Preventive Audiology: Screening for Hearing Impairment in Children Having Recurrent URTI

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Received: 27 March 2015 / Accepted: 7 December 2015 / Published online: 17 December 2015
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Abstract A late detection of hearing impairment in children can affect speech and language development. Otitis media with effusion (OME) associated with risk factors like recurrent upper respiratory tract infections (URTI) is considered the most common cause of silent hearing impairment among children. So this study was carried out to screen such at risk children for hearing impairment. The study was conducted on 1000 children in the age group of 2–12 years who presented to the OPD of ENT and Pediatrics Department, Govt Medical College with the complaint of recurrent URTI. The children were screened by history taking, general physical examination and local ENT examination. This was followed by impedance audiometry and pure tone audiometry (PTA, wherever indicated). Children with discharging ears and perforated tympanic membrane (TM) were excluded from the study. The most common presenting complaint was nasal discharge (67.9 %), followed by mouth breathing (66.3 %) and snoring (65 %). Only 16.2 % cases actually complained of some hearing impairment on exploratory history indicating the silent nature of OME. On examination 52.65 % cases had a normal looking TM whereas 41.2 % had a dull retracted TM. Results of impedance audiometry showed Type A graph in 56.75 %, Type B in 33.4 % indicating OME and Type C in 9.85 % indicating Eustachian tube dysfunction. PTA showed a mild conductive hearing loss in 26.7 % cases. OME is quite

prevalent in high risk children and incidence of OME resulting in silent hearing impairment is quite high especially in young children having recurrent URTI. Impedance audiometry has been proved to be an objective screening tool for the same with a diagnostic accuracy of 87 % and thus under preventive audiology, it has a definite role in young children having recurrent URTI.

Keywords Impedance · OME · Recurrent URC

Introduction

Clinical guidelines from a joint commission of specialties document that screening surveys of healthy children between infancy and age 5 years show 15–40 % point prevalence of middle ear effusion. Furthermore, among children examined at regular intervals for 1 year, 50–60 % of child care attendees and 25 % of school going children were found to have a middle ear effusion at some point during the examination period, with peak incidence during the winter months. 84–93 % of all children experience at least 1 episode of acute otitis media. Furthermore, approximately 80 % of children have had an episode of otitis media with effusion (OME) when younger than 10 years. At any given time, 5 % of children aged 2–4 years have hearing loss due to a middle ear effusion that lasts 3 months or longer. The prevalence of otitis media with effusion in children is bimodal. The first peak is in those aged 2 years or younger and the second peak is at 5–6 years of age. Thereafter it sharply declines in children older than 6 years [1]. Besides this, OME plays a significant role in delayed language development, social development backwardness and also affects educational skills [2].

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Hearing screening allows hearing loss to be identified at a younger age. Hearing impairment should be identified as early as possible to enable interventions to take full advantage of the plasticity of developing sensory system. Hearing integrity in the first 3–4 years of life, the ‘critical period’ is essential for acquisition of speech and language. There is evidence that this is beneficial because early detection and management improve outcomes in terms of speech, language and education [3].

OME, associated with risk factors like recurrent URC, is considered the most common cause of silent hearing impairment among children. The main clinical problem for some children with symptoms of OME is occult and is easily neglected by parents, in terms of poor expression and communication skills of the children. For young children, tympanometry is an objective and easy to perform test and therefore should be used in routine examination in children presenting with risk factors like adenoidal hypertrophy, adenoiditis, chronic tonsillitis, and recurrent upper respiratory catarrh. Tympanometry provides useful quantitative information about the presence of fluid in the middle ear, mobility of middle ear system and ear canal volume. Acoustic reflexes are mainly useful as crude but non-subjective method of evaluating hearing, as the stapes should tighten for a given level of perceived loudness [4, 5].

World health report describes hearing loss due to OME as a serious problem due to its influence on the language development as well its impact on school life. So it can be concluded that OME need monitoring over time to identify the persistence of disease and to assess their hearing thresholds as a surrogate of auditory disability. It will be useful if tympanometry can be used to predict those having hearing impairment. Studies have shown that limiting audiometry to those with type B or type C tympanogram reduces the work load to 69 % of the sample and 95 % of the children will be identified. With such data decisions as to how to allocate audiometric resources for monitoring child, tympanometry should be ideally recommended [6, 7].

