Section: ENT

Original Research Article

RISK FACTORS AND MICROORGANISMS ASSOCIATED WITH OTITIS MEDIA WITH EFFUSION IN CHILDREN

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ABSTRACT

Background: Otitis media with effusion (OME) is a common childhood otological condition. The middle ear effusion is mucoid or seromucinous in nature, but not purulent. The condition lasts for at least 3 months; this sets it apart from persistent effusion after acute otitis media, which disappears after 2 months in 90% of cases. OME has a high prevalence in children and is responsible for most of the hearing losses in school going age group (5-12 years). Most cases of OME are relatively asymptomatic with nearly 25% discovered incidentally. Despite this apparent absence of symptoms, the potential impact on hearing, speech, language and cognition highlights the need for timely intervention. **Aim:** To estimate the risk factors associated with OME and to detect different types of microorganisms in the middle ear fluid of children with OME.

Materials and Methods: A cross-sectional study was conducted on 458 children presenting with features of OME. A questionnaire was used to determine the risk factors for OME among these children. Otoscopy and tympanometry were used to diagnose and confirm OME. The pure tone average for children with OME was measured. Assessment of risk factors were done in all children. Myringotomy was performed in children with obvious fluid in the middle ear and a sample was sent for culture and sensitivity.

Results: OME was highly linked with age less than 9 years in univariate analysis. The mean age of the sample was 8.71 years with the median age being 2.5 years. There are several risk factors related to OME, with nasal allergies (22.9%) and adenoid hypertrophy (22.9%) being the most prevalent. Middle ear fluid was sterile in 74.7% cases whereas 9% of the samples showed Streptococcus pneumoniae & Haemophilus influenzae as the microorganism.

Conclusion: Nasal allergies and adenoid hypertrophy were the most common risk factors of OME in children less than 18 years. Otoscopy, tympanometry and pure tone audiometry should be used as screening tools for OME. Middle ear fluid was sterile in majority of cases and hence routine use of antibiotics for treatment of these cases is not recommended.

Keywords: Adenoid hypertrophy, Otitis media with effusion, Serous otitis media, Tympanometry.

INTRODUCTION

The otological disorder known as otitis media with effusion (OME) is frequent in children. In the year 1976, Sir Mawson defined the illness as middle ear inflammation with fluid build-up behind an intact tympanic membrane.[1] To qualify as a chronic condition, the fluid must persist for at least three months. The disease is also known as an early childhood occupational hazard.[2] OME is very common in youngsters and is mostly to blame for hearing loss in the school-age population. Before the age of three, more than 80% of kids will have experienced one OME episode.[3] Other names for this illness include secretory otitis media, non-

suppurative otitis media, serous otitis media, middle ear effusion, and glue ear.[4]

OME often follows a bout of upper respiratory tract infection. Children as early as one year of age can experience OME. About 60% of cases affect children under the age of two, with 50% of cases affecting babies.[5] If OME is left untreated, it can result in consequences including hearing loss and tympanic membrane damage (atrophy, tympanosclerosis, retraction pockets, and cholesteatoma). Additionally, it might hinder children's language development and cause behavioural problems.[6]

Eustachian tube dysfunction (ETD), allergies, viral infections and untreated otitis media are some of the risk factors for the development of OME. Biofilm development, Gastro esophageal reflux disease (GERD), respiratory allergies, pollution, low socioeconomic position, smoking and genetic risk factors are additional risk factors.[7] The current standard of care calls for conservative treatment (steroids and antibiotics) as the first step, followed by adenoidectomy in resistant cases or when symptoms of adenoid hypertrophy are prominent. OME is still difficult to manage, and such consensus on the indications for medical or surgical intervention has been indirectly supported by evidence couched in rather general terms and not always followed in practice.[8]

Knowledge of the severity of risk factors in children with OME will aid in the avoidance of these factors, hence reducing the occurrence of OME.

Aim

This study aims to study the risk factors associated with OME in children and to find the different types of microorganisms in the middle ear fluid of children with OME.

MATERIAL AND METHODS

All children in the age group of <18 years, with features of otitis media with effusion presenting to ENT OPD in Government Medical College Kozhikode from November 2021 to December 2022 were considered for the study. After obtaining approval from the Institutional Research Committee and the Institutional Ethics Committee the patients were enrolled. A total of 458 patients were selected for the study based on the sample size calculation.

