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Original Research Article

The causes of pure conductive hearing loss in relation with age groups

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ABSTRACT

Background: Pure conductive hearing loss might be detected at any age, that made verbal communication is a problem issue, as well as, educational and social implications, therefore, earlier diagnosis and treatment of this problem is essential, since it`s have impact on patient`s life quality. To assess the causes of pure conductive hearing loss in relation with the age group.
Methods: A prospective observational study, where 38 patients at Otolaryngology unit were selected after taking a precise history, full (Ear, Nose and Throat) clinical examination and tunning forks tests assessment, as well as, complete audiological tests, within 1-year following-up period.
Results: Mean age in children (5.5±3.41 SD) and in adolescents and adults (25.5±1,78 SD) and (53%) males and (47%) females. Main usual reason of pure conductive hearing loss, among children was otitis media with effusion in about (55.55%), with association to adenoid hypertrophy (89.76%), while in adolescents and adults was otosclerosis (35%). Most common otoscopic findings was tympanic membrane retraction (44.73%) and the commonest chief complain was earache (68.42%).
Conclusions: Most common cause of pure conductive hearing loss, in children was otitis media with effusion, with high associations between it and adenoid hypertrophy, while in adolescents and adults, it was otosclerosis.

Keywords: Audiology, Age groups, Conductive hearing loss

INTRODUCTION

Hearing loss is usually classified into 3 sorts conductive, sensorineural and mixed.[1] Conductive hearing loss (CHL) involved a wide scope of conditions, that there are several anatomical structures in this area extending from external meatus to stapedial footplate, in which they are susceptible to a wide range of pathologies and could produce a CHL.[2] CHL impacts a wide demographic character, from younger generation to the elderly population, the etiologies also scoped from otitis media with effusion (OME) in children to probable severe pathology like nasopharyngeal tumor in adults leading to unilateral adult mid-ear effusion, therefore, a comprehensive interpretation of conductive hearing loss is fundamental for whole physicians, as it is usually facing by otolaryngologist specialist.[3] CHL may be due to congenital anomalies of external ear like meatal atresia, because of mal-development of first and second branchial arches and first branchial cleft, as well as tympanic membrane perforations due to any cause, such as ear trauma during ear cleaning, barotrauma from diving or consequence of otitis media.[4]

Pathology in mid-ear give rise to CHL as OME, which considered the major usual reason of acquired hearing loss in children, which mainly is a transient issue, which often have a spontaneous recovering property and so it requires no further management, yet, in several children, hearing loss can have catastrophic impact on speech/language evolution, also, adult unilateral or a refractory mid-ear effusions must increase speculation of a nasopharyngeal tumor.[5] Otosclerosis, on other hand, is an osseous dyscrasia in the temporal bone, where the

spongy bone from the Otic-capsule had been replaced by sclerotic bone, this activity to a large extent impacts the anterior oval window, causing calcification of the stapes or its annular ligament, also, it is commoner in females and existing in early adulthood with a progressive CHL results from fixation of stapes.[6] Other important etiology of CHL is cholesteatomas, which mainly in adults age group, these results from the existence of squamous epithelium in the mid-ear or another aerated places in temporal bone, even its not a tumor, but it can be regionally devastating and so, it needs to be removed surgically, so, hearing recuperation is a secondary objective following creation of safe and dry ear.[7,8]

Aims of the current study were to assess the etiology of pure conductive hearing loss in relation with the age group, as well as, identify how the conductive hearing loss is common in relation to other types of hearing loss, in addition, to follow up the fate of conductive hearing loss for untreated or improperly treated cases.

METHODS

A prospective observational study was conducted, among all age group with hearing loss whom visited Otolaryngology department unit, within 1-year study period from first January 2024 to first January 2025. After, taken the adult patients and/or patient`s gardener "in case of children" written consent and the approval of the Institutional Ethics Committee Approval "number 183 at 12 September 2022" was received, as well as, all patients filled pre-designed questionnaire. A number of 38 patients (18 children and 20 adults) from 850 patients, whom complaining of pure conductive hearing loss, as they fitting (the inclusion criteria), were selected for this study.

After, they taken a precise and thorough history and Ear, Nose and Throat (ENT) clinical examination "starting with the ears via otoscopic examination, followed with complete nose and throat examination" and, tuning fork tests assessment, as well as, audiological tests as: audiometry (PTA), Tympanometry, auditory brainstem response test (ABR) and otoacoustic emission (OAE). Most causes of CHL could be detected via precise ENT examination, then a CT scan was done "when it was important to had images of the bones of the mid and inner ears", as it`s beneficial in conditions, like congenital conductive hearing loss, chronic suppurative otitis media (CSOM) particularly "cholesteatoma", ossicular damage or discontinuity and otosclerosis.

Then, after confirmation of conductive hearing loss, the patients were categorized to have one disease which causes this type of conductive hearing loss.