Materials and Methods

The present study was conducted on 1000 patients in the age group of 2–12 years after appropriate approval from the ethical committee to find the effectiveness of impedance audiometry in prevention and management of hearing impairment in young children presenting as a case of recurrent upper respiratory catarrh, tonsillitis, adenoiditis, and chronic adenoidal hypertrophy in the outpatient Department of ENT/Paediatrics Department of a Tertiary Care Health Centre. Informed consent was obtained from all individual participants included in the study.

Each case after being screened from the outpatient department was clinically evaluated by taking proper history, general physical and complete local ENT examination; followed by pneumatic otoscopic examination. Children presenting with wax in the ears were included in the study after removing their wax in order to avoid any false positive results. Patients were taken up for impedance audiometry to evaluate the Eustachian tube function and status of the middle ear. Radiological examination of the nasopharynx for adenoids was done (where ever indicated). Whenever there was subjective/objective hearing impairment or the impedance showed positive results (c and b graphs) the hearing evaluation was done by Pure tone audiometry/Free field audiometry/Auditory Brainstem response audiometry depending upon the mental age of the child.

Inclusion criteria:

Children of age group 2–12 years reporting with:

1. History of recurrent upper respiratory tract infection.
2. History of recurrent rhinorrhea/mouth breathing/adenoid faces.
3. History of hearing impairment.
4. History of delayed speech/underachiever in school.

Exclusion criteria:

1. Patients having acute otitis media.
2. Patients having discharging ear.
3. Pts having any congenital aural/palatal defects.

Results

Most of the children were in the age group of 5–10 years (66.4 %) followed by 18.9 % in age group >10 years and 14.7 % were <5 years. There was no significant difference in the sex distribution and in rural/urban distribution. The most common presenting complaint (Fig. 1), was nasal discharge (67.9 %), followed by mouth breathing (66.3 %) and snoring (65 %). Only 16.2 % cases actually complained of some hearing loss on exploratory history indicating the silent nature of OME. On examination (Fig. 2), 52.65 % cases had a normal looking TM whereas 41.2 % had a dull retracted TM. Results of impedance audiometry (Fig. 3), showed Type A graph in 56.75 %, Type B in 33.4 % indicating OME and Type C in 9.85 % indicating Eustachian tube dysfunction. PTA (Fig. 4), showed a mild CHL in 26.7 % cases. Acoustic reflex was absent in 63.2 % cases indicating middle ear pathology. On radiological examination, it was seen that majority of the cases (72.6 %) had grade 2–3 adenoid hypertrophy. 34.3 % children had adenoid grade 1 and 9.3 % cases had grade 4 adenoids. Clinically, majority of the cases (65 %) had

Fig. 1 Chief Complaints

Fig. 2 Otoscopy

Fig. 3 Impedance Audiometry

grade 1 tonsils. 39.9 % cases had grade 2, 21.9 % had grade 3 and remaining had a grade 4 tonsillar hypertrophy.

Discussion

The study was conducted on 1000 patients to find the effectiveness of Impedance audiometry in the prevention and management of Hearing impairment in the young children who presented with chief complaints of URC, in the OPD of department of ENT/Paediatrics of Govt Medical College.

Fig. 4 PTA

Out of 1000 children presenting with URC the most common presenting complaint was nasal discharge (67.9 %), followed by mouth breathing (66.3 %) and snoring (65 %). Only 16.2 % cases actually complained of hearing loss. Similar silent hearing loss was seen in 5 % cases in the study by Sinha et al. [8]. Here lies the importance of screening to take timely intervention to prevent silent hearing loss in children having OME.

The various methods for diagnosing OME are clinical, audiometric and tympanometric assessment. There is considerable variation in appearance of tympanic membrane in otitis media with effusion [9]. There is similar degree of inter and intra observer variability in the otoscopic assessment of TM. In our study, 41.2 % cases were having dull and retracted TM and 52.65 % were having normal TM 4.35 % were congested and 1.8 % were atrophic.