Exclusion criteria was set as

- Children with mixed or sensorineural hearing loss
- Children with ear discharge, cleft lip/cleft palate
- children who are not willing to participate in the study
- other causes of conductive hearing loss

Criteria to Diagnose OME was set as

- Otoscopy — Retracted tympanic membrane with an abnormal light reflex and the membrane may appear dull or a fluid level may be seen.
- Type B tympanogram
- Pure Tone Audiometry —shows conductive hearing loss with air-bone gap > 10 dB HL

A thorough clinical history was taken after obtaining demographic data. An otoscopic examination was done to assess the status of the tympanic membrane. Tuning fork test done using 256 Hz Tuning fork. Pure tone audiometry (PTA) and tympanometry was done in all cases. A diagnostic nasal endoscopy (DNE) was done to look for adenoid hypertrophy. X-Ray nasopharynx lateral view was taken in children who were not cooperative for DNE. Myringotomy was performed in children with obvious fluid collection in the middle ear. Fluid was aspirated using a 5-CC syringe and 23G 25mm needle. Aspirated fluid was sent for culture and sensitivity to know about microorganisms associated with OME.

Data was tabulated in excel worksheet and statistical analysis performed using SPSS software version 28. Qualitative variables were expressed in frequencies and percentages. Quantitative variables were expressed as mean and standard deviation. A P value <0.05 was considered statistically significant.

RESULTS

A total of 458 patients were included in the study. The mean age of the sample was 8.71 years with the median age being 2.5 years. The most common age affected with OME as per this study was 9 years. According to this study, both males (49.8%) & females (50.2%) were equally affected. Majority of the study population presented with hard of hearing as the presenting complaint with a prevalence of 91.3% (418/458 cases). Children with allergic rhinitis and atopy were more predisposed to the development of OME (105/458 samples) with a prevalence rate of 22.9%. A similar prevalence was also seen in children with adenoid hypertrophy (22.9%) who had symptoms of mouth breathing and snoring. The other risk factors were daycare attendance (9%), passive smoking (8.7%), recurrent URTI (8.5%), LPRD (8.3%), bottle feeding (7%) and recurrent tonsillitis (7%).

The tympanic membrane was dull and retracted in majority of cases. A clear fluid level with air bubbles could be seen in about 101 cases (22.1%) on the right side and 108 cases (23.6%) on the left side. However, the tympanic membrane appeared normal in 110 cases on the right side and 93 cases on the left side. On pure tone audiometry assessment, majority of patients had a minimal conductive hearing loss closely followed by the group with mild conductive hearing loss. Some children even presented with a moderate conductive hearing loss.

The prevalence of adenoid hypertrophy as detected by a DNE, clinically significant enough to cause a choanal and eustachian tube obstruction was 50.6%. Out of 458 cases, 91 children were not cooperative

for DNE, for whom X-Ray of the nasopharynx was taken. Out of this, about 49.4% cases showed an adenoid hypertrophy compromising the nasopharyngeal airway.

Out of 458 cases, myringotomy was performed in 209 cases who did not respond to medical treatment. Middle ear fluid collection was done as far as possible under sterile precautions and 186 samples were sent for culture and sensitivity. As expected, the middle ear fluid was found to be sterile in majority of cases (prevalence of 74.7%). However, 9% of the samples showed Streptococcus pneumoniae & Haemophilus influenzae as the predominant microorganism.

DISCUSSION

Otitis Media with Effusion is one of the commonest otological conditions seen in children. In the present study, out of 458 established cases of OME, majority were young children. This warrants that, parents and teachers of children in this age group should be well aware of the symptoms of OME and so that an early detection can be done. Even though, there are various risk factors associated with OME in children, nasal allergy and adenoid hypertrophy had the highest prevalence of 22.9%. Although there are limitations in the study, the results obtained were comparable to other studies described in the literature.

