

Original Research Article

ACUTE MEMBRANOUS TONSILLITIS IN CHILDREN: CLINICAL PRESENTATION, ETIOLOGICAL SPECTRUM AND TREATMENT OUTCOMES

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ABSTRACT

Background: Acute membranous tonsillitis is an important clinical presentation in children because a tonsillar membrane may occur with several infectious etiologies, including streptococcal infection and diphtheria. Differentiation based solely on clinical appearance may be difficult, making microbiological evaluation important. **Objective:** To evaluate the clinical presentation, etiological profile, microbiological findings, treatment and clinical outcomes of children presenting with acute membranous tonsillitis.

Materials and Methods: A hospital-based cross-sectional study was conducted in the Department of Otorhinolaryngology, Sardar Patel Medical College and PBM Hospital, Bikaner, Rajasthan, from April 2024 to April 2025. Thirty children aged <14 years presenting with a white or membranous patch over the tonsillar surface were included by convenience sampling. Demographic and clinical details, immunization history, tonsillar and cervical findings, hematological parameters and microbiological investigations were recorded. Throat swabs were subjected to culture and sensitivity, Gram staining and Albert staining, with KOH mount performed as part of the microbiological evaluation. Treatment modalities, complications and clinical outcomes were documented.

Results: The largest proportion of patients belonged to the 6–10-year age group (43.3%), while females constituted 53.3% and rural residents 60.0%. Seventy percent had a history of immunization. Most patients presented after 4–5 days of illness (56.6%). Fever persisted for 4–5 days in 83.3%, and dysphagia/odynophagia for 3–4 days in 60.0%. Bilateral tender cervical lymphadenopathy was the predominant nodal finding (56.7%). Leukocytosis was present in 70.0% of patients. Bacterial etiologies accounted for 66.7% of cases, with *Streptococcus pyogenes* being the most frequently identified pathogen (46.7%), followed by *Corynebacterium diphtheriae* (20.0%). *Candida albicans* accounted for 10.0%, while 23.3% were classified as other etiologies. All patients received intravenous antibiotics. Tracheostomy was required in 6.7%, one patient had ECG changes suggestive of myocarditis, and all included patients recovered without mortality.

Conclusion: Acute membranous tonsillitis has a heterogeneous etiological spectrum, with *S. pyogenes* predominating in this cohort. The findings emphasize that a tonsillar membrane is not synonymous with diphtheria and that microbiological assessment is important for etiological evaluation and appropriate management. Early recognition and monitoring for airway and cardiac complications remain essential.

Keywords: Acute membranous tonsillitis; Tonsillitis; *Streptococcus pyogenes*; *Corynebacterium diphtheriae*; Diphtheria; Children; Microbiological profile.

INTRODUCTION

Acute tonsillitis is a common inflammatory and infectious condition of the palatine tonsils, particularly affecting children and young adults. It commonly presents with fever, sore throat, odynophagia or dysphagia, and cervical lymphadenopathy. Although most cases are self-limiting, identification of the underlying etiology is important because the clinical course, need for antimicrobial therapy, and risk of complications vary according to the causative organism. Bacterial, viral and, less commonly, fungal pathogens have all been implicated in tonsillar infections.^[1,2]

Acute membranous tonsillitis represents a distinct clinical presentation characterized by the development of a white, greyish-white or adherent membrane over the tonsillar surface. The presence of such a membrane is diagnostically important because it may be seen in a variety of infectious conditions and should not be considered pathognomonic of diphtheria. Studies of ulceromembranous and membranous tonsillar lesions have demonstrated a heterogeneous etiological spectrum, emphasizing the need for careful clinical assessment and appropriate microbiological investigation.^[3,4] The appearance of the membrane, its adherence and tendency to bleed on manipulation, together with associated lymphadenopathy and systemic manifestations, may provide useful clinical clues, although considerable overlap can occur between different etiologies.

