



Review Article

Epidemiology of otitis media in children from developing countries: A systematic review



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ABSTRACT

Objective: This systematic review examined the epidemiology of otitis media (OM) in children <6 years within 90 developing and newly industrialised countries.

Methods: Literature searches (1992–2011), based on MEDLINE, EMBASE, WHO, Index Medicus, country-specific websites, conferences, and the reference lists of included studies, yielded 11,413 records; 59 of 344 studies analysed were included in this review.

Results: The majority of the identified studies provided only a single timepoint for OM. In children <6 years of age, OM prevalence was found to be 9.2% in Nigeria, 10% in Egypt, 6.7% in China, 9.2% in India, 9.1% in Iran and 5.1–7.8% in Russia. Few studies examined the etiology of OM and the antibacterial resistance. The most common bacterial pathogens were *S. pneumoniae*, *H. influenzae* and *S. aureus*. A high resistance to penicillin was reported in Nigeria and Turkey.

Conclusions: Despite the variability between the identified studies, this review indicates that OM and its various sub-types remain a significant burden in different settings. However, the heterogeneity of studies and a general lack of reliable data made generalisation very difficult.

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1. Introduction

Otitis media (OM) is one of the most common childhood infections in pre-school aged children [1] and a major cause of childhood morbidity [2–5]. OM also represents the most frequent reason why children are prescribed with antibiotics or undergo surgery in the developed countries [6,7]. Moreover, in most of the countries belonging to developing countries, no guidelines regarding the use of antibacterial treatment in OM and respiratory tract infections exist and in several countries, parents can purchase any antibacterial drug in pharmacies without mandatory medical prescriptions.

OM is subdivided into several disease sub-categories: acute otitis media (AOM), recurrent AOM, OM with effusion (OME) and chronic suppurative OM (CSOM). AOM presents with local and systemic signs and has a rapid onset [8,9], and is a leading cause of antibacterial treatment for children in developed countries [10,11]. OME can occur during the resolution of AOM once the acute inflammation has resolved but bacteria may still be present [12], while CSOM requires ongoing inflammation of the middle ear leading to otorrhea persisting for at least two weeks and perforation of the tympanic membrane [13].

In general, OM can be caused by bacteria or viruses [14]. The two leading bacterial pathogens are *Streptococcus pneumoniae* and non-typeable *Haemophilus influenzae* (NTHi) [14–16]. Other important bacterial causes of OM are *Staphylococcus aureus*, *Moraxella catarrhalis* and *S. pyogenes* [14,16]. In terms of causative agent, the difference between OME and AOM is that the frequency of *S. pneumoniae* is not as high, and *H. influenzae* and *M. catarrhalis* are moderately more common.

It has been estimated recently that around 20,000 people die annually from complications associated with OM, with the highest mortality rates in the children <5 years of age [4]. Recurrent or chronic forms of the disease can lead to considerable hearing loss and negatively affect learning ability and scholastic achievement [17].

It is well known that the prevalence of OM is increasing over time; Auinger et al. have reported this observation from the US during the 80s, attributed in part to the increase in child care and in higher prevalence of allergic conditions [1,18]. While there is a considerable body of work examining the treatment of OM [19–21], limited research has been undertaken on the burden of OM in developing and newly industrialised countries. A systematic review of AOM in children from Latin America and the Caribbean [2], a review of OM burden in children from Asia-Pacific [5], and a systematic review on global estimates for OM and related conditions [4] were published previously.

To build on this work, we conducted a systematic review of the epidemiology of OM, including all sub-categories, in children <6 years of age from 90 developing and newly industrialised countries covering Africa, China, India and South Asia, Russia and the Commonwealth of Independent States (CIS), and the Middle East. Our review focussed on incidence, prevalence, distribution of pathogens and antimicrobial resistance in children with OM.

2. Materials and methods

2.1. Search strategy and eligibility criteria

This review was restricted to a pre-defined list of 90 developing and newly industrialised countries (see Supplementary Material,

Appendix A for a list of the countries included). These countries covered 5 regions of interest: Africa, China, India and South Asia, Russia and CIS, and the Middle East.

Children <6 years of age with a diagnosis of OM (any sub-category) were the population of interest. Studies including a wider age-range for participants were only included when they reported separate results for those aged <6 years. Searches were not limited by language or publication status.

Twenty-three electronic databases were searched from 1992 to October 2011, including MEDLINE, EMBASE, African Index Medicus, Index Medicus for the Eastern Mediterranean Region, Index Medicus for South Asia Region, Western Pacific Region Index Medicus. Conference abstracts and relevant websites (e.g. Health Ministry websites) were also searched. An example of search strategy for MEDLINE is included in Supplementary Material, Appendix B.

The current review reports on the following outcomes: incidence or prevalence or count of OM (any sub-category), distribution of pathogens causing OM and antimicrobial resistance and susceptibility of pathogens causing OM. Otitis externa and labyrinthitis were excluded from this review.

Any study or data source reporting relevant outcome data were included, for example, observational studies (e.g. cohort studies, case-control studies, case series), country-specific/regional trials, registries, guideline/guidance documents, and statistical databases. We planned to investigate various subgroups of interest (disease sub-categories, age-groups, vaccination status, HIV status, malnutrition, diagnostic approach), but a paucity of data made these analyses unfeasible.

2.2. Screening and data abstraction

Pairs of reviewers working independently screened the titles and abstracts of the retrieved references for relevance and any disagreements were resolved through consensus. Studies that were potentially relevant (prevalence, incidence and mortality of OM in children [aged <6 years] in the countries of interest, both overall and in different patient groups; distribution of pathogens and serotypes causing OM in the countries under consideration; seasonal variation in the incidence rate of OM; rate of treatment failure, antibiotic resistance, and hearing impairment from OM for the countries under consideration; health resource use for OM; health related quality of life for OM patients, parents or care givers; vaccination programmes and recommendation) or studies that were in disagreement were ordered and the full article was assessed for inclusion by one reviewer and checked by a second reviewer. Any disagreements were resolved through discussion or were checked by a third reviewer. Justifications for excluding papers from the review were documented for all full papers ordered for further inspection. Studies fulfilling all inclusion criteria were included in the review.

Data abstraction sheets Microsoft Excel (version 2010) were first piloted on a small selection of studies. Subsequently, for each study, data were abstracted by one reviewer and checked by a second reviewer. Any disagreements were resolved by consensus.

2.3. Assessment of methodological quality

The risk of bias for included studies was assessed using the Downs and Black 27 item checklist for the methodological quality

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