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**Dr. Mamta Verma**

DNB (ENT), Senior Resident,  
Department of ENT, Autonomous  
State Medical College,  
Shahjahanpur, Uttar Pradesh,  
India

**Dr. Roshan Shahakar**

DNB (ENT), Fellow Surgeon,  
National Cancer Institute, Nagpur,  
Maharashtra, India

**Dr. Raghuji Thorat**

MS (ENT), FCPS, DORL,  
Professor & Head, Department of  
ENT, Government Medical College,  
Kolhapur, Maharashtra, India

**Dr. Chetan Ghorpade**

MS (ENT), Consultant, Ishaan  
Hospital, Kolhapur, Maharashtra,  
India

**Dr. Priyadershini Rangari**

MDS (Oral Medicine and  
Radiology), Assistant Professor,  
Department of Dentistry, Sri  
Shankaracharya Medical College,  
Bhilai, Durg, Chhattisgarh, India

**Corresponding Author:**

**Dr. Roshan Shahakar**

DNB (ENT), Fellow Surgeon,  
National Cancer Institute, Nagpur,  
Maharashtra, India

## Diagnostic assessment and various treatment modalities of secretary otitis media

**Dr. Mamta Verma, Dr. Roshan Shahakar, Dr. Raghuji Thorat, Dr. Chetan Ghorpade and Dr. Priyadershini Rangari**

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### Abstract

**Background:** Secretary Otitis Media (SOM) is the commonest cause of hearing difficulty in childhood encountered by the Otologist. It is characterized by accumulation of effusion in the middle ear cavity due to altered mucociliary system within middle ear and Eustachian tube.

**Objectives:** To study the common clinical features of Secretary Otitis Media (SOM) and its various treatment modalities.

**Methods:** In our study total 55 subjects with secretary otitis media in less than or equal to 13 years of age were assessed. Demographic data, detail case history and Clinical examination were recorded. Complete otolaryngological examination including ear, TFT, ET Function, nose and throat. Blood investigations, urine examination, audiological examinations like pure tone audiometry and impedance audiometry, Urine investigation, Radiological examinations were performed. Microbiological testing of ear effusion and diagnostic nasal endoscopy (DNE) were performed. All the patients were treated first on medical line then followed up for 4 weeks. Refractory cases were considered for surgical modality of treatment like myringotomy with grommet insertion, adenoidectomy with grommet insertion and adenotonsillectomy with grommet insertion.

**Results:** Most of the cases showed significant improvement in signs and symptoms. Good results were seen mostly in patients who had undergone adenotonsillectomy, adenoidectomy with grommet insertion and in hearing threshold. Post operatively most common complication found was mucopurulent discharge after grommet insertion and at ectasis changes.

**Conclusion:** Attention should be paid to parental concern regarding their child's hearing particularly if there is a recent history of acute otitis media.

**Keywords:** Hearing loss, secretary otitis media (SOM), otorrhea, otologist, tympanometry

### Introduction

Secretary Otitis Media (SOM) is the commonest cause of hearing difficulty and one of the most frequent reasons for elective admission to hospital for surgery during childhood. A variety of synonyms describes the condition. It has been termed catarrhal, exudative, seromucinous, serous, otitis media with effusion (OME) and non-suppurative otitis media. Following sequential discussion at International Symposia the term middle ear effusion and otitis media with effusion are currently acceptable<sup>[1]</sup>.

Secretary Otitis Media (SOM) is defined as the presence of effusion behind an intact eardrum without symptoms of acute inflammation<sup>[2]</sup>. It is a common problem of children between 1 to 5 years old. Most of the cases of SOM are asymptomatic. Any condition which affects the proper function of the mucociliary system of the upper respiratory tract may predispose to development of Middle ear effusion (MEE). There is a relationship between the presence of ME fluid and hearing impairment, though in younger children the hearing loss is not always obvious. When covert it may present as speech, language or learning delay and sometimes as behavioral and educational problems. Hearing loss may be first detected on routine screening examination at 7-9 months, 3 years age or later at pre-school testing. Secretary otitis media in recurrent persistent cases might significantly delay or impair communication skills resulting in educational and behavioral difficulties<sup>[3]</sup>.

