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Chronic Otitis Media and Hearing Loss in Nepalese Schoolchildren

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Abstract

Background: Chronic otitis media is one of the leading causes of avoidable hearing loss in children in developing countries. Early diagnosis and management of chronic otitis media can prevent hearing loss and the consequences that follow. These include delayed language development, poor academic performance and lifelong socioeconomic impacts. **Objectives:** To find out the prevalence of chronic otitis media in school-aged Nepalese children and to evaluate associated hearing loss. **Methods:** This is a retrospective study conducted by reviewing the screening records of schoolbased ear health programs conducted by our institute over a five-year period. Medical records of children diagnosed with chronic otitis media were studied and segregated. Data including diagnoses, tympanic membrane findings and pure tone audiogram reports were documented and analyzed.

Index terms— chronic otitis media, hearing loss, schoolchildren, nepal.

1 Introduction

Chronic Otitis media (COM) is a permanent abnormality of the pars tensa or pars flaccida, most likely a result of previous acute otitis media, otitis media with effusion or long-standing negative middle ear pressure. 1 The prevalence of chronic otitis media has been reported to be between less than 1% in high-income countries to up to 46% in disadvantaged ethnic groups and low-income countries. 2 A prevalence of 1-2% of COM in children in a definite community is considered low and a prevalence of more than 4% is considered high, which also indicates a public health issue requiring urgent attention. 3 Chronic otitis media is the leading cause of preventable hearing loss in children, especially in developing countries. According to the WHO, about 60% of people with COM have clinically significant hearing loss and 90% of these are in developing countries. 3 This is a matter of serious concern especially in children because of the negative developmental and educational impacts caused by hearing loss. Chronic otitis media contributes most to the global burden of hearing loss; hence, eliminating it can potentially reduce the global burden of hearing loss.

Recent prevalence of chronic otitis media in Nepalese children is not known, and there is lack of accurate data. The little available data are from either hospital-based or of small cohort studies. More recent data on COM prevalence would help to determine if COM management should be prioritized in the national health care program. Therefore, the main objective of our study is to find out the most recent status of chronic otitis media in Nepalese children and to evaluate corresponding hearing loss.

2 II.

3 Methods

This is a retrospective study based on data from the medical records of Nepalese Schoolchildren who participated in the school-based ear health programs conducted by our institute over a five-year period from January 2015 through January 2020. Permission to conduct the school-based ear health programs was obtained in writing from the educational authorities of the concerned district and from the individual schools. Schools that provided written consent to conduct ear health program were included in the study. The schools that did not consent were excluded.

44 The medical records contain otoscopic findings of the tympanic membrane, final diagnoses and pure tone
45 audiometry reports of all the children. Detail findings of the tympanic membrane such as the integrity of the
46 membrane, the size and site of perforations, the presence of ear discharge and cholesteatoma were recorded.
47 Demographic details such as age, gender, grade, and ethnicity were also documented. All the confirmed cases
48 of chronic otitis media in children in grades 1 through 10 along with their pure tone audiometry reports were
49 included in the study. Children diagnosed with acute otitis media, otitis media with effusion, ear diseases other
50 than COM and children with normal findings were excluded from this study. Children with incomplete medical
51 records or missing data were also not included in this study.

52 The school-based ear screening programs were conducted and documented by senior Ear Nose Throat surgeons
53 having more than five years experiences in this community screening work. A Heine Mini 3000 otoscope was
54 used for tympanic membrane examinations. Chronic otitis media was diagnosed when there was a permanent
55 abnormality of the pars tensa or pars flaccida with or without active ear discharge. It is divided into chronic
56 otitis media mucosal and chronic otitis media squamous as per Browning et al. classification of COM. 4 Pure
57 tone audiometry was conducted and documented by an audio-technician using an Arphi Proton SX3 pure tone
58 audiometer. Hearing loss was defined as a pure tone average of four frequencies 0.5, 1, 2, and 4kHz greater than
59 25dB HL in one or both ears. Data analysis was done using frequency and percentage. The ethical clearance
60 to conduct the study was approved by the Nepal Health Research Council (NHRC) bearing registration number
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62 4 III.

