

Passive and Active Smoking, Ear-Nose-Throat Disorders, Chaotic Urbanization, Socio-Cultural Factors, and Mixed Hearing Loss among Schoolchildren – Adolescents from Kinshasa Province, DRC

Sokolo Gedikondele J¹, Longo-Mbenza B^{1,2,3,4}, Matanda Nzanza R¹, Mvitu Muaka M¹, Mambueni Thamba C¹, Nkodila Natuhoyila A^{4*} and Longo Longo G^{3,4}

¹Faculty of Medicine, University of Kinshasa, DR Congo

²Walter Sisulu University, MTHATHA, South Africa

³University of President Joseph KASA-VUBU, DR Congo

⁴Lomo University of Research, Kinshasa-Limete, DR Congo

***Corresponding author:** Nkodila Natuhoyila A, Lomo University of Research, Kinshasa-Limete, DR Congo, Tel: +243 812726941, E-mail: longombenza@gmail.com

Citation: Sokolo Gedikondele J, Longo-Mbenza B, Matanda Nzanza R, Mvitu Muaka M, Mambueni Thamba C, et al. (2020) Passive and Active Smoking, Ear-Nose-Throat Disorders, Chaotic Urbanization, Socio-Cultural Factors, and Mixed Hearing Loss among Schoolchildren – Adolescents from Kinshasa Province, DRC. J Otolaryngol Res 2: 204

Abstract

Background and objectives: Passive and active smoking patterns are well associated with ear-nose-throat (ENT) complications worldwide in general and in Kinshasa school/DRC in particular. The study aimed to determine whether ENT disorders, degrees of urbanization sociocultural patterns, passive and active smoking patterns were related to mixed hearing loss among schoolchildren-adolescents.

Methods: A cross-sectional survey was conducted between January 10th and November 20th, 2005 a cross randomly 5 schools from North, west East, South and centrum of Kinshasa town DRC. Participants were also a random multistage sample of from selected schoolchildren-adolescents evaluated using univariate and multivariate (logistic regression) analyses.

Results: Out of all participants (n=381 with 50.9% males vs. 49.1% females), 22.3% (n=85) leaners were diagnosed for co-existing mixed hearing loss-acute media otitis (coMHL-AOM). Catholic religion, youngest, oldest, East Tshangu Districts semi-urban noisy and chaotic residences, higher parental socioeconomic status, allergic rhinitis, chronic rhinitis, passive smoking, and chronic pharyngitis were identified as univariate and significant factors associated with coMHL-AOM. After adjustment for confounding univariate factors (age, religion, degrees of urbanization, and parental socioeconomic status); using multivariate logistic regression, only passive smoking (OR=12, 95%CI 4-36, p<0.0001), chronic rhinitis (OR=4, 95%CI 12-9, p<0.0001), and chronic pharyngitis (OR=3, 95%CI 2-7, p<0.01) were maintained as the most important independent and significant determinants of coMHL-AOM.

Conclusion: Parents, teachers, general practitioners, policy leaders, and otolaryngologists are invited to work together for early prevention, diagnosis and treatment of coMHL-AOM epidemic prevalence and to tackle its independent determinants a cross elementary, primary and secondary schools from poor, polluted, noisy and chaotic semi-urban environment of Kinshasa Province; DRC.

Keywords: Passive Smoking; Acute Otitis Media; Mixed Hearing Loss; Pollutions; Central Africa

Introduction

Relevant information about environmental epidemiology of interaction of urbanization, exposure to tobacco smoke (Environmental tobacco smoke, ETS or passive smoking), noise active smoking, and ear-nose-throat (ENT) complications are known worldwide [1-6] in general and in developing countries such as Democratic Republic of Congo (DRC) in particular [7,8].

Indeed, ETS or passive smoking is recognized as a crucial issue among schoolchildren [9].

However and despite significant association of upper respiratory infection diseases, ENT disorders and hearing loss among children [10], there is a lack of clear policies and preventive approach for screening and diagnosis of hearing loss related to upper respiratory tract infections (URTI) [11] and acute otitis media (AOM) infection [12] in the literature globally and in DRC.

Indeed, pathogenies and/or inflammatory and immune response, damage the middle ear in terms of AOM-hearing loss (AOMHL) [13-16].

A cross sectional survey demonstrated significant association between semi-urban peripheral areas, Catholic religion, elementary level, exposure to family tobacco smoke, history of ENT surgery, ENT disorders and chronic pharyngitis among schoolchildren-adolescents from Kinshasa town, DRC [17].

Therefore, the study aimed to determine whether ENT disorders, degrees of urbanization, noise, sociocultural patterns, passive and active smoking patterns were related to mixed hearing loss among schoolchildren-adolescents from Kinshasa Province DRC

Methods

This cross-sectional, descriptive and analytic survey was carried out between January 10th and November 20th, 2005, Kinshasa megacity DRC (Figure 1).

