Does Pneumococcal Vaccine Have A Role In Prevention Of Otitis Media In Children? (Meta-analysis)

SUBMITED FOR PARTIAL FULFILMENT OF MASTER DEGREE IN OTOLARYNGOLOGY

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هل للقاح المكورات الرئوية دور فى منع الإصابة بالتهابات الأذن الوسطى عند الأطفال؟

دراسة تحليليـــة

توطئة للحصول على درجة الماجستير

في جراحة الأذن والأنف والحنجرة

مقدمة من

الطبيب/أحمد حسن على كوكه

بكالوريوس الطب والجراحة

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Summary

Otitis media is one of the most common infections in childhood. Within the first 3 years of life; up to 80% of children will have experienced at least one episode of otitis media requiring specific treatment. Manipulation of the immune system to provide enhanced protection will probably result in a significant decrease in the incidence of this disease process. Vaccination may play a significant role in this endeavor. As Streptococcus pneumoniae is one of the predominant bacterial pathogens involved in acute otitis media (AOM), pneumococcal vaccines may be effective in preventing or decreasing the burden of disease related to otitis media.There are two types of pneumococcal vaccines:

1. Pneumococcal polysaccharide vaccine contains purified capsular polysaccharide from each of 23 capsular types which is suitable for adults 65 years or over.
2. Pneumococcal conjugate vaccine which is suitable for children under 2 years of age.

The purpose of this meta-analysis study was to answer the following question: is pneumococcal vaccination having a role in prevention of acute otitis media in children?

In our meta-analysis study, 5 studies fulfilled the inclusion criteria 4 of them their data analysed by software revman 5 these studies done on 16603 patients and there was 3925 acute otitis media episodes in control group and 3654 episodes in vaccine group.

بِسْمِ اللَّهِ الرَّحْمَٰنِ الرَّحِيمِ

وَمَنْ أَحْيَاهَا فَكَأَنَّمَا أَحْيَا النَّاسَ جَمِيعًا

الآية ٣٢ سورة المائدة

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Abbreviations

AOM .... **A**cute otitis media

Cd4 .... **c**luster of differentiation 4 glycoprotein

Crm197 . **C**orynebacterium diphtheria nontoxic mutant protein

Dtap ... **d**iphtheria, tetanus, and pertussis vaccines

Elisa .. **E**nzyme-linked immunosorbent assay

Hib .... **H**aemophilusinfluenzae type B vaccine

HIV .... **H**uman immunodeficiency virus

IgA .... **I**mmunoglobulin A

IgG .... **I**mmunoglobulin g

IL6 .... **I**nterleukin-6

IPV .... **I**nactivated Polio Vaccine

Menc ... **M**eningococcal group C vaccine

MMR .... **M**easles, mumps, and rubella vaccines

PCV .... **P**neumococcal conjugate vaccine

PCR .... **p**olymerase chain reaction

Pnccrm . **P**neumococcal vaccine conjugated to diphtheria nontoxic mutant protein

Pncompc **P**neumococcal vaccine conjugated to meningococcal outer membrane protein

PPV .... **P**neumococcal polysaccharide vaccine

RR ..... **R**isk Ratio

Abbreviations

Tnfa ... **T**umor necrosis factor a

Tlr4 ... **T**oll-like receptor 4

UK ..... **U**nited kingdom

US ..... **U**nited states of america

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Introduction

Otitis media is one of the most common infections in childhood. Within the first 3 years of life, up to 80% of children will have experienced at least one episode of otitis media requiring specific treatment **(Teele et al, 1989)**.

As streptococcus pneumonia is one of the major bacterial pathogens responsible for a wide spectrum of invasive disease and acute respiratory tract infections such as community-acquired pneumonia, acute otitis media, bacteremia, and meningitis, especially in children younger than 2 years in both developing and industrialized countries **(Williams et al., 2002)**.

The high morbidity and mortality rates resulting from these diseases and the increase of multidrug resistant pneumococcal strains **(Johnson et al, 2006; Van Bambeke et al., 2007)** have emphasized the urgent need for introduction of effective vaccines against diseases caused by S.pneumoniae **(O'Brien and Santosham, 2004; Oosterhuis-Kafeja et al., 2007).**

To date, trials of pneumococcal vaccines have mainly focused on the prevention of AOM. Pooled analyses of the results of these trials indicate that the 8- and 14-valent pneumococcal polysaccharide vaccines (PPV) might prevent about 10% of AOM episodes and that the 7- and 9- valent pneumococcal conjugate vaccines (PCV) may prevent about 8% of AOM episodes in young children who receive these vaccinations before the age of 6 months **(Straetemans et al., 2004)**.

