CLINICAL REVIEW

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Chronic Otitis Media in Childhood: Impact on Hearing, Language Development and Cognitive Educational Outcomes

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ABSTRACT: Otitis media in childhood comprises a spectrum of highly prevalent clinical entities with the potential to produce significant functional consequences, particularly when disease is persistent or recurrent. Within this spectrum, two conditions are especially relevant in the context of chronic otitis: persistent otitis media with effusion (OME), characterized by the presence of middle ear fluid without signs of acute infection, and chronic suppurative otitis media (CSOM), defined by chronic inflammation and infection associated with tympanic membrane perforation and recurrent or persistent otorrhea. These conditions are particularly important because they occur during sensitive periods for language acquisition, consolidation of pre-academic skills and maturation of attentional and self-regulatory processes, potentially resulting in episodes of conductive hearing loss (typically fluctuating in OME and more sustained in CSOM). This narrative overview examines: (1) the epidemiology and pathophysiology of chronic otitis in childhood; (2) the audiological and functional characteristics of the associated hearing impairment; and (3) current evidence regarding impacts on language, learning and cognitive development, including relevant moderating factors. The discussion highlights implications for screening, interdisciplinary assessments and clinical and educational intervention.

KEYWORDS: Childhood; Chronic Otitis Media; Conductive Hearing Loss; Language Development; Cognitive Development

INTRODUCTION

Otitis media is among the most common childhood conditions and represents a substantial component of the global burden of pediatric disease, particularly during the first five years of life. Global reviews indicate that otitis media and its sequelae significantly contribute to avoidable hearing loss and disability, disproportionately affecting socioeconomically vulnerable populations [1,2]. Even mild conductive hearing loss may be clinically relevant in classroom environments, where speech understanding critically depends on signal-to-noise ratio and binaural integration [3,4].

Persistent OME is frequently painless and may therefore be underdiagnosed despite causing bilateral and fluctuating conductive hearing loss. Clinical guidelines recommend careful documentation of effusion, appropriate hearing assessments when effusion persists and identification of children at developmental risk [4,5]. CSOM carries a greater likelihood of persistent hearing loss and complications and remains an important cause of hearing impairment globally [6,7].

Evidence linking otitis media with neurocognitive development is heterogeneous. While meta-analyses sug-

gest small average effects on language, other studies report specific deficits and greater impact in vulnerable subgroups [8–10]. This apparent discrepancy warrants critical synthesis.

METHODS

This article presents a narrative overview of the literature addressing persistent and chronic otitis media in childhood and associated auditory, linguistic, cognitive and educational outcomes. Rather than applying formal systematic review procedures, the aim was to provide a structured and clinically oriented synthesis of relevant evidence.

Key publications were identified through targeted searches of biomedical literature databases (PubMed/MEDLINE), including primary studies, systematic reviews, meta-analyses, clinical practice guidelines and major reference articles addressing the epidemiology, pathophysiology and developmental implications of otitis media. In addition, manual searches of the reference lists of relevant publications were undertaken to identify further pertinent studies. [4,11]. Particular attention was given to studies clearly describing exposure to persistent OME, recurrent otitis media or CSOM, and reporting developmental outcomes using recognised measures. Both prospective and retrospective pediatric studies, as well as population-based investigations of longer-term outcomes, were considered [8,12,13]. Given the methodological diversity across studies, findings are presented narratively and organised into thematic domains.

RESULTS

Epidemiology and Risk

The burden of otitis media is concentrated in early childhood, a critical period for phonological and lexical development [1,2]. Persistence and progression are influenced by social determinants, explaining disproportionate impact in vulnerable populations [7,9]. OME often produces bilateral, fluctuating conductive hearing loss [5]. CSOM may lead to more stable and potentially greater hearing deficits [11,14].

Auditory Processing, Language and Literacy

Meta-analytic evidence suggests small mean effects on global language measures [8]. However, specific vulnerabilities in phonological awareness and emerging literacy have been reported [10]. A recent systematic review indicates potential associations between early OME and altered auditory processing performance in some children [15], supporting the hypothesis that fluctuating hearing loss may influence auditory maturation [16].

Learning, Academic Performance and Cognition

Population studies show small but measurable associations between early otitis media and later cognitive or educational outcomes [13]. In high-prevalence settings, educational impact may be substantial [9]. Reviews highlight heterogeneity in findings and underscore the importance of moderating variables such as disease duration, severity and social context [12]. Mechanistic interpretations frequently emphasize listening effort and language-mediated pathways [3].

DISCUSSION

Listening Effort, Language Mediation and Executive Function

The pathway linking chronic otitis and cognitive outcomes is most plausibly indirect. Degraded auditory input increases processing demands, placing additional strain on working memory and attention. The FUEL model offers a coherent explanatory framework for understanding how listening effort may affect learning in complex acoustic environments [3]. Language development appears central in mediating potential downstream effects. Evidence from broader hearing loss literature indicates bidirectional relationships between language skills and executive functioning [17,18]. Although not specific to otitis media, this body of work strengthens the conceptual plausibility of indirect cognitive impact.

Clinical and Educational Implications

Guideline-based diagnosis and monitoring remain essential [8]. Functional audiological assessment, including evaluation of speech perception in noise, may be warranted in children with persistent academic concerns [19]. Early tympanostomy tube placement does not guarantee long-term developmental gains in unselected populations [20]. The management of CSOM prioritizes infection control and mitigation of persistent hearing impairment [7,14]. Educational accommodations, particularly in vulnerable settings, may reduce functional impact [9].