63 5 Results

64 Over a period of five years from January 2015 until January 2020, 79,340 children from grades 1 through grade 10
65 were screened for ear and hearing problems. Out of which, chronic otitis media was diagnosed in 8.04% (n=6,382)
66 children, of which 50.75% (n=3,239) were in boys and 49.25% (n=3,143) in girls. Ages of the children in the
67 study ranged between 4 to 18 years old. The majority of the children with chronic otitis media 60.59% (n=3,867)
68 were aged 11-15 years old with only 3.85% (n=246) of children in the 4 to 5 years age group testing positive
69 for this. Chronic otitis media was seen in 41 Hearing loss was seen in 41.57% (n=2,653) of the children with
70 chronic otitis media, out of which 93.40% (n=2,478) of the cases were conductive hearing loss, which was of mild
71 degree in 87.36% (n=2,165), moderate in 9.76% (n=242) and moderately severe in 2.86% (n=71) of the children.
72 Mild conductive hearing loss was the commonest type of hearing loss. This was seen in 81.60% (n=2,165) of the
73 children with COM, whereas, moderately severe mixed hearing loss was the least commonly seen in only 1.31%
74 (n=35) of children with chronic otitis media. 95.60% of children with mucosal-COM had associated hearing loss,
75 whereas only 74.65% of children with squamous-COM had hearing loss. The type and degree of hearing loss
76 associated with different types of COM by age groups are shown in Table 2.

77 6 Discussions

78 Despite improvement in public health care in last two decades, there is still a significant burden of chronic otitis
79 media in school-aged children in Nepal. This study shows that the prevalence of chronic otitis media in Nepalese
80 schoolchildren is 8.04%. According to WHO categorization of the countries with disease burden, a prevalence
81 rate of 8.04% places Nepal in the group of the countries with the highest prevalence rates. The high prevalence
82 rate in our study may be caused by increased exposure of the study children to risk factors associated with low
83 socioeconomic strata such as overcrowding, passive smoke and poor nutrition.

84 The largest population-based survey was conducted in 1991 in the general population and found that 7.4% of
85 all Nepalese had middle ear pathology. 5 Following that, a few studies conducted in small pediatric populations
86 have reported prevalence rates of 3.26% by Thakur et al. 6 5% by Adhikari et al. 7 and 10% by Maharjan et
87 al. 8 The relatively low prevalence rate reported by Thakur et al. could be due to differences in sampling size
88 and sampling technique followed in the study. Adhikari et al. conducted the study in urban private schools
89 where socioeconomic status and literacy rates of the parents are high, which could explain the lower number of
90 children with COM in their study group. The school where Maharjan et al. conducted their study mostly enrolled
91 children from one particular ethnic group with poor socioeconomic backgrounds where children had the habit of
92 swimming in dirty water along with their cattle during hot and humid weather in the plains of Nepal, which must
93 have acted as a predisposing factor for chronic discharging ear. Swimming in local pools has been considered an
94 associated risk factor in developing COM. 9 In comparison, the prevalence of COM in children has been reported
95 as 4.79% in India, 10 5.2% in Bangladesh, 11 7.26% in Malaysia, 12 1.74% in Thailand, 13 2.19% in Korea 14 and
96 1.65% in Indonesia. 15 In the African countries, lower prevalence rates of COM have been reported such as 4%
97 in Rwanda, 16 5.3% in Malawi, 17 1.4% in Tanzania, 18 and 1.5% in Kenya. 19 Low prevalence rates have been
98 reported in other parts of the globe as well, such as 1.31% in Saudi Arabia 20 and, 0.94% in Brazil. 21 Developed
99 nations such as the US, the UK and most of the European countries have prevalence rates of less than 1%. 3
100 Contrary to this, high prevalence rates of COM are reported in certain populations and ethnic minorities 22 such
101 as Australian Aborigines, 23 the Inuit 24 and Greenlandic children. 25,26 The wide range in the prevalence rates
102 in these epidemiological studies could be due to differences in exposure to risk factors and access to health care
103 among the study population, population size, ethnic group, sampling technique, and methodology. Differences in

104 the definition and classification of COM used in the study is another important factor for wide variations in the
105 prevalence rates. In our study, the Browning classification of COM was followed because it is the classification
106 of choice used in Nepal. Classifications such as suppurative and nonsuppurative COM are now less commonly
107 used because it is the progression of the same pathological process. Similarly, use of tubo-tympanic as safe and
108 attico-antral as unsafe COM is not recommended any longer since marginal perforations of the pars tensa can
109 also develop complications. 27 Many studies classified COM as tubo-tympanic and attico-antral. 7,28,29 Muftah
110 et al. 9 and Hunt et al. 17 only included the cases with active ear discharge lasting more than 2 weeks with
111 perforated tympanic membrane and excluded the cases with dry perforation and healed tympanic membrane in
112 their study. Other factors such as genetic and environmental factors as a possible cause need to be further studied
113 in certain populations and ethnic minorities.

