



A Study on Acute Membranous Tonsillitis, Its Different Etiologies and Its Clinical Presentation in a Tertiary Referral Centre

Kalpana Sharma¹ · Sunita Das¹ · Abhilasha Goswami¹

Received: 8 February 2021 / Accepted: 13 April 2021
© Association of Otolaryngologists of India 2021

Abstract Membranous tonsillitis is the infection of the palatine tonsils where the exudation from the crypts coalesce to form a membrane over the tonsillar surface. It is a stage ahead of the acute follicular tonsillitis. There are different etiologies for membrane formation over the tonsils. The commonest cause in the present scenario is still *Corynebacterium diphtheriae*. A one year prospective study was conducted on patients presenting with membranous tonsillitis in a tertiary referral centre in North-East India. Proper history was taken, clinical examination and all the necessary investigations were done. The patients were managed conservatively, while a few patients required tracheostomy. In our one year study, we found that majority of the patients presenting with acute membranous tonsillitis were males (65%) and 35% were females. Most of the cases were seen in 6–12 years of age and belonged to the lower socioeconomic group, and also to the lower Assam belt. Most of the cases were seen in the months of November to January. This prospective study gives a view of the different etiologies of acute membranous tonsillitis, its presentation and how its management affects the outcome of the patients and also affects the mortality and morbidity. This study also shows that diphtheria is still prevalent in the current Indian scenario and

thus, proper implementation of the vaccination programs and prompt reporting of the cases should be done to prevent outbreaks.

Keywords Membranous tonsillitis · *Corynebacterium diphtheriae* · Immunization schedule · Mortality · Morbidity

Introduction

Tonsils are a mass of lymphoid tissue. The palatine tonsils, the adenoids, the lingual tonsils, the tubal tonsils and aggregates of pharyngeal submucosal lymphoid tissue together forms the Waldeyer's ring [1]. They provide local immunity and also act as sentinels against bacteria, viruses and other antigens which come into contact with the body through inhalation or ingestion. They are also involved in the production of immunoglobulins and development of both B-cell and T-cell lymphocytes. The palatine tonsils consists of surface epithelium, crypts and lymphoid tissue. Thus any infection of the tonsils may involve these components.

Acute tonsillitis is acute infection of the palatine tonsils and can be clinically of different types. Acute catarrhal tonsillitis occurs due to viral infection. Acute cryptic tonsillitis occurs when bacterial infection follows viral infection and gets entrapped in the crypts. Acute follicular tonsillitis occurs when inflammation spreads to the tonsillar follicles. Acute parenchymal tonsillitis occurs when bacterial infection spreads to the tonsillar parenchyma. Acute membranous tonsillitis occurs when exudates from the follicles coalesce to form a membrane over the surface of the tonsils. There are various clinical entities that can form membrane over the tonsils, and its severity and outcome

✉ Sunita Das
suni.das9293@gmail.com

Kalpana Sharma
kalpanasharmak@yahoo.co.uk

Abhilasha Goswami
abhilasha.goswami@gmail.com

¹ Department of Otorhinolaryngology and Head & Neck Surgery, Gauhati Medical College & Hospital, Guwahati 781032, Assam, India

depends on its different etiologies and its clinical management (Table 1).

Corynebacterium diphtheria is still the commonest cause of membrane formation over the tonsil. The patients suffering from it, usually present with fever, sore throat, odynophagia, malaise and sometimes with respiratory distress.

Aims of the Study

The study emphasizes on the various aspects of acute membranous tonsillitis in terms of:

1. Etiological factors
2. Clinical presentation
3. Diagnosis and management
4. Outcome

After approval by the Institutional Ethical Committee, this prospective study was done for one year and included all the cases with a white patch over the tonsillar surface that were admitted in the Department of Otorhinolaryngology and Head & Neck Surgery, Gauhati Medical College & Hospital, irrespective of their age and gender. The patients who died before any intervention or therapeutic measures were taken, or who left the hospital against medical advice, were excluded from the study.

