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RESEARCH ARTICLE

PREVALENCE AND ASSESSMENT OF OTITIS MEDIA WITH EFFUSION IN EARLY PRIMARY SCHOOL CHILDREN IN MOSUL CITY

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INTRODUCTION

Otitis media with effusion (OME) or glue ear is the collection of fluid behind the tympanic membrane without inflammatory signs present for 6 weeks (Stool *et al.*, 1994). OME is a common health problem both in pre-school and school children. Its symptoms are insidious, the diagnosis is difficult and generally delayed (Schappert, 1992). OME is characterized by a high recurrence rate. The potential risks of sequel formation and complications like tympanosclerosis, retraction pockets, adhesive otitis media and hearing or speech impairment make the disease an important public health problem (Caylan *et al.*, 2006). Otitis media with effusion is a common health problem in children less than 15 years old. If left untreated or inadequately treated, it may lead to a series of sequelae and complications, such as permanent hearing loss and hearing or speech impairment (Rosenfeld *et al.*, 1992; Paradise *et al.*, 2003). The etiology of OME is multifactorial. Infection and Eustachian tube (ET) dysfunction are the most widely accepted contributory factors (Stenstro *et al.*, 1991; Umopathy *et al.*, 2007). Frequent infections like common cold, mechanical obstruction or craniofacial malformations that

interfere with the proper ET functioning increase susceptibility to accumulation of fluid within the middle ear cavity (Birch and Elbrond, 1987). Etiologic causes are infection, inflammation and insufficient pneumatization of the middle ear. Conditions like eustachian tube dysfunction, insufficient pneumatization of the mastoid, craniofacial abnormalities, infections, immunodeficiency and allergic agents are among controversial causes of OME (Gultekin *et al.*, 2004). There are many environmental risk factors in the development of OME like smoking, poor socio-economic conditions, seasonal conditions and risk factors specific to the child like sex, race, properties of the eustachian tube, adenoid tissue hypertrophy, allergy, immunologic status, presence of cleft palate and mucocilliary dysfunction. The diagnosis of OME is not easy, and there is significant variability in the ability of clinicians, especially primary care physicians or pediatricians, to diagnose it (Lyon *et al.*, 1998). Symptoms of OME are neither sensitive nor specific, and most children with OME are asymptomatic (Bluestone *et al.*, 1995). Furthermore, children may be uncooperative with the examination. Other numerous diagnostic tools have been developed to improve the accuracy for diagnosis of OME. In the diagnosis of OME, pneumatic

ABSTRACT

Introduction: Otitis media with effusion OME, which refers to the accumulation of fluid in the middle ear cavity without any signs of acute infection. The aim of study is to determine the prevalence, the risk factors and treatment. Early detection of OME leads to obtain good result within short time and help children for retaining their normal hearing. Untreated OME leads to serious social complications to the child, school, teachers and society like loss of hearing, mental retardation behavioral abnormality, speech problem, learning problem and school performance. Treatment of OME was by eradication of risk factors, medical treatment, eustachian tube rehabilitation and surgical interference. **Material and methods:** 1812 children examined from the first and second grade in primary schools by pneumatic otoscope. 308 children positive OME send for assessment of hearing and measuring the middle ear pressure by pure tone audiometry and tympanometry. Medical treatment was given (local steroid as Mometazone for 8 weeks, systemic antibiotic for 10 days as Amoxicillin, and systemic decongestant for 8 weeks as Montelukast, loratadine). **Results:** OME prevalence was 17% in Mosul city. 308 from 1812 children have had OME, those children were given medical treatment, 66% cured completely and their regaining their hearing. Only 34% resist the medical treatment and they need further treatment, follow up and surgical interferences. 21 children underwent bilateral tympanostomy with insertion of ventilation tube, 8 children underwent bilateral adenotonsillectomy with bilateral insertion of ventilation tube. **Conclusion:** OME is a common health problem in pre and primary school children, need early detection and early treatment with eradication of risk factors to retain their hearing for improving their school work performance

otoscopy remains to be the gold standard (Palmu *et al.*, 2012). The use of other diagnostic tools in addition to pneumatic otoscopy, such as impedance audiometry and tympanocentesis, further improve the diagnostic accuracy (Klein, 1995).

The aim of study is to

1. Determine the prevalence of OME in primary school children
2. Discover OME as early as possible
3. Treat as early as possible by medical treatment to cure children from OME and improve their hearing for elevation of their school performance by using systemic and local decongestant, antibiotic, steroid locally or systematically and by using Eustachian tube rehabilitation (using chewing gum to activate jaw movements, increases salivary flow, the rate of swallowing and the rate of activation of paratubal muscles and tubal opening) (Kapila *et al.*, 1984; Kouwen and Dejonckere, 2007).
4. Discover the resist cases which they need surgical interference (tympanostomy with insertion of drainage tube or adenoidectomy)

MATERIALS AND METHODS

The study was conducted between October 2017 and May 2018 in primary schools in Mosul city. The study involved a total number of 1812 pupils in primary school (first and second grade) the age of children involved in the study between six to nine years. Males were 1069 while females were 743.