114 We did not find gender preponderance in our study; COM was almost equal in both boys and girls, which
115 is consistent with other studies. 16,30 Several studies found that older children were more likely to develop
116 COM than the younger children were. 9,17,30 We too found that 60.59% of the COM cases were seen in older
117 children aged 11-15 years and least affected were the youngest children aged five years and younger at 3.85%.
118 COM as well as sequelae of COM such as tympanosclerosis and atelectasis climbed steadily with increasing age
119 suggesting chronicity of the disease. 19 The high prevalence of COM in older children could be result of frequent
120 and untreated or poorly treated cases of acute otitis media and/or otitis media with effusion, which progressed
121 into the chronic phase of the disease. Additionally, traditional practices such as instillation of oil or other liquids
122 to treat ear diseases can lead to continuous otorrhoea progressing the disease into the chronic phase. This trend
123 could explain increasing rates of COM in older children.

124 Chronic otitis media was unilateral in 78.94% (n=5,038) and bilateral in 21.06% (n=1,344) children. This
125 finding is consistent with other studies. 7,16,19,28,31 Bilateral disease are thought to have poor consequence
126 because of associated bilateral hearing loss and poorer surgical outcome. Eustachian tube dysfunction is
127 considered as the main pathogenesis of bilateral disease whereas, in unilateral cases, more localized causes are
128 assumed. Many studies suggest an increased risk of developing COM in the contralateral ear in later years but to
129 evaluate the status of the contralateral ear, a long-term follow up of the children with unilateral disease would be
130 needed. 32,33 In this study, out of 6,382 cases, mucosal-COM was the most commonly observed COM, detected
131 in 30.68% (n=1,958) of the children and the squamous type detected in only 6.80% (n=434). Similar findings
132 were also noted in other studies. 7,10,28,29,31 Contrary to our findings, squamous-COM was more commonly
133 seen in a study conducted by Kumari et al. 34 whereas; Abraham et al. 18 did not find a single case of squamous-
134 COM in their study. Simoes et al. 19 detected squamous-COM in only 0.45% cases whereas 62.51% (n=3,990)
135 of the children had scarring of the tympanic membrane such seen as a thin and healed tympanic membrane,
136 tympanosclerosis, and chalk white patches suggesting previous history of otitis media.

137 A literature review on childhood hearing loss published by Davidson et al. found that children from developing
138 countries had almost double the chances of developing associated hearing loss in COM than in children from
139 developed countries. In our study, we found that 41.57% (n=2,653) of the children with COM were suffering
140 from hearing loss. Similarly, other studies conducted in developing countries also reported increase possibilities of
141 developing hearing loss due to COM. 9,31,34,35 The hearing loss in this study was predominantly the conductive
142 type 93.40% (n=2478) and of a mild degree 87.36% (n=2165). Muftah et al. also observed a similar pattern 9
143 whereas Anggraeni et al. stated that most of the hearing loss associated with COM in their study group was
144 of a moderate degree. 35 In our study mixed hearing loss suggesting involvement of the inner ear was seen in
145 6.60% (n=175) of children with COM. This finding demonstrates that the inner ear is vulnerable to chronic
146 discharging ears. [36][37][38][39][40] Significant involvement of bone conduction thresholds were noted in cases
147 with COM. [41][42][43][44] In this study we observed that hearing loss in children with COM increased steadily
148 with increasing age, from 5.69% in <5 year old's to 57.01% in children >15 years old. Sakagami et al. found
149 hearing deterioration was more in the ear with COM than in the normal ear; 0.61dB/year versus 0.13 dB/year.
150 45 Long-term follow up of COM and its impact on the bone conduction found significant association between
151 duration of COM and presence of involvement of bone conduction. 41,44 It was observed that in mucosal-COM,
152 94.76% of the hearing loss was of the conductive type and only 5.23% was mixed type, whereas in squamous-
153 COM mixed hearing loss increased to 17.28%. Opposite to our findings, mixed hearing loss was seen more often
154 in mucosal-COM by kumari et al. 34 In general, a healed tympanic membrane is rarely considered a problem
155 therefore hearing tests are only occasionally done, especially in children. In our study, we noticed that 17.22%
156 of the total hearing loss was seen in children with healed tympanic membranes and 4.60% of which was of mixed
157 type. This finding suggests that scarring of the tympanic membrane should not be taken casually, and it should
158 be further investigated for hearing loss. Similarly, atelectasis of the tympanic membrane was also found to be
159 associated with involvement of the inner ear. 44,46 The size of the tympanic membrane perforation was also found
160 to be related to sensorineural hearing loss. 44,46 In this study, 75.68% of the children had large sized tympanic
161 membrane perforations, but we did not observe similar findings. We did not find any cases of COM with profound
162 hearing loss. This could be because children with profound hearing loss may be deprived of enrolling into the
163 normal education system and were thus under-represented in our study.