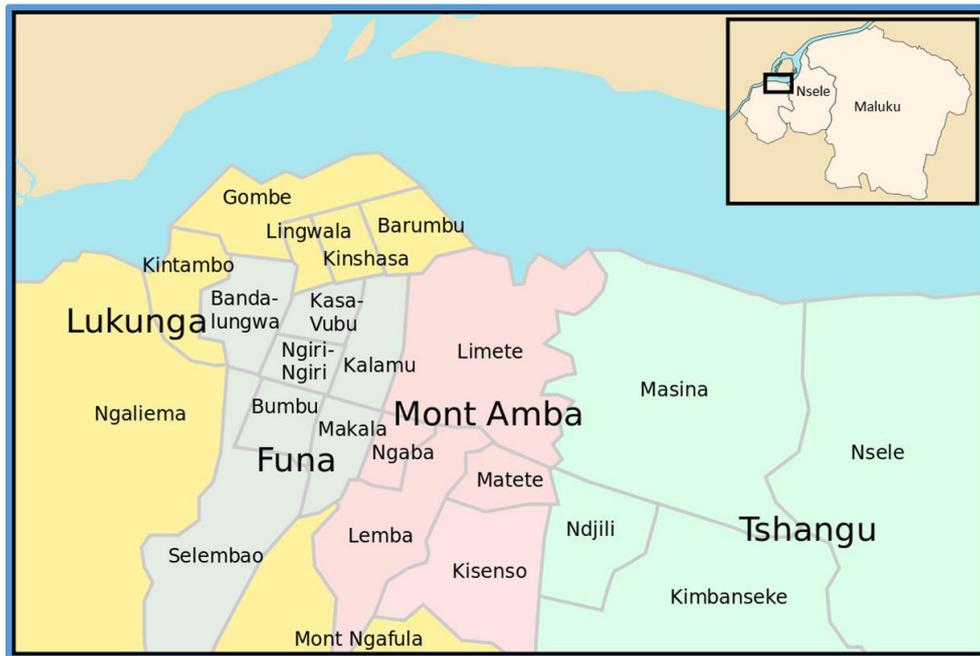


Figure 1: The administrative map of the Kinshasa megacity DRC

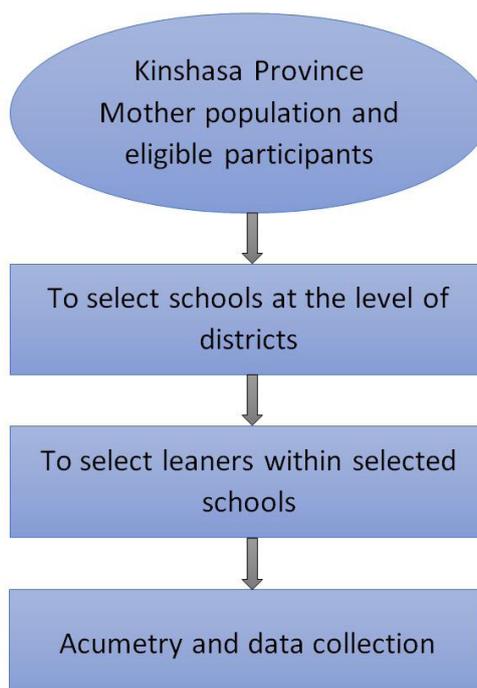


Figure 2: Logigram for the study

The promoter recommended a statistical multistage and stratified random sample model to select schools at districts, sub-districts and to select learners within select schools of Kinshasa megacity respectively (Figure 2). The study was specifically and extensively designed to select representatives from a list of each strata according to inclusion (parental authorization and within consent of learner) and exclusion (refusal of learners to participant) criteria.

The sample size (n_i) of children was calculated according to the following formula: $n_i = (K \times Z^2 \times P \times Q / D^2)$, P = prevalence of passive smoking in Kinshasa (Longo-Mbenza, unpublished data) equal 17% or 0.17, $Q = 1 - 0.17$, parameter related to error risk of 5% = 1.96, K = cluster factor =2, and D = accuracy level of 0.05.

Thus, 433 schoolchildren-adolescents were eligible for the study mother population.

The Ministry of Public Health, The Ministry of Education, the school principal and the parents gave permissions to conduct this study respectively. Ethical approval was given by the institutional review board of National Committee, DRC according to Helsinki Declaration II visions.