Materials and Methods

- Consent of all the patients and their guardians included in the study were taken.
- Detailed history along with immunization history were taken
- Thorough clinical examination of all the patients were done.
- Immediately after admission, they were advised to do the necessary investigations which included throat swab for culture and sensitivity, gram stain, Albert stain; blood investigations which included routine blood examination, blood sugar level, serum electrolytes; and electrocardiogram (ECG).

Table 1 Etiological factors for membranous lesions over the tonsil [1]

Membranous tonsillitis	Vincent's angina
Infectious mononucleosis	Aphthous ulcer
Diphtheria	Leukaemia
Agranulocytosis	Traumatic ulcer
Candidiasis	Malignancy tonsil

- After the throat swab samples were taken, they were started on injectable broad spectrum antibiotics, analgesics and antiseptic gargles. The antibiotics were later changed, if necessary, according to the throat swab culture and sensitivity reports.
- Patients whose swab reports came to be positive for *C. diphtheria* were kept in isolation and treated with antidiphtheric serum and antibiotics, and were advised for serial ECG to look for cardiotoxicity.
- Patients whose reports were in favour of Streptococcal tonsillitis were treated with Benzyl Penicillin.
- Patients usually presented with dehydration and dyselectrolytemia, which were treated with intravenous fluids
- Nasogastric tube feeding was started for patients with severe odynophagia.
- Medicine and paediatrics opinion were taken for proper treatment of dehydration and dyselectrolytemia. Cardiology opinion was taken for patients whose electrocardiogram report showed features of myocarditis.
- Tracheostomy was done when patients presented with severe respiratory distress (stridor).

Results and Observations

In our one year study, a total of 37 patients were admitted in the ward with acute membranous tonsillitis.

Out of these, 24 (65%) were males and 13 (35%) were females.

Most of the cases of membranous tonsillitis were seen in pre-teen age group (6–12 years) which were 24 (65%). The number of cases between 13 and 18 years were 9 (24.3%), between 19 and 30 years were 2 (5%), between 0 and 5 years was 1 (3%) and above 30 years was 1 (3%) (Table 2).

Out of the total cases, 89% of the cases belonged to the rural areas and 11% cases were from the urban areas.

With respect to the socioeconomic status, highest number of cases were seen in people belonging to lower socioeconomic group i.e. 35 cases (95%). The remaining 2 (5%) cases belonged to the middle socioeconomic group (Table 3).

Out of the 37 cases, 24 cases (65%) belonged to the lower Assam belt, 7 cases (19%) belonged to the North Assam belt and 6 cases (16%) belonged to the Hills & Central Assam belt. The more common symptoms were sore throat, odynophagia, fever and palpable lymph nodes. The less common symptoms were the constitutional symptoms like malaise, nausea and vomiting. Complications like cardiac involvement (myocarditis) were seen in 5% cases and death was seen in 14% cases (Table 4).

Table 2 Showing age distribution of cases

Age group	No. of cases	Percentage
Children (0–5 years)	1	3
Pre-teen (6–12 years)	24	65
Teen (13–18 years)	9	24
Youth(19–30 years)	2	5
Elderly (> 30 years)	1	3

Table 3 Showing socioeconomic status distribution of cases

Socioeconomic status	No. of cases	Percentage
Lower	35	95
Middle	2	5
Upper	0	0

In the study, it was observed that 70.3% cases were caused by *Corynebacterium diphtheria*. These cases were kept in isolation. 16% cases showed no growth on throat swab, 11% cases showed the growth of *Streptococcus pneumonia* and 2.7% cases showed candidal infection (Table 5).

Seasonal distribution of cases shows that most of the cases were seen in the months of November to January, with the highest number of cases in the month of November (Table 6).

All the cases of membranous tonsillitis were hospitalized and proper history were taken. Most of the patients had no immunization history and the immunization status of the remaining patients were unknown or incomplete. It was also observed that most of the cases were living in crowded areas in unhygienic conditions. Longer duration of hospital stay (14–20 days) was observed in cases where Diphtheria was the causative organism. The remaining

Table 4 Showing various symptoms of patients

Symptoms of patients	Percentage
Sore throat	100
Odynophagia	94
Fever	88
Palpable lymph nodes	84
Constitutional (malaise, nausea, vomiting)	33
Death	14
Bull neck	11
Cardiac involvement	5
Stridor	5

Table 5 Showing throat swab results

Throat swab results	Number of cases	Percentage
<i>C. diphtheriae</i>	26	70.3
No growth	6	16
<i>Streptococcus pneumonia</i>	4	11
<i>Candida</i>	1	2.7

cases had relatively shorter duration of hospital stay (7–10 days). Patients with late presentation had increased mortality and morbidity. All the patients were called for regular follow-up every month for six months after being discharged, to rule out cardiac defects.