164 Poor socioeconomic status has been associated with a higher prevalence of COM due to risk factors such as poor
165 hygiene, overcrowded living conditions and malnutrition. 9,30 This study was conducted in children studying
166 in government schools. The schools run by the state government in Nepal are considered to provide inferior

167 education quality as compared to the more expensive private schools. Therefore, only the most underprivileged
168 children attend government schools. That could explain the higher prevalence rates seen in our study population.
169 Many studies found statistically significant association between COM and socioeconomic status. 11,30,47,48 In
170 school-based studies, prevalence of COM was found more commonly in children studying at rural schools as
171 compare to urban schools; 2.7% versus 0.7%, 15 5.11% versus 2.32%, 28 7% versus 1.8%, 30 and 5.7% versus
172 4.8%. 48 The wide variation was because these studies were conducted in areas where distinct differences in
173 socioeconomic status such as low socioeconomic status in rural areas and higher status in urban schools was
174 obvious. Lack of access to proper health care in rural settings is another reason for the wide variations in
175 prevalence rates. Hence, improvement in access to affordable health care for children of such communities could
176 decrease the disease burden.

177 This study has both strengths as well as weaknesses. The strength of our study is that it is the largest study
178 documented in a pediatric population in recent years in Nepal, and it explored the detail classification of chronic
179 otitis media and hearing evaluation of all the children with COM. A limitation of this study is that this is a
180 retrospective school-based study. This study only covered schoolchildren; younger children and those who did
181 not attend schools were not included in the study. Although examinations were carried out using an otoscope in
182 respective schools by senior Ear Nose and Throat surgeons with more than five years of experience, early cases
183 of cholesteatoma could have been misdiagnosed as mucosal-COM. Microscopic examination of the ears of all the
184 children was not feasible for the children in this study.

185 This study suggests that chronic otitis media is still a public health issue in Nepal that needs to be addressed
186 urgently to reduce the burden of disease. Findings of our study could help in developing a national health care
187 program focusing on ear and hearing care in Nepal. Measures such as conducting school entrance ear screening,
188 raising public awareness about ear and hearing care, and early treatment of chronic otitis media could prevent
189 hearing loss in most children.

190 V.

191 7 Conclusions

192 Chronic otitis media is a public health issue in Nepal. Early diagnosis and proper treatment of chronic otitis
193 media could prevent most of the hearing loss in schoolchildren. Health measures such as school entrance screening,
194 public awareness program and integration of ear and hearing screening in national health care could reduce the
burden of disease. ¹

11

.84% (n=2,670) of

Figure 1: Table 1 .Table 1 :

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2

Age distribution	Children with chronic otitis media n (%)	Children with hearing loss n (%)	Type and degree of hearing loss n (%)		
<5 years old	246 (3.85%)	14 (5.69%)	Conductive hearing loss	Mild	13 (92.86%)
5-10 years old	1,220 (19.12%)	438 (35.90%)	Conductive hearing loss	Moderate Mild	1 (7.14%) 372 (84.93%)
				Moderate Moderately Severe	28 (6.40%) 11 (2.51%)
			Mixed hearing loss	Moderate Moderately Severe	10 (2.28%) 9 (2.05%)
11-15 years old	3,867 (60.59%)	1,603	Conductive	Severe Mild	8 (1.82%) 1,372 (85.59%)

Figure 2: Table 2 :