The mean age group of the study was 8.7 years. The result is similar to a study conducted in Turkey, where the prevalence was high (9.8%) in the age group 6 to 9 years.[9] The highest age of presentation in our series was 16 years (1 out of 458 cases) and the lowest age of presentation was 2 years. This is almost identical to the study conducted by Nicola C. Lyngdoh et al were 54% of the participants were between the ages of 5 and 8 years.[10]

In their study, M. Fujioka, W. Young and R. Girdany showed that the size of the adenoid fluctuates from child to child and even within the same individual as he or she grows. The adenoids reach their maximum size between the ages of 4 and 8 and subsequently shrink until the age of 12.[11] Zielhius et al analyzed around 23 research and discovered that the prevalence is bimodal, with a first peak at age 2 when the kid joins a play group or nursery school and a second high at age 5 when the child begins elementary school.[12]

There was no sex predilection for OME as per this study. Our sample comprised of 230 females (50.2%) and 228 males (49.8%). This was similar to a study by Ajayan PV et al, which showed a slightly higher incidence in male children, as they are more exposed to allergic and infectious agents compared to female children.[13] Majority of studies show a higher prevalence among males than in females, as in a study by Nicola C. Lyngdoh, where the male-to-female ratio was 3:1.[10] In a study by Ila Upadhya et al,[14] the ratio of males to females was 1.85:1, however, it was 2:1 in a study by Khan et al .[15]

The etiopathogenesis of OME is multifactorial. There are certain individual and environmental risk factors in the development of OME. These include socioeconomic factors, family history, birth and neonatal history, bottle feeding, passive smoking, allergy, nasal symptoms, recurrent URTI, and attendance at daycare centres. In our study, children with allergic symptoms and adenoid hypertrophy were more prone to OME (22.9%). Other predictors for OME were children attending daycare centres (9%), history of passive smoking (8.7%), recurrent URTI (8.5%) and LPRD (8.3%). A relationship of these risk factors associated with OME has been reported by Kiris et al.[16] The prevalence of the two environmental risk factors evaluated in a study by Alice Mugawanze were 19.3% for daycare centre attendance and 16.1% for passive smoking at the patient's home.[17] Majority of children with OME (73.7%), spent their day at home, while 19.3% attended daycare centres. Children attending daycare (n = 11) had a median age of 60 months, compared to 56 months for children spending time at home (n = 42) and 53.5 months for children attending school (n = 4).

Generally, the first and only symptom of OME is hearing loss. Even in our study, hard of hearing was the most common presenting complaint (418/458). About 77.8% of total cases presented with conductive hearing loss, out of which minimal conductive hearing loss was the most common type (247 cases- Right,257 cases- Left). In a study by Khilnani AK et al, deafness was the most common symptom with which the patients presented (38 out of 40 cases).[18] In a similar study by Ajayan P V et al, mouth breathing and nasal obstruction were the commonest symptoms.[13]

In our study, culture and sensitivity of the middle ear fluid done in 186 cases, yielded no growth and was sterile (74.7%). In 9% cases, the sample showed growth of Streptococcus pneumoniae and Haemophilus influenzae. In a study by Artur N et al for assessing bacteriology in OME, Haemophilus influenzae was most frequently isolated (38.89%).[19] In another study by Shah M Z et al, Streptococcus pneumoniae was found as the most frequent isolate.[20]

The main limitation of this study is that, due to the limited sample size, the generalization of the result to the whole population may not be valid. Since some of the children under the age of three were not cooperative in the examination process, there would have been a selection bias. Obtaining middle ear fluid following myringotomy was difficult as in most of the cases, the middle ear fluid was lost during ear suction during myringotomy.

CONCLUSION

The main risk factors for the development of OME were allergic rhinitis and adenoid hypertrophy, with

the others being age, daycare centre attendance, parental smoking and history of upper respiratory tract infection. These modifiable risk factors should be communicated to parents and care takers. Thus, a delayed diagnosis of OME can often be avoided. Otoscopy, tympanometry and pure tone audiometry should be used as screening tools for the diagnosis of OME. Middle ear fluid was sterile in majority of cases and hence routine use of antibiotics for treatment of these cases is not recommended.

