

Epidemiology of Otitis media in a local tropical African population

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Summary

Background: Otitis media is one of the most common childhood infections. There are however very few community based studies on the prevalence of this disease in Nigeria children.

Objectives: To establish the community prevalence of otitis media; and to identify associated environmental and the host risk factors in Nigerian children.

Setting: A semi urban community of Ife Central Local Government area of Osun State, Southwestern part of Nigeria.

Material and Methods: Thirty enumeration areas within the study location were randomly picked and their boundaries were defined with the assistance of the National Population Commission (NPC) Officials. Households were used as sampling units within the area. Children aged 1 day old – 12 years in each selected household were identified. A questionnaire was administered to the mother/guardian of each child. Otoloscopic examination, in addition to the general physical examination was carried out on each child. The data were analyzed using simple descriptive statistics, correlation and multivariate regression technique.

Result: 600 children aged 0 -12 years were investigated. There were 299 males and 301 females. The prevalence of otitis media was found to be 14.7%. This comprises of acute otitis media (AOM) in 11.8%, chronic suppurative otitis media (CSOM) in 2.5%, while Otitis media with effusion (OME) was diagnosed in less than 1%. The peak age of incidence was found to be in the age group 1-4years 55(9.2%), while the least age of occurrence was found to be in the age group less than 1 year 10(1.7%). There was no statistical association between the duration of breastfeeding practice and occurrence of otitis media among the subject ($P>0.05$). There was no statistical association between the occurrence of otitis media and immunization ($p>0.05$).

However there were 3 children who had otitis media associated with measles infection. A highly significant association was shown between exposure to household cooking fuel (wood smoke) and the occurrence of otitis media ($P<0.05$). Mother's educational status, number of children sleeping in the same room greater than four was found to demonstrate a strong association with the occurrence of Otitis media ($p<0.05$).

Conclusion: Otitis media is prevalent among Nigeria children and it is found to occur more in children of mothers with lower educational status and in number of children greater than 4 sleeping in the same room. A strong association was found between exposure to wood smoke in the living environment and the occurrence of otitis media.

Key-words: Otitis media, Nigeria children.

Résumé

Introduction: Otite médias est une infection d'enfance plus ordinaire. Toutefois, il y a peu d'étude de base communautaire sur la prévalence de cette maladie chez des enfants nigériens.

Objectif: Etablir la fréquence communautaire d'otite médias; et identifier des facteurs associés qui ont rapport à l'environnement et facteur de risque d'hôte chez des enfants nigériens.

Cadre: Une communauté semi-urbaine de l'administration centrale communale d'Ife de l'Etat d'Osun du sud-ouest coté du Nigeria.

Matériels et méthodes: Trente zones de recensement dans l'emplacement de cette étude ont été sélectionnée au hasard et leur frontières ont été définies avec l'aide des officiers de la Commission de la Population Nationale (CPN). Ménages ont été utilisés comme unités d'échantillonnage dans la zone. Des enfants âgés d'un jour - 12 ans dans chaque maison choisie ont été identifiées. Un questionnaire a été administré à la mère/gardiennne de chaque enfant. Examen otoscopique, en plus d'examen de la physique générale a été effectué sur chaque enfant. Les données ont été analysées à travers l'utilisation des statistiques descriptives simple, technique de la corrélation et de la régression multivariété.

