INTRODUCTION

Otitis Media with Effusion (OME) is defined as an inflammation of the middle ear mucosa along with an accumulation of liquid without signs or symptoms of acute infection. The condition results due to functional alteration in the mucociliary system of the middle ear and the eustachian tube. Although the fluid collected in the middle ear is usually sterile but multiple organisms have been grown from the culture of the fluid. OME may occur spontaneously because of poor eustachian tube function or as an inflammatory response. Many episodes resolve spontaneously within 3 months, but about 30-40% of children have recurrent OME and 5-10% of episodes last one year or longer. Persistent middle ear fluid from OME results in decreased mobility of tympanic membrane and serves as a barrier to sound conduction, resulting in deafness, the commonest symptom of the disease. The risk factors include cleft palate, adenoids, ascending eustachian tube infections and allergic conditions of the nose, leading to obstruction of the nose and eustachian tube. The disease covertly may present with poor hearing, irritability, poor school performance, insularity and problems in cognitive development. The vagueness of the complaints and the usual inability to do the proper otological examination by the general practitioners and paediatricians, who are the primary physicians for the children, lead to late and missed diagnoses of a large number of cases. As the constellation of vague symptoms may persist from weeks to months, it leads to multiple hospital visits, which in turn results in loss of school days for the children, increased burden on the hospital resources due to misdirected investigations and undue apprehension of the parents.

This study was conducted to document the frequency of otitis media with effusion in the children, who are presenting with above-mentioned vague symptoms along with history of recurrent respiratory tract infections.

PATIENTS AND METHODS

The study was carried out at the Combined Military Hospital, Gujranwala, over a period of 2 years from...
September 2003 to September 2005. The study population consisted of the children of army personnel, of either gender from 3 to 12 years of age reporting in the Paediatric Outpatient Department (OPD) with the symptoms of upper respiratory tract infection i.e. cough, rhinorrhea, ear ache and fever. Children suffering from two or more episodes of upper respiratory tract infection in the last 12 weeks time period were included. The referral criteria to the otolaryngologist included mild intermittent ear pain, fullness or “popping” of the ear drum; failure of children to respond appropriately to normal conversational level of speech or the need for excessively high volume of sound when using audio equipment or television; non-specific hearing loss suggested by lack of attentiveness and behavioural changes; excessive irritability, insularity and sleep disturbances of the child noted by parents or peers; balance problems, unexplained clumsiness and poor school performance.

Children having history of previous otological problems like chronic suppurative otitis media, sensorineural deafness, congenital anomalies or congenital deafness, neurological problems like cerebral palsy, mental retardation or attention deficit disorder were excluded from the study.

After an informed consent from the parents, all cases underwent a detailed history and thorough physical examination in the Paediatric OPD. The clinical history revealed information about the age, gender, duration of disease, and other associated symptoms like poor hearing, excessive irritability, insularity, poor school performance or significant behavioural changes. The children suspected of suffering from Otitis Media with Effusion (OME), were referred to otolaryngologist for further evaluation.

The otolaryngological evaluation included reassessment of history with more emphasis on the otolaryngological aspect and detailed examination of the ear, nose and throat. Otoscopy was performed with Halogen lamp and pneumatic attachment to document the dullness, retraction or bulge, loss of cone of light, change of normal greyish colour of the tympanic membrane to blue or black, retracted handle of malleus and prominent lateral process and the presence of fluid or bubbles behind the tympanic membrane. All patients suspected of having OME on the basis of pneumatic otoscopy underwent further otolaryngological evaluation to substantiate the findings of pneumatic otoscopy. Tympanometry was performed to find out fluid in the middle ear. Tuning-fork tests and Pure Tone Audiometry (PTA) were done to assess the level of deafness. Diagnosis of OME was made on the basis of history, clinical evaluation, pneumatic otoscopic examination and tympanometry.

Data was collected and analyzed by SPSS (version 12.0) for windows and 95% confidence interval was calculated for the frequency of OME cases.