Diphtheria remains an important differential diagnosis in patients presenting with a tonsillar membrane. Infection with toxigenic *Corynebacterium diphtheriae* classically produces an adherent pseudomembrane and may be associated with cervical lymphadenopathy and systemic toxicity. More severe disease can result in airway obstruction and systemic complications, including cardiac involvement. Although immunization has substantially reduced the burden of diphtheria, clinically suspected diphtherial illness continues to be encountered, and prompt recognition remains essential.^[5] Importantly, studies of diphtheria-like illness have demonstrated that organisms other than *C. diphtheriae* may also be isolated from patients with membranous throat lesions, reinforcing the need for microbiological confirmation rather than relying exclusively on clinical appearance.^[6]

Among bacterial causes of tonsillitis, *Streptococcus pyogenes* is an important pathogen, particularly in school-aged children. Accurate identification of streptococcal infection is clinically relevant because antimicrobial treatment may be indicated, while inappropriate antibiotic use should be avoided in patients with non-streptococcal disease.^[7] Other bacterial organisms, viruses and fungal pathogens may also contribute to tonsillar infection. Differences in the bacterial flora between bacterial

and viral tonsillitis further demonstrate the complex microbiological environment of the tonsillar surface.^[8]

Despite the clinical importance of membranous tonsillitis, available literature has frequently focused on diphtheria or on individual aspects of tonsillar infection. A comprehensive assessment incorporating demographic characteristics, presenting symptoms, membrane morphology, immunization status, hematological findings, microbiological profile, treatment and clinical outcomes may therefore provide a broader understanding of this condition.

The present study was undertaken to evaluate the clinical profile and etiological spectrum of acute membranous tonsillitis in children, with particular emphasis on clinical presentation, microbiological findings, treatment and outcomes.

MATERIALS AND METHODS

Study design and setting: A hospital-based descriptive observational study was conducted in the Department of Otorhinolaryngology, Sardar Patel Medical College and PBM Hospital, Bikaner, Rajasthan, over a period of one year from April 2024 to March 2025. The study included pediatric patients presenting to the ENT outpatient department or admitted to the Department of Otorhinolaryngology with a white or membranous patch over the tonsillar surface.

Study population and sample size: The study population comprised children ≤ 14 years presenting with a white patch over the tonsillar surface. The minimum sample size was calculated assuming an expected prevalence of acute membranous tonsillitis of 2%, a 95% confidence level and an absolute allowable error of 5 percentage points, using the formula $n = Z^2P(1-P)/d^2$. The calculated minimum sample size was 30, and 30 eligible patients were included in the study.

Eligibility criteria and sampling: Children aged ≤ 14 years presenting with a white patch over the tonsillar surface and attending the ENT outpatient department or admitted to the Department of Otorhinolaryngology were eligible for inclusion. Patients who died before any intervention or therapeutic measure, those who left the hospital against medical advice, patients aged > 14 years, and those whose parents or guardians refused consent were excluded. Convenience sampling was used for recruitment.

Data collection and clinical assessment: Written informed consent was obtained from the parents or guardians of all participants included in the study. A detailed history was obtained, including demographic characteristics, presenting complaints and immunization history, followed by a thorough clinical examination. The clinical assessment focused on the presenting features and examination

findings associated with acute membranous tonsillitis.

Laboratory and microbiological investigations: Immediately after admission, patients underwent relevant laboratory and microbiological investigations. Throat swabs were collected for culture and sensitivity, Gram staining and Albert staining, while KOH mount was performed as part of the microbiological evaluation. Routine blood investigations, blood glucose, serum electrolytes, renal function tests and electrocardiography (ECG) were also performed.