Data collection

All parents of children received an anonymous pre-school health history questionnaire including items on various early childhood health problems in general and on ENT and upper respiratory diseases in particular. The structured, anonymous and standardized questionnaire was pre-tested with 30 families to avoid ambiguous or incomprehensible questions. The modified Dillman techniques [20] were used to implement the survey questionnaire. The questionnaire ascertained demographic factors (sex, gender), district of residence, exposure to cigarette smoking, education attainment (elementary, primary, and secondary/high school), exposure to noise and pollution medical history of ENT, socioeconomic status (SES: high vs. low), history of allergies, upper and lower respiratory tract infections.

Comprehensive oto-rhino-laryngological evaluation demonstrated the presence or otherwise of acute otitis media (AOM), allergic rhinitis, pharyngitis, and hearing loss.

Definitions

Passive smoking or ETS was defined as the particulate and gas-phase compounds released into the air from burning tobacco product such as cigarettes, cigars and pipe tobacco.

AOM was defined by the rapid occurrence of one or more signs or inflammatory responses (symptoms) within the middle ear in with earache, tugging at the ear fever and /or irritability accompanied by middle-ear effusing [21].

Mixed hearing loss was defined by the combination of sensorineural hearing loss from possible causes exposure to loud noise and passive smoking [22,23] and conductive hearing loss from possible causes (ear infection, allergies, and presence of a foreign body) [24,25] using acumetry [26].

Statistical analysis

Data were presented as means \pm standard deviation for continuous variables and proportions (%) for qualitative variables. The Chi-square tests were used to test for significance of observed univariate associations between independent variables (coMHL-AOM) and existing dependent variables.

For these univariate associations, the Cochran-Mantzel - Haenszel statistic and the estimates of Odds ratios (OR) were calculated with their 95% confidence intervals (CI).

The multivariate regression logistic model was used with OR with 95%CI after adjusting for confounding factors to identify significant and independent determinants of acute coMHL-AOM. A value of $p < 0.05$ was considered significant for differences. All data analyses were performed using SPSS software for Windows version 25 (SPSS Inc, Chicago, IL, USA).

Results

A total of 381 schoolchildren adolescents (response rate of 88%), aged 4-20 years (mean age=10 \pm 4 years) with 194 males (50.9%) and 187 females (49.1%): sex ratio of 1 male: 1 female, were evaluated in the study population.

The prevalence of co-existing mixed hearing loss and acute media otitis (coMHL-AMO) was estimated 22.3% ($n=85$) in the study population. There was not significant ($P > 0.05$) association between sex, active smoking and coMHL-AMO respectively (results not presented). However, there was significant and positive univariate association between Catholic religion, poor, crowded, and polluted semi-urban Tshangu District, oldest age \geq 12 year, youngest age \leq 6 years, higher parental socio-economic status, allergic rhinitis, chronic rhinitis, passive smoking, chronic pharyngitis, and coMHL-AMO respectively (Table 1) (Figures 3, 4 & 5).

Independent variables	Statistics of dependent variables coMHL-AMO OR (95% CI)	P
Passive smoking		
Yes	54(22.4-156)	<0.0001
No	1	
Chronic rhinitis		
Yes	26(14-50)	<0.0001
No	1	
Chronic pharyngitis		
Yes	22(12-41)	<0.0001
No	1	
Parental SES		
High	2.5(1.2-5.5)	<0.01
Low	1	
Allergic rhinitis		
Yes	1.7(1.1-2.9)	<0.05
No	1	

Table 1: Univariate significant associated factors of coMHL-AMO

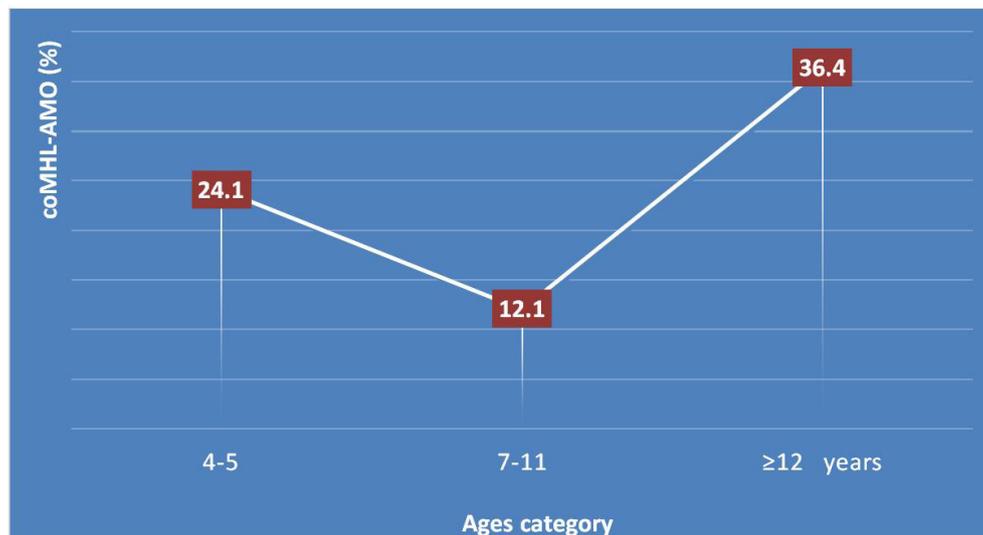


Figure 3: Inequal but significant variations of proportions of coMHL-AMO between ages category