Discussion

There are various etiological factors for the formation of membrane over the tonsil.

1. Bacterial causes

- *Corynebacterium diphtheria* is the most common cause of membranous tonsillitis. It forms greyish white patch over the tonsils which may extend to the nasopharynx, larynx, trachea and bronchus. It is a pseudomembrane which bleeds on removal. The exotoxin which is produced also affects the myocardium and peripheral nerves.
- Group A beta hemolytic Streptococcus can also form membrane over the tonsil. But the membrane is less extensive and does not bleed on removal.
- Gonococcal tonsillitis caused by *Neisseria gonorrhoea* leads to formation of whitish yellow exudates, fever and cervical lymphadenopathy. It is usually seen in sexually active individuals.
- Other rare bacterial causes of membranous tonsillitis are *Haemophilus influenza* and *Staphylococcus*.

2. Viral causes

- Infectious mononucleosis caused by Epstein Barr virus also can form membrane over the tonsils alongwith fever, pharyngitis and lymphadenopathy. A less common feature is Hoagland sign, which is a transient edema of bilateral upper eyelids. It is seen before the exudative lesion or cervical lymphadenopathy occurs [2]. Patients may also suffer from maculopapular rash, splenomegaly and cranial neuropathies. Paul-Bunnell test and monospot test, using sheep and horse red blood cells respectively, may be used to detect

Table 6 Number of cases in each month of the year

January	February	March	April	May	June	July	August	September	October	November	December
6	0	2	0	1	1	6	1	1	3	10	6

heterophile antibodies. Patients require only supportive treatment.

- Adenovirus tonsillitis spreads by the use of public swimming pools. It also causes gastroenteritis, conjunctivitis, cystitis and rash. It is detected by Polymerase chain reaction assay, antigen detection or serology and the patients are given symptomatic treatment.
- Herpes simplex tonsillitis occurs in immunocompromised individuals. It causes greyish white exudates and is confirmed by polymerase chain reaction. It is treated with Valacyclovir.
- Other rare viral causes of tonsillitis are Rhinovirus, Respiratory Syncytial virus, Coronavirus and Cytomegalovirus.

3. Fungal causes

- Oral Candidiasis, can be caused by variety of species, most commonly by *Candida albicans*. It is an opportunistic infection seen mostly in neonates, immunocompromised individuals, recipients of prolonged antibiotics or steroid therapy. Patients present with sore throat, burning sensation over the tongue and friable white/ grey patch on the oral mucosa. It is treated using antifungals like nystatin/cotrimazole or oral fluconazole and proper oral hygiene. In refractory cases itraconazole/voriconazole/amphotericin B can be used based on culture and sensitivity reports.

4. *Vincent's angina* It is caused by fusiform bacilli and spirochaete, *Borrelia vincentii*. It forms membrane over one tonsil or gingival which bleeds easily. It is insidious in onset and causes less fever and less discomfort. Other presenting features are halitosis, fever, malaise and lymphadenopathy.
5. *Agranulocytosis* It forms ulcerative necrotic lesions over the tonsils and oropharynx. Patients are severely ill and has a total leucocytic count of < 2000/cu mm with neutrophils of 5% or less.
6. *Leukaemia* may also show ulcerative lesion over the tonsils with a total leucocytic count of > 100,000/cu mm. Patients also present with anaemia and blast cells on bone marrow examination.
7. *Aphthous ulcer* is another differential diagnosis for membrane over the tonsils. These are painful lesions

and are treated with local application of lidocaine and antiseptic mouthwash.

8. *Traumatic ulcer* following injury to oropharynx can also form membrane over the tonsils. The membrane is formed within 24 h.
9. *Malignancy tonsil* is another reason for ulcerative membrane formation over the tonsil.