Treatment and clinical management: Following collection of throat-swab specimens, patients were initiated on injectable broad-spectrum antibiotics, analgesics and antiseptic gargles. Antibiotic therapy was subsequently modified when required according to the throat-swab culture and sensitivity results. Patients whose throat swab was positive for *Corynebacterium diphtheriae* were isolated and treated with antidiphtheritic serum along with antibiotics and were advised serial ECG monitoring for evidence of cardiotoxicity. Patients presenting with dehydration or dyselektrolytemia were managed with intravenous fluids, with medicine and pediatric consultations obtained when required. Nasogastric tube feeding was initiated in patients with severe odynophagia. Cardiology consultation was obtained for patients whose ECG findings

suggested myocarditis. Tracheostomy was performed in patients presenting with severe respiratory distress or stridor.

Statistical Analysis: Data were collected using a pre-structured and pre-tested proforma and entered into Microsoft Excel. Data were analyzed using appropriate statistical software. Categorical variables were summarized as frequencies and percentages, while continuous variables, where applicable, were summarized using appropriate measures of central tendency and dispersion. The analysis was primarily descriptive, and no inferential statistical comparisons were performed.

Ethical considerations: Informed consent was obtained from the parents or guardians of all participants before inclusion in the study. The study was conducted in accordance with the institutional requirements and ethical principles applicable to research involving pediatric participants.

RESULTS

A total of 30 children with acute membranous tonsillitis were included in the study. The findings are presented under demographic characteristics, clinical presentation, tonsillar and cervical findings, laboratory and microbiological findings, etiological profile, and treatment and outcome.

Table 1: Demographic characteristics of study participants (n=30)

Characteristic		No.	%
Age (years)	0–5	9	30.0
	6–10	13	43.3
	11–14	8	26.7
Sex	Female	16	53.3
	Male	14	46.7
Residence	Rural	18	60.0
	Urban	12	40.0
Immunization history	Present	21	70.0
	Absent	9	30.0

The largest proportion of patients belonged to the 6–10-year age group (43.3%), followed by those aged 0–5 years (30.0%) and 11–14 years (26.7%). Females constituted 53.3% of the study population.

Rural residents accounted for 60.0% of cases. A history of immunization was present in 70.0% of patients, while 30.0% had no immunization history.

Table 2: Duration and severity of presenting symptoms (n=30)

Clinical characteristic		No.	%
Duration of illness (days)	2–3	2	6.7
	4–5	17	56.6
	6–7	11	36.7
Duration of fever (days)	2–3	1	3.3
	4–5	25	83.3
	6–7	4	13.4
Duration of sore throat (days)	2–3	7	23.3
	4–5	19	63.3
	6–7	4	13.4
Duration of dysphagia/odynophagia (days)	1–2	4	13.3
	3–4	18	60.0
	5–6	8	26.7
Difficulty in breathing	None	18	60.0
	Minimal	10	33.3
	Severe	2	6.7

Most patients presented after 4–5 days of illness (56.6%). Fever persisted for 4–5 days in 83.3% of

patients, while sore throat of 4–5 days' duration was reported in 63.3%. Dysphagia/odynophagia most

commonly persisted for 3–4 days (60.0%). Respiratory difficulty was absent in 60.0% of

patients, minimal in 33.3%, and severe in 6.7%.

Table 3: Tonsillar membrane characteristics and cervical lymphadenopathy (n=30)

Clinical finding		No.	%
Tonsillar membrane	Dirty white	3	10.0
	Greyish white	7	23.4
	Greyish white, bleed on touch	6	20.0
	Greyish white, adherent	1	3.3
	White	7	23.4
	White patchy	5	16.7
	White, non-adherent	1	3.2
Cervical lymphadenopathy	Bilateral tender	17	56.7
	Bilateral non-tender	6	20.0
	Unilateral tender	4	13.3
	Minimal	3	10.0

The tonsillar membrane showed variable morphology. Greyish-white and white membranes were the most frequent individual appearances (23.4% each), followed by greyish-white membranes that bled on touch (20.0%) and white

patchy membranes (16.7%). Cervical lymphadenopathy was predominantly bilateral and tender (56.7%), followed by bilateral non-tender lymphadenopathy (20.0%).