- All pupils involved in the study examined by otoscopic examination for tympanic membrane evaluation for the appearance of typical normal tympanic membrane was defined to be translucent, pearl gray, fully mobile, and with no evidence of effusion. When one or more findings of followings were seen, OME was diagnosed; opaque tympanic membrane, yellow or amber color, decreased mobility, presence of air fluid level or bubbles, and retracted tympanic membrane.
- A questionnaire form was specially prepared (for patient with positive hearing loss and clinically OME) in order to collect all the relevant information related to the study like: age, gender, socioeconomic status of parents, smoker parents, bottle feeding in infancy, family history of deafness and ear problems. The main source of data was obtained directly from parents.
- The positive OME (otitis media with effusion) patients were sent for
 - a) Tympanometry examination to detect the compliance of tympanic membrane (to measure the middle ear pressure and to detect the presence of fluid inside the middle ear)
 - b) Pure tone audiometry to detect the degree of hearing loss.
- Medical treatment consists of systemic and local decongestant, antibiotic and nasal steroid for all patients with OME.
- Surgical interference for the resist cases include tympanocentesis with insertion of tube or adenoidectomy with tympanocentesis.

21 bilateral myringotomy with insertion of ventilation tube, 8 adenotonsillectomy was done.

RESULTS

The number of children included in the study were 1812 taken from first and second grade of primary school and the age of children included in the study was 6-9 years. Males were 1069 (59%) and females were 743(41%). Among 1812 children were examined by otoscopic examination and pneumatic otoscopy, 308 children were found with OME, 180 of them were male and 128 were female as shown in table1.

Table 1. No. of children examined by pneumatic otoscope

	Tested	Positive OME
Boys	1069	180
Girls	743	128
Total	1812	308

The prevalence of our study is 17%. All children with OME clinically diagnosed by pneumatic otoscopy we send them for tympanometry and pure tone audiometry to prove the clinical diagnosis of OME. We found small difference between the results of tympanometry, pure tone audiometry (P.T.A) and the clinical findings however we took all children with clinical findings in our study as shown in Table 2:

Table 2. Result of different tools investigations

Otoscopic	Tympanometry	Pure tone audiometry
308 +ve	303 +ve	290 +ve
0 -ve	5 -ve	18 -ve (uncooperative child)

All children with OME they have hearing loss, most of them 71% 206 children have mild hearing loss (10-40 dB), 18% 52 child have moderate hearing loss (40-60 dB) and 11% 32 child have severe hearing loss (above 60 dB) as shown in Table 3.

Table 3. Results of pure tone audiometry

Hearing loss	Degree of hearing loss	No. and percentage
Mild hearing loss	10-40 dB	206(71%)
Moderate hearing loss	40-60 dB	52(18%)
Severe hearing loss	60-100 dB	32(11%)
Total No. of children included in this test		290

According to the symptoms which was taken from the parents in our study, 35% 108 child was asymptomatic, 52% 106 child with hearing loss, 20% 62 child with otalgia, 28% 86 child complains from sleep disturbance, 25% 77 child with behavioral problems (abnormal movement, delayed response, agitation, aggressive, isolated), 17% 52 child have speech problems, and 3% 9 child with balance symptoms as shown in Table 4.

Table 4. Symptoms of children with OME

Asymptomatic	108(35%)
Hearing loss	160(52%)
Otalgia	62(20%)
Sleep disturbance	86(28%)
Behavioral problems	77(25%)
Speech problems	52(17%)
Balance symptoms	9(3%)

All children were given medical treatment after taking parents' permission which was systemic antibiotic for 10 days (Amoxicillin), systemic steroid (prednisolone for 5 days),

local steroids (Mometazone 50µg as single puff at night in each nostril for 8 weeks), and systemic decongestant (Montelukast 4mg, Loratidine 5mg daily for 8 weeks). Two months later we examined all those patients with OME we found 66% of them were cured clinically and there is improvement in their hearing as shown in Table 5.

Table 5. No. of children responded to the medical treatment

	Tested	Children with OME	OME positive after two months of medical treatment
Boys	1069	180	62
Girls	743	128	44
Total	1812	308	106

In our study about 34% 106 children of all OME after treated medically get resist and responded weakly. Those 106 children we advise their parent for further investigation and may need surgical interference. 21 children underwent tympanostomy with insertion of ventilation tube in both ears. 8 children underwent for adenotonsillectomy with insertion of ventilation tube. From 308 child with OME we found that 63% of them at least have one smoker parent. This data obtained from the questionnaire form as shown in table6. We found that there is a very high association between smoker parents and children having OME.