Limitations and Future Research

The available evidence is limited by hetero-

geneous exposure definitions, incomplete quantification of cumulative disease burden and variability in developmental outcome measures [1,8]. Residual confounding related to socioeconomic and linguistic environments remains a concern [2,9]. Future research would benefit from longitudinal designs incorporating repeated otological and audiological documentation, sensitive functional measures (including speech-in-noise and auditory processing) and explicit modeling of mediation and moderation pathways. The FUEL framework provides a useful conceptual basis for such investigations [3].

CONCLUSIONS

Chronic otitis media in childhood, particularly persistent OME and CSOM, may result in conductive hearing loss during sensitive developmental periods. Although average effects on language appear small, evidence suggests increased risk for specific phonological and literacy difficulties and measurable educational impact in vulnerable subgroups.

A mediated model offers the most coherent interpretation, whereby degraded auditory input increases listening effort and constrains cognitive resources necessary for learning. Risk stratification, functional assessments and integration of clinical and educational support are central to mitigating potential long-term consequences.

REFERENCES

1. Schilder AGM, Chonmaitree T, Cripps AW, Rosenfeld RM, Casselbrant ML, Haggard MP, et al. Otitis media. Nat Rev Dis Primers. 2016 Sep 8;2(1):16063.
2. Monasta L, Ronfani L, Marchetti F, Montico M, Vecchi Brumatti L, Bavcar A, et al. Burden of Disease Caused by Otitis Media: Systematic Review and Global Estimates. Moormann AM, editor. PLoS ONE. 2012 Apr 30;7(4):e36226.
3. Pichora-Fuller MK, Kramer SE, Eckert MA, Edwards B, Hornsby BWY, Humes LE, et al. Hearing Impairment and Cognitive Energy: The Framework for Understanding Effortful Listening (FUEL). Ear Hear. 2016;37 Suppl 1:5S-27S.
4. Vanneste P, Page C. Otitis media with effusion in children: Pathophysiology, diagnosis, and treatment. A review. J Otol. 2019 Jun;14(2):33–9.
5. Rosenfeld RM, Shin JJ, Schwartz SR, Coggins R, Gagnon L, Hackell JM, et al. Clinical Practice Guideline: Otitis Media with Effusion (Update). Otolaryngol--head neck surg [Internet]. 2016 Feb [cited 2026 Feb 15];154(S1). Available from: https://aao-hnsfjournals.onlinelibrary.wiley.com/doi/10.1177/0194599815623467
6. Acuin J. Chronic suppurative otitis media. BMJ Clin Evid. 2007 Feb 1;2007:0507.
7. World Health Organization. Chronic suppurative otitis media : burden of illness and management options [Internet]. World Health Organization; 2026. Available from: https://iris.who.int/handle/10665/42941
8. Roberts JE, Rosenfeld RM, Zeisel SA. Otitis Media and Speech and Language: A Meta-analysis of Prospective Studies. Pediatrics. 2004 Mar 1;113(3):e238–48.
9. Su JY, Guthridge S, He VY, Howard D, Leach AJ. The impact of hearing impairment on early academic achievement in Aboriginal children living in remote Australia: a data linkage study. BMC Public Health. 2020 Dec;20(1):1521.
10. Winskel H. The effects of an early history of otitis media on children's language and literacy skill development. Brit J of Edu Psychol. 2006 Dec;76(4):727–44.
11. Verhoeff M, Van Der Veen EL, Rovers MM, Sanders EAM, Schilder AGM. Chronic suppurative otitis media: A review. International Journal of Pediatric Otorhinolaryngology. 2006 Jan;70(1):1–12.
12. James R, Machell A, DeLacy J, Stephens J. Long-term outcomes of childhood otitis media and hearing loss: a systematic review. Speech, Language and Hearing. 2025 Jan 2;28(1):2420455.
13. Mortensen M, Nielsen RB, Fisker N, Nørgaard M. Hospitalisation with otitis media in early childhood and cognitive function in young adult life: a prevalence study among Danish conscripts. BMC Pediatr. 2013 Dec;13(1):8.
14. Mittal R, Lisi CV, Gerring R, Mittal J, Mathee K, Narasimhan G, et al. Current concepts in the pathogenesis and treatment of chronic suppurative otitis media. Journal of Medical Microbiology. 2015 Oct 1;64(10):1103–16.
15. Gyawali BR, Kharel S, Giri S, Ghimire A, Prabhu P. Impact of Otitis Media With Effusion in Early Age on Auditory Processing Abilities in Children: A Systematic Review and Meta-Analysis. Ear Nose Throat J. 2024 Apr 1;01455613241241868.
16. Nittrouer S, Lowenstein JH. Early otitis media puts children at risk for later auditory and language deficits. International Journal of Pediatric Otorhinolaryngology. 2024 Jan;176:111801.
17. Jamsek IA, Kronenberger WG, Pisoni DB, Holt RF. Executive functioning and spoken language skills in young children with hearing aids and cochlear implants: Longitudinal findings. Front Psychol. 2022 Sep 23;13:987256.
18. Kronenberger WG. Executive Functioning and Language Development in Children with Cochlear Implants. Cochlear Implants Int. 2019;20(Suppl 1):2–5.
19. Borges LR, Paschoal JR, Colella-Santos MF. (Central) auditory processing: the impact of otitis media. Clinics (Sao Paulo). 2013 Jul;68(7):954–9.
20. Paradise JL, Feldman HM, Campbell TF, Dollaghan CA, Rockette HE, Pitcairn DL, et al. Tympanostomy Tubes and Developmental Outcomes at 9 to 11 Years of Age. N Engl J Med. 2007 Jan 18;356(3):248–61.