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 197 [Sep-Oct] , Sep-Oct . 10.1016/s1808-8694. <https://doi.org/10.1016/s1808-8694> 75 p. .
 198 [Article] , 10.1155/2017/4280583. ID 4280583: 8. <https://doi.org/10.1155/2017/4280583> *Article*
 199 [] , 10.1016/S0165-5876(01)00616-4.
 200 [] , 10.3402/ijch.v63i0.17926. <https://doi.org/10.3402/ijch.v63i0.17926>
 201 [] , 10.1016/j.ijporl.2013.06.025. <https://doi.org/10.1016/j.ijporl.2013.06.025>
 202 [] , 10.1016/j.ijporl.2016.01.017. <https://doi.org/10.1016/j.ijporl.2016.01.017>
 203 [] , 10.1016/j.ejenta.2016.04.001. <http://dx.doi.org/10.1016/j.ejenta.2016.04.001>
 204 [Int J Pediatr Otorhinolaryngol (1991)] , 10.1016/0165-5876(91)90098-v. [https://doi.org/10.1016/0165-5876\(91\)90098-v](https://doi.org/10.1016/0165-5876(91)90098-v) *Int J Pediatr Otorhinolaryngol* 1991 Jul. 22 p. .
 205 [Chadha et al. ()] ‘A comparative evaluation of ear diseases in children of higher versus lower socioeconomic
 206 status’. S K Chadha , A K Agarwal , A Gulati , A Garg . 10.1017/S0022215105001520. <https://doi.org/10.1017/S0022215105001520> *J Laryngol Otol* 2005. 120 p. .
 207 [Parvez et al. ()] ‘A cross sectional study of chronic suppurative otitis media and its associated factors among
 208 primary school children in rural and urban areas of Aligarh, India’. A Parvez , Z Khan , S F Hashmi , M S Khan
 209 . 10.18203/2394-6040.ijcmph20162561. <http://dx.doi.org/10.18203/2394-6040.ijcmph20162561>
 210 *Int J Community Med Public Health* 2016. 3 p. .
 211 [Chayarpham et al. (1996)] ‘A study of the prevalence of and risk factors for ear diseases and hearing loss in
 212 primary school children in Hat Yai, Thailand’. S Chayarpham , J Stuart , V Chongsuvivatwong , S Chinpairoj
 213 , A Lim . *J Med Assoc Thai* 1996 Jul. 79 p. .
 214 [Browning (ed.) ()] *Aetiopathology of inflammatory conditions of the external and middle ear*, G G Browning .
 215 Kerr AG, editor. Scott-Brown’s Otolaryngology. 6 th ed. London: Hodder Arnold (ed.) 1997.
 216 [Feng and Chen (2004)] ‘Analysis of sensorineural hearing loss in chronic suppurative otitis media’. H Feng , Y
 217 Chen . <https://pubmed.ncbi.nlm.nih.gov/15620131/> *Lin Chuang Er Bi Yan Hou Ke Za Zhi* 2004
 218 Oct. 18 p. .
 219 [Browning et al. (ed.) ()] *Chronic otitis media*, G G Browning , S N Merchant , G Kelly , I Swan , Rc , R Canter
 220 , W S Mckerrow . Gleeson M, editor. Scott-Brown’s otolaryngology. 7 th ed. London: Hodder Arnold (ed.)
 221 2008. p. .
 222 [Shaheen et al. ()] ‘Chronic suppurative otitis media and its association with socio-economic factors among rural
 223 primary school children of Bangladesh’. M M Shaheen , A Raquib , S M Ahmad . 10.1007/s12070-011-0150-9.
 224 <https://doi.org/10.1007/s12070-011-0150-9> *Indian J Otolaryngol Head Neck Surg* 2012. 64 p. .
 225 [Adhikari ()] ‘Chronic suppurative otitis media in school children of Kathmandu Valley’. P Adhikari . http://arquivosdeorl.org.br/additional/acervo_eng.asp?id=421 *Int Arch Otorhinolaryngol* 2007.
 226 11 p. .
 227 [Adhikari et al. ()] ‘Chronic suppurative otitis media in urban private school children of Nepal’. P Adhikari , S
 228 Joshi , D Baral , B Kharel . *Braz J Otorhinolaryngol* 2009.
 229 [Anvstorp et al. ()] ‘Chronic suppurative otitis media, middle ear pathology and corresponding hearing loss in
 230 a cohort of Greenlandic children’. M B Anvstorp , P Homoe , P Bjerregaard , R G Jensen . *Int J Pediatr*
 231 *Otorhinolaryngol* 2016. 83 p. .
 232 [Ibekwe and Nwaorgu (2011)] ‘Classification and management challenges of otitis media in a resource-poor coun-
 233 try’. T S Ibekwe , Ogb Nwaorgu . 10.4103/1119-3077.86764. <https://doi.org/10.4103/1119-3077.86764>
 234 *Niger J Clin Pract* 2011 Jul-Sep. 14 p. .
 235 [Davidson et al. (1989)] ‘Epidemiologic patterns in childhood hearing loss: a review’. J Davidson , M L
 236 Hyde , P W Alberti . 10.1016/0165-5876(89). [https://doi.org/10.1016/0165-5876\(89\)](https://doi.org/10.1016/0165-5876(89)) *Int J Pediatr*
 237 *Otorhinolaryngol* 1989 Jul. 17 p. .
 238 [Zakzouk and Hajjaj ()] ‘Epidemiology of chronic suppurative otitis media among Saudi children-a comparative
 239 study of two decades’. S M Zakzouk , M F Hajjaj . *Int J Pediatr Otorhinolaryngol* 2002. 62 p. .
 240 [Thampi et al. ()] ‘Evaluation of contralateral ear in unilateral chronic otitis media: necessary or not?’.
 241 M Thampi , A Gupta , K Sen , S Jain . 10.1007/s12070-020-01824-x. <https://doi.org/10.1007/s12070-020-01824-x>
 242 *Indian J Otolaryngol Head Neck Surg* 2020.
 243 [Little et al. ()] ‘Hearing impairment and ear pathology in Nepal’. P Little , A Bridges , R Guragain , D Friedman
 244 , R Prasad , R Weir . 10.1017/S0022215100123278. <https://doi.org/10.1017/S0022215100123278> *J*
 245 *Laryngol Otol* 1993. 107 p. .
 246 [Elango et al.] *Hearing loss and ear disorders in Malaysian school children*, S Elango , G N Purohit , M Hashim
 247 , R Hilmi .