Inclusion criteria

Any patient with history of hearing loss for more than one month duration. Patients with hearing assessment; showing air conduction worse than 25 dB (abnormal air conduction by hearing testing PTA or ABR) and normal bone conduction better than 20 dB and ABG >10 dB. Assessment by PTA with masked bone conduction for adolescents and adults and by ABR with bone conduction transducer for children.

Exclusion criteria

Hearing loss less than one month. Mixed hearing loss. Sensorineural hearing loss. Bone conduction threshold in any frequency is worse than 20 except at 2 KHz because bone conduction in any frequency other than 2 KHz more than 20 dB hearing loss regarded as abnormal while in 2 KHz drop of masked bone conduction is regarded as Carhart notch (part of conductive hearing loss). Also, unilateral OME, as a cause of pure conductive hearing loss was excluded from this study, because may be there be another underling pathology, like nasopharyngeal mass.

Statistical analysis

Statistical Package for Social Science (SPSS) version 25 (IBM SPSS Software, Chicago, Illinois, United State). Descriptive statistics utilizing: mean, frequency and standard deviation for continuous measures, counts and percentages for categorical variables. The data presented as mean, standard deviation and ranges and confidence determined as 95%. Data entry was done using Microsoft Excel 2019 and a p value<0.05 was noted as statistically significant.

RESULTS

Among of 38 patients enrolled in current study, there 18 patients were children (47%) and 20 patients were adolescents and adults (53%). Mean age of children was (5.5±3.41 SD) years, while mean age of adolescents and adults was (25.5±1,78 SD) years, also, there were 20 (53%) males; being 11 (29%) children and 9 (24%) adolescents and adults and 18 (47%) females being 7 (18%) children and 11 (29%) adolescents and adults. A total number of 38 patients, that diagnosed with pure CHL from 850 patients complaining from hearing loss in general, therefore, the incidence of CHL among all patients was 3.72 in each 100000 patients.

The most common cause of pure CHL among children was OME (55.55%), as seen in table 1 and it`s had association with adenoid hypertrophy, which analyzed as large size (grade 3), in relation to the size of nasopharynx (adenoid/nasopharynx ratio), according to Fujioka's method, in about (89.76%), while, in adolescents and adults, the most common cause of pure CHL was otosclerosis (35%), as shown in Table 2. A significant difference for OME between the two groups, as it was is more relevant to children than in adolescents and adults (moderate degree of significance), as the p value was 0.042. The commonest presenting complaint was earache

in 26 (68.42%) and it was more common clinical finding in children as compared with adolescent and adults, while ear discharge was commoner in adolescent and adults, with showing a significant difference (moderate significance level), as, the p value was 0.017. The most common otoscopic findings, in all studied patients, was tympanic membrane retraction in 17 patients (44.73%), with non-statistically significant difference, as the p value was 0.063. Although, in all 38 patients, whom otological examination and audiological tests, were done, but, still in 20 (52.63%) patients of them, there was no possibility to reach to diagnosis, so, they needed to send them for imaging study either CT scan or post nasal space X-ray, to confirm the diagnosis. As far as, OME was the most common cause of pure CHL and among those patients; being 6 patients of them, they were responding to medical treatment, during the study follow-up period, so, they need surgical intervention in form of myringotomy and grommet, that leads to reduction in air bone gap assessed by PTA for them. About, the tubal complications: There were 2 patients of them, their grommet tubes had been extruded (in 1 patient, after 2 months and in another 1 patient, after 4 months). In adults and adolescent, the otosclerosis; being 1 patient ends with stapedectomy and remaining patients got benefit from hearing aids.

Table 1: Diagnosis of cases of children with pure conductive hearing loss.

Diagnosis	No. of patients
Otitis media with effusion	10
Chronic suppurative otitis media	4
Congenital anomaly	2
Mastoiditis	1
Cholesteatoma	1
Total	18

Table 2: Diagnosis of cases of adolescents and adults with pure conductive hearing loss.

Diagnosis	No. of patients
Otosclerosis	7
Early-stage cholesteatoma	5
Tympanic membrane perforation	4
Chronic suppurative otitis media	2
Mastoiditis	1
Ossicular disruption	1
Otitis media with effusion	-
Total	20

Table 3: Presenting (chief complaint) symptoms.

Symptoms	Age group	No. of patients
Earache	Children	15
	Adolescents and adults	11
Tinnitus	Children	4
	Adolescents and adults	12
Ear discharge	Children	5
	Adolescents and adults	8
Snoring & mouth breathing	Children	9
	Adolescents and adults	3
Others	Children	5
	Adolescents and adults	8

Table 4: Otoscopic findings.

Otoscopic findings	Age group	No. of patients
Tympanic membrane retraction	Children	10
	Adolescents and adults	7
Tympanic membrane perforation	Children	4
	Adolescents and adults	6

Continued.