The diagnosis is otoscopic and confirmed by tympanometry. A proportion of SOM resolves spontaneously or with the treatment of upper respiratory tract infections. The failures require the surgical solution of ventilating tube and adenoidectomy.

OME is the commonest cause of HL in an infant. It is a simple condition but, if left undiagnosed or untreated can lead to preventable long-term consequences. Hence, a high index of suspicion is necessary, early and accurate diagnosis, prompt treatment with close follow-up is of essence and research is needed to support treatment decisions [4].

In this study we aimed the clinical profile, etiological factors, epidemiology, diagnosis, various medical and surgical outcomes and impact of OME on child's development. So the parents need to be informed about the symptoms and risk factors of OME to avoid delayed diagnosis which can lead to permanent hearing loss [5].

**Materials and Methods**

This Prospective Observational Study was carried out in the Department of ENT Rajarshree Chattrapati Shahu Maharaj Govt. Medical College and Chattrapati Pramilaraje Hospital, (RCSM GMC & CPRH) Kolhapur, Maharashtra. 55 cases of Secretary Otitis Media had given consent for study purpose between November 2014 to 30 April 2016, were included in this study.

In the expected population of the number of subjects aged up to 13 year, approximately 1500 subjects visiting our institute and documented frequency of the secretary otitis media 8.5% in the literature with proposed power of the study 80% and alpha error to be 5 % the sample size calculated was found to be 49. The sample size calculation were performed by EPI Info 7™ Stats Calc™ (Centre for disease control and prevention) [6].

The patients who were diagnosed as secretary otitis media and less than or equal to 13 years of age and who had given consent for operative procedure were included in the study. Prior to commencement, the study was approved by the ethical committee of Medical College. Informed, written and well understood consent was obtained from parents of each patient fulfilling above criterias. Voluntary nature of participation and free will to withdraw from study were clearly spelt out to the parents of each patient. Consent was also taken for the use of their clinical photographs for documentation purposes in the record of study. Before enrollment demographic data such as age, sex, detail history and Clinical examination were recorded on a predesigned pretested proforma. The pattern of examination was detailed history, general physical, systemic examination and otolaryngological examination of the patient. Each patient was evaluated for health assessment like temperature, pulse rate, respiratory rate, weight etc. Pallor, icterus, cyanosis, clubbing, hydration, lymphadenopathy were also noted. Each patient was also examined system wise such as respiratory system, cardiovascular system, abdominal system and central nervous system. Each patient underwent complete otolaryngological examination including ear, TFT, ET Function, nose and throat.

Blood investigations, urine examination, audiological examinations like pure tone audiometry and impedance audiometry, Urine investigation, Radiological examinations were performed. Microbiological testing like culture and sensitivity of ear effusion, diagnostic nasal endoscopy (DNE) were also performed. Proper medical treatment interventions were taken and recorded; all the patients were treated first on medical line. These patients were followed up for 4 weeks. Refractory cases were considered for surgical modality of treatment. Empirical treatment was initiated with combination of antibiotics, antihistaminic drug, steroids and nasal decongestants. Once the diagnosis was confirmed as SOM, fluid aspiration was done and sent for culture and sensitivity Refractory cases (cases that did not responded to medical treatment for more than 4 weeks were considered for surgical

modality of treatment which were myringotomy with grommet insertion, adenoidectomy with grommet insertion and adenotonsillectomy with grommet insertion.

For statistical analysis, guidance and expert opinion of guide and faculty statistician was taken. Collected data was tabulated and analysed by using one proportion Z test and chi square test, ANOVA test. P-value < 0.05 was considered to be statistically significant. SPSS 14 and MS Excel were used for statistical calculations.