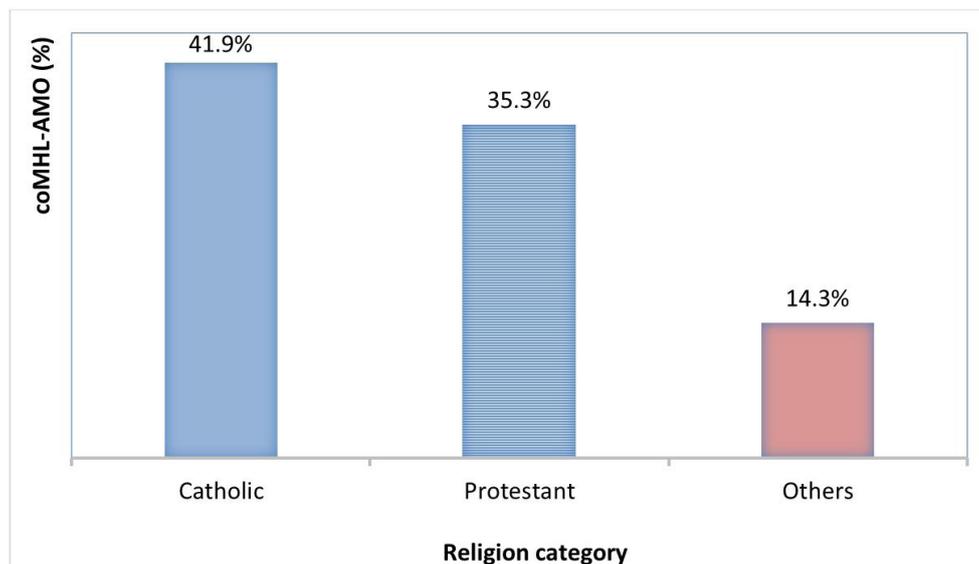


Figure 4: Signification variations of coMHL-AMO a cross religion groups

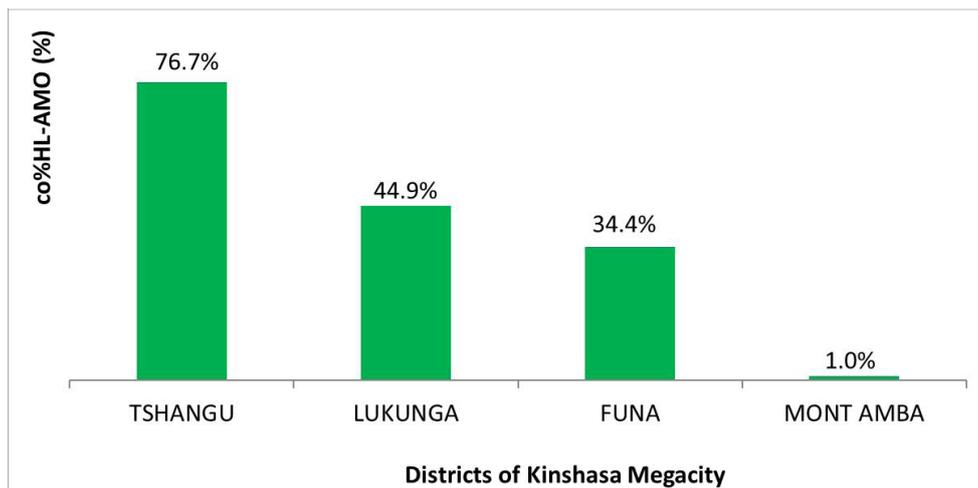


Figure 5: Distribution of proportions of coMHL-AMO between different Districts of Kinshasa Megacity

After adjusting for confounding factors (age, socioeconomic status, residence, religion and active smoking), using multivariate logistic regression, only passive, chronic rhinitis, and chronic pharyngitis were maintained as most important independent and significant determinant of coMHL-AMO (Table 2).

