Role of Low Socio-economic Status in Chronic Suppurative Otitis Media

A SYSTEMATIC REVIEW SUBMITTED FOR PARTIAL FULFILLMENT OF MASTER DEGREE IN OTORHINOLARYNGOLOGY

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2013

Acknowledgment

At first and at the end all thanks should be for my ***God ALLAH*** *that the one who really helped me.*

I would like to express my deep gratitude to Professor ***Dr. Hassan Alaa Elebiary,*** *Professor of Otorhinolaryngology and Head and Neck surgery, Faculty of Medicine, Ain Shams University, for the encouragement that he generously offered during this work.*

Words stand short to express my respectand thanks to ***Professor Dr. Sabry Magdy Sabry,*** *Professor of Otorhinolaryngology and Head and Neck surgery, Faculty of Medicine, Ain Shams University, for his kindness and cooperation in all steps of this work.*

I am also very grateful to Dr. ***Hesham Abdel-Aty Abdel-kader,*** *Lecturer of Otorhinolaryngology and Head and Neck surgery, Faculty of Medicine, Ain Shams University, for his guidance and supervision of this work.*

Last, but not least, I wish to express my deepest thanks to my family, and to all persons who helped me in this work.

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List of Abbreviations

AOM	: Acute otitis media
CSOM	: Chronic suppurative otitis media
ETS	: Environmental tobacco smoke
IgA	: Immunoglobulins
OM	: Otitis media
TM	: Tympanic membrane

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Introduction

Introduction

Definition:

Chronic suppurative otitis media (CSOM) denotes a chronic inflammation of the middle ear and mastoid air cells in which the tympanic membrane is not intact (perforation or tympanostomy tube) and discharge is present. The infection may occur during the first 6 years of a child's life, with a peak around 2 years ***(Koch et al., 2011).***

Pathology and Pathogenesis:

Tubotympanic disease is a safe type of chronic suppurative otitis media, characterized by perforation of the pars tensa (figure 1). Also, there may be thickened granular middle ear mucosa and mucosal polypi ***(Acuin, 2007).***

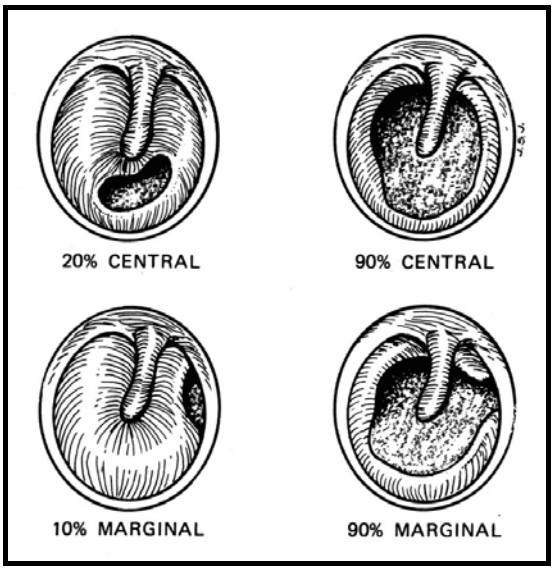

Figure (1): Types of tympanic perforation in tubotympanic disease ***(Husseman & Davidson, 2006).***

Etiology and pathogenesis are multifactorial and include infections, allergy, genetic, environmental, social and racial factors in addition to eustachian tube dysfunction ***(Adhikari et al., 2009).*** The Eustachian tube appears to be crucial to the pathogenesis of tubotympanic disease. The normal physiologic functions of the Eustachian tube are to (1) maintain the gaseous pressure within the middle ear at a level that approximates atmospheric pressure; (2) prevent reflux of the contents of the nasopharynx into the middle ear; and (3) clear secretions from the middle ear by both mucociliary transport and a "pump action" of the Eustachian tube. The failure of any or all of these normal functions of the Eustachian tube can result in tubotympanic disease ***(Lim, 2005).***

Both anatomical and functional obstruction of the Eustachian tube results in the failure of normal regulation of the middle ear pressure. Anatomical obstruction is most commonly caused by inflammation of the Eustachian tube mucosa or extrinsic compression by tumor or large adenoids. Functional obstruction usually occurs as a result of either the failure of the normal muscular mechanism of Eustachian tube opening, as seen in cleft palate, or insufficient stiffness of the cartilaginous portion of the Eustachian tube, often seen in infants and young children**.** If the Eustachian tube is abnormally patent or short, its normal protective function against the reflux of nasopharyngeal contents is lost, these abnormalities are often

seen in patients with Down syndrome, which may account for the high rate of tubotympanic disease. Normal function of the Eustachian tube is also dependent on ciliary function; therefore, any condition that affects mucociliary clearance, such as viral infection, bacterial toxins, or inherited abnormalities of ciliary structure, can predispose to tubotympanic disease ***(Lim, 2005).***

Probably the most important factors related to the onset of tubotympanic disease in infants and young children are immaturity of the structure, function of the Eustachian tube and immaturity of the immune system, which make them more liable to upper respiratory tract infections ***(Bluestone, 2004).***

In most cases of AOM, an antecedent viral upper respiratory tract infection leads to disruption of Eustachian tube function. Also, inflammation of the middle ear mucosa results in an effusion, which cannot be cleared via the obstructed Eustachian tube. This effusion provides a favorable medium for proliferation of bacterial pathogens, which reach the middle ear via the Eustachian tube, resulting in suppuration**.** Although viral infection is important in the pathogenesis of AOM, the majority of patients develop subsequent bacterial colonization, and therefore, AOM should be considered as a predominantly bacterial infection ***(O'Neill & Roberts, 2005).***

