

# Prevalence and Management of Otitis Media with Effusion Amongst the School Going Children of a Rural Area in Puducherry

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## ABSTRACT

### **Background**

Otitis Media with Effusion (OME) also known as Secretory Otitis Media, has been identified as the commonest middle ear condition causing deafness in children in developed countries. Neither the indication for surgical treatment nor the types and number of procedures used are uniform. Possible treatment includes myringotomy with or without insertion of ventilation tube either alone or with adenoidectomy and occasionally tonsillectomy.

### **Aims and Objectives**

To assess the prevalence and the different modes of presentation of Otitis Media with Effusion among the rural school children of Puducherry and to assess the improvement in hearing after 6 months of surgical intervention done on patients with Otitis Media with Effusion.

### **Materials and Methods**

A school screening camp was conducted on 600 children in the age group of 5-12 years in a government middle school near our medical college hospital for identifying children with Otitis Media with Effusion. Students with Otitis Media with Effusion were further classified into 4 groups for various interventional procedures namely adenotonsillectomy with bilateral grommet insertion (Group A), adenoidectomy with bilateral grommet insertion (Group B), bilateral grommet insertion (Group C), bilateral myringotomy with wide field incision in the antero-inferior quadrant (Group D).

### **Result**

The prevalence was almost in equal proportions in the age group between 5-12 years and the overall prevalence of Otitis Media with Effusion among the study population was 13.3%. The adenotonsillectomy with bilateral grommet insertion procedure had shown a significant improvement in hearing, which was measured by using pure tone audiometry by assessing the mean air-bone gap, which was 9.81, 8.27 and 6.73 at the end of 6 weeks, 3 months and 6 months respectively, when compared to the other procedures.

### **Conclusion**

Adenotonsillectomy with bilateral grommet insertion should be considered in a child with Otitis Media with Effusion who is at risk for speech/language/hearing loss.

### **Keywords**

Otitis Media with Effusion; Prevalence; Adenoidectomy; Tonsillectomy; adenoidectomy; Grommet Insertion.

Otitis Media with Effusion (OME) also known as Secretory Otitis Media, has been identified as the commonest middle ear condition causing deafness in children in developed countries.<sup>1</sup> It affects children's learning ability through temporary and recurrent hearing loss, permanent hearing impairment and language disorders. Even slight hearing loss, in the order of 10-15 db may be sufficient to impair speech and language acquisition in infants and young children

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and may lead to a generalized educational retardation.<sup>2</sup> Children with hearing loss of more than 30db are significantly retarded in vocabulary level and are placed below their normal grade in school.<sup>7</sup> The prevalence of Otitis Media with Effusion (commonly known as glue ear) has increased in last 50 years, due to widespread inadequate use of antibiotics for the treatment of acute otitis media. The hearing loss may be latent or overt with the child rarely complaining of it.<sup>3</sup>

Two main theories of the cause of Acute Otitis Media exist. The classic explanation proposes that eustachian tube dysfunction is the necessary precursor. The newer models describe the primary event as inflammation of the middle ear mucosa caused by a reaction to bacteria already present in the middle ear. Indeed, Bluestone and others have shown (using radiographic evidence) that reflux up the eustachian tube is demonstrable in children prone to otitis media.<sup>4</sup> Furthermore, Crapko et al. demonstrated the presence of pepsin in the middle ear space of 60% of children with otitis media with effusion,<sup>5</sup> although this reflux certainly may also occur in otherwise healthy individuals.

Academic skills particularly in reading and other language based subjects may be affected when there is a high demand for attention to verbally presented information.<sup>6</sup> Several studies have shown that Otitis Media with Effusion also occurs in children in the developing countries even though they are not brought for treatment. Most parents pay attention to suppurative problems of the ear. The conductive hearing loss associated with OME must have been missed by parents and teachers.<sup>7</sup>

Neither the indication for surgical treatment nor the types and number of procedures used are uniform. Possible treatment includes myringotomy with or without insertion of ventilation tube either alone or with adenoidectomy and occasionally tonsillectomy. However diagnosis of these patients at an early stage can be a difficult task even for the clinician.<sup>8</sup> More difficult is choosing a surgical treatment considering the complications associated with each of these procedures.

This study hence attempts to throw light on the different modes of presentation, the various modalities of management and the improvement in hearing after

surgical management of Otitis Media with Effusion.

### Aims and Objectives

1. To assess the prevalence and the different modes of presentation of Otitis Media with Effusion among the rural school children of Puducherry
2. To assess the improvement in hearing after 6 months of surgical intervention done on patients with Otitis Media with Effusion.

### Methodology

A prospective longitudinal study was carried out by the department of Otorhinolaryngology of a medical college and hospital in Puducherry. A school screening camp was conducted on 600 children in the age group of 5-12 years in a government middle school near our medical college hospital. Children with nasopharyngeal tumors, cleft lip and palate and students with sensorineural hearing loss were excluded from the study.

