

## Approach to a Child with Sore Throat

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**Abstract** Sore throat is one of the common reasons for outpatient and emergency visits among children. It could be because of several etiologies; of these bacterial pharyngitis is the most important. Major challenge for the clinician is to diagnose group A beta hemolytic streptococcus (GABHS) pharyngitis and diphtheria, which are associated with serious complications. Throat swab smear with culture and rapid antigen tests are useful for making the diagnosis but the later may not be available in resource poor settings. Many clinical scores have been devised to diagnose GABHS with variable success but usually clinical features, epidemiological criteria and expert clinical judgment with or without supportive investigations indicate need for antibiotics. A child with sore throat and toxic look may have diphtheria or parapharyngeal/retropharyngeal abscess, and therefore should be hospitalized.

**Keywords** Children · Group A beta-hemolytic streptococcus · Sore throat · Diphtheria · Pharyngitis · Throat swab

### Introduction

Upper Respiratory tract infections are seen with great frequency in both children and adults and have remarkable economic impact, related to the frequent prescription by physicians of antibiotics, even when the causative agents of infection are not bacteria. About one-fourth of children with sore throat have bacterial pharyngitis and about half of the families with index case have a secondary case [1].

Identification and adequate antibiotic treatment of group A streptococcal sore throat is important for primary prevention of acute rheumatic fever, as it carries approximately 3% risk of development of acute rheumatic fever.

### Definition

Soreness is generally described by the patient as pain in the throat without the effort of swallowing and also a painful swallow [2]. *Sore throat* is primary symptom of pharyngitis. The terms “sore throat” and “pharyngitis or pharyngotonsillitis” are often used interchangeably. *Pharyngitis* refers to objective evidence of inflammation of the pharynx, such as exudates, ulceration, or definite erythema. Redness of the throat may occur as part of the general redness of all mucous membranes in a patient with fever. A diagnosis of pharyngitis is justified only when the pharynx is redder than the rest of the oral mucosa.

### Etiology

Most sore throats are caused by viruses. Less often, sore throats are due to bacterial infections.

#### Viral Infections

- Corona virus, rhinovirus, adeno virus, influenza and parainfluenza are the commonest etiological agents and usually presents as common cold.
- Other viral infections that can present with sore throat are Epstein Barr (EB) virus and HIV which can present as a sore throat in initial course of illness.
- Recurrent sore throat can occur due to cytomegalovirus or fungal infections in immunosuppressed patients.

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## Bacterial Infections

- Group A beta-hemolytic streptococcus (GABHS) is the most common cause of bacterial sore throat. It accounts for 15–36% of cases of acute pharyngitis in children in west [1], and 13.4% of cases in India, according to one study done at PGIMER [3].
- Streptococcus type C and G
- Diphtheria—is an important cause in India and many developing countries.
- *H influenza*, *Staphylococcus aureus*, Mycoplasma, *Chlamydia pneumoniae*, *Moraxella catarrhalis* and *Yersinia* are some uncommon bacterial causes.
- *Fusobacterium necrophorum* infection. This uncommon infection which starts as fever and sore throat, can complicate into Lemierre's syndrome. (Positive blood culture, clinical or radiographic evidence of internal jugular vein thrombosis, and at least one metastatic focus.)

## Other Causes

- *Peritonsillar, Retropharyngeal and Lateral Pharyngeal abscesses*—usually due to spread of infection from local site like bacterial tonsillitis. Along with fever and sore throat, other features like painful swallowing, drooling, trismus, visible swelling below mandible and deviation of uvula to opposite side may be present.
- *Allergies*—especially when complicated by postnasal drip.
- *Irritants*—Dust, tobacco smoke (in teenagers) or chemicals (occupational hazard for children/adolescents working in factories). Sore throat in such patients is usually chronic.
- *Muscle strain*—talking in loud noise without rest for long period.
- *GastroEsophageal Reflux Disease (GERD)*
- *Psychogenic*

## Approach to the Patient

Majority of the times, history and clinical examination gives clue to etiology (Table 1). The major challenge is to diagnose GABHS infection, because the signs and symptoms of GABHS pharyngitis overlap with other infections and untreated GABHS can cause serious complications. No single element of the history or physical examination reliably confirms or excludes GABHS pharyngitis.