7 CONCLUSIONS

- 252 [Sakagami et al. ()] 'Long-term observation on hearing change in patients with chronic otitis media'. M Sakagami
253 , A Maeda , M Node , M Sone , Y Mishiro . 10.1016/s0385-8146(99)00065-6. [https://doi.org/10.1016/s0385-8146\(99\)00065-6](https://doi.org/10.1016/s0385-8146(99)00065-6) *Auris Nasus Larynx* 2000. 27 p. .
- 255 [Rajput et al. (2020)] 'Mucosal type of chronic suppurative otitis media and the long-term impact on hearing
256 loss'. M S Rajput , Msa Rajput , A A Arain , S S Zaidi , A Hatem , S Akram . 10.7759/cureus.10176.
257 <https://doi.org/10.7759/cureus.10176> *Cureus* 2020 Sep. 12 p. e10176.
- 258 [Ayukawa et al. ()] 'Otitis media and hearing loss among 12-16-year-old Inuit of Inukjuak'. H Ayukawa , S
259 Bruneau , J F Proulx , J Macarthur , J Baxter . *Int J Circumpolar Health* 2004. 63 p. .
- 260 [Simões et al. (2016)] 'Otitis media and its sequelae in Kenyan schoolchildren'. E A Simões , F Kiio , P J
261 Carosone-Link , S N Ndegwa , J Ayugi , I M Macharia . <https://dx.doi.org/10.1093%2Fjpid%2Fpiv038> *J Pediatric Infect Dis Soc* 2016 Dec. 5 p. .
- 263 [Anggraeni et al. (2014)] 'Otitis media in Indonesian urban and rural school children'. R Anggraeni , W W
264 Hartanto , B Djelantik , A Ghanie , D S Utama , E P Setiawan . 10.1097/inf.0000000000000366. <https://doi.org/10.1097/inf.0000000000000366> *Pediatr Infect Dis J* 2014 Oct. 33 p. .
- 266 [Anggraeni et al. (2019)] 'Otitis media related hearing loss in Indonesian school children'. R Anggraeni , P
267 Carosone-Link , B Djelantik , E P Setiawan , W W Hartanto , A Ghanie . 10.1016/j.ijporl.2019.06.019.
268 <https://doi.org/10.1016/j.ijporl.2019.06.019> *Int J Pediatr Otorhinolaryngol* 2019 Oct. 125 p.
269 .
- 270 [Thakur et al. ()] 'Pattern of otological diseases in school-going children of the Sunsari district of Eastern
271 Nepal'. S K Thakur , S K Singh , B Mahato , A Singh , D Mahato . 10.5580/IJORL.25808. <http://ispub.com/doi/10.5580/IJORL.25808> *The Internet Journal of Otorhinolaryngology* 2015. 17 p. 1.
- 273 [Jesic et al. ()] 'Predictors for sensorineural hearing loss in patients with tubotympanic otitis, cholesteatoma,
274 and tympanic membrane retractions'. S D Jesic , A D Jotic , B B Babic . 10.1097/mao.0b013e318259b885.
275 <https://doi.org/10.1097/mao.0b013e318259b885> *Otol Neurotol* 2012. 33 p. .
- 276 [Kumari et al. ()] *Prevalence and associated risk factors of otitis media and its subtypes in South Indian
277 population. Egyptian journal of ear nose throat and allied sciences*, M S Kumari , J Madhavi , N B Krishna
278 , K R Meghanadh , A Jyothy . 2016. 17 p. .
- 279 [Abraham et al. ()] 'Prevalence and etiological agents for chronic suppurative otitis media in a tertiary hospital
