscript.

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Figures

Figure 1

Cases distribution over the selected months