Table 4: Hematological and preliminary microbiological findings (n=30)

Investigation/finding		No.	%
Hemoglobin (g/dL)	<7	1	3.3
	7.1–9.0	13	43.3
	9.1–11.0	16	53.4
	>11.0	0	—
Total leukocyte count (/mm ³)	<4,000	0	—
	4,000–11,000	9	30.0
	>11,000	21	70.0
KLB staining/KOH mount/swab culture	Epithelial cells, occasional	2	6.7
	KLB-like organisms/gram-positive rods	6	20.0
	No KLB/normal flora	8	26.7
	No KLB/gram-positive cocci	14	46.6

The majority of patients had hemoglobin levels between 9.1 and 11.0 g/dL (53.4%), while 43.3% had levels of 7.1–9.0 g/dL. Leukocytosis was present in 70.0% of patients. On preliminary throat-

swab microbiological examination, gram-positive cocci were the most frequent finding (46.6%), followed by normal flora (26.7%) and KLB-like organisms/gram-positive rods (20.0%).

Table 5: Etiological profile of acute membranous tonsillitis (n=30)

Etiological category/causative agent	No.	%
Bacterial	20	66.7
Streptococcus pyogenes	14	46.7
Corynebacterium diphtheriae	6	20.0
Fungal	3	10.0
Candida albicans	3	10.0
Others	7	23.3
Total	30	100.0

Bacterial etiologies accounted for 66.7% of cases and constituted the predominant etiological category. Streptococcus pyogenes was the most frequently identified causative agent (46.7%),

followed by Corynebacterium diphtheriae (20.0%). Candida albicans accounted for 10.0% of cases, while 23.3% were classified as other etiologies.

Table 6: Treatment, complications and clinical outcome (n=30)

Parameter	No.	%
IV antibiotics	30	100.0
Antidiphtheritic serum + antibiotics	6	20.0
IV antibiotics + topical antifungal	3	10.0
Tracheostomy	2	6.7
ECG changes suggestive of myocarditis	1	3.3
Recovery	30	100.0
Mortality	0	0

All 30 patients received intravenous antibiotics. Antidiphtheritic serum with antibiotics was

administered in 6 patients (20.0%), while 3 patients (10.0%) received topical antifungal therapy in

addition to intravenous antibiotics. Two patients (6.7%) developed severe respiratory difficulty/airway obstruction and underwent tracheostomy. One patient (3.3%) developed ST-T changes on ECG suggestive of myocarditis. All patients recovered and no mortality was recorded.

DISCUSSION

Acute membranous tonsillitis is an important clinical presentation in children because the presence of a tonsillar membrane raises the possibility of diphtheria while also occurring with several other infectious etiologies. In the present study of 30 children, the largest proportion belonged to the 6–10-year age group (43.3%), with a slight female predominance (53.3%). The predominance among school-aged children is consistent with the recognized epidemiology of acute tonsillar infections and with previous studies of membranous tonsillar disease.^[1,3] The rural predominance observed in the present study (60.0%) should, however, be interpreted cautiously because of the small sample size and single-centre design.

Most patients presented after 4–5 days of illness (56.6%), with fever and sore throat commonly persisting for 4–5 days. Dysphagia/odynophagia was present predominantly for 3–4 days (60.0%). These findings indicate that patients generally presented during the middle of the first week of symptomatic illness. Previous literature has similarly described acute tonsillitis as a predominantly short-duration illness, with symptoms generally occurring over several days.^[2] Respiratory difficulty was absent in 60.0% of patients, while severe respiratory difficulty occurred in only 6.7%, suggesting that significant airway compromise was uncommon but clinically important when present.