Otoscopic findings	Age group	No. of patients
Tympanic membrane congestion	Children	4
	Adolescents and adults	2
Aural polyp	Children	1
	Adolescents and adults	1
Discharging ear	Children	2
	Adolescents and adults	4
Nearly normal	Children	2
	Adolescents and adults	4
Can't assessed	Children	3
	Adolescents and adults	1

DISCUSSION

Hearing loss is a usual pathology, which could exist at every age-groups and made verbal communication problematic, the main reasons of CHL like wax impaction, otitis media and otosclerosis, so, interpretation of the evidences for medical/surgical therapy and amplification can aid the family physician to supply higher efficacious attention for them.[9] During the current study period, there were 850 patients presented with hearing loss, but only 38 patients had been confirmed with a pure conductive hearing loss and this detection was agreed with study of Williams et al.[10] In the current study, the mean age of CHL in children was 5.5 years, which was similar to the study done by Jalali et al.[11] The age group was (53%) reported in adolescent and adults, which is slightly higher than children (47%), this finding was agreed with Sumanth et al, which reported, that, CHL in most patients were seen in 21-30 age group (51.5%).[12]

In addition, this result was agreed with study performed by Shargorodsky et al that the adolescent hearing loss particularly popular and can have essential educational and social insinuations, with many hazard items like; music loud sound listening.[13] In current study, the prevalence of pure CHL was more in males (63%), than females (37%), these findings were agreed with Jalali et al, that was the prevalence rate in boys was higher than in girls, also, with Sumanth et al that result in men more effected than women.[11,12]

In the current study, in age range (2-13 years), had adenoid hypertrophy, so that there was a correlation between CHL and adenoid hypertrophy in children, this was in a line with Khadgi et al, study, whom reported, that's, the mean age of presentation of CHL with adenoid hypertrophy was 7.67 years and adenoid had a positive correlation with CHL in children.[14] OME was major common etiology of pure CHL detected in children (55.5%) and this result was agreed with Cai et al reported that the hearing loss related to OME.[15] Also, in this study, most cases of OME had adenoid hypertrophy in children aged range (2-13 years), so that there is a correlation between CHL and adenoid hypertrophy, this agreed with Khadgi et al, which concluded, that, adenoid had a positive correlation with CHL in children.[14] The most common otoscopic findings was tympanic membrane retraction (44.73%), followed by tympanic membrane perforation, on other hand, Khurshid N, et al, study, they address that, patients with inactive mucosal CSOM and one-sided TM perforation were seen in (67.5%) of cases.[16] Cases of congenital anomaly like (macrotia or anotia) were reported in the current study, as a reason of CHL in 2 patients in children. and 1 patient in adolescent and adults and this was agreed with Wang et al study, which show the severity of hearing loss (97%) were conductive and it was invariably related with external ear abnormalities.[17]

Regarding, the causes of pure CHL in adult, in this study the main cause was otosclerosis, followed with early-stage cholesteatoma and these results were agreed with Robertson et al and Mills et al study.[18] In addition, this study showed that, early cholesteatoma was seen more in adolescent and adults than in children and this finding was agreed with Rosito et al study which reported, the prevalence of cholesteatoma CSOM patients was revealed commoner in adults.[19] The current study, revealed (otalgia) earache was commoner clinical finding in children compared to adolescent and adults, while (otorrhea) ear discharge was commoner in adolescent and adults compared to children, while, a study done by Mills R, Vaughan-Jones R, reported that, both otalgia and/or otorrhea were significantly more prevalence in children.[20]

Also, in current study, the imaging techniques in form (CT scan of temporal bone or post nasal space X-ray) was done in 20 cases (53%) and this was concurrent with study conducted by Trojanowska et al, as they mentioned that, the requirement for imaging in case of suspicion of complications or in non-efficient management.[21] So, fear of full clinical presentation, combined with imaging indexes, will reduce differential diagnosis spectrum, that will aid to avoid any inaccurately decision making. The response of cases to medical treatment was in OME, in the current study, as in 6 patients of them, need surgery, again this result was goes in line with Malik et al study, whom shows, just in (65%), where there was a complete recovery from the disease on medical treatment, while in (35%), they, did not improved by the medical treatment, so in those cases surgery was required.[22] Williams et al study which showing that's, the antibiotics appear to have

limited impact on recurrent otitis media and concise -term of OME resolution.[10]

One center study setting and somewhat small study sample size.

CONCLUSION

Pure conductive hearing loss must be diagnosed and managed, as early as conceivable to prevent progression and deterioration of the hearing, it most commonly caused by otitis media with effusion in children; with high associations between it and adenoid hypertrophy, while, in adolescents and adults; it`s otosclerosis. Also, audiometric tests are mandatory to confirm the diagnosis of pure conductive hearing loss, if these tests were not possible, then CT scanning of temporal bone should be performed, even when the tympanometry suggesting middle ear problem.

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