Table 6. The relationship between smoker parents and OME children

Total child with OME	Children with OME at least having one smoker parent	Children with OME of nonsmoker parents
308	194(63%)	114(37%)

DISCUSSION

Our study was conducted between October 2017 and may 2018 for primary school in Mosul city. We examined 1812 child by otoscopic examination from first and second grade in the primary school, 1069 was male and 743 was female. From 1812 we found 308 of them having OME by clinical pneumatic otoscopy and we put them in our study. According to their symptoms taken from parents, 35% of them was asymptomatic, 52% have hearing loss, 20% have otalgia, 28% have sleep disturbance, 25% have behavioral problems, 17% have speech problems and 3% balance symptoms in comparison with other study they found 76% of children with OME suffering from otalgia, 64% from sleep disruption, 49% from behavioral problems, 33%-62% from speech and hearing concerns and 15% from balance symptoms (Brouwer *et al.*, 2015; Karkanavatos and Lesser, 1998). Our present study the prevalence of OME in Mosul city was 17%, we found a great difference from other studies which they found less prevalence such as the prevalence was reported as 9.5% for Caucasians and 5.3% for Chinese primary school children (Rushton *et al.*, 1997; Tong *et al.*, 2000). In a study from Greece including 5,121 children who varied in age from 6 to 12, the prevalence of OME was reported as 6.5% (Apostolopoulos *et al.*, 1998), this may be due to our study was done in winter climate which show increased number of children exposed to common cold and upper respiratory tract infection. The mechanism of action of steroids in this context is still unclear. Mometasone furoate has been shown to help in the recovery of transport function of ciliary epithelium helping in appreciable clinical effect (Poliakova *et al.*, 2011). A high level of expression of the human glucocorticoid receptor- α (vs. β) in the adenoids and

tonsils of patients who have obstructive sleep apnea versus recurrent throat infections suggested a possible chance for these patients to respond to topical steroid therapy (Goldbart *et al.*, 2015). In our present study we treated 308 child with antibiotic (Amoxicillin) for 10days, local steroid for 8 weeks as (Mometazone spray 100µg daily as single puff in each nostril) and systemic decongestant (Montelukast, Loratidine) for 8 weeks we found 203 children were cured completely from OME by clinical assessment and measuring there hearing. 65.9% which is considered as good result only 34% 105 child still having OME even they got some mild improvement, they need further study, investigations, reevaluation and might need repeated medical treatment, Eustachian tube rehabilitation and surgical interference.

The current treatment options for OME include elimination of the risk factors, follow-up without treatment, use of antibiotic and/or decongestant medication, maneuvers to open the Eustachian tubes, such as with nasal balloons, prophylactic antibiotic use, and, if medical treatment fails, tympanostomy tube placement with or without adenoidectomy (American Academy of Family Physicians, 2004; Rosenfeld and Bluestone, 1999). In our study 21 child underwent bilateral tympanostomy with insertion of ventilation tube and 8 child underwent adenotonsillectomy with insertion of ventilation tube. Although many OME cases resolve spontaneously, referral rates from primary care remain high, with ~1–5/1000 children in the general population undergoing surgery (grommets) each year (Petrou *et al.*, 2010). Finally elimination of risk factors by avoiding passive smoking, educate the parent for encouraging their child for Eustachian tube rehabilitation by using chewing gum, strengthen the muscle of swallowing by strengthen of muscles responsible for the opening of eustachian tube, increase the awareness of teachers to follow up with low school performance children which they may have a health problem, advise parent to increase their attention on child hygiene and if the child have any unnoticeable health problem such as hearing loss.

The common mechanism in the development of serous otitis media is considered to be loss of patency of the eustachian tube, to which anatomical factors, impaired mucociliary function, and upper respiratory infection or allergy may contribute. Passive smoking may increase the risk of blockage of the eustachian tube in three ways: by directly impairing mucociliary function; by causing congestion of the soft tissues of the nasopharynx; or by predisposing people to upper respiratory infection (Maw *et al.*, 1987). OME is a matter of discussion between otolaryngologists and pediatricians for significant practice variations in management (Coyte *et al.*, 2001). On the other hand, tympanostomy tubes seem to be associated with complications in at least 80% of operated ears such as purulent otorrhea, myringosclerosis, segmental atrophy, atrophic scars, retraction pockets, membrane perforation and granulation tissue (Vlastarakos *et al.*, 2007).

Conclusion

Otitis media with effusion (glue ear, serous OM) mean accumulation of fluid in the middle ear behind the tympanic membrane. The prevalence in Mosul city was 17% which is considered as high. OME is a common pediatric health problem among pre and primary school children. Late discovering of OME or untreated early may lead to complications. the potential of OME to cause a serious of

sequels and complication such as tympanosclerosis, retraction pocket, adhesive otitis media and hearing or speech impairment or even permanent hearing loss makes the disease an important public health problem. Treatment of OME by eradication of the risk factors, medical treatment, Eustachian tube rehabilitation and surgical interference accordingly. Adenoidectomy should not be performed unless a distinct indication exists (nasal obstruction, chronic adenoiditis)

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