Adequate history was taken from all the 600 students as per the proforma. Detailed ear, nose and throat examination was performed and recorded. Otoscope findings were confirmed with examination under microscope. Hearing threshold of both the ears as determined by pure tone audiometry was recorded. The type of tympanogram and the stapedial reflex was recorded. The students who had been diagnosed as having Otitis Media with Effusion had further underwent other relevant investigations like X-ray nasopharynx, X-ray mastoids and X-ray paranasal sinuses as per the requirement.

Out of 600 students 80 students were found to have secretory otitis media and those 80 were randomly grouped into 4 groups. Group A had 20 cases of Otitis Media with Effusion and underwent adenotonsillectomy and bilateral grommet insertion (Shepherd). Group B consists of 20 cases and underwent adenoidectomy with bilateral grommet insertion (Shepherd). Group C had 20 cases and underwent bilateral grommet insertion (Shepherd) and finally Group D with 20 cases underwent bilateral myringotomy with wide field incision in the antero-inferior quadrant. All the cases which were operated were discharged on the same day or in the first

post-operative day.

All the operated cases were followed up for a period of 6 months. Pure tone audiometry was performed on all these cases at the end of 6 weeks, 3 months and 6 months of surgery and the hearing improvement was assessed at the end of 6 months in each group and between groups.

## Results

The age wise prevalence of Otitis Media with Effusion among the study population was shown in Table I. The prevalence was almost in equal proportions in the age group between 5-12 years and the overall prevalence of Otitis Media with Effusion among the study population was 13.3%. Similarly among the gender (Table II) the

**Table I : Age wise prevalence of Otitis Media with Effusion among the study population**

AGE GROUP (IN YEARS)	TOTAL NUMBER OF STUDENTS	TOTAL NUMBER OF CASES WITH OTITIS MEDIA WITH EFFUSION	PERCENTAGE
5 – 6	88	15	17%
6 – 7	85	14	16.4%
7 – 8	82	11	13.4%
8 – 9	84	12	14.2%
9 – 10	89	10	11.2%
10 – 11	86	9	10.4%
11 – 12	86	9	10.4%
<b>Total</b>	<b>600</b>	<b>80</b>	<b>13.3%</b>
<b>p value (by Chi Square test)</b>		<b>0.761</b>	

prevalence of Otitis Media with Effusion was 14.3% among males and 12% among females and it did not show any statistical significant difference between males and females ( $p=0.837$ ).

Pure tone audiometry was used to measure the pre-operative hearing loss among the patients with Otitis Media with Effusion according to the type of interventions they had been planned to undertake (Table III). The mean air-bone gap was used as a measure to assess the amount of hearing loss in the patients. The pre-operative air-bone gap measured by pure-tone audiometry among the patients who had been assigned to various modes of intervention was almost similar and there was no statistically significant difference in the readings between them ( $p = 0.639$ ).

The audiometry recording was done 3 times post operatively, in the 6th week, 3 months and at the end of 6 months for all the patients who had undergone the various modes of interventions and it was compared

**Table II : Gender wise prevalence of Otitis Media with Effusion among the study population**

GENDER	TOTAL NUMBER OF STUDENTS	TOTAL NUMBER OF CASES WITH OTITIS MEDIA WITH EFFUSION	PERCENTAGE
Male	334	48	14.3%
Female	266	32	12%
<b>Total</b>	<b>600</b>	<b>80</b>	<b>13.3%</b>
<b>p value (by Chi Square test)</b>		<b>0.837</b>	

with their pre-operative audiometry readings (Table IV). It was reported that in all the procedures namely, adenotonsillectomy with bilateral grommet insertion (Group A), adenoidectomy with bilateral grommet insertion (Group B), bilateral grommet insertion (Group C), bilateral myringotomy with wide field incision in the antero-inferior quadrant (Group D), the readings of the air-bone gap had significantly reduced during the follow-up period when compared to the pre-operative readings ( $p<.0001$ ).

**Table III : Preoperative hearing loss among the patients with Otitis Media with Effusion according to their mode of intervention**

GROUP	MODE OF INTER-VENTION	MEAN AIR-BONE GAP	SD
A	Adenotonsillectomy + Grommet insertion	31.15	6.4
B	Adenoidectomy + Grommet	29.4	6.4
C	Bilateral grommet insertion	28.35	5.85
D	Bilateral myringotomy	27.5	4.88
p value (ANOVA)		0.639	

The hearing improvement was also measured between the groups (Table V). The adenotonsillectomy with bilateral grommet insertion procedure had shown a significant reduction in the air-bone gap when compared to the other procedures and this was followed by adenoidectomy with bilateral grommet insertion.

## Discussion

In our study a total of 600 students were checked for ear pathologies in which 334 were males and 266 were females. The disease prevalence of Otitis Media with Effusion was seen in 80 students, i.e. 14.2% were males and 12% were females with overall percentage of 13.3% among the rural school going children.