Independent determinants	Multivariate adjusted OR(95% CI) of coMHL-AMO	P
Passive smoking		
Yes	12(4-36)	<0.0001
No	1	
Chronic rhinitis		
Yes	4(2-9)	<0.0001
No	1	
Chronic pharyngitis		
Yes	3(2-7)	<0.01
No	1	

Table 2: Independent determinants of coMHL-AMO after multivariate logistic regression

Discussion

The present survey revealed a high prevalence of coMHL-AMO among schoolchildren/adolescent from Kinshasa megacity, DRC. Indeed, 22.3% of schoolchildren/adolescents were suffering from hearing loss in these Bantu Central Africans, in terms of a mass public problem as reported worldwide within the interval 0.88%-46.4% [27]. This large and wide interval of hearing loss prevalence varies according to economic level, developing countries vs. rich countries, geography setting, heterogeneity methods and normality criteria diagnosed by authors [27]. However, hearing loss estimated 22.3% in the present DR Congolese study was similar to that estimated 22.2% in the North-African-Egyptian City study [28] but higher than those 8%-15% reported by other developing Pakistan and Kenya [29,30].

Pathophysiology and mechanisms of hearing loss as reported by other authors working in infants, children, and adolescents [28,31,32], the present study obviously characterized both sensorineural and conductive lesions for mixed bilateral hearing loss. Both univariate associated factors and independent determinants of coMHL-AMO from the present study at explaining the Environmental epidemiology and the pathophysiology of hearing loss.

The present DR Congolese study, the Egyptian study [28] and a previous English study [28] have shown that there was no influence of sex on mixed hearing loss. There is significant association between active smoking and hearing loss in the literature [33,34], whereas the present study did not have any effect of active smoking on coMHL-AMO.

Our results could be explained by the fact that active smokers had quit smoking before the survey was carried out. Data consistent with the Australian study which showed that the risk of hearing loss associated with smoking would decrease within five years of quitting smoking [35]. However, there was clear explanation for significant and positive association between identified univariate associated factors, multivariate independent determinants of coMHL-AMO in the present study. AMO might have an influence on the occurrence of sensorineural and mixed sensorineural and conductive hearing loss among Bantu children-adolescent from the present study as reported by several foreign studies [28,36-38]. Other ENT conditions such as allergic rhinitis, chronic rhinitis well associated with AMO in the same population previously published (17), were also identified as univariate associated factors of coMHL-AMO in the present study.

Furthermore, noisy and polluted semi-urban Tshangu District, passive smoking, AMO, rhinitis, and pharyngitis might have synergistic effect on mixed hearing loss in the present study as reported by other authors [39-44].

Indeed, the same significant univariate positive association between non-ENT conditions (poverty, passive smoking) [39-41] are related to ENT conditions among DR Congolese schoolchildren adolescents and associated with smoke Tobacco [17], Otologic disorders in the literature [27,45], and hearing loss [46,47]. The present study used the multivariate logistic regression to avoid confounding factors to consider only passive smoking chronic, rhinitis, and chronic pharyngitis as the most significant and important determinants of coMHL-AOM.

In the present Central African/DRC study as in European and other Sub-Saharan African studies, the most frequent cause of hearing loss is chronic and suppurative OMA [28,48-50].

The epidemiological profile of passive smoking is extensive among extreme (oldest and youngest) ages in the same DR Congolese population [17] as reported by other authors [51-54]. Literature reports that having a rich parent could be the cause of the passive smoking [55,56] as well as univariate-associated factor of coMHL-AMO in the present study. Passive smoking and other pollutants from high socioeconomic status and urban Kinshasa areas may determine allergic rhinitis and chronic pharyngitis also independent determinants of coMHL-AMO from the present study. Indeed, the impaired mucociliary clearance and irritation of adenoid tissue with elevated concentrations of histamine may induce allergic rhinitis and other upper respiratory tract infections [15,57].

Both chronic rhinitis and chronic pharyngitis, upper respiratory tract infections known to be associated with passive smoking [58-60], were also independent and significant determinants of coMHL-AMO in the present study.

Public Health, Practice and Research Perspectives

The present findings will impact on a range of implications whose major importance in terms of public health, prevention and policy, clinical practice, school environment, and research. Thus, the assessment of hearing loss is needed urgently in Kinshasa megacity with efficient interventions among parents, schoolchildren/adolescents, and practitioners. Audiometric screening, family and schools without noise neither passive smoking is recommended. A participatory approach will invite parents, teachers, general practitioners, policy leaders, otolaryngologists, and learners (schoolchildren/adolescents) to work together to reduce high prevalence of coMHL-AMO in Kinshasa megacity, DRC.

Strength and Limitations of the Study

The strength of the present study might be reflected by its first comprehensive large and probabilistic community research in Central Africa. However, the present study had limitations to some degree such as its cross-sectional design, lack of some biomarkers such as cotinine, fibrinogen, and other inflammatory markers [61-63]. Moreover, acumen without precision was used to diagnose hearing loss as a limitation of the present study. Indeed, the audiometric assessment of hearing loss is considered as the golden standard objective and reliable measure in different studies.