**Results**

This study was carried out in the Department of ENT, RCSM GMC AND CPRH, Kolhapur. In our study total 55 subjects with secretary otitis media in less than or equal to 13 years of age were assessed. All the cases (100%) of SOM ranged between 4 to 13 years and majority (47.27%) were of the age group 8-10 years. The study showed male predominance. Male to female ratio was 2.66:1. Majority of cases (69.09%) belonged to lower socioeconomic class. The most common clinical presentation was fullness of ear (72.23%). On otoscopic examination dull, lusterless and amber colored tympanic membrane was seen most commonly (72.23%). On PTA most of the patients showed conductive hearing loss and on tympanometry most commonly type C tympanogram was found followed by type B tympanogram. Out of all the cases (54.64%) cases showed positive bacterial cultures of ME effusion, and Streptococcus pneumoniae (29.09%) was the most common organism isolated. All cases (100%) were put on medical line of treatment and regularly followed up. Some patients (16.36%) responded well, but most cases (83.63%) were the refractory cases and required different surgical modalities like adenotonsillectomy with grommet insertion (40%), adenoidectomy with grommet insertion (29.09%) and myringotomy with grommet insertion (14.55%). Most cases on follow-up showed significant improvement. All patients who underwent surgical intervention showed significant improvement in hearing threshold on post operative follow up. Expulsion of grommet (6.67%), mucopurulent discharge (10%) and at electatic changes (3.33%) were seen post-operatively in some cases.

**Table 1:** Age and gender wise distribution of cases

Age group	Male	Percentage	Female	Percentage	Total
<5	2	3.64	0	0	2
5-7	10	18.18	0	0	10
8-10	15	27.27	11	20.00	26
>10	13	23.64	4	7.27	17
Total	40	72.73	15	27.27	55

**Table 2:** Distribution of cases according to socioeconomic status and symptoms

Variables	Subgroups	N	%
Socioeconomic status	Upper class	8	14.55
	Middle class	9	16.36
	Lower class	38	69.09
Symptoms	Fullness of ear	40	72.23
	Hard of hearing	31	56.36
	Tinnitus	16	29.09
	Bubbling sound	25	45.45
	Earache	4	7.27
	Ear discharge	2	3.64
Signs	Dull, lusterless, amber colored TM	36	72.23
	Prominent handle of malleus	28	56.36
	Prominent short process	25	45.45
	Fluid with air bubble	13	29.09
	Flashing movement	7	12.73

**Table 3:** Relationship between size of Nasopharyngeal airway and age of patient

Age in years	Adenoid hypertrophy grading		
	Nasopharyngeal Airway < 5 mm	Nasopharyngeal airway 6-10 mm	Nasopharyngeal airway >10 mm
<5	3(5.45)	7(12.70)	7(12.70)
5-7	3(5.45)	1(1.81)	1(1.81)
8-10	10(18.18)	7(12.70)	2(3.63)
>10	9(16.36)	3(5.45)	2(3.63)
Total(n=55)	25(45.45)	18(32.72)	12(21.81)

**Table 4:** Mobility of Tympanic membrane on Tuning fork test and Pneuamatic Otoscopy:

		Left ear N (%)	Right ear N (%)
Tuning fork test Mobility	Normal	2(3.63)	1(1.81)
	Conductive Hearing Loss	45(81.81)	44(80)
	Inconclusive	8(14.54)	10(18.18)
	Normal	3(5.45)	4(7.27)
	Absent	12(21.81)	11(20)
	Restricted	40(72.72)	40(72.72)
Tympanometry Pattern	Type A	2	3.63
	Type B	20	36.36
	Type C	33	60

**Table 7:** Effect of tympanostomy with adenoidectomy/adenotonsillectomy on air conduction (AC) threshold pure tone mean audiometry at 0.5, 1, 2, 4 KHz

ACdBHL	Pre-op	Post-op 2 months	Post-op 6 months	p Value at post- op 2 months	P value at post-op 6 months
Rt. Ear ACdBHL (Mean± SD)	26.58± 5.89	16.50 ± 4. 07 <sup>a</sup>	15.80 ± 3.82 <sup>a</sup>	P<0.001	P<0.001
Lt. Ear ACdBHL (Mean± SD)	26.73± 6.01	16.61 ± 4.18 <sup>a</sup>	16.10 ± 3.5 <sup>a</sup>	P<0.001	P <0.001