As there is ongoing debate about the best strategy, it is not clear whether the whole infant population should bevaccinated or high-risk groups only **(Ofran et al., 2001)**.

Aim of the work

To assess the result of pneumococcal vaccine in prevention of otitis media in children. This is an evidence based study to evaluate the efficacy of pneumococcal vaccine in prevention of otitis media in children.

Review of Literature

Chapter1: Acute Otitis Media

Anatomy of Middle Ear

1. Tympanic Membrane

The tympanic membrane consists of three layers: outer, middle, and inner. The outer layer arises from the ectoderm, which consists of squamous epithelium. The inner layer originates from the endoderm and consists of cuboidal mucosal epithelium. The middle layer originates from the mesenchyme and is called the middle fibrous layer. The middle fibrous layer of the tympanic membrane consists of both radial and circumferential fibers. The tympanic membrane has an oval shape and is approximately 8 mm wide and 10 mm high (Figure 1) **(John and William, 2008).**

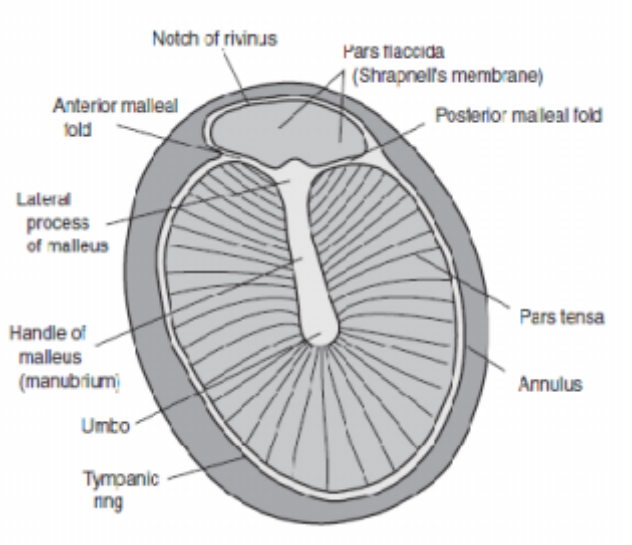

Figure 1: Anatomy of the tympanic membrane (left ear)

(John and William, 2008)

2. Middle Ear Cavity

The middle ear cavity is connected to the nasopharynx via the Eustachian tube. Posterior to the middle ear cavity are the mastoid air cells, which connect with the attic portion of the middle ear cavity through the aditusadantrum. The middle ear cavity and mastoid air cells are lined with ciliated mucosal epithelium**(John and William, 2008).**

The Eustachian tube is the conduit through which air is exchanged between the middleear space and upper aerodigestive tract **(Proctor, 1964; Grimmer and Poe, 2005)**.

3. Ossicular Chain

There are three ossicles: the malleus, theincus, and the stapes. The malleus has a long process, a short process, and a head. The malleus is bonded to the tympanic membrane from the tip of the long process (the umbo) to the short process. The head of the malleus articulates with the body of the incus in the attic. The incus has a long process and a short process. The short process is tethered to the posterior wall of the middle ear cavity for structural support and the long process is connected to the stapes capitulum. The distal portion of the long process of the incus is known as the lenticular process. The stapes consists of a footplate and a superstructure. The superstructure includes the anterior and posterior crus, which are attached at the capitulum. The footplate is the bony covering that sits within the oval window. The stapedius muscle originates from the pyramidal eminence. The tensor tympani muscle is anchored by the cochleariform process where it turns 90° and becomes a tendon that connects to the malleus. The ponticulus is a ridge of bone between the round window and the oval window. The

subiculum is a ridge of bone just anterior to the round window. The promontory is the medial wall of the middle ear cavity. Medial to the promontory is the cochlea **(John and William, 2008)**.

4. Nervous Structures

The facial nerve is the major nerve traversing the middle ear cavity. After entering the temporal bone via the internal auditory canal, the labyrinthine segment courses to the geniculate ganglion, immediately superior to the cochlea. The facial nerve then turns (first genu) and runs horizontally through the middle ear space (the tympanic portion of the facial nerve). The nerve lies superior to the oval window and the bone is often missing (dehiscent facial nerve) at this point. The nerve then turns again (second genu) and runs vertically (the vertical portion of the facial nerve). The nerve exits the temporalbone through the stylomastoid foramen, which is medial to the digastric muscle but lateral to the styloid process**(John and William, 2008).**

5. The Facial Recess & the Sinus Tympani

The bony ear canal ends at the level of the annulus. The space medial to the end of the ear canal, but lateral to the facial nerve, is the facial recess. Medial to the facial nerve is another pocket of space called the sinus tympani**(John and William, 2008).**