Resultats: Six cents enfants âgés d'0 - 12 ans été étudiés. Il y a 299 du sexe masculin et 301 du sexe féminin. La fréquence d'Otite médias était trouvée d'être 14,7%. Ceci comprend d'Otite Médias Aigue (OAM) en 11,8%. Otite Média Suppurative Chronique (OMSC) en 2,5%, tandis que Otite Médias avec Effusion OME a été diagnostiqué en moins de 1%. L'incidence d'âge maximum était noté d'être dans la tranche d'âge de 1 - 4 ans 55 soit 9,2% tandis que la moindre fréquence d'âge était notée d'être dans la tranche d'âge d'0 - 12 mois 10 soit 1,7%. Il n'y a aucune association statistique entre la durée de la pratique d'allaitement maternel et la fréquence d'otite média parmi les sujets ($P > 0,05$). Il n'y avait aucune association statistique entre l'incidence d'otite média et l'immunisation ($P > 0,05$). Toutefois, il y a 3 enfants atteints d'otite media liée avec l'infection de la rougeole. Une association fortement importante était indiquée entre ouverture au combustible de ménage (fumée du bois) et l'incidence d'Otite Média ($P < 0,05$) statut de l'éducation de la mère, nombre des enfants qui dorment dans la même chambre plus de quatre est trouvé de démontrer une association forte avec la fréquence d'otite Médias ($p < 0,05$).

Conclusion: Otite Médias est prédominante parmi des enfants nigériens et on avait noté qu'elle arrive le plus souvent chez des enfants dont la mère est du bas peuple avec un enseignement primaire ou secondaire et chez le nombre des enfants plus de 4 qui dorment dans la même chambre. Une association forte était notée entre l'exposition à la fumé du

bois dans l'environnement de la maison et la fréquence d'otite médias.

Introduction

Otitis media is one of the common childhood diseases. It was found to be responsible for every third office visit in a pediatric practice¹. A study showed that 47% of children at one year of age would have developed at least one episode of otitis media, and 71% by the age of 3 years². Treatment of otitis media in children is associated with substantial expenditures because of its high frequency during childhood, total national estimates for the year 1998 in the United States of America was 5.3 billion dollars³. It is therefore a disease of great importance especially in a developing country like Nigeria where resources are scarce and the associated risk factors for middle ear infections like poor nutrition, overcrowding, poverty, environmental smoke pollution from cooking fuel, and infectious diseases are prevalent².

An incidence of Acute otitis media of 28% has been reported in under than five-year-old febrile children in Ilesha in Osun state of Nigeria⁴. Another work reported a prevalence of 4.9% of secretory otitis media in Nigerian children⁵. Majority of the works were hospital based and thus the data may not reflect the true picture of the disease in the community.

This prospective study was partly designed to examine the association between host related risk factors and exposure to household smoke pollutant with the occurrence of otitis media in children living in Osun state of the South western part of Nigeria.

Patients and methods

This is a cross-sectional community based survey carried out in Ife Central Local Government area of Osun state. Ife central local government area is located in the Southwestern part of Nigeria. Thirty enumeration areas were randomly selected in Ife central local government area.

The study population was made up of children between the ages of 0-month to 12 years. A stratified multi stage cluster sampling method was employed. In view of the practical difficulty of obtaining a convenient sample frame of the study population, households (HHs) were selected as the basic sampling unit, the sample size was determined using the WHO Health Survey statistics formula⁶ $N = (1.96)^2 P (1-P) / d^2$. N= Minimum sample size needed, d= absolute error that can be tolerated (5% chance of error), P= estimated prevalence rate of 30% and $1.96 = \text{Fraction of area under normal distribution curve covered by two standard deviation on either side of normal distribution}$. The figure was topped up to 600. All eligible children aged 0-12years within the selected HHs were included until a total of 20 children were examined in each enumeration area. Prior to data collection and with the assistance of the officials of the National Population Commission, the boundaries of the selected enumeration areas were defined. Starting from about the mid point of the enumeration area and moving in a clockwise direction, the first 6 HHs with at least one eligible child were picked. Otoscopy was done on all the children by the first author. Otitis media with effusion was diagnosed based on the clinical findings of dull and retracted tympanic membrane alone as there was no facility

for Tympanometry. The mothers/others were interviewed with the aid of a questionnaire. Ethical approval was obtained from the research and ethical committee of the Obafemi Awolowo University Teaching Hospital, and the head of the family of each eligible child gave informed consent.

The Questionnaire were designed to collect data on personal identification of the child, the informant, history of known risk factors of otitis media, history of the disease, complication or any other associated ailments. Data analysis was done using SPSS statistical software version 9.0 for windows.