Acute membranous tonsillitis constitutes about 1–2% of all oropharyngeal diseases [3]. These cases usually presents to the department within 3–5 days of the onset of symptoms. Late presentation were associated with increased mortality and morbidity. The more common symptoms with which the patients presented included sore throat (100%), odynophagia (92%), fever (84%) and palpable neck nodes (80%). The less common symptoms were malaise, nausea, vomiting and voice change, seen in 36% cases [4]. It was seen more commonly in males than females and in the economically weaker section of the society, who were living in crowded areas, in unhygienic conditions and with no or unknown immunization status. Increased mortality and cardiac complications like myocarditis were seen in patients who presented late. Most of the cases in our study belonged to the lower Assam belt and lower socioeconomic status. These cases were mostly seen in the months of November to January.

The most common cause of membranous tonsillitis is *Corynebacterium diphtheriae*. The most common age group of presentation was pre-teen age group (6–12 years), followed by teenage group (13–18 years). Diphtheria mainly affects children belonging to 1–5 years age [5]. However, a shift in age group to pre-teen age group (6–12 years) has been seen due to good vaccination coverage of the primary doses [6, 7] and lack of follow-up for the booster doses [8]. Thus, proper monitoring of the vaccination strategies is of utmost importance. Other causes for the shift in age group are low immunity due to poor nourishment, living in crowded places, illiteracy and improper medical care [9, 10]. In our study, throat swab results, in 70.3% cases, showed Diphtheria as the causative organism. Clinically, extensive membrane formation in the oral cavity was seen in 74% cases, of which 60% of the cases came to be positive for diphtheria. 2.7% cases presented with severe respiratory distress, for which tracheostomy was done. These patients were also observed to have a longer duration of hospital stay. Serial

electrocardiogram (ECG) was advised regularly for these patients. ECG changes (conduction blocks, arrhythmias) with complications were seen in 8% of the cases. The commonest cause for mortality was found to be dehydration and dyselectrolytemia, and was usually seen in patients who presented late to the hospital.

Apart from *Corynebacterium diphtheria*, throat swab results in 16% cases showed no growth, 11% cases showed the growth of *Streptococcus pneumoniae* and 2.7% cases showed candidal infection. The reason for no growth of organisms in the throat swab maybe due to prior use of antibiotics or the causative agent maybe a virus [4].

Modified CENTOR score can be used to estimate the probability of Streptococcal infection and thus, help in its management [11]. One point is awarded for the presence of each of the following features:

- No cough
- Tonsillar exudates/swelling
- Tender cervical lymphadenopathy
- Raised temperature
- Age 3–14 years or, > or equal to 45 years

If score is less than or equal to 1, no further diagnostic test or antibiotic required. Score of 2–3 recommends use of antigen test or throat culture and score of more than equal to 4 recommends use of empirical antibiotics.

NICE guidelines recommends the use of immediate antimicrobials if the patient is systemically unwell, has signs of complications like peritonsillar abscess, Lemierre syndrome etc. or has co-morbidities [12]. The anti-microbial of choice is Penicillin V. if allergic to penicillin, macrolides (clarithromycin, azithromycin or erythromycin) can be used.

In our study, we found that membranous tonsillitis presented with similar features of sore throat, fever, lymphadenopathy and white membrane over the tonsils, which makes it difficult to find the etiology. Prompt diagnosis and management should be done to reduce the mortality and morbidity. The study also showed that the confirmed diphtheria cases were sensitive to penicillin, erythromycin, tetracycline and clindamycin. The cases with Streptococcal infection was found to be sensitive to gentamycin, amikacin, vancomycin and piperacillin-tazobactam. Treatment was started accordingly. Supportive management in the form of analgesia, adequate intravenous hydration and nasogastric tube feeding were given as the patients were not able to take orally due to sore throat and odynophagia. The absolute indication of hospitalization was airway compromise and the relative indications were odynophagia, dehydration or complications associated with it like peritonsillar abscess.

Follow-up of all the cases were done monthly for a period of six months to rule out cardiac complications.