**Discussion**

This was a prospective observational study performed on 55 cases of secretary otitis media of patients <13 age study period who were less than or equal to 13 years and diagnosed as SOM. In our study patients aged ≤13 years were considered. Majority of the patients i.e. 26 cases (47.27%) were in the age group of 8-10 years and minimum number of patients i.e. 1 case (3.64%) was in the age group of < 5 years. Apostolopoulos *et al.* (1998) [6] in their study showed that 33.2 % of patients were in the age group of < 8 years. While, Brooks (1976) [7] in his study showed 50% of the patients were in the age group of 5-7 years. As compared to other studies, the high age incidence in our study indicates the late presentation to the hospital due to poverty, ignorance and low socioeconomic conditions of the patients in this area. There is also lack of regular follow up in school children as they do in western countries. In our study, it was observed that the SOM is more common in males i.e. 40 cases (72.73%) than females i.e. 15 cases (27.27%). M: F Ratio being the 2.66:1. Tos *et al.* (1985) [8] have shown that male children have more incidence of SOM than female due to male preponderance of childhood infection. Other studies with consistent findings are of Alho OP *et al.* (1995) [9] which showed higher incidence of SOM in males. Paradise *et al.* (1997) [10] reported no apparent gender based difference in the incidence of SOM. Some studies are also consistent with our studies that showed 58% male predominance [6]. The socioeconomic status was based on modified Kuppuswamy scale. Here the education level, occupation of head of household

**Table 5:** distribution of cases according to Culture results

		N	%
Culture report	Streptococcus pneumonia	16	29.09
	Hemophilus influenza	6	10.91
	Nisseria catarrhalis	2	3.64
	Diphtheroids	6	10.91
	No growth	25	45.45
Treatment modalities used	Adenotonsillectomy + Grommet insertion	22	40.00
	Adenoidectomy + Grommet insertion	16	29.09
	Myringotomy + Grommet insertion	8	14.55
	Medical management	9	16.36

**Table 6:** Comparison of symptoms and socioeconomic status in culture positive and culture negative subjects

	Symptoms	Culture Negative (n=25)	Culture Positive (n=30)	p Value*
Symptoms	Fullness of ear	16	24	0.1
	Hard of hearing	16	15	0.5
	Tinnitus	10	6	0.02
	Bubbling sound	11	14	0.5
	Earache	0	4	0.1
	Ear discharge	0	2	0.4
	Socioeconomic status	Upper class	4	4
Middle class		3	6	
Lower Class		18	20	

and per capita family income was taken into account. In the present study, most of the cases i.e., 38 (69.09%) belonged to lower class and least were in the upper class i.e., 8 cases (14.55%). 9 cases (16.36%) were in the middle class. Paradise *et al.* (1997) [10] followed 2253 infants for 2 years and found an inverse relationship between the cumulative proportion of days with middle ear effusion and socioeconomic status. Most of the cases i.e. 40(72.23%) presented with fullness of ear followed by 31 cases (56.36%) with hard of hearing, 25 cases (45.45%) with bubbling sound, 16 (29.09%) cases with tinnitus, 4 cases (7.27%) with earache and 2 case (3.64%) with ear discharge. Study by Howie VM (1975) [11] have also shown the predominance of fullness in ear. The symptom of adenoid hypertrophy was observed in 38(69.09%) patients. 17(30.90%) patients did not have any symptom suggestive of adenoid hypertrophy at presentation. The symptom of tonsillar Hypertrophy was observed in 22(40%) patients. 33(60%) did not have any symptom suggestive of tonsillar hypertrophy [6]. In our study, on otoscopic examination 36cases (72.23%) have shown dull, lusterless and amber coloured tympanic membrane. Prominent handle of malleus and prominent short process were seen in 28 cases (56.36%) and 25 cases (45.45%) respectively.13 cases (29.09%) were having fluid with air bubble and 7 cases (12.73%) were presented with flashing movements. Spremos *et al.* (1998) [11] found that enlarged adenoids in 58% patients in their study for OME. On Tuning fork test: 81.81% cases had conducting hearing loss in left ear and 80% in right ear. However in 8 cases (14.54%) in

left and 10 cases (18.18%) in right ear, which were below 7 years of age, results were inconclusive due to uncooperative nature.