Conclusion

Parents, teachers, general practitioners, policy leaders, and otolaryngologists are invited to work together for early prevention, diagnosis and treatment of coMHL-AOM epidemic prevalence and to tackle its independent determinants a cross elementary, primary and secondary schools from poor, polluted and chaotic semi-urban environment of Kinshasa Province; DRC.

Acknowledgement

We grateful all those who from far or near agreed to participate in this study; all the investigators, the children and their father who willingly approved and supported within them the data collection.

References

1. Brownson RC, Figgs LW, Caisley LE (2002) Epidemiology of environmental tobacco smoke exposure. *Oncogene*. 21: 7341-8.
2. Cheraghi M, Salvi S (2009) Environmental tobacco smoke (ETS) and respiratory health in children. *Eur J Pediatr*. 168: 897-905.
3. Lee PN, Hamling JS (2016) Environmental tobacco smoke exposure and risk of breast cancer in nonsmoking women. An updated review and meta-analysis. *Inhal Toxicol* 28: 431-54.
4. Vanker A, Gie RP, Zar HJ (2019) The association between environmental tobacco smoke exposure and childhood respiratory disease: a review. *Expert Rev Respir Med* 11: 661-73.
5. Annette V, Zimmermann H, Lorenz E, Becher H (2018) Is smoking a risk factor for tinnitus? A systematic review, meta-analysis and estimation of the population attributable risk in Germany. *BMJ Open*. 8: e016589.
6. Carter S, Laird C (2005) 10 Assessment and care of ENT problems. *Emerg Med J* 22: 128-39.
7. World Health Organization (2019) WHO report on the global tobacco epidemic 2019. Geneva: World Health Organization. 2019:109.
8. Owili PO, Muga MA, Kuo HW (2018) Gender Difference in the Association between Environmental Tobacco Smoke and Birth Weight in Africa. *Int J Environ Res Public Health*. 15: 1409.
9. Abdullah A, Farhan AE, Mohammad MA (2015) Effects of passive smoking on students at College of Applied Medical Sciences, King Saud Bin Abdulaziz University for Health Sciences, Riyadh. *J Nat Sci Biol Med* 6: 100-5.