The Eustachian tube is generally regarded as the etiological basis for otitis media with effusion. In our study of 2000 ears, total 668 were having type B tympanogram indicating fluid behind the TM and 197 were having type C tympanogram indicating retracted TM. The incidence of otitis media with effusion came out to be 33.4 % in our study. It was seen to be 33 % in a study by Sinha et al. [8] and 20.75 % in a study done by Yadav [10]. The maximum incidence of OME was found in children 5–10 years of age. As the age advances, the incidence of OME decreases because of reduction in size of adenoids and improved Eustachian tube function. Also, older children are able to tell their complaints. The eustachian tube dysfunction came out to be 8.95 %. The opening mechanism of the tube is not developed at birth and that interval between 0 and 7 years is very critical period in terms of tubal insufficiency.

In our study, out of the children who underwent PTA, 68.5 % were having PTA within normal limit, 26.7 % showed mild hearing loss and 3.5 % cases were having moderate hearing loss. In a similar study done by Yamamah et al. [11] out of 10.8 % cases of OME 8.5 % cases

were having mild to moderate hearing loss and only 0.4 % cases were having severe hearing loss.

On radiological examination, it was seen that 34.3 % children had adenoid grade 1, 35.8 % had grade 2 and 36.8 % had grade 3 adenoid hypertrophy. 9.3 % cases had grade 4 adenoids. These findings suggest that adenoids are a risk factor for OME not just owing to their size, but also due to the recurrent infection that leads to collection of fluid behind the ear. Also, adenoid hypertrophy is an important cause for Eustachian tube dysfunction.

The accuracy of impedance audiometry came out to be 87.8 % in this study which is very close to the value of 85.8 % as suggested by Bluestone and Ogisi [12].

Conclusion

The impedance audiometry should be included as an integral part of all hearing screening programmes. Pneumatic otoscopy with impedance audiometry is an ideal protocol for screening for OME and is better than traditional hearing testing. This screening protocol can contribute a lot for prevention of speech, language and educational delay in children. Pediatricians, general physicians and ENT surgeons need to be sensitized about this screening rationale. OME is one of the target areas under National Programme for Prevention and Control of Deafness (NPPCD). Thus, screening of at risk young children with significant recurrent upper respiratory tract infections will contribute significantly to our national programme and also play a great role in achieving the mission of SOUND HEARING 2030.

Acknowledgments We would like to thank the Department of Otorhinolaryngology and Paediatrics for contributing a lot for this very vital study in relation to hearing impairment in young children. Further we are also thankful to other faculty members of our institution who are sending the cases of recurrent upper respiratory tract infections for hearing screening as a protocol.

Compliance with Ethical Standards

Conflict of interest All the authors declare that they have no conflict of interest.

References

1. Higgins TS, Meyers A. Otitis media with effusion. <http://emedicine.medscape.com/article/858990-overview#a0156>. 20 Feb 2015
2. Singh V (2005) Newborn hearing screening: present scenario. *Indian J Community Med* 40(1):62–65
3. Pimperton H, Kennedy CR (2012) The impact of early identification of permanent childhood hearing impairment on speech and language outcomes. *Arch Dis Child* 97(7):648–653
4. Khadim AL, Spilsbury Semmens JB, Coats HL (2007) Adenoidectomy for middle ear effusion. *Laryngoscope* 117:427–433
5. McNicholas WT (2008) The nose and OSA, variable nasal obstruction may be more important than fixed obstruction. *Eur Respir J* 32:3–8
6. Davis A, Wood S (1992) The epidemiology of childhood impairment: factors relevant to planning of services. *Br J Audiol* 26:77–90
7. (1988) Tympanometry. ASHA working group on aural acoustic-immittance measurements committee on audiologic evaluation. *J Speech Hear Disord* 53(4):354–377
8. Sinha V, Bhavin H, Sinha S (2005) Incidence of uncomplicated secretory otitis media in patients undergoing adenotonsillectomy. *Indian J Otolaryngol Head Neck Surg* 57(2):110–111
9. Microtos K, Fiellow N (1980) Recent advances in middle ear effusion, pathogenesis of secretory otitis media. *Ann Otorhinolaryngol* 89(3):91–97
10. Yadav S, Saxena S, Sharma H (2006) Secretory otitis media: a school health survey. *Indian J Otolaryngol Head Neck Surg* 58(3):250–252
11. Yamamah G, Mabrouk A, Ghorab E (2012) Middle ear and hearing disorders of school children aged 7–12 years in South Sinai Egypt. *East Mediterr Health J* 18(3):255–260
12. Bluestone H, Ogisi FO (1971) Eustachian tube dysfunction in infants with cleft palate. *Arch Otorhinolaryngol* 80(2):1–30