280 in Tanzania'. Z S Abraham , D Ntunaguzi , A A Kahinga , K B Mapondella , E R Massawe , E J Nkuwi
281 . 10.1186/s13104-019-4483-x. <https://doi.org/10.1186/s13104-019-4483-x> *BMC Res Notes* 2019.
282 12 p. 429.
- 283 [Godinho et al. ()] 'Prevalence and impact of chronic otitis media in school age children in Brazil. First
284 epidemiologic study concerning chronic otitis media in Latin America'. R N Godinho , Tml Goncalves , F B
285 Nunes , C G Becker , Hmg Becker , Res Guimaraes . S0165-5876(01)00579-1. <https://doi.org/10.1016/IntJPediatrOtorhinolaryngol> 2001. 61 p. .
- 287 [Kim et al. ()] 'Prevalence and risk factors of chronic otitis media in Korea: results of a nation-wide survey'. C
288 S Kim , H W Jung , K Y Yoo . 10.3109/0001648930913. <https://doi.org/10.3109/0001648930913>
289 *Acta Otolaryngol* 1993. 113 p. .
- 290 [Bellad et al. (2019)] 'Prevalence of chronic suppurative otitis media among schoolchildren residing in rural
291 area of Belagavi, South India'. S A Bellad , A Kavi , R S Mudhol . 10.1007/s12070-019-01627-9. <https://doi.org/10.1007/s12070-019-01627-9> *Indian J Otolaryngol Head Neck Surg* 2019 Nov. 71 p. .
- 293 [Kamal et al. (2004)] 'Prevalence of chronic suppurative otitis media among the children living in two selected
294 slums of Dhaka city'. N Kamal , A H Joarder , A A Chowdhury , A W Khan . <https://pubmed.ncbi.nlm.nih.gov/16240980/> *Bangladesh Med Res Counc Bull* 2004 Dec. 30 p. .
- 296 [Muftah et al. (2015)] 'Prevalence of chronic suppurative otitis media and associated hearing impairment among
297 school-aged children in Yemen'. S Muftah , I Mackenzie , B Faragher , B Brabin . 10.5001/omj.2015.72.
298 <https://doi.org/10.5001/omj.2015.72> *Oman Med J* 2015 Sep. 30 p. .
- 299 [Parmar et al. ()] 'Prevalence of chronic suppurative otitis media in schoolgoing children'. S M Parmar , A
300 Sood , H S Chakkal . <https://www.indianjotol.org/text.asp> *Indian journal of otology* 2018.
301 2018/24/4/223/ 254227. 24 p. .
- 302 [Mukara et al.] 'Prevalence of middle ear infections and associated risk factors in children under 5 years in Gasabo
303 district of Kigali city, Rwanda'. K B Mukara , R J Lilford , D L Tucci , P Waiswa . *Int J Pediatr*
- 304 [Maharjan et al. ()] 'Prevalence of otitis media in school going children in Eastern Nepal'. M Maharjan , S
305 Bhandari , I Singh , S C Mishra . <https://pubmed.ncbi.nlm.nih.gov/18603958/> *Kathmandu Univ
306 Med J* 2006. 4 p. .
- 307 [Hunt et al. ()] 'Prevalence of paediatric chronic suppurative otitis media and hearing impairment in rural
308 Malawi: A cross-sectional survey'. L Hunt , W Mulwafu , V Knott , C B Ndamala , A W Naunje , S
309 Dewhurst . 10.1371/journal.pone.0188950. <https://doi.org/10.1371/journal.pone.0188950> *PLoS
310 One* 2017. 12 p. e0188950.