The result of the study is being presented using descriptive statistics, correlation, and multivariate regression analysis.

Results

The gender and age distribution of the sampled population are as shown in table I.

Socio- economic risk factors for otitis media.

The informants were the mothers in over 80% of cases.

Table 1 Age distribution of the respondents

Age in years	Male N299 (49.8%)	Female N301(50.2%)	Total N600 (100%)
Less than 1	40 (6.7)	29(4.8)	69(11.5)
1 - 4	151 (25.2)	94(15.7)	245 (40.9)
5 - 8	90(15.0)	118(19.7)	208 (34.7)
9 - 12	18(3.0)	60(10.0)	78(13.0)
Total	299(49.8%)	301(50.2%)	600(100.0)

Table 2 Duration of breastfeeding practice

Duration	Frequency (%)
< 6 months	5(0.8)
6 months	94(15.7)
18 months	125(20.8)
24 months	357(59.6)
Total	581(96.8)
Missing System	19 (3.2)
Total	600 (100)

Table 3 Age and gender distribution of patients with Otitis media.

Age in years	Male n = 45(%) No (%)	Female n = 43(%) No (%)	Total n = 88(%) No (%)
Less than 1	6(6.8)	4(4.5)	10(11.3)
1 - 4	25(28.4)	30(34.1)	55(62.5)
5 - 8	7(8.0)	5(5.7)	12(13.7)
9 - 12	7(8.0)	4(4.5)	11(12.5)
Total	45(51.2)	43(48.8)	88(100)

Mothers' occupation

345 (57.5%) of the mothers were traders, 79 (13.2%) fashion designers, while 46 (7.7%) were hairdressers. Fathers' occupation: 300(50%) of the fathers were traders, 168(28%) were artisans\farmers while 132 (22%) were civil servants. The significance of this is that over 70% of the population is from

the low social economic class with no stable regular income. Significant association was found between mothers' educational status and method of cooking, i.e. mothers with no formal education are more likely to cook with firewood, while mothers with the educational status above secondary school level were found to cook with kerosene stove, gas stove and or electric stove. ($P < 0.001$). Exposure to firewood smoke in the living environment through cooking was also found to be strongly associated with otitis media. ($P < 0.05$).

Breast-feeding practice

Over 90% of mothers breastfed their children for between 6 months to 24 months. While only 0.8% of mothers breastfed for less than 6 months, either due to maternal loss or teenage pregnancy. See table II.

Number of children sleeping in the same room

There was a correlation between number of children greater or equal to 4 sleeping in the same room and the occurrence of otitis media. ($P < 0.01$)

Method/place of cooking

Exposure to kerosene smoke pollution was found in 82.7% of the sampled population while 12.3% were exposed to firewood smoke in their home environment. Eighty six percent of mothers cook indoors while only 14% cook in the open.

There was a significant association between cooking with firewood and otitis media. ($P < 0.05$).

Immunization

Over eighty per cent of the study populations had their childhood immunization up to date, 17.3% had partial immunization, while only 1% had no immunization. There was no significant correlation between immunization and otitis media, however there were 3 cases of measles with associated otitis media; 100% of these cases had significant hearing loss with one of the cases being a deaf-mute.

History of the disease

The age and sex distribution of the study populations with otitis media is as shown in Table III.

Eighty-eight (14.7%) of the children were found to have otitis media. Acute otitis media was responsible for 71 (11.8%), while 15 (2.5%) of cases were suffering from chronic discharging ear, less than 1% had otitis media with effusion. Otorrhea was the most common symptoms of otitis media in this survey, this was the complaint in 98% of the cases, and the remaining 2% presented with otalgia.

Recurrent ear disease was not a common finding in this survey as only 14 (2.3%) of the sampled populations had more than one episode of recurrence, and only one child 0.2% had up to 6 episodes of recurrent ear discharge. See Table IV.

Treatment modalities

Fifty-nine (67.0%) of subjects with Otitis media had orthodox medical treatment, while the remaining had consulted the traditional healers or applied home care.

The home care methods of treatment employed by the mothers included; Gentian Violet as ear drops, Dusting Powder, Miss Paris (Spiritual healing perfume) and the use of goat nasal discharge as ear drops!! All these had disastrous results.

Discussion

The prevalence of Otitis media in this work was found to be highest in the age group 1-4 years. Otitis media with effusion and chronic suppurative Otitis media accounted for a smaller percentage and were found to be more common in the older age group. This agrees with the existing literature⁷ and could be due to the presence of such factors like the wider and shorter eustachian tube in infants and the higher incidence of acute respiratory infections in childhood. The very high prevalence rate in this work may be associated with low socio-economic factors. There is slight male preponderance with a male: female ratio of 45:43. The prevalence of Otitis media in this study is 14.7%. This comprises of AOM 11.8%, CSOM of 2.5% while OME was found in less than 1%. This prevalence is higher than what obtained in a similar work in Saudi children by ZakZouk. He found a prevalence rate of 1.05% for acute Otitis media and a prevalence rate of 1.15% for chronic suppurative Otitis media⁸. Bruneau found a prevalence rate of 9.4% and 10.8% respectively in 1987 and 1997 in Canadian children⁹. A prevalence rate of 9.4% was found in Brazilian children in another epidemiologic study concerning chronic suppurative Otitis media in Latin America¹⁰. Otitis media was also found to be prevalent among the low socio-economic group in Latin America, this is similar to the observation in this study. Prolonged breast-feeding is standard practices among the women in this community as shown in table I; the low incidence of Otitis media in children of age group less than 1 year could be due to the protective effects of breastfeeding¹¹. However the higher prevalence in the age group 1-4 years could be attributed to the diminishing protection from breastfeeding beyond 12 months when breast milk alone could not meet the nutritional requirement of the child¹¹. Recurrent disease was not common in the sampled population when compared with studies in developed countries². This could be due to the protective effect of the prolonged breast-feeding practice in Nigeria women in this part of the country. Heining found that breast-feeding confers live saving protection against infectious illness among disadvantaged populations¹⁰. Although overcrowding was found to be significantly associated with the incidence of Otitis media in this work ($p < 0.01$) other determinants such as the standard room size and adequacy of ventilation were not directly measured. However from general observation during the data collection most of the rooms were small with 1-2 windows, which was not adequate for ventilation. Bruneau et al. found an association between Otitis media and overcrowding⁹.

Significant association between exposures to household cooking smoke from firewood is perhaps one of the very important findings in this work. Despite the small size of children potentially exposed to wood smoke, a significant per-cent age of them had Otitis media. Sofoluwe, and Abdul

Wahab et al found a significant association between exposure to wood smoke and the incidence of acute respiratory infections^{12, 13}. It has also been established that major noxious agents in wood smoke such as Nitrogen dioxide and Sulphur compromise local respiratory defense¹⁴. Aromatic hydrocarbon, benzene and carbon monoxide also found in wood smoke may cause local respiratory and systemic toxicity^{12, 15}. It is well established in literature that acute respiratory infections predispose to Otitis media¹⁶.

Over forty per cent of the mothers consulted the traditional healers while 5% resorted to self-medication. Some of the treatment modalities included the use of gentian violet as eardrops, Miss Paris (a spiritual perfume which is for treating every known ailment by a particular Christian sect) and goat nasal discharge! These can be said to be due to lack of adequate finances for hospital care and largely ignorance, and may explain the high prevalence of Otitis media recorded in this study.

Finally there were 3 cases that had measles with Otitis media, these cases were not immunized against measles and they all developed socially significant hearing loss with one of them developing deaf-mutism. Association between immunization and Otitis media was not statistically significant in this work; however there is a strong association between measles, Otitis media and deafness. It is already established in literature that measles cause necrotizing type of Otitis media and mixed hearing loss from the involvement of the inner ear¹⁷.

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