RESULTS

During the study period, 350 children including 193 (55.1%) boys and 157 (44.9%) girls were selected by the paediatric department according to the inclusion criteria. The mean age was 56.4 months with a range from 3 to 12 years. These were referred to otolaryngology department, where further evaluation was done as follows:

Pneumatic otoscopy was performed in all the cases. Out of 350 cases, 147 (42%, 95%, CI=37.9 to 47.1) showed dullness of tympanic membrane with loss of cone of light. Out of these 147 cases, 112 (76%) had retracted tympanic membrane. Bulging of tympanic membrane was present in 25/147 (17%) cases. Only 10/147 (6.08%) cases showed dullness of tympanic membrane with loss of cone of light and no additional features. So more than two features were seen in 137/147 (93.2%) cases i.e. dullness, loss of cone of light, and retraction in 112 cases, while dullness, loss of cone of light and bulging in 25 cases (Table I). The 112 cases with retracted tympanic membrane also showed bubbles behind the tympanic membrane in 22/112 (19.6%) cases, fluid level seen behind the tympanic membrane in 30/112 (26.7%) cases, bluish and black discoloration in 2/112 (1.7%) cases and retraction with prominent lateral process was seen in 58/112 (51.7%) cases (Table II).

Tympanometry showed flat type-B curve in 145/147 (98.6%) cases indicating fluid presence behind the tympanic membrane. Tuning-fork tests were done with 512-Hz tuning fork with foot plate. It showed negative Rinnie’s test in 122 (83%) out of 147 cases, which indicates conductive hearing loss of more than 15-20 decibels (dB). Pure tone audiometry showed deafness in 138/147 (93.8%) cases; deafness was of conductive type. The average pure tone hearing loss was assessed at three frequencies (500, 1000, and 2000). The hearing

### Table I: Pneumatic otoscopy results in 147 cases of OME.

<table>
<thead>
<tr>
<th>Clinical tests</th>
<th>Cases</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dullness of tympanic membrane with loss of cone of light and retracted tympanic membrane</td>
<td>112</td>
<td>76.19%</td>
</tr>
<tr>
<td>Dullness of tympanic membrane with loss of cone of light and bulging tympanic membrane</td>
<td>25</td>
<td>17.06%</td>
</tr>
<tr>
<td>Only dullness with loss of cone of light of tympanic membrane</td>
<td>10</td>
<td>6.08%</td>
</tr>
<tr>
<td>Total cases</td>
<td>147</td>
<td>100%</td>
</tr>
</tbody>
</table>

### Table II: Features of retracted tympanic membrane (in 112 cases).

<table>
<thead>
<tr>
<th>Clinical findings</th>
<th>Cases</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bubbles</td>
<td>22</td>
<td>19.6%</td>
</tr>
<tr>
<td>Fluid level</td>
<td>30</td>
<td>26.7%</td>
</tr>
<tr>
<td>Bluish or black colour</td>
<td>2</td>
<td>1.7%</td>
</tr>
<tr>
<td>Only retraction with no other features</td>
<td>58</td>
<td>51.7%</td>
</tr>
</tbody>
</table>
loss ranged from mild to moderate (25-55 dB). More than 50% cases showed about 35 dB hearing loss and 10% of ears exceeded 45 dB hearing loss. Seven (4.7%) children were not cooperative enough to interpret the results (Table III).

Table III: Diagnostic accuracy percentage of different adjunct tests of 147 cases of OME suspected on pneumatic otoscopy.

<table>
<thead>
<tr>
<th>Tests</th>
<th>Cases</th>
<th>Percentage</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tuning fork tests</td>
<td>122</td>
<td>83%</td>
<td>Negative Rinne’s</td>
</tr>
<tr>
<td>Tymanometery</td>
<td>145</td>
<td>98.6%</td>
<td>Flat type B curve</td>
</tr>
<tr>
<td>PTA</td>
<td>138</td>
<td>93.8%</td>
<td>Conductive deafness (25-55 dB)</td>
</tr>
</tbody>
</table>

With the help of all the above-mentioned clinical evaluation and investigations, 147 (42%) out of 350 cases were confirmed to have otitis media with effusion. Forty three (29.2%) cases were lost to follow-up. Out of the rest 103 cases, 91 (88.3%) cases showed spontaneous resolution within 3 months.

**DISCUSSION**

Otitis media with effusion is a common childhood otological condition that most of the time is left undiagnosed on account of unawareness and negligence in seeking early medical attention for trivial ailments. Untreated OME might leads to serious consequences in the form of poor speech and intellectual development and permanent anatomical disabilities within middle ear cleft. OME may occur spontaneously because of poor eustachian tube function or as an inflammatory response following acute otitis media. Approximately, 90% of children have OME at some time before school age, most often between ages 6 months and 4 years. In the first year of life, 50% of children will experience OME, increasing to 60% by 2 years. Many episodes resolve spontaneously within 3 months, but 30-40% of children have recurrent OME, and 5-10% of episodes last 1 year or longer. In 40-50% of cases of OME, neither the affected children nor their parents or caregivers describe significant complaints referable to a middle ear effusion.

