

Evaluation of hearing among kindergarten children in Jazan (Kingdom of Saudi Arabia)

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Abstract: *Introduction:* Hearing loss among kindergarten children is considered as a major health problem especially when there is a deficiency in routine hearing screening during the clinical examination. The aim of the study was to detect any pattern of hearing loss among kindergarten children in Jazan (Kingdom of Saudi Arabia). *Methods:* A total of 1220 kindergarten students in Jazan (Kingdom of Saudi Arabia) were subjected to meticulous hearing evaluation using otological examination, Tuning fork tests, pure tone audiometry (PTA), speech audiometry, and tympanometry. *Results:* We found that 18 kindergarten students had type C tympanogram (Eustachian tube dysfunction), 28 had type B tympanogram (secretory otitis media with conductive hearing loss), 4 had chronic otitis media with conductive hearing loss, and 6 had mild sensorineural hearing loss. *Conclusions:* Early detection and eradication of hearing loss improves quality of life outcomes of children which reduces the incidence of social burden from unrecognized hearing loss.

Keywords: hearing, assessment, kindergarten, outcomes

Introduction

Hearing loss among kindergarten children is considered as a major health problem especially when there is a deficiency in routine hearing screening during the clinical examination [1]. Unfortunately, many countries ignored hearing screening which had negative outcomes on educational performance [2].

Therefore, the early detection and rehabilitation of hearing impairment changes the children's quality of life which reduces the community's health burden [3]. In addition, many countries start protocols for hearing screening during routine clinical examination as a considerable major health problem using audiometric evaluation particularly in kindergarten schools [4].

Based on World Health Organization (WHO), hearing impairment, in children under 15 years of age, is defined as a permanent unaided hearing threshold level of 31 dB or greater for the better ear [5]. This criterion, however, has some inherent limitations; for example, it excludes kindergarten children with conductive

hearing loss, which is common in this age group as a result of recurrent, chronic, or acute otitis media [1]. It also does not recognize kindergarten children with unilateral hearing loss of any degree or those with permanent sensorineural or mixed hearing loss less than 31 dB who face difficulties in communication caused by adverse listening conditions such as noisy classrooms which have a negative effect on their educational state [6].

A large number of kindergarten school children with hearing loss can be detected by hearing screening based on the WHO criterion with primary parental suspicion; on the other hand, mild hearing loss (16–40 dB) is unlikely to be detected, because the condition is associated more with receptive rather than expressive linguistic skills [7].

The objective of the study was to identify and detect early any pattern of hearing loss among kindergarten children in *Jazan (Kingdom of Saudi Arabia)* as a protocol for improving the quality of life outcomes of children.

Methods

A cross-sectional study was carried out in *Jazan (Kingdom of Saudi Arabia)* for hearing screening in kindergarten school children (age 4–6 year) – from 2012 to 2014 – to identify and detect early with management any pattern of hearing loss among 1220 kindergarten students registered in ministry of education, which created a data base in system files for follow-up especially of positive cases aiming for early eradication of any hearing insult.

All kindergarten children were subjected to: a structured questionnaire that was distributed to the parents to ascertain the medical, social, and family status of the kindergarten child; anthropometric measurements which include height, weight, and head circumference; otological examination using pneumatic otoscope (Walch Allen, Germany); Tuning fork test (Weber and Rinne tests); and basic audiometric evaluation which includes pure tone audiometry with speech audiometry (model MAICO MA 51, USA) in double wall soundproof room and tympanometry (GSI 39 Auto Tymp Made By: Grason-Stadler Inc).

Data management

Discrete variables were expressed as percentages. All statistical analyses were performed using SPSS software version 13.

Ethical consideration

Written consents were obtained from all parents or first degree relatives before the study. The local ethics committee had approved all procedures.

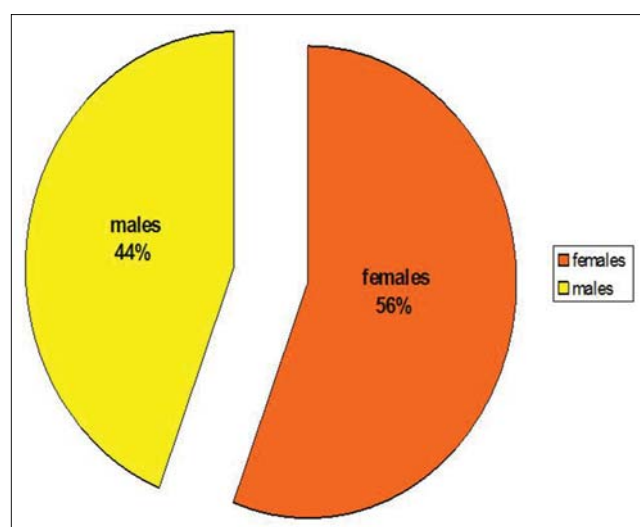


Fig. 1. Distribution of sex among studied kindergarten children

Results

In 1220 kindergarten students with mean age of 4.9 years (ranged from 4 to 6 years), 677 females represent 56.4% and 543 males represent 44.6% as seen in Fig. 1.

Seventeen kindergarten children who had impacted wax were treated by ear wash, while 63 who had upper respiratory tract infection were subjected for medical treatment before the audiological evaluations.