In our study abnormality of tympanic membrane mobility was noted in 40 cases (72.72%) in both ears. 12 cases (21.81%) had absent Mobility in left ear and 11 cases (20%) had absent Mobility in right ear. There was good relationship between patient presenting with unilateral hearing impairment and otoscopic abnormality on the same side. However there was no relationship between laterality of presentation and otoscopic findings with adenoid hypertrophy.

On pure tone audiometry, there was conductive hearing loss of 25-40 db. Studies consistent with this was of Fria TJ *et al.* (1985)<sup>[12]</sup> in which they reported > 35 dB hearing loss. Study by Venden Brook (1993)<sup>[14]</sup> have shown mean 20 dB hearing loss. In Glasgow studies by Dempster and Mackenzie (1991)<sup>[15]</sup> have shown 26 dB hearing loss. Martines F *et al.* (2010)<sup>[13]</sup> showed conductive hearing loss of more than 20 dB at any one of the frequencies from 250 kHz to 4 kHz.

On tympanometry type C: Tympanogram was found in 33 patient (60%) which is suggestive of middle ear pressure followed by type B tympanogram in 20 patient (36.36%) suggestive of negative middle ear fluid.

In most of the cases Spremos *et al.* (1998)<sup>[11]</sup> found type C tympanogram followed by type B. It is observed in our study that in 16 cases (29.09%), the organism isolated was *Streptococcus pneumoniae*. Followed by this 6 cases (10.91%) have shown *H. Influenzae*. In 2 case (3.64%) and 6 cases (10.91%) *N. Catarrhalis* and Diphtheroids were isolated. So, positive bacterial cultures were seen in 30 cases (54.55%), and the remaining 25 cases (45.45%) did not show any growth.

Klein *et al.* (1980)<sup>[16]</sup> showed positive bacterial cultures in up to 50% of ME effusions. Bacteria found are similar to those cultured in cases of ASOM. Previous studies consistent with similar finding are done by Jero J, Karma Pet *et al.* (1997)<sup>[17]</sup> whop stated negative culture in 66 % cases. They found *streptococcus pneumoniae* in 8 % cases and *H. influenza* in 3% cases. Stenfors & Raisanen (1992)<sup>[18]</sup> have shown positive ME cultures for *H influenzae*, *Streptococcus pneumoniae* and *Moraxella catarrhalis* in 30% of cases and in 19% there were dormant organisms of *H. influenzae* and *Streptococcus pneumoniae*.

In our study, all the cases i.e., 55 (100%) were started with medical line of treatment. They were prescribed with amoxicillin and clavulanic acid and pseudo ephedrine hydrochloride. On follow up, only 9 cases (16.36%) responded well and the remaining 46 cases (83.63%) did not show favourable results. This was supported by study done by Chan *et al.* (1988)<sup>[19]</sup>.

On categorizing air conduction thresholds into 3 groups, the effect of tympanostomy and adenoidectomy on hearing impairment was analyzed. All patients had significant hearing loss ( $\geq 20$ dBHL) in bilateral ear. Out of which 46 patient 46(83.63%) patients underwent surgical treatment, hearing returned to normal hearing thresholds (<20 dBHL) following surgery.

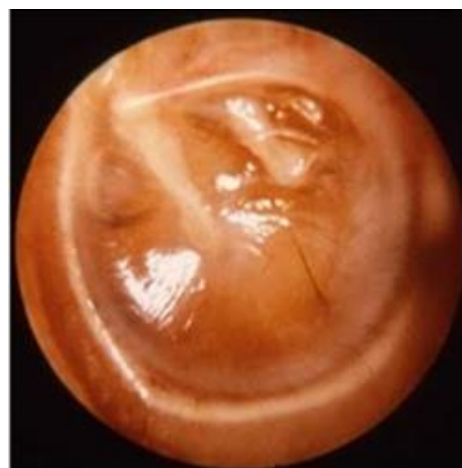
Of the refractory cases i.e., 46 (83.63%), 22 cases (40%) required adenotonsillectomy with grommet insertion and another 16 cases (29.09%) required adenoidectomy and grommet insertion and remaining 8 cases (20%) required myringotomy and grommet insertion depending on the presence or absence of hypertrophied adenoids or tonsils.