Several scoring systems have been developed to predict which patients will have GABHS. Use of these does improve quality of care but none of these systems, however, is totally reliable in identifying children who need treatment [4]. A clinical scoring system has been designed in India but it has to be validated for local use. This scoring system uses variables such as age, season, fever, erythema of pharynx, size of tonsil, pharyngeal exudates; lymphadenopathy and pain in throat, and scores are assigned according to throat culture positivity in association with the same. Cut off value of 15 predicts GAS infection with 91% sensitivity and 98% specificity [3].

The evaluation of patient should include the following:

### History

- Onset and duration
- Fever—degree (doesn't help much to differentiate)
- Associated cough, coryza, conjunctivitis (more with viral); headache, myalgia (more with GABHS)
- Any breathing difficulty especially new onset snoring at night or stridor (a likely sign of developing abscess)
- History of rash, diarrhea, allergy
- History of regurgitation, epigastric or retrosternal pain usually indicates GERD
- History of sore throat in family in past 2 wks.
- Similar complaints in past, with vaccination history

**Table 1** Clues towards etiological diagnosis of sore throat

Enterovirus	Summer, pharyngeal vesicle/ulcer, rash, diarrhea
EBV(infectious mononucleosis)	Teenagers, tender posterior cervical lymphadenopathy, tender hepatomegaly, splenomegaly, petechial rash, edema of eyelids, supported by thrombocytopenia, >10% atypical lymphocytes on peripheral smear and positive monospot test or IgM antibody against Viral Capsular Antigen (VCA).
Adenovirus	Preschoolers, conjunctivitis, follicular hyperplasia of tonsils
Diphtheria	Unvaccinated child, shallow ulceration of upper lips and external nares, neck swelling, characteristic pseudomembrane
GastroEsophageal Reflux Disease	Retrosternal burning/epigastric pain, lump in throat, no fever
Fungal	Oral thrush, common in neonates and infants <9 months. Immunocompromised/HIV

## Examination

Look oral cavity with a good light for-

- *Exudates*: White/gray scum on the surface of the tonsils or pharynx, readily wiped off without producing bleeding is more likely with bacterial pharyngitis.
- *Ulcer*
- *Membrane*: Exudates of bacterial pharyngitis may organize as gray-white layer of materials that can be peeled from the pharynx.
  - A membrane is seen with infectious mononucleosis, diphtheria and sometimes streptococcal infection. *Arcanobacterium hemolyticum* and tularemia are rare causes of membranous pharyngitis.
  - Gray to black adherent membrane, with extension beyond the faucial area (esp. soft palate and uvula), dysphagia, and relative lack of fever suggest a diagnosis of diphtheria.
  - Oral thrush seen in neonates and infants which can have pseudomembrane (curd like plaques), removal of which may cause mild punctuate bleeding.
- *Bulging of oropharynx or uvula displacement* are suggestive of parapharyngeal or peritonsillar abscess.
- *Painful vesicular lesions on pharynx and tonsils* are characteristic of herpangina. Herpes simplex produces painful vesicles confined to anterior mouth which may sometimes extend to anterior tonsillar pillars.
- *Lymphadenopathy*: Look for anterior (tonsillar) and posterior cervical lymph nodes. Tender anterior lymphadenopathy favors bacterial sore throat. Tender posteri-

or cervical and/or generalized lymphadenopathy favours Epstein Barr (EB) virus infection.

- Examine for neck swelling, conjunctivitis, auscultatory abnormalities and hepatosplenomegaly.
- Vital signs, including blood pressure, should be recorded. Poor quality of the heart sounds raises the possibility of diphtheritic myocarditis. Absence of a heart murmur or dependent edema should be noted for their relevance to rheumatic fever and glomerulonephritis.

Common signs and symptoms of streptococcal pharyngitis include sore throat, temperature  $\geq 38.3^{\circ}\text{C}$ , tonsillar or pharyngeal exudates and cervical lymphadenopathy. Cough, coryza and diarrhea are more common with viral pharyngitis. Differentiating features between streptococcal pharyngitis and viral pharyngitis are given in Table 2.

## Investigations

A major concern in emergency room for a child with sore throat is not to miss diagnosis of diphtheria and GABHS pharyngitis.