A study done by Okolugbo et al.<sup>9</sup> on prevalence of Otitis Media with Effusion amongst primary school children in Benin city Nigeria had shown the prevalence as 15.9%. This value was quite close to that of Ijaduola et al.,<sup>10</sup> 18.6% and 18.2% which was obtained by

Nwawolo et al.<sup>11</sup>

Adhikari<sup>12</sup> in his study over 1245 students in Kathmandu valley during the calendar year of 2008, found Otitis Media with Effusion as 3.7%. Shah<sup>13</sup> found incidence Otitis Media with Effusion as 8.31%, of which 8.50% were males and 7.49% were females. Maximum number of cases were in 6 to 7 years of age group which is 13.21%. In our study the prevalence of Otitis Media with Effusion is 13.3% and is maximum in the age group of 5 to 6 years.

Amusa et al.<sup>14</sup> in 2005, found Otitis Media with Effusion to be less than 1% in 600 children in 0-12 age group of tropical African population. Shaheen et al.<sup>15</sup> in the year 2008, found Otitis Media with Effusion from 5 different rural primary schools of Palash Upazilla of Narsingdi district as 9.8%. Mozaffarinia<sup>16</sup> found the prevalence of Otitis Media with Effusion as 5.7% amongst 1001 students of kindergarten schools of Kerman city, Iran in year 2010 in which 50% were asymptomatic.

A study done by Yadav et al.<sup>17</sup> on prevalence of Otitis Media with Effusion among the government school children in Haryana found that 20.75% of children in the age group 7-12% had Otitis Media with Effusion and also quoted that lower socio economic status and poor hygiene as the major contributing factors, which was almost in par with our results.

The prevalence of Otitis Media with Effusion in our study was comparatively higher than the previous studies, as almost all the students in our study belong to a low socio-economic status studying in a government school and their personal hygiene was very poor.

Climatic conditions also have an influence in the development of Otitis Media with Effusion. A study done by Kowen,<sup>18</sup> Silvia<sup>19</sup> and Liu-Li-Min<sup>20</sup> reported higher prevalence of 24%, 27% and 30% respectively, however, they studied children in the age group of 2-4 years.

In the present study, on comparing the various treatment modalities for students with Otitis Media with Effusion, adenotonsillectomy with grommet insertion had best results followed by adenoidectomy with grommet insertion. In 2004, Coyle,<sup>21</sup> in a study compared the effects of adenoidectomy, adenotonsillectomy and

**Table IV : Comparison of pure tone audiometry readings before and after various interventions among the study population**

MODE OF INTERVENTION	MEAN AIR – BONE GAP				P VALUE (ANOVA)
	PRE-OP	6 WEEKS	3 MONTHS	6 MONTHS	
Adenotonsillectomy + Grommet insertion	31.15	9.81	8.27	6.73	<.0001
Adenoidectomy + Grommet	29.4	13.27	9.04	7.5	<.0001
Bilateral grommet in-sertion	28.35	13.12	11.04	10.83	<.0001
Bilateral myringotomy	27.5	13.96	13.96	13.12	<.0001

**Table V : Comparison of pure tone audiometry readings among various interventions among the study population**

MODE OF INTERVENTION	MEAN AIR – BONE GAP		
	6 WEEKS	3 MONTHS	6 MONTHS
Adenotonsillectomy + Grommet inser-tion	9.81	8.27	6.73
Adenoidectomy + Grommet	13.27	9.04	7.5
Bilateral grommet insertion	13.12	11.04	10.83
Bilateral myringotomy	13.96	13.96	13.12
P value (ANOVA)	<.001	<.001	<.001

ventilation tube. They found that at 6 months after surgery there was an average of 15.40 dB improvements in hearing threshold after adenoidectomy with tube insertion, 12.18 dB in adenoidectomy and 15.15 dB in ventilation tube insertion. There was just 3.60 dB improvement in the no surgery group. On long term follow up they found adenoidectomy results in long term sustained resolution while grommet insertion produces immediate resolution.

A study conducted by Ryding<sup>22</sup> compared myringotomy, tympanostomy tube and medical line of treatment. He found that tympanostomy tube and myringotomy produced significant improvement in hearing when compared to the medical line of management.

In a prospective randomized study in 2007 by Vlastarakos,<sup>23</sup> the mean threshold level after adenotonsillectomy with grommet decreased from 32.5 dB to 16.0 dB after 6 months. The mean hearing threshold after adenoidectomy with grommet insertion, adenoidectomy, adenotonsillectomy and grommet insertion decreased from 33.2 dB to 16.4 dB, 33.2 dB to 20.4 dB, 32.6 dB, 18.8 dB and 31.3 dB to 17.5 dB respectively after 6 months of surgery. Therefore there is a better clearance after adenotonsillectomy with grommet insertion than after plain adenoidectomy



with grommet insertion. Even adenoidectomy or adenotonsillectomy without grommet too produces good amount of improvement in hearing at 6 months. Similar type of results was also shown by Kouwen.<sup>24</sup>

## Conclusion

The prevalence of Otitis Media with Effusion in the present study was 13.3% and poverty and poor hygiene were the major factors contributing to the development of the otitis media. Among the treatment options adenotonsillectomy with grommet insertion had shown a better improvement in hearing followed by adenoidectomy with grommet insertion and myringotomy grommet only. It is recommended that surgical intervention should be attempted as early as possible when the medical management fails to respond. Among the various surgical intervention adenotonsillectomy was found to have a better improvement in hearing in our study.

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