10. Elizabeth M. Fitzpatrick (2019) Association between otitis media infection and failed hearing screenings in children. *PLoS One* 14: e0212777.
11. Cook DG, Whincup PH, Jarvis MJ (1994) Passive exposure to tobacco smoke in children aged 5-7 years: individual, family, and community factors. *BMJ*. 308: 384-9.
12. Granath A (2019) Recurrent Acute Otitis Media: What Are the Options for Treatment and Prevention? *Curr Otorhinolaryngol Rep* 5: 93-100.
13. Couloigner V, T Van Den Abbeel (2004) Rhinopharyngites de l'enfant. *EMC-oro-rhino-laryngologie*. 1: 93-112.
14. Dutau D (1999) Passive smoking in children; nothing more to demonstrate, we must act. *General medicine* 1852: 6-17. (Le Tabagisme passif chez l'enfant; plus rien à démontrer, il faut agir).
15. Bakley BW, Blakley JE (1995) Smoking and middle ear disease: are they related? A review article. *Otolaryngol Head Neck Surg* 112: 441-6.
16. Wigand M, Hoffmann TK, Ryan AF (2018) The role of innate immunity in otitis media. 66: 464-71.
17. Sokolo Gedikondele J, Longo-Mbenza B, Matanda Nzanza J (2011) Nose and throat complications associated with passive smoking among Congolese school-children. *Afr Health Sci*. 11: 315-9.
18. Öberg M, Jaakkola MS, Prüss-Üstün A (2010) Second-hand smoke: Assessing the environmental burden of disease at national and local levels. Geneva, World Health Organization.
19. Ali I Bozkurt, Şahinöz S, Özçırpıcı B, Özgür S, Şahinöz T, et al. (2006) Patterns of active and passive smoking, and associated factors, in the South-east Anatolian Project (SEAP) region in Turkey. *BMC Public Health* 6: 15.
20. Tager IB, Hanrahan JP, Tosteson TD, Robert G Castile, Randy W Brown et al. (1992) Lung function, pre- and post-natal smoke exposure, and wheezing in the first year of life. *Am Rev Respir Dis* 147: 811-7.
21. Venekamp RP, Damoiseaux RA, Schilder AG (2014) Acute otitis media in children. *BMJ Clin Evid* 2014: 0301.
22. Sung JH, Sim CS, Lee CR, Yoo CI, Lee H, et al. (2013) Relationship of cigarette smoking and hearing loss in workers exposed to occupational noise. *Ann Occup Environ Med* 25: 8.
23. English GM, Northern JL, Fria TJ (1973) Chronic Otitis Media as a Cause of Sensorineural Hearing Loss. *Arch Otolaryngol- Head and Neck Surg* 98: 18-22.
24. Peter Kullar, Philip D Yates (2012) Infections and foreign bodies in ENT. *Surg* 30: 590-6.
25. Lombardi C, Tansini A, Passalacqua G (2006) Seasonal sensorineural hearing loss associated with allergic rhinitis: A case report. *J Allergy Clin Immunol* 117: 468-9.
26. Kolski C (2014) Hearing screening by community physicians in under-2 year-olds. *Eur Ann Otorhinolaryngol, Head and Neck Dis* 131: 263-4.
27. Nunes ADDS, Silva CRL, Balen SA, de Souza DLB, Barbosa RI (2019) Prevalence of hearing impairment and associated factors in school-aged children and adolescents: a systematic review. *Braz J Otorhinolaryngol* 85: 244-53.
28. Abdel Rahman AG, Meko FAS, Allam MF, El Tabakh M, El Gaafary MM, et al. (2007) Prevalence and risk factors for hearing disorders in secondary school students in Ismailia, Egypt. *EMHJ-Eastern Mediterr Health J* 13: 586-94.
29. Elahi MM, Elahi F, Elahi A, Elahi SB (1998) Paediatric hearing loss in rural Pakistan. *J Otolaryngol* 27: 348-53.
30. Kirkpatrick M, Costello ADL, Palmer HM, Pandey BD (1992) Is the prevalence of childhood hearing impairment overestimated in developing countries?. *J Trop Pediatr* 38: 92.
31. Korver AM, Smith RJ, Van Camp G, Schleiss MR, Bitner Glindzic MA, et al. (2017) Congenital hearing loss. *Nat Rev Dis Primers* 3: 16094.
32. Feder KP, Michaud D, McNamee J, Elizabeth F, Pamela RM, et al. (2017) Prevalence of Hearing Loss Among a Representative Sample of Canadian Children and Adolescents, 3 to 19 Years of Age. *Ear Hear* 38: 7-20.
33. Yung Lin Y, Wei Wu L, Wei Kao T, Jung Wu C, Fang Yang H, et al. (2016) Secondhand Smoke is Associated with Hearing Threshold Shifts in Obese Adults. *Sci Rep* 6: 33071.
34. Lindsay RP, Tsoh JY, Sung HY, Max W (2016) Secondhand smoke exposure and serum cotinine levels among current smokers in the USA. *Tob Control* 25: 224-31.
35. Robertson J, Stevenson L, Usher K, Devine S, Clough A (2015) A Review of Trends in Indigenous Australian Tobacco Research (From 2004 to 2013), Its Associated Outputs and Evidence of Research Translation. *Nicotine Tob Res* 17: 1039-48.
36. Larsson ML, Frisk M, Hallström J, Kiviloog J, Lundbäck B (2001) Environmental tobacco smoke exposure during childhood is associated with increased prevalence of asthma in adults. *Chest* 120: 711-7.
37. Vinked JG, Klein Jan, Severijne LW, Fokker WJ (1999) Passive smoking causes an allergic all infiltrate in the nasal mucosa of atopic children. *Int J Pediatr Otorhinolaryngol* 51: 73-81.
38. Teele DW, Klein JO, Rosner B (1989) Epidemiology of otitis media during the first seven years of life in children in greater Boston: a prospective, cohort study. *J Infect Dis* 160: 83-94.
39. Heikkinen T, Chonmaitree T (2003) Importance of Respiratory Viruses in Acute Otitis Media. *Clin Microbiol Rev* 16: 230-41.
40. Zernotti ME, Pawankar R, Ansotegui I, Hector B, Sebastian CJ, et al. (2017) Otitis media with effusion and atopy: is there a causal relationship? *World Allergy Organ J* 10: 37.
41. Brandon E Cohen, Anne Durstenfeld, Pamela C Roehm (2014) Viral Causes of Hearing Loss: A Review for Hearing Health Professionals. *Trends Hear* 18: 2331216514541361.
42. Sajeda A, Abrar H, Ferhana F, Abdul MB (2018) Effect of noise pollution on hearing capacity of workers in Jute Mills of Chittagong City. *Afr J Environ Sci Tech* 12: 15-20.
43. Chang J, Ryou N, Jun HJ, Hwang SY, Song JJ, et al. (2016) Effect of Cigarette Smoking and Passive Smoking on Hearing Impairment: Data from a Population-Based Study. *PLoS One* 11: e0146608.
44. Lin X, Shan X, Lin S, Shu B, Wang Y, et al. (2019) Is Sensorineural Hearing Loss Related to Chronic Rhinosinusitis Caused by Outer Hair Cell Injury? *Med Sci Monit* 25: 627-36.
45. Czechowicz JA, Messner AH, Alarcon Matutti E, Alarcon J, Calderon GQ, et al. (2010) Hearing impairment and poverty: The epidemiology of ear disease in Peruvian school children. *Otolaryngol-Head and Neck Surg* 142: 272-7.
46. Acharya A, Singh M, Shrestha A, Pokharel B (2013) Ear Nose Throat (ENT) disorders in Government Schools of Far-Western Nepal. *J Lumbini Med Coll* 1: 83-5.
47. Schmucker C, Kapp P, Motschall E, Loehler J, Meerpohl JJ, et al. (2019) Prevalence of hearing loss and use of hearing aids among children and adolescents in Germany: a systematic review. *BMC Public Health* 19: 1277.
48. Adair Bischoff CE, Sauve RS (1998) Environmental tobacco smoke and middle ear disease in preschool-age children. *Arch Pediatr Adolesc Med* 152:127-33.