- 311 [Chadha et al. ()] ‘Prevalence of preventable ear disorders in over 15000 schoolchildren in northern India’. S K
312 Chadha , A Sayal , V Malhotra , A K Agarwal . 10.1017/s0022215112002691. [https://doi.org/10.1017/](https://doi.org/10.1017/s0022215112002691)
313 [s0022215112002691](https://doi.org/10.1017/s0022215112002691) *J Laryngol Otol* 2013. 127 p. .
- 314 [Singer et al. (2018)] ‘Risk factors of sensorineural hearing loss in patients with unilateral safe chronic suppurative
315 otitis media’. Aea Singer , A-Nog Awad , Rma El-Kader , A R Mohamed . 10.1016/j.amjoto.2018.01.002.
316 <https://doi.org/10.1016/j.amjoto.2018.01.002> *Am J Otolaryngol* 2018 Mar-Apr. 39 p. .
- 317 [Macandie and Bf ()] ‘Sensorineural hearing loss in chronic otitis media’. C Macandie , O’reilly Bf
318 . 10.1046/j.1365-2273.1999.00237.x. <https://doi.org/10.1046/j.1365-2273.1999.00237.x> *Clin*
319 *Otolaryngol Allied Sci* 2001. 24 p. .
- 320 [Papp et al. (2003)] ‘Sensorineural hearing loss in chronic otitis media’. Z Papp , S Rezes , I Jókay , I Sziklai
321 . 10.1097/00129492-200303000-00003. <https://doi.org/10.1097/00129492-200303000-00003> *Otol*
322 *Neurotol* 2003 Mar. 24 p. .
- 323 [Cusimano et al. ()] ‘Sensorineural hearing loss in chronic otitis media’. F Cusimano , V Cocita , D ’amico , A
324 . 10.1017/S0022215100108333. <https://doi.org/10.1017/S0022215100108333> *JLaryngolOtol* 2007.
325 103 p. .
- 326 [Shetty et al. (2019)] ‘Sensorineural hearing loss in chronic otitis media: analysis of an overlooked entity’. K
327 C Shetty , S K Jayaramaiah , B Kolathingal , AlvaS . 10.18203/issn.2454-5929.ijohns20193883. <http://dx.doi.org/10.18203/issn.2454-5929.ijohns20193883> *Int J Otorhinolaryngol Head Neck Surg*
328 2019 Sep. 5 p. .
- 330 [Amali et al. (2017)] *Sensorineural hearing loss in patients with chronic suppurative otitis media: Is there a*
331 *significant correlation? Electron Physician*, A Amali , N Hosseinzadeh , S Samadi , S Nasiri , J Zebardast .
332 10.19082/3823. <https://doi.org/10.19082/3823> 2017 Feb. 9 p. .
- 333 [Levine et al. ()] ‘Sensorineural loss in chronic otitis media: Is it clinically significant?’. B A Levine , C Shelton , K
334 I Berliner , J L Sheehy . 10.1001/archotol.1989.01860310052021. [https://doi.org/10.1001/archotol.](https://doi.org/10.1001/archotol.1989.01860310052021)
335 [1989.01860310052021](https://doi.org/10.1001/archotol.1989.01860310052021) *Arch Otolaryngol Head Neck Surg* 1989. 115 p. .
- 336 [Costa et al. (2008)] ‘The contralateral ear in chronic otitis media: a series of 500 patients’. Da Costa , S S Rosito ,
337 Lps Dornelles , C Sperling , N . 10.1001/archoto.2007.38. <https://doi.org/10.1001/archoto.2007.38>
338 *Arch Otolaryngol Head Neck Surg* 2008 Mar. 134 p. .
- 339 [Jensen et al. ()] ‘The risk of hearing loss in a population with a high prevalence of chronic suppurative otitis
340 media’. R G Jensen , A Koch , P Homoe . *Int J Pediatr Otorhinolaryngol* 2013. 77 p. .
- 341 [Gunasekera et al. (2007)] ‘The spectrum and management of otitis media in Australian indigenous and non-
342 indigenous children: a national study’. H Gunasekera , S Knox , P Morris , H Britt , P McIntyre , J
343 C Craig . 10.1097/inf.0b013e3180621177. <https://doi.org/10.1097/inf.0b013e3180621177> *Pediatr*
344 *Infect Dis J* 2007 Aug. 26 p. .
- 345 [World Health Organization, Chronic suppurative otitis media; burden of illness and management options ()]
346 *World Health Organization, Chronic suppurative otitis media; burden of illness and management options*,
347 <https://apps.who.int/iris/handle/10665/42941> 2004. Geneva, Switzerland. p. .
- 348 [World Health Organization, Prevention of hearing impairment from chronic otitis media: report of a WHO/CIBA foundation wo
349 *World Health Organization, Prevention of hearing impairment from chronic otitis media: report of*
350 *a WHO/CIBA foundation workshop*, <https://apps.who.int/iris/handle/10665/63870> 1996.
351 London, U.K.. p. .