Conclusion

The study conducted shows that Diphtheria is still prevalent in the current Indian scenario, despite implementation of the vaccination programs and is the commonest cause of acute membranous tonsillitis, followed by *Streptococcus*. Thus, proper monitoring of the vaccination strategies is very essential, along with continuous surveillance and prompt reporting of the cases, to control the outbreaks. Importance should also be given to create awareness among people to avoid over-crowding, to maintain proper hygiene, for proper immunization of the children in accordance with the Universal Immunization Program (UIP), for proper nutrition of the children and to immediately attend health care facilities, when necessary. These can decrease the mortality and morbidity, and also decrease the persistence of Diphtheria.

Apart from Diphtheria, there are various etiologies which can lead to formation of membrane over the tonsil, which usually affects young individuals. If proper diagnosis is not made in a timely manner, it may lead to its mismanagement causing life-threatening complications. So, basic knowledge is required for its proper management and the health care professionals should be cautious while diagnosing the suspected patients.

Funding No funding was availed for conducting this study.

Declarations

Ethics Approval The study conducted was approved by the institutional ethical committee.

Consent to Participate Consent was obtained from all the patients that were included in the study.

References

1. Bajaj Y, Hore I (2018) Diseases of tonsils, tonsillectomy and tonsillotomy. *Scott-Brown's Otorhinolaryngol Head Neck Surg* 435–442. doi:<https://doi.org/10.1201/9780203731017-38>
2. Bass MH (1954) Periorbital edema as the initial sign of infectious mononucleosis. *J Pediatr* 45(2):204–205. [https://doi.org/10.1016/s0022-3476\(54\)80144-2](https://doi.org/10.1016/s0022-3476(54)80144-2)
3. Reddy DS, Babu AS, Rathod JBS, Kumar CS, Rajesh S (2016) Study of ulcero-membranous lesions of tonsil in an Indian scenario. *Indian J Otolaryngol Head Neck Surg* 69(1):16–19. <https://doi.org/10.1007/s12070-016-0994-0>
4. Vijayashree M, Viswanatha B, Sambamurthy B (2014) Clinical and bacteriological study of acute tonsillitis. *IOSR J Dental Med Sci* 13(1):37–43. <https://doi.org/10.9790/0853-131103743>
5. Galazka A (2000) The changing epidemiology of diphtheria in the vaccine era. *J Infect Dis* 181(s1). doi:<https://doi.org/10.1086/315533>
6. Bitragunta S, Murhekar MV, Hutin YJ, Penumuru PP, Gupte MD (2008) Persistence of diphtheria, Hyderabad, India, 2003–2006.

- Emerg Infect Dis 14(7):1144–1146. <https://doi.org/10.3201/eid1407.071167>
7. Havaladar PV (1992) Diphtheria in the eighties: experience in a south Indian district hospital. *J Indian Med Assoc* 90(6):155–156
 8. Meera M, Rajarao M (2014) Diphtheria in Andhra Pradesh—a clinical-epidemiological study. *Int J Infect Dis* 19:74–78. <https://doi.org/10.1016/j.ijid.2013.10.017>
 9. Lodha R, Dash NR, Kapil A, Kabra SK (2000) Diphtheria in urban slums in north India. *Lancet* 355(9199):204. [https://doi.org/10.1016/s0140-6736\(99\)04847-3](https://doi.org/10.1016/s0140-6736(99)04847-3)
 10. Patil N, Gawade N, Gaidhane A, Syed Z (2014) Investigating diphtheria outbreak: a qualitative study in rural area. *Int J Med Sci Public Health* 3(4):513. <https://doi.org/10.5455/ijmsph.2014.260120141>
 11. Palla AH, Khan RA, Gilani AH, Marra F (2012) Over prescription of antibiotics for adult pharyngitis is prevalent in developing countries but can be reduced using McIsaac modification of Centor scores: a cross-sectional study. *BMC Pulmon Med* 12(1). doi:<https://doi.org/10.1186/1471-2466-12-70>
 12. Barton E, Spencer R (2011) URTIs: recommended diagnosis and treatment in general practice. *Prescriber* 22(8):23–36. <https://doi.org/10.1002/psb.743>

Publisher's Note Springer Nature remains neutral with regard to jurisdictional claims in published maps and institutional affiliations.