49. Overpeck MD, Moss AJ (1991) Children's exposure to environmental cigarette smoke before and after birth: health of our nation's children, United States, 1988. *Adv Data* pp. 1-11.
50. Cook DG, Whincup PH, Jarvis MJ, Strachan DP, Papacosta O, et al. (1994) Passive exposure to tobacco smoke in children aged 5-7 years: individual, family, and community factors. *BMJ* 308: 384-9.
51. Nurhasana R, Ratih SP, Djaja K, Hartono RK, Dartanto T (2020) Passive Smokers' Support for Stronger Tobacco Control in Indonesia. *Int J Environ Res Pub Health* 17: E1942.
52. Ellis J Neufeld, Michele M Snyder, Alexa S Beiser, Annette L Baker, Jane W Newburger, et al. (1997) Passive Cigarette Smoking and Reduced HDL Cholesterol Levels in Children With High-Risk Lipid Profiles. *Circulation* 96: 1403-7.
53. Reynolds P, Goldberg D, Hurley S, Nelson DO, Largent J, et al. (2009) Passive Smoking and Risk of Breast Cancer in the California Teachers Study. *Cancer Epidemiol Biomarkers Prev* 18: 3389-98.
54. Cao S, Yang C, Gan Y, Lu Z (2015) The Health Effects of Passive Smoking: An Overview of Systematic Reviews Based on Observational Epidemiological Evidence. *PLoS One* 10: e0139907.
55. Hutchinson SG, Kuijlaars JS, Ilse Mesters, Muris JW, van Schayck CP, et al. (2014) Addressing Passive Smoking in Children. *PLoS One* 9: e93220.
56. Pérez Stable EJ, Juárez Reyes M, Kaplan C, Fuentes Afflick E, Gildengorin V, et al. (2001) Counseling smoking parents of young children: comparison of pediatricians and family physicians. *Arch Pediatr Adolesc Med* 155: 25-31.
57. Saulyte J, Regueira C, Montes Martínez A, Khudyakov P, Takkouche B, et al. (2014) Active or Passive Exposure to Tobacco Smoking and Allergic Rhinitis, Allergic Dermatitis, and Food Allergy in Adults and Children: A Systematic Review and Meta-Analysis. *PLoS Med* 11: e1001611.
58. Capper R, Canter RJ (2001) Is the incidence of tonsillectomy influenced by the family medical or social history? *Clin Otolaryngol Allied Sci* 26: 484-7.
59. Mania M, Przybys Z, Kurylak A (2006) Passive smoking and frequency of occurrence of disease symptoms in the respiratory system in children aged 0-7. *Przegl Lek* 63:b831-3.
60. Guan WJ, Zheng XY, Chung KE, Zhong NS (2016) Impact of air pollution on the burden of chronic respiratory diseases in China: time for urgent action. *Lancet* 388: 1939-51.
61. Lüdicke F, Magnette J, Baker G, Weitkunat R (2015) A Japanese cross-sectional multicentre study of biomarkers associated with cardiovascular disease in smokers and non-smokers. *Biomarkers* 20: 411-21.
62. Yamini S Levitzky, Yu Guo C, Rong J, Martin G Larson ScD, Robert E Walter, et al. (2008) Relation of Smoking Status to a Panel of Inflammatory Markers: The Framingham Offspring. *Atherosclerosis* 201: 217-24.
63. Panagiotakos D, Pitsavos C, Chrysohoou C, Kavouras S, Stefanadis C (2005) The associations between leisure-time physical activity and inflammatory and coagulation markers related to cardiovascular disease: The ATTICA Study. *Preventive Med* 40: 432-7.