The tonsillar membrane showed considerable morphological variation. In the present study, greyish-white and white membranes were the most frequent individual appearances, each observed in 23.4% of patients, followed by greyish-white membranes that bled on touch (20.0%) and white patchy membranes (16.7%). This variability supports the observation that membrane morphology alone may not reliably establish the underlying etiology. The presence of an adherent or bleeding membrane may provide useful clinical clues, but microbiological assessment remains important for etiological differentiation.^[1,3,4]

An important finding was that 70.0% of patients had a history of immunization, whereas 30.0% were reported as unimmunized. The occurrence of membranous tonsillitis among immunized children emphasizes that the presence of a tonsillar membrane should not automatically be attributed to diphtheria.^[9] At the same time, the identification of *C. diphtheriae* in 20.0% of the present cohort highlights the continued importance of maintaining

clinical suspicion for diphtheria and ensuring appropriate immunization coverage.^[10]

Hematological findings demonstrated that 53.3% of patients had hemoglobin levels of 9.1–11.0 g/dL and 43.3% had levels of 7.1–9.0 g/dL. Leukocytosis was present in 70.0% of patients. These findings indicate a substantial inflammatory response in the cohort; however, hematological parameters alone cannot reliably distinguish the specific infectious etiology and should therefore be interpreted alongside clinical and microbiological findings.^[11,12]

The most important finding was the etiological distribution. Bacterial etiologies accounted for 66.7% of cases, with *Streptococcus pyogenes* being the most frequently identified pathogen (46.7%), followed by *Corynebacterium diphtheriae* (20.0%). *Candida albicans* accounted for 10.0%, while 23.3% were classified as other etiologies. These findings reinforce that the presence of a tonsillar membrane is not synonymous with diphtheria and that membranous tonsillitis has a heterogeneous etiological spectrum.^[1,3,4] The relatively high proportion of *S. pyogenes* in the present cohort also supports the importance of appropriate microbiological evaluation when determining the need for antimicrobial therapy.^[7,12]

All patients received intravenous antibiotics, while antidiphtheritic serum was administered to six patients and topical antifungal therapy to three. Two patients required tracheostomy and one had ECG changes suggestive of myocarditis. Although airway intervention was uncommon, the occurrence of severe respiratory distress in 6.7% of patients highlights the importance of early recognition and timely airway management. All included patients recovered without mortality.

Overall, the findings suggest that acute membranous tonsillitis in children has a heterogeneous etiological profile dominated by bacterial infections, with *S. pyogenes* more frequently identified than *C. diphtheriae*. The results emphasize the importance of microbiological confirmation, appropriate antimicrobial therapy and vigilance for airway and cardiac complications.

CONCLUSION

Acute membranous tonsillitis in children demonstrates a heterogeneous clinical and etiological profile, with bacterial infections constituting the predominant cause in the present study. *Streptococcus pyogenes* was the most frequently identified pathogen, followed by *Corynebacterium diphtheriae*, while fungal and other etiologies accounted for the remaining cases. Although most patients presented with fever, sore throat, dysphagia/odynophagia and cervical lymphadenopathy, significant airway compromise was uncommon. The presence of a tonsillar membrane should therefore not be considered synonymous with diphtheria. Microbiological

evaluation is important for establishing the underlying etiology and guiding appropriate treatment. Despite a small proportion of patients requiring tracheostomy or having ECG changes suggestive of myocarditis, the overall outcome among included patients was favorable, with recovery in all 30 patients and no mortality recorded. Early recognition, appropriate antimicrobial therapy, and vigilance for airway and cardiac complications remain essential in management.

DECLARATIONS

Ethics approval and consent to participate: The study was conducted after obtaining approval from the Institutional Ethics Committee of Sardar Patel Medical College, Bikaner. Institutional approval for submission of the thesis protocol was documented vide No: F.29.(Acad)SPMC/2023/4046 dated 20 May 2024.

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Data availability: The data generated and analyzed during the study are available from the corresponding author on reasonable request.

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