

Otitis Media

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Otitis media (OM) refers to middle ear infection, and is a highly prevalent condition in the Australian Aboriginal population. While OM occurs with different degrees of severity, it invariably presents a serious healthcare problem, with significant medical, psychological and social impacts. Recurrent OM infection may lead to chronic suppurative otitis media (CSOM), a condition characterised by ‘persistent discharge from the middle ear through a tympanic membrane perforation’.¹ While the pathogenesis of a persistent middle ear infection such as CSOM is relatively unknown, the greatest risk factor is an earlier episode of acute infection, with the primary pathogens implicated in OM being *Streptococcus pneumoniae*, *Haemophilus influenzae* and B-haemolytic streptococci.^{2,3} There are a wide range of risk factors correlated with the onset of OM, which if untreated can present with severe morbidity or lead to a variety of potentially fatal complications.

While in developed nations worldwide OM has a very low prevalence of less than 1%, it is an endemic condition among developing nations.¹ As such, its exceptionally high prevalence in Aboriginal Australians (a country whose position in the ‘developed world’ has been firmly established over the past few decades) represents a failure of the healthcare system to adequately care for Aboriginals, and is thus a source of considerable concern. A study in 2004 by Morris investigating the prevalence of OM in 709 Aboriginal children from Northern and Central Australian communities discovered that ‘nearly all children examined had some form of otitis media’.²

Only 8% of the sample participants had two normal ears upon examination, with the remaining 92% suffering from some degree of OM. In addition, 15% of these children were afflicted with a tympanic membrane perforation secondary to suppurative infection (2).

The National Trachoma and Eye Health Program survey in 1976–1979 of 60,273 Aboriginal people identified OM in 11% of those surveyed.⁴ More recently, studies report that the current day prevalence of OM among Indigenous Australians stands at approximately 15%.^{2,5} Hence, despite supposedly increased medical education and improved living conditions in Australian Aboriginal communities, the incidence of OM, and in particular CSOM, has not changed over the past 20 years.⁴ Indeed, the most recent literature suggests an increasing incidence of OM among Australian Aboriginals.

In infants, incidence of OM is particularly devastating. The onset of OM is remarkably rapid, and occurs much more frequently in Aboriginal children than in non-Aboriginal subpopulations. A study by Boswell in 1995 discovered that 95% of Aboriginal infants within a postpartum period of eight weeks had OM as opposed to 30% among non-aboriginal infants.⁶ However, while OM in non-Aboriginal children appears to be a transient infection that does not lead to further complications, its occurrence in Aboriginal infants appears to predispose them to developing secondary complications concomitant to the middle ear infection.⁶

In Far North Queensland, a similar survey conducted in 2006 of 1553 Aboriginal infants between 8 to 48 months of age identified ‘disturbingly high rates of chronic suppurative otitis media’ with up to 25% of the entire paediatric practice population suffering from the disease.⁵

CSOM is undoubtedly one of the most widespread diseases afflicting Aboriginal children in rural Australia, with up to 40% of Aboriginal children being affected.^{2,4,5,8} What makes this prevalence so alarming is that the World Health Organization (WHO) has indicated that a ‘prevalence rate of CSOM greater than 4% in a defined population of children is indicative of a massive public health problem’.¹ As the preva-

lence of CSOM in first world countries is considered to be less than 1%, the sustained and disproportionate prevalence of OM in Aboriginal children is of great concern.

In Australian non-Aboriginal children, the incidence of CSOM is almost negligible,⁷ and consequently it is easy to note the marked discrepancy between Aboriginal and non-Aboriginal subpopulations within Australia. The difference in prevalence between these two groups is the cumulative result of a combination of different risk factors, particularly those involved with Aboriginal social positioning. Internationally, children suffer from higher rates of OM than adults, and this is physiologically a result of immunologic factors such as a comparative lack of circulating antibodies and anatomical factors such as the low angle of the Eustachian tube in relation to the nasopharynx, which predisposes to fluid stasis and infection.⁷

However, while these factors explain the increased incidence of OM among infants, they do not explain the marked divergence of incidence between children belonging to Aboriginal and non-Aboriginal subpopulations within Australia. Perhaps the greatest predisposing factor for the initial onset of OM (and hence the potential inception of CSOM and its complications) is nasopharyngeal colonisation by multiple pathogenic bacterial species (particularly *Haemophilus influenzae*, *Streptococcus pneumoniae* and *Moraxella catarrhalis*) not associated with local flora.^{1,3}

Higher rates of OM have been discovered in Aboriginal households that are consistently overcrowded, and where children are exposed to siblings colonised by nasopharyngeal bacteria.^{8,9} Since Aboriginal households are typically crowded with multiple children, infants' susceptibility to OM is greatly increased. A study of infants in Central and Northern Australia concluded that it was this early 'cross-infecting' among Aboriginal children that led to the prolonged carriage of bacteria, potentially permanent Eustachian tube damage and the consequent progression of this condition to persistent OM.⁹

Poor living standards are a key risk factor in childhood inception of OM, with reduced hygiene linked with an

increased susceptibility to airborne pathogens that are responsible for middle-ear infection.^{9,10} Similarly, being exposed to cigarette smoking from a young age has been shown to have an immunosuppressant effect that would contribute to childhood infection.¹¹ A recent study demonstrated that infants between 37 to 48 months of age who were exposed to smoking were twice as likely to carry two or more strains of bacteria (particularly *H. influenzae*, *Streptococcus pneumoniae*, *Moraxella*).¹⁰

Passive smoking in particular appears to be a significant risk factor for the development of acute OM in infants. Exposure to environmental tobacco smoke (ETS) increased the risk of OM in both Aboriginal and non-Aboriginal populations by a factor of three.¹¹

OM in Australian Aboriginal children is exacerbated by a considerable degree of social marginalisation and social exclusion. Aboriginal youth are perhaps the most socially and economically marginalised group in society.¹² In many cases, Aboriginal children have lower school retention rates, markedly decreased numeracy and literacy levels, as well as higher rates of juvenile delinquency and substance abuse when compared to the non-Aboriginal population. A report published by the Australian Institute of Criminology attributed low school retention rates to a marginalisation borne 'out of a complex interrelation of social, economic and cultural factors',¹² and this marginalisation has dire medical and psychosocial implications.