None of them had any congenital ear malformation or any history of previous ear operation.

Eighteen kindergarten students who had bilateral type C tympanogram (Eustachian tube dysfunction) received medical treatment for 14 days with repeated tympanometry and improved to normal with type A tympanogram (normal middle ear pressure).

Twenty-eight kindergarten students who had type B tympanogram (*secretory* otitis media with conductive hearing loss) at four frequencies (500, 1000, 2000, and 4000 Hz) ranged from mild to moderate conductive hearing loss (25–45 dB) received amoxicillin–clavulanic acid 90 mg/kg, oral steroids, antihistamines, nasal decongestants, and mucolytics for 4 weeks and did not have any improvement as documented by otoscopic examination and tympanometry. They were subjected for

Table I Affected kindergarten students with different ear disorders

	Number of	Percent (%)
Wax	17	1.4
Upper respiratory infection	63	5.2
Eustachian tube dysfunction	18	1.5
Secretory otitis media	28	2.3
Chronic otitis media	4	0.3
Sensorineural hearing loss	6	0.4

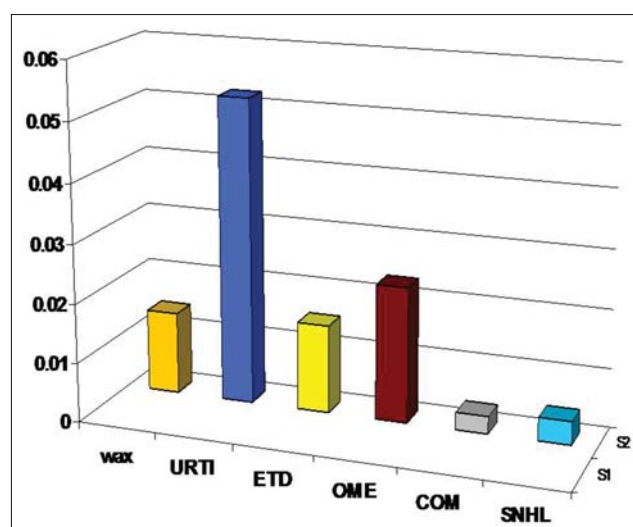


Fig. 2. Affected kindergarten students with different ear disorders

conventional myringotomy with ventilation tube insertion and with additional adenoidectomy or adenotonsillectomy according patient's situation.

Chronic otitis media was observed in 4 children with moderate conductive hearing loss at four frequencies (500, 1000, 2000, and 4000 Hz) ranged from 40 to 55 dB with safe type (dry central tympanic membrane perforation).

Mild sensorineural hearing loss at four frequencies (500, 1000, 2000, and 4000 Hz) ranged from 25 to 40 dB was observed in 6 children (2 had bilateral mild SNHL while 4 had unilateral SNHL) who need hearing aids, hearing conversation program, and meticulous follow up as seen in *Table I* and *Fig. 2*.

All the kindergarten students had excellent speech discrimination score (SDS) ranged from 92% to 100% at 40 dBSL.

Discussion

Hearing is a critical part of a child's social, emotional, and cognitive development [3]. Hearing loss among preschool children in the developing countries has been widely reported as a considerable health problem [4]. In addition, hearing loss has a negative outcome on educational tasks.

Hearing screening at preschool entry has been widely developed for early detection and rehabilitation [8]. The purpose of the screening program is to identify early in a child's life any possible hearing loss that may affect their development and their overall general health [9].

Unfortunately, preschool-aged children are not routinely screened for hearing loss in many countries that the children with hearing loss usually face difficulties in communication due to adverse listening conditions such as noisy classrooms which have a negative effect on their educational level [6, 10, 11].

Thirty-eight kindergarten children with hearing loss were reported in our study population, representing 3.1% from the total screened population.

Twenty-eight kindergarten children had *secretory* otitis media with mild to moderate conductive hearing loss, 4 kindergarten children had chronic otitis media with moderate conductive hearing loss, and 6 kindergarten children had mild sensorineural hearing loss.

Otitis media is considered as the most common cause of hearing loss in kindergarten children in the developing countries [12].

Secretory otitis media usually develops in kindergarten children due to several factors such as adenoid hypertrophy, poor nutritional status, poor housing conditions, and presence of viral or bacterial infection and upper respiratory allergy [13].

Tympanometry is highly sensitive and quite expensive to diagnose *secretory* otitis media [14], but considering

the negative effect of hearing loss on speech and language development, early detection of hearing loss is undoubtedly worthwhile. Currently, with new technology, such as otoacoustic emission screening, initial testing can be done at an earlier age and with better reliability [15].

Our study found that hearing loss in kindergarten children cannot be detected during clinical examination without additional audiologic screening. In addition, *secretory* otitis media which is the most common cause of hearing loss in this population needs suitable tympanometric evaluation.

Our raw data identify and detect early hearing loss due to different causes that are probably managed medically or surgically to eradicate hearing disability in kindergarten children which have data resources in file system especially for chronic patients who need regular follow-up and also considered to have chronic otitis media which needs surgical intervention as a schedule protocol in certain suitable age.

Conclusions

Early detection and eradication of hearing loss improves the quality of life outcomes of children and reduces the incidence of social burden from unrecognized hearing loss.

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Conflict of interest: None.

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