The high prevalence of OME, difficulties in diagnosis and assessing, duration, increased risk of conductive hearing loss, potential impact on language and cognition, and significant practice variations in management makes OME, an important condition for the use of up-to-date evidence-based practice guidelines. Correct diagnosis of OME is fundamental to proper management. Moreover, OME must be differentiated from acute otitis media to avoid unnecessary antimicrobial use.

The present study was conducted on the basis of clinical observation by otolaryngologists that most of the cases of OME go undiagnosed in paediatric practice because upper respiratory tract infections get the priority due to acuteness of the situation and lack of experience of paediatricians regarding this purely otological problem. As deafness does not get priority over fever by the parents, sometimes this complaint is ignored by parents in critical situation of the child in upper respiratory tract infection. Although, a lot of stress is being put on otolaryngologist during training to master this disease in both diagnosis and management aspects but unfortunately, it does not get due importance during paediatric training practice. Most of the time otoscopy is left as a job otolaryngologist rather than being part of clinical assessment of the child by paediatrician. At the same time, it has been observed that the infrequent otoscopic examinations by the paediatricians make it difficult to pick-up the tympanic membrane changes, that too in children, where ear examination is comparatively trickier than in adults.

In the present study, the frequency of OME associated with upper respiratory tract infection was 42%. This is a considerable number in view of the fact that those children were reporting to paediatric OPD for different vague complaints most of which were not related to ear problems. If not diagnosed, these children would have been treated or investigated unnecessarily causing anxiety to parents, waste of hospital resources and loss of school days for the children.

In the present study, pneumatic otoscopy was used as the main diagnostic tool. Its diagnostic accuracy was 93.2%. The AHRQ (Agency of Healthcare Research and Quality, USA) evidence report systematically reviewed the sensitivity, specificity, and predictive values of nine diagnostic methods for OME. Pneumatic otoscopy had the best balance of sensitivity and specificity, consistent with the 1994 guidelines. Meta analysis revealed a pooled sensitivity of 94% (95% confidence interval: 91-96%) and specificity of 80% (95% confidence interval: 75-86%) for validated observers using pneumatic otoscopy versus myringotomy as the Gold standard. Pneumatic otoscopy, therefore, should remain the primary method of OME diagnosis because the instrument is readily available in practice settings, is cost-effective, and is accurate in experienced hands. Non-pneumatic otoscopy is not advised for primary diagnosis. The accuracy of pneumatic otoscopy in routine clinical practice may be less than that shown in published results, because clinicians have varying training and experience.

When the diagnosis of OME is uncertain, tympanometry or acoustic reflectometry should be considered as an adjunct to pneumatic otoscopy. In the present study while using as adjunct tests, tympanometry, pure tone audiometry and tuning-fork tests were suggestive of diagnosis of OME in 98.6%, 93.8% and 83% cases respectively, which were suspected to have OME by pneumatic otoscopy. Otitis media with effusion has a high rate of spontaneous resolution, and a policy of waiting and watching for 3 months is justified. The decision about further treatment should be individualized, depending
on duration and symptoms. The likelihood of spontaneous resolution of OME is determined by the cause and duration of effusion. In the present study, 43 (29.2%) cases were lost to follow-up and 91 (88.3%) cases showed spontaneous resolution. This high dropout rate was due to posting out of the parents of the patients who were serving army personnel. Another reason was the fact that the symptoms of the children were considered trivial and no treatment was being offered to them. Resolution of clinical symptoms and tympanometry were used as tools to confirm the resolution. Ninety five percent confidence interval was calculated for the pneumatic otoscopy, which was 36.09-47 as compared to 42% in this study.

CONCLUSION

Otitis media with effusion is common in children having recurrent upper respiratory tract infection, non-specific ear-related symptoms and poor school performance. Though, this is a benign condition with a high rate of spontaneous resolution, yet it leads to parental apprehension, multiple unnecessary investigations and sometimes unjustified medication.

It is recommended that a long-term multi-centre study should be conducted to find out the true magnitude of this problem in our society. More emphasis should be laid on the training of doctors at all levels so that they should be able to pick and diagnose the cases of OME as early as possible.

REFERENCES