Lower education standards among the Aboriginal population predispose them to a life of poor employment, and as a result higher rates of poverty are manifestly evident among this subpopulation within Australia. Poverty, poor living conditions and overcrowding due to unemployment can all be considered pertinent risk factors to the early onset of OM among the Australian Aboriginal community. It is the cumulative effect of these social factors that have contributed not only to the alarmingly high prevalence of OM, but also to a far wider range of medical and psychosocial issues such as alcoholism and unemployment, both of which are endemic issues among the indigenous population.¹²

OM is a condition with serious complications and consequences if left undiagnosed or untreated. In particular, the CSOM in Aboriginal communities and its associated negative outcomes present a significant burden of suffering. The WHO reported in 1993 that OM was responsible for the deaths of 51,000 children under the age of five annually.⁸ While this mortality rate includes the worldwide population, rather than just the Australian Aboriginals, it is nonetheless alarmingly high, and consequently shows that OM in developing nations is an issue of global concern.

Even if OM and its associated complications do not result in mortality, they are nonetheless associated with considerable morbidity. Non-fatal complications include earache, fever, diminished hearing and deafness.⁷ A series of surveys between 1964 and 2000 detected deafness in 10 to 41% in those suffering from CSOM (13). Rarer but equally serious complications include facial paralysis, inner-ear infections or brain abscesses stemming from a perforated tympanic membrane.¹⁴ Even if antibiotics are used early in intracranial complications arising from OM, there is an alarmingly high mortality rate of 18.4%. If antibiotic treatment is not used (as may be the case in undiagnosed cases of OM/CSOM), this mortality rate increases significantly to 76.4%.¹⁵

As such, the prevalence of OM among Aboriginal children is of serious concern, with many of these children being condemned at an early age to a life of significant disability. In terms of disability-adjusted life years (DALY), the WHO has reported that the impact of OM is comparable to conditions such as meningitis, trachoma, syphilis and polio.⁸ The most common complication of OM is hearing loss. The generally slow onset of this condition and the lack of communication skills in infants mean that OM can cause severe hearing loss before appropriate medical attention is sought. This can lead to irreparable damage to the tympanic membrane and Eustachian tube, with the consequence of lifelong hearing impairment.

Long-term complications of impaired hearing can include slow language development, learning difficulties, and subse-

quently poorer performances at school and in gaining employment. In comparison with non-Aboriginal children, OM in Aboriginal children has an earlier onset, is more common, and is more likely to result in complications such as permanent hearing loss.^{14,15}

While the management of OM in Aboriginal people is beyond the scope of this essay, in brief, early diagnosis (generally through tympanometry¹⁵) and treatment is the key to reducing the incidence rate among Indigenous Australians. However, while antibiotic therapy (amoxicillin 80-90 mg/kg/d) and steroidal drugs (mainly Prednisolone and Dexamethasone) can eliminate infection and reduce inflammation, it is imperative that the risk factors involved in the inception of OM are addressed in addition to the short-term treatment options.¹⁵

Indeed, the management of risk factors as a method of treatment for acute OM has been shown to be perhaps more important than early antibiotic therapy. A meta-analysis by Del Mar and Glasziou of six independent studies investigating the effectiveness of antibiotic treatment for acute OM concluded that while drug therapy reduced the risk of tympanic membrane perforation, it had no influence on the incidence of new and recurrent episodes of OM or the potential onset of hearing impairment.¹⁶ As such, the management of the risk factors associated with CSOM is more important than early antibiotic treatment in reducing the prevalence of this condition. Indeed, early antibiotic treatment is associated with many adverse side-effects, including vomiting, diarrhoea and rashes.¹⁶ Consequently, while antibiotics certainly play an important role in managing inflammation and preventing perforation in acute OM, long-term therapeutic options need to focus more on addressing the risk factors associated with OM rather than the use of prescription medications.

In conclusion, the disturbingly high prevalence of OM among Aboriginal children in Australia is a source of significant concern. OM, and in particular CSOM, predispose many Indigenous Australians to lower living standards, with a wide variety of life-threatening complications stemming from middle-ear infections if left untreated. Risk of inception is

multifactorial, and the high frequency of OM within the Aboriginal population can be attributed to numerous social factors such as overcrowding, early exposure to OM pathogens and poor hygiene. OM and its complications can result in considerable morbidity, particularly hearing loss, which has significant impacts on medical, psychological and social health. The alarmingly high prevalence of OM in Australian Aboriginal children in comparison with inhabitants of other developed countries is a serious public health concern, and tackling this problem will be one of the keystones to medico-social progress as we move further into the 21st century.

Abbreviations

OM: Otitis media

CSOM: Chronic suppurative otitis media

WHO: World Health Organization

DALY: Disability-adjusted life years

Endnotes

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