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REFERENCES

1. S.R. Mawson. Middle ear effusions: definitions, Ann. Otol. Rhinol. Laryngol., 85 (1976), pp. 12-14
2. Rosenfeld RM, Shin JJ, Schwartz SR, Coggins R, Gagnon L, Hackell JM, et al. Clinical Practice Guideline: Otitis Media with Effusion (Update). Otolaryngol Head Neck Surg. 2016 Feb;154(1 suppl): S1-41.
3. George Browning, Otitis media with effusion; Scott—Brown Otorhinolaryngology, Head& Neck Surgery 8th Edition; Chapter 13: Volume 2;115-135
4. P L Dhingra, Diseases of Ear Nose & Throat and Head and neck surgery, Elsevier, 6/e; 2014; p-64
5. Casselbrant, M.L., Mandel, E.M., 2003. Epidemiology. In: Rosenfeld RM, Bluestone CD. Evidence-Based Otitis Media, second ed. BC Decker Inc, Hamilton, pp. 147e162.
6. Maw, R., Wilks, J., Harvey, I., Peters, T.J., Golding, J., 1999. Early surgery compared with watchful waiting for glue ear and effect on language development in preschool children: a randomised trial. Lancet. 1999 Mar 20;353(9157):960-3. doi: 10.1016/S0140-6736(98)05295-7.
7. Rovers, M.M., Schilder, A.G., Zielhuis, G.A., Rosenfeld, R.M., 2004. Otitis media. Lancet. 2004 Feb 7;363(9407):465-73. doi: 10.1016/S0140-6736(04)15495-0.
8. Simon F, Haggard M, Rosenfeld RM, Jia H, Peer S, Calmels M-N, et al. International consensus (ICON) on management of otitis media with effusion in children. Eur Ann Otorhinolaryngol Head Neck Dis. 2018 Feb;135(1S): S33-9.
9. Gultekin E, Develioglu ON, Yener M, Ozdemir I, Kulekci M. Prevalence and risk factors for persistent otitis media with effusion in primary school children in Istanbul, Turkey. Int J PediatrOtorhinolaryngol. 2004;68(8):1069-1074.
10. Lyngdoh NC, Jaiswal I, Singh OP, Saha DR et al. A Study on the Clinical Profile and Treatment Modalities of Otitis Media with Effusion. Journal of Dental and Medical Sciences. Volume 16, Issue 7 Ver. III (July. 2017), PP 60-66
11. Fujioka M, Young LW, Girdany BR. Radiographic evaluation of adenoidal size in children: adenoidal-nasopharyngeal ratio. AJR Am J Roentgenol. 1979 Sep;133(3):401-4.
12. Zielhuis GA, Heinen HE, Rach GH, Van Den, Broek P. Environmental risk factors for otitis media with effusion in preschool children. Scand J Prim Health Care.1989;7:33-8
13. V AP, L DRM, Jacob AM. A study on the effect of adenoidectomy with tonsillectomy in otitis media with effusion in children. International Journal of Research in Medical Sciences. 2017 Apr 26;5(5):1796—801.
14. Ila Upadhya, J. Datar. Treatment options in otitis media with effusion. Indian. J Otolaryngol Head Neck Surg.2014 Jan;66(suppl1):191-197
15. Khan F, Asif M, Farooqi GH, Shah SA, Sajid T, Ghani R. Management outcome of secretory otitis media. J Ayub Med Coll Abbottabad. 2006 Mar;18(1):55-8.
16. Kiris M, Muderris T, Kara T, Bercin S, Cankaya H, Sevil E. Prevalence and risk factors of otitis media with effusion in school children in Eastern Anatolia. hit J PediatrOtorhinolaryngol. 2012; 76:1030-5
17. Alice Mugwanez, Peter Mugwe, Joyce Aswani. Risk factors for otitis media with effusion in children at Kenyatta national hospital. UoN Digital repository Nirobia;2015
18. Ajeet Kumar Khilnani, Viral Prajapati. Study of clinical and demographical profile of patients diagnosed with secretory otitis media. Int J Otorhinolaryngol Head Neck Surg.2017.Jul;3(3):715-720
19. Artur Niedzielski, Lechoslaw Pawel Chmielik, Tomasz Stankiewicz. The formation of biofilm and bacteriology in otitis media with effusion in children: A prospective cross-sectional study. Int.J.Environ.Res.Public Health.2021,18(7),3555
20. M Z Shah,G Mustafa,M Iqbal, M Qasim .Prevalence of gram positive bacteria in the affected individuals with otitis media with effusion from the indigenous population of southern Punjab,Pakistan.Brazilian journal of biology;2024 ;vol 84,e2678874.