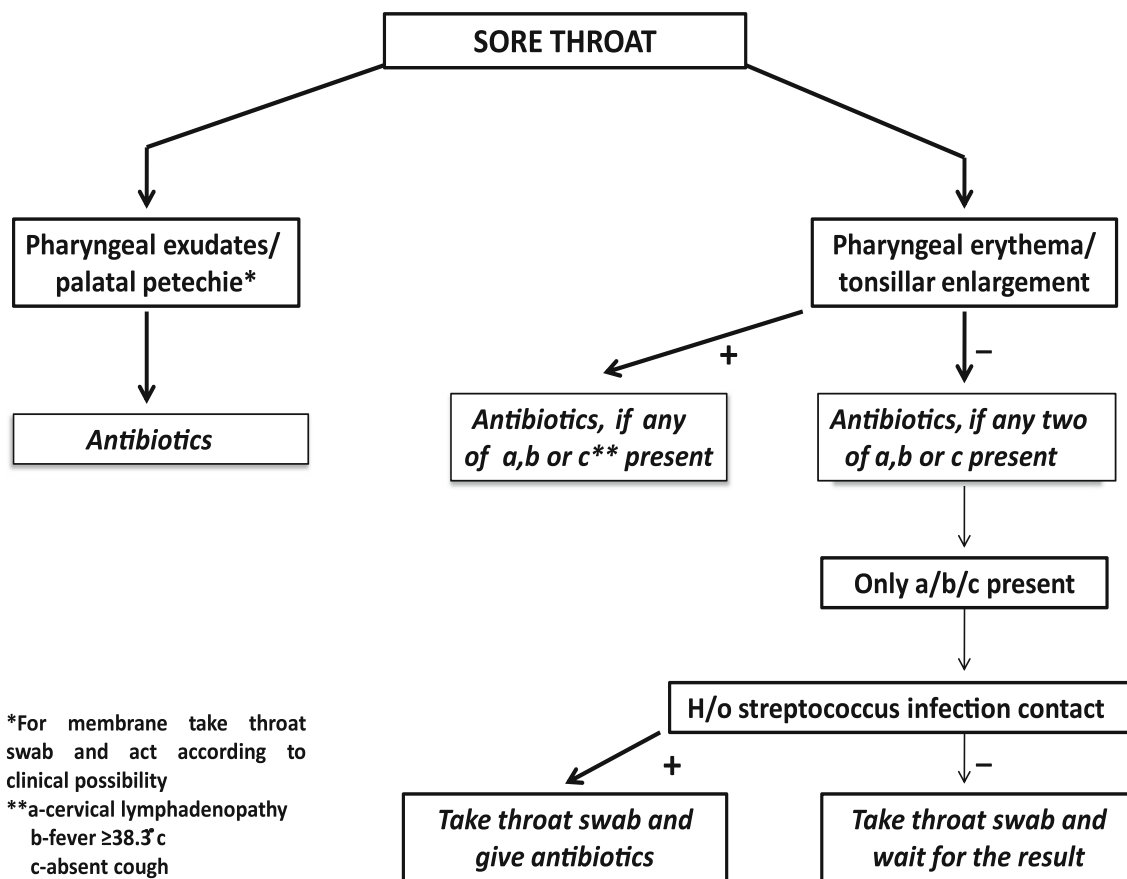
- Obtain *throat swab* for bacterial smear and culture including Albert stains for diphtheria. A provisional diagnosis of diphtheria is suggested if typical drum stick organisms are seen in the smear. However, a definitive diagnosis requires growth of *C. diphtherium* in culture as diphtheroids are commensals in throat.
- *Rapid Antigen Diagnostic Tests (RADTs)* for GABHS [5, 6]: It is based on nitrous acid extraction of group A carbohydrate antigen from organisms obtained by throat

**Table 2** Clinical clues to differentiate viral infection from those of Group A beta-hemolytic streptococcus (GABHS)

	GABHS	Viruses	
Age	5–11 years	All ages	
Season	Late winter/early spring	All	
Symptoms	Sudden onset	Onset varies	
	Severe sore throat	Mild sore throat	
	Absent cough <sup>a</sup>	Present	
	Fever $\geq 38.3^{\circ}\text{C}$ <sup>a,b</sup>	Varies	
	Absent coryza	Present	
	Headache, myalgia	+/-	
	Throat pain	-	
	Signs	Severe pharyngeal erythema	Mild
		Pharyngeal exudates <sup>b</sup>	No exudate
		Palatal petechiae <sup>b</sup>	Enanthem
Anterior cervical nodes <sup>a</sup> , tender		Varies	
Tonsillar exudate		Absent	
Tonsil enlargement large/moderate		Normal	
Scarletiform rash <sup>b</sup>		Exanthem	
H/o streptococcus exposure in past 2 wks	Present <sup>b</sup>	Absent	

<sup>a</sup>High sensitivity for GABHS [1]

<sup>b</sup>High specificity for GABHS [1]



Note: antibiotics are indicated in any child who is looking sick and/or suspected to have complications.

