Institute of Postgraduate Childhood Studies
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Auditory Profile in Children with Recurrent Upper Respiratory Tract Infection

Thesis submitted for Fulfillment of PhD in childhood Studies
(Child Health and Nutrition)
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معهد الدراسات العليا للطفولة
قسم الدراسات الطبية

الإطار السمعي للأطفال الذين يعانون من التهابات الجهاز التنفسي العلوي المتكررة

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Abstract

Objective: The aim of this study is to evaluate the auditory profile of children with recurrent upper respiratory tract infection and to study the effect of auditory deprivation on language and cognition development.

Methods: This case-control was conducted on 30 children patients with recurrent upper respiratory tract infection, these patients were attending the pediatric outpatient clinic, ENT Clinic and Auditory Unit – El Hussien Hospital – Al Azhar University, throughout the period from November 2007 to December 2008. They were at the age of 2-6 years old. The results of the study group were compared to a control group composed of 30 healthy children matched with age and gender of the study group. They were randomly chosen from the relatives of the patients attending the auditory clinic.

All the cases of the study and the control groups would be subjected to:

1. Full history taking, prenatal, natal, postnatal and developmental history. Family history of allergy and hearing loss.
2. Full clinical examination and otological examination.
3. Audiological evaluation which include:
   - Basic audiological evaluation:
     a) Pure tone audiometry
     b) Speech audiometry
     c) Tympanometry and a coustic reflex measurement.
   - Auditory Brainstem Response (ABR).
4. Developmental evaluation to detect the DQ of each patient by using the language and cognitive development at tests
   (معايير نمو طفل ما قبل المدرسة للأستاذة الدكتورة/ أمينة كاظم والأستاذ الدكتور/ عماد الدين إسماعيل)

Equipment:

- Clinical audiometer interacoustics model AC40.
- Impedance meter interacoustics model AZ26.
- Auditory Evoked Potential Audiometer Nicolet model compact 4.
- Data were collected tabulated, entered on PC, and then analyzed with standard statistical software using students "t" test and chi square.

Results: OME is highly prevalent in young children boys are more prone to RURTI than girls. Chronic tonsillitis represented 60% of all cases followed by adenoid hypertrophy (33.3%). Winter was the season of high frequency and percent of recurrence of symptoms. There was significant difference in pure tone audiometry test between study and control groups (air conduction) but no significant difference in bone conduction. As regards the speech audiometry there was significant difference in SRT and MCL but no significant difference in WDS. There was highly significant difference in tympanometry between the two groups. ABR results revealed that delayed wave I, wave II and wave V while interpeak latency I-III, III-V and I-V and HRR did not show significant difference which indicate no brain stem affection. There was a significant relationship between delay in language and cognition development and RURTI and repeated episodes of OME. There was a positive significant relationship between delay in cognition development and language development. There was also risk factors for delay in speech and language development which is caused by a poor giving environment, including low maternal educational level, unfavorable child care environment and low socioeconomic status.

Key words: RURTI (Recurrent upper respiratory tract infection)– OME (Otitis media with effusion) – ABR – Tympanometry – Pure Tone Audiometry – Speech Audiometry – cognition and language development.

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Aim of the Study

- Evaluation of the auditory profile in children with recurrent upper respiratory tract infection.
- Study the effect of auditory deprivation on development.

Introduction

The upper airways play an essential role in the conduction of air into the lungs, and influence the properties of inhaled air through the anatomical structure and the functional properties of the mucosa, cartilages and neural tissues ***(Pohunek, 2004).***

Upper airway disorders in children may be divided into congenital and acquired. The presentation and management of these disorders is significantly influenced both by the anatomic location of the pathology, which is obstructive in nature, and by the severity of the obstruction ***(Rutter, 2006).***

Viral infection of the upper respiratory mucosa initiates the whole cascade of events that finally leads to the development of acute otitis media as a complication. Viruses also actively invade the middle ear and may significantly impair the resolution of otitis media ***(Heikkienen and Chonmaitree, 2003).***

Pharyngeal tonsil (adenoids) plays an important role in the recurrent otitis media and its enlargement is frequently responsible for upper airway obstruction ***(Lourenco et al., 2006).***

IgE sensitization and respiratory allergy symptoms are independent risk factors for the development of otitis media with effusion, suggesting that both immunological and mechanical pathways may contribute to the development of the diseases ***(Chantzi et al., 2006).***

Repeated ear infections (EI) are associated with similar consequences in terms of reduced hearing across frequencies, 0.25 to 8 KHz which increase with age ***(Tambs et al., 2004).***

Allergic rhinitis patients have a higher risk of Eustachian tube dysfunction, particularly during childhood. Tympanometry is a non invasive readily available procedure that may be useful in these patients to diagnose early middle ear disease ***(Lazo et al., 2005).***

Early age of onset of ear infections increases the risk of a substantially reduced hearing level later in life ***(Tambs et al., 2004).***

Growing interest surrounds the question of whether or not otitis media with effusion (OME) and the temporary conductive hearing loss that frequently accompanies the condition result in auditory sequelae on the short and long term. The issue is most important and most controversial for

children, since OME is more prevalent in infancy and early childhood, an important period for language learning. The conductive hearing loss that accompanies episodes of middle ear effusion has been suggested as a reason for some reports of children's early delay in language acquisition ***(Friel-Patti and Frinitzo, 1990).***

Gravel and Ruben, (1996) attributed these effects to auditory deprivation. However, they suggested that the plasticity of the developing auditory system will facilitate the recovery from any early auditory deficits.

Contrary to the prevailing belief, recurrent otitis media in childhood should be taken seriously because it might lead to irreversible effect on the middle ear and cochlea and may lead to hearing deficits in later life ***(de Beer et al., 2003).***

Audiometric and physiologic indices of various auditory processes in childhood were significantly related to children's experiences with OME and hearing loss in early life. This suggested that the effects of OME and hearing loss affect auditory brain stem function ***(Gravel et al., 2006).***

List of Abbreviations

ABA:	Applied behavior analysis
ABR:	Auditory Brain stem Response
AOM:	Acute otitis Media
BU:	Binaural unmasking
CBC:	Complete Blood Count
CHL:	Conductive hearing loss
dBHL:	Decibels hearing level
DNA:	Deoxy Ribo Nucleic Acid
DQ:	Developmental quotient
EBV:	Epstein-Barr virus
EI:	Ear infection
ENT:	Ear, Nose and Throat
GABHS:	Group A β-hemolytic streptococcus
HL:	Hearing loss
IgA:	Immune globulin A

IgG:	Immune globulin G
LLR:	Late latency Response
MEE:	Middle ear effusion
MRI:	Magnatic resonance imaging
NICU:	Neonatal Intensive Care Unit
OM:	Otitis media
OME:	Otitis media with effusion
PCR:	Polymerase chain reaction
RNA:	Ribo Nucleic Acid
RSV:	Respiratory syncytial virus
RURTI:	Recurrent upper respiratory tract infections
UHL:	Unilateral Hearing loss
URTI:	Upper respiratory tract infection

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