There is a number of mechanisms by which a persistent tympanic membrane perforation may develop. In most cases,

tubotympanic disease occurs as a consequence of an episode of AOM with perforation and, with subsequent failure of the perforation to heal. There is also, an association between OME and chronic perforation. The continued presence of a middle ear effusion leads, in some cases, to degeneration of both the fibrous layer of the tympanic membrane, and minute blood capillaries between the two layers of the tympanic membrane, resulting in weakness of tympanic membrane. This weakness of the tympanic membrane predisposes to perforation and reduces the likelihood of spontaneous healing ***(Acuin, 2007).***

There are two main mechanisms by which a chronic perforation can lead to continuous or repeated middle ear infections: (1) Bacteria can contaminate the middle ear directly through water contamination from the external ear canal, because the protective physical barrier of the tympanic membrane is lost, this occurs due to low socioeconomic factors including, lack of hygienic measures, poverty and ignorance. (2) The intact tympanic membrane normally results in a middle ear "gas cushion", which helps to prevent the reflux of nasopharyngeal secretions into the middle ear via the Eustachian tube. Loss of this protective mechanism results in the increased exposure of the middle ear to pathogenic bacteria from the nasopharynx ***(Acuin, 2007).***

Bacteriology:

In chronic suppurative otitis media (tubotympanic type), polymicrobial nature is often a cause of exacerbation in the clinical course and failure in treatment. The microorganisms which are involved in etiology of tubotympanic disease include bacteria and fungi, and bacteria may be aerobic or anaerobic. The predominant aerobic bacteria are Streptococcus pneumoniae, Staphylococcus aureus, Pseudomonas aeruginosa, Streptococcus pyogenes, Proteus mirabilis, and Klebsiella species, while the most frequent anaerobic bacteria are Peptostreptococcus, Fusobacterium spp., pigmented Prevotella and Porphyromonas spp.. Also, Aspergillus flavus is the most common fungus which may cause tubotympanic disease. A study was done to investigate the incidence and profile of both aerobic and anaerobic bacteria in chronic otitis media. The samples of consecutive middle ear discharges taken from 228 patients with chronic otitis media were analysed and, smears were obtained using sterile cotton swabs, then incubated and identified. Twenty five species of microorganisms were found, among them and, the most common isolates were Staphylococcus aureus and Pseudomonas aeruginosa, and rarely were recovered Proteus mirabilis, Proteus vulgaris and methicillin-resistant Staphylococcus bacterial isolates. Among fungal pathogens, Aspergillus spp. was the most common fungus isolated followed by Candida albicans ***(Pajor, 2006).***

These microorganisms are infrequently found in the skin of the external canal, but may proliferate in the presence of trauma, inflammation, lacerations or other environmental factors as poor sanitation, unclean water, and lack of personal hygiene and nutrition. These bacteria may then gain entry to the middle ear through a chronic perforation, resulting in progressive destruction of middle ear and mastoid structures ***(Acuin, 2004).***

Epidemiology and risk factors:

Tubotympanic disease, still constitutes a major public health problem and is one of the most common ear diseases in children and adults in Africa, Asia and Latin America. It is commonly a disease of the developing world with malnutrition, over-crowding, substandard hygiene, frequent upper respiratory tract infections and under-resourced health care (all linked to low socio-economic status) listed as risk factors. In developing countries, ear infections including tubotympanic disease are usually neglected conditions due to insufficient funds, work force, facilities, and knowledge. Adoga et. al (2010), show that, the socio-economic burden of chronic suppurative otitis media on a northern Nigerian population where, presence of low socio-economic conditions. Seventy-four patients were evaluated for full history, clinical examination, investigations, cost of treatment, and the social impact on individuals. Results were that, the estimated cost of treatment for tubotympanic

disease is higher than the monthly minimum wage for individuals in this environment where the cost of health care is the sole responsibility of the patient**.**

It is found that the incidence of tubotympanic disease has been reported to depend on socioeconomic factors. During recent decades, the incidence has dramatically declined due to improvement in the socio-economic status, health education and health facilities. In the developing countries, there is differential prevalence among the different socio-economic strata of the community. A prospective cross sectional study was carried out among 500 children in urban private schools of Nepal, to find out the prevalence of tubotympanic disease among children studing in these schools. The result was that, prevalence of tubotympanic disease in children studing in rural schools in Nepal is higher than other studies done in urban private school children in Nepal ***(Adhikari et al., 2009)*.**

Malnutrition is an important risk factor and, the synergism between infection, poor environmental conditions and poor nutrition, contributes to the burden of disease suffered by many high risk populations ***(Jones, 1994).***

It is likely that epidemiologic factors (list 1) for acute otitis media (AOM) also play a role in the development of the tubotympanic disease. These include intrinsic (host) factors such as race, age, genetics, and educational level of the parents,

and extrinsic (environmental) factors such as day care attendance, not being breast fed, passive smoking, and previous upper respiratory tract infections. A Case-control study was done to determine which factors predict development of chronic suppurative otitis media (tubotympanic type) in children. The result was that, there were many predictors for tubotympanic disease which may be extrinsic factors from the sourrounding environment as day care attendance, not being breast fed, passive smoking, and previous URTI or intrinsic factors related to the host as race, age, genetics, and educational level of the parents ***(Vander Veen et al., 2006).***

Table (1): Factors relevant to the epidemiology of otitis media ***(Bluestone, 2004).***

Environmental Factors
Day-care attendance
Not being breast-fed
Passive smoking
Upper respiratory tract infections
Host Factors
Race
Age
Genetics
Educational level of the parents