Fig. 1 Clinical decision guideline for suspected streptococcal pharyngitis

swab. It is highly specific (>95%), and provides immediate results, but has variable sensitivity. Throat culture confirmation of a negative RADT is recommended to increase sensitivity. Confirmation of positive test is not recommended because of very high specificity.

- Other investigations to be done according to clinical possibility.

- Complete blood count
- Peripheral blood smears-for atypical lymphocytes.
- EB virus serology (IgM antibody against VCA(viral capsular antigen))
- Streptococcal antibody titre is not useful for diagnosis of streptococcal pharyngitis and is not routinely recommended.

Table 3 Antibiotic choice for streptococcal pharyngitis

Drug	Route	Dosage	Duration
Penicillin V	Oral	<27 kg–250 mg 2–3/day ≥27 kg–250 mg 3–4/day or 500 mg 2/day	10 days
Amoxicillin <sup>a</sup>	Oral	40 mg/kg/day in 3 divided doses	10 days
Penicillin G benzathine	IM	<27 kg–6 lac unit ≥27 kg–12 lac unit	Single dose
<b>Options for patients allergic to penicillin</b>			
Erythromycin ethylsuccinate	Oral	30–50 mg/kg/day in 2–4 divided doses	10 days
Erythromycin estolate	oral	20–40 mg/kg/day in 2–4 divided doses	10 days
Cefadroxil	Oral	30 mg/kg/day in 2 divided doses	10 days
Cephalexin	Oral	25–50 mg/kg/day in 2 divided doses	10 days

<sup>a</sup> Amoxicillin is equally effective as penicillin V and is more palatable

The following medications are FDA (U.S. Food and Drug Administration) approved, but are not recommended by guidelines for primary GABHS therapy: azithromycin, clarithromycin, cefpodoxime, cefibuten, and cefdinir

- X ray soft tissue neck (lateral view) for retropharyngeal abscess.
- CT scan of neck including base of skull for abscess.

### Throat Swab Sampling Technique

Samples should be obtained by vigorous swabbing of both tonsillar surfaces or fossae and the posterior pharynx [6, 7]. Correctly sampled and plated, throat swab culture has 90–95% sensitivity. Swabbing the soft palate and uvula should be avoided, because it dilutes the inoculums.

### Management

GABHS pharyngitis is self-limiting illness. Antibiotic treatment provides acute symptom relief, prevent suppurative (otitis media, sinusitis, quinsy) and non suppurative complications, and reduce communicability. Antibiotics reduce incidence of rheumatic fever by more than two third [8]. Clinical decision guideline for sore throat is given in Fig. 1.

Clinical features, epidemiological criteria and expert clinician judgment with or without supportive investigation usually indicate need for antibiotics. Currently used score for decision making in pharyngitis has been adapted by adding age to four components of original Centor score (absence of cough, swollen and tender anterior cervical nodes, temperature >38°C and tonsillar exudates or swelling) [9]. Each component is given 1 point; age of 3–14 years carries 1 point while that of 14–44 years, zero. Patients with a score of zero or 1 do not require testing or antibiotic therapy. Patients with score of 2 or 3 should be tested and prescribed antibiotics if found positive while patients with score of 4 or higher, are at high risk of streptococcal pharyngitis and should be given empiric treatment [10].

### Antibiotics

Based on cost, narrow spectrum of activity, safety, and effectiveness, penicillin is the drug of choice [10, 11]. Shorter duration of treatment increases risk of bacteriological recurrence [12] Inappropriate use of macrolides for treatment of GABHS pharyngitis has been the main cause of resistant strains in western countries [13]. The various alternatives to penicillin and the dosage of antibiotics are given in Table 3.

### Diphtheria Management

- Stabilize child (ABC...) (For details refer to section on upper airway obstruction).
- Diphtheria antitoxin: 50,000–120,000 U IV depending on extent of involvement.

- Antibiotics: Aqueous crystalline penicillin G 40,000 U/kg/dose 6 hourly IV or erythromycin 15 mg/kg 8 hourly (not to exceed 2 g/day) oral/IV for 14 days.

For prophylaxis to contacts same dose of erythromycin for 7 days or a single injection of benzathine penicillin G (600,000 U IM for <30 kg, 1,200,000 U IM for ≥30 kg.) is recommended.

### Indication for Hospitalization

- Toxic looking child
- Not accepting orally well
- Suspected to having associated complications or diphtheria.

**Conflict of Interest** None.

**Role of Funding Source** None.

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