All patients on regular follow up showed significant results on air conduction (AC) threshold pure tone audiometry mean (mean

$\pm 2$  SD) at 2 and 6 months as compared to pre-operative air conduction (AC) threshold. There was no significant difference on air conduction threshold between 2 and 6 months follow up.

During follow-up the otoscopic examination and audiometry results showed that there were significant changes in the appearance of tympanic membrane and reduction in air-bone gap, this is comparable to studies done by Tampowpong K *et al.* (2007)<sup>[20]</sup> which showed that VTI with myringotomy causes significant reduction in air-bone gap. These results were more obvious in 22 cases (40 %) who had undergone adenotonsillectomy with grommet insertion and adenoidectomy with grommet insertion (16 cases i.e., 29.09 %).

Mikals *et al.* (2014)<sup>[21]</sup> in their study reported that adenoidectomy with VTI decreases the risk of OME as compared to VTI alone which is consistent with our study finding. Wallace IF *et al.* (2014)<sup>[22]</sup> reported that adenoidectomy alone or as an adjunct to myringotomy, or combined with tubes, reduces OME and improve hearing as compared to watchful waiting. Of the cases studied for results of management, 2 patients (6.67%) had expulsion of grommet after 2 months. In 3 cases (10%), there was mucopurulent discharge followed by grommet insertion. These patients were treated with proper antibiotics after removal of grommet. One patient (3.33%) was not happy and there was less discharge and more at electatic changes. In a study by Multicenter otitis media group<sup>[23]</sup> done in 2014 showed 27 % patients had otorrhoea after adenoidectomy with VTI. In a study by Bingham *et al.* (1988)<sup>[24]</sup> removal of tube in patients with mucopurulent otorrhoea resolved the discharge in 79% of ears within a month.



A. Tympanic membrane discoloration in SOM



B. Tympanic membrane showing air fluid level in SOM



C. Tympanic membrane with grommet in situ



D. Tympanic membrane discoloration in SOM

### Conclusion

In present study, SOM mostly occur in children most common age group being 8 – 10 years with male predominance. Most of these patients belonged to lower socioeconomic status. The most common clinical presentation was fullness of ear, followed by hard of hearing. Maximum patients were having conductive hearing loss on tuning fork tests. Most common sign on otoscopic examination encountered was dull lusterless, amber colored tympanic membrane. On tympanometry type C tympanogram was noted most commonly followed by type B. Only half of the cases showed positive bacterial culture of ME effusion, and *Streptococcus pneumoniae* was the most common organism isolated. All the cases were put on medical treatment and only few of cases responded well with medical treatment.

For refractory cases adenotonsillectomy with grommet insertion, adenoidectomy with grommet insertion and myringotomy and grommet insertion were the surgical treatment modalities.

All children should have Otoscopy to confirm OME and exclude AOM or COM.

Pneumatic Otoscopy should be done in a children presenting with fullness of ear and hearing loss or otalgia or both for assessment of OME. When diagnosis is ascertain, tympanometry should be done in children of suspected OME.

When children with OME are not at risk we can manage them with watchful waiting for 3 months from date of onset of effusion/ diagnosis. Intranasal or systemic steroids and systemic antibiotics should not be recommended in childhood OME.

Adenoidectomy/ adenotonsillectomy should be performed along with ventilation tubes insertion at the same time particularly if there is concern regarding general health of upper respiratory tract. It also extends the period of benefit to the hearing. It is important that all parents of children with OME receive appropriate general counseling regarding natural history, need for follow up and possible sequel.

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