

EVALUATION OF RISK FACTORS ASSOCIATED WITH OTITIS MEDIA IN CHILDREN IN BAUCHI STATE- NIGERIA

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Abstract

Risk factors associated with Otitis Media in children were evaluated using a structured questionnaire amongst parents of patient-children attending ENT section of Specialist Hospital Bauchi. Out of the 400 respondents that ear swabs were collected from their children, 332 yielded microbial isolates and 68 no growth. The highest occurrence of infection was observed in male children below the ages of three years that suffered underlying infection such as common cold. These infections were mostly unilateral amongst children of breast and bottle feeding illiterate housewives using wood as source of domestic energy. This established relationship was significant between Age and sex, mode of feeding and type of energy generation processes ($p < 0.01$). However, there was no statistically significant relationship between types of Otitis Media and sex, family history of Otitis Media and underlying infection, parental social, occupational and educational status, Age and forms of Otitis Media, sex and number of persons co-habiting in a room. This study confirms that Otitis Media is a highly multi-factorial disease associated with a number of environmental factors. Thus, routine check-up should be conducted in children at the onset of identified potential risk factors so as to avert the risk of permanent hearing loss, speech and language disabilities associated with Otitis Media. Lifestyles that minimize the risk of developing ear infection is hereby advocated such as encouraging breast feeding and bottle feeding of children in upright posture and avoidance of exposure to passive smoke.

Key words: Risk factors, otitis media, children, questionnaire, parents/guardian, Bauchi State

Introduction

Otitis Media (OM) is one of the most common infections of early childhood and constitutes a major public health problem in children and adults in Africa, Asia and Latin America (1). It is a common disease of the developing countries with malnutrition, over-crowding, substandard hygiene, frequent Upper Respiratory Tract infection and under-resourced health care been the important risks factor (2). OM is associated with significant percentage of permanent hearing loss, speech and language disabilities, which premised the identification of epidemiological risk factors such as age, sex, race, genetic, socio-economic, cultural, environmental and nutritional factors, poor hygiene and allergies (3-6).

Others include repeated exposure to large numbers of children whether at home or at day care centre, exposure to household smoke, smoke from tobacco, low maternal level of education, overcrowding in sleeping environment, duration of breast feeding and mode of feeding (6). Factors that facilitate the development and resistance of OM to antibiotics within the community can be categorized as behavioral and environmental which include inappropriate use of antibiotics, ineffective infection control, hygiene practices and the continued use of antibiotics in agriculture with lack of development of new antibiotics respectively (7). The increasing emergence of resistant pathogen, changing pattern of antibiotics resistance and complications arising in OM infections in infants and children, premised the need for continuous identification of emerging potential environmental risk factors hence the need

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for this investigation. This study was designed to maintain active surveillance on infant and children with OM presented to the ENT unit of the Specialist Hospital, Bauchi over a period of six month from

This study was carried out at the Specialist Hospital, Bauchi. It is the major health facility of the state located in its capital, Bauchi local Government Area (LGA). Bauchi is a first- order administrative division, located in the northern part of Nigeria with a population size of 4,706,909 as reported during the 2006 Census. It is bordered by seven states, Kano and Jigawa to the North, Taraba and Plateau to the South, Gombe and Yobe to the east and Kaduna to the west. This state is on latitude N 10° 30' 0'' and longitude E 10° 0' 0'' with two distinctive vegetation of Sudan and Sahel Savannah, occupying a land area of 549,260 square kilometers representing about 5% of the country's total landmass, made of 20 LGA's. There are 55 different tribes and the principal ethnic groups include Fulani, Hausa, Gerawa, Sayawa, Jarawa, Bolewa, Karekare, Kanuri, Fa'awa, Butuwa, Warjawa, Zulawa and Badawa (8).

Specimen collection

Ear swabs were collected using sterile swab sticks from 400 Children between the ages of 0-12years that attended the Ear, Nose and Throat (ENT) clinic of the Specialist Hospital Bauchi during the study period. These ear swabs (collected before the commencement of any medical therapy) were stored in transport medium and immediately taken to the laboratory for both Bacteriological and Mycological investigations.

Isolation of Pathogens

Bacteriology and Mycology of specimens: Collected sample were inoculation onto MacConkey Agar (MCA), Blood Agar (BA), Chocolate Agar (CA) and Saboraud Agar (SA) plates (9). MCA and BA plates were incubated

October, 2009 to March, 2010, in order to establish new emergent risk factor.

Materials and Methods

Study Area

aerobically at 37 °C for 24 hour while CA plates were incubated at 37 °C for 24 hour in presence of 2-5% Carbon dioxide and SA were in incubated at 25°C for up to 72hrs. Post incubation, colonial and cultural morphology were observed and documented. Pure isolates were obtained by repeated sub culturing of these organisms onto Nutrient Agar (NA) plates, and maintained on NA agar slants at 4 °C until required for use.

Questionnaire

Risk factors associated with OM was established using structured questionnaire administration to parents/ guardian of each child-patient from which ear swab was collected as described (4, 6) and where necessary accompanied with an in-depth confidential discussion. Associated risk factors evaluated in relation to OM occurrence in children include types of infection, sex, age, family history and underlying infections, educational, occupational and social status of parents/guardians, feeding habits, type of housing and number of inhabitants and means of energy generation.

Data Analysis

All obtained results were recorded and analyzed using simple descriptive statistics (percentage (%) frequency). The analyzed data were further subjected to chi-square analysis to establish the level of the significance within risk factors and the occurrence of ear infection. Factors not statistically significant were represented by 3D column Charts.

Result

Out of the 400 samples collected, 332 had OM of different types. The distribution of OM in relation to sex and types of Infection from patients whom specimens

were collected is as shown in Table I which indicated microbial growth in 190/332 (57.23%) for males and 142/332 (42.77%) for females. The most occurring type of ear infection was the Acute OM 151(45.48%) and least was the Chronic Suppurative type 80 (24.48%). The highest infection occurred within the age group 0-3years (88.76%) and the least infection amongst the 10-12year (46.43%) as shown in Table II. Infection in relation to family history of OM/other underlying infection as in Fig.1 showed that children with underlying infections such as Common cold were the highest population 216 (65.06%) affected by OM and children with family history of OM also recorded high infections 182 (54.82%). The distribution of OM in relation to their different forms of occurrence within the different age group as indicated in Fig.2 revealed that unilateral type OM occurred most with 238 (71.69%) and bilateral type had the least 94 (28.31%). While OM distribution in relation to different mode of feeding within different age group revealed the highest occurrence within the age group of below 3 years 131(39.46%)

who are basically breast and bottle feeders and least amongst the self-feeder 86 (25.90%) as indicated in Table III. Children of housewives, 96 (28.9%) were mostly affected and the least in children of those parents working in the health sectors 1(0.3%) as seen in Fig.3. The relationship of parental level of education with OM showed highest occurrence amongst parents with no form of formal education (Stalk illiterate) 107 (32.2%) and least within those whose parents had tertiary level of education 32 (9.6%) as indicated in Fig.4. OM infection in relation to population co-habiting in a room showed that ear infection increases with the number of persons sleeping in a room. The highest occurrence was observed among the population of 6 per room 143 (43.1%) with the least among 2 per room 14 (4.2%) Fig.5. Ear infections in relation to the different types of energy generation process observed highest occurrence of OM in children whose parents used wood smoke 172 (51.8%) and the least in those that used electricity as a mean of energy generation 34 (10.2%) as indicated in Table IV.

Table 1: Distribution of the different types of Otitis Media with sex in relation to its occurrence

Sex	Types of Otitis Media			Total
	COM	AOM	CSOM	
Male	55	87	48	190 (57.23%)
Female	46	64	32	142(42.77%)
Total	101(30.42%)	151(45.48%)	80(24.10%)	332(100%)

X² Test: p ≥0.01

Keys: AOM - Acute Otitis Media
 CSOM - Chronic Suppurative Otitis Media
 COM - Chronic Otitis Media

Table 2: Distribution of sex and age in relation to the occurrence of Otitis Media

Age group (years)	Sex				Total	
	Male		Female		Total	
	Number Tested	Number Infected	Number Tested	Number Infected	Tested	Infected (%)
≤1-3	96	85	73	65	169	150 (88.76)
4-6	69	68	49	35	118	103 (87.29)
7-9	41	33	44	33	85	66 (77.65)
10-12	15	4	13	9	28	13 (46.43)
Total	221	190(57.23%)	179	142(42.77%)	400	332(83.0%)

p < 0.01

Table 3: Distribution of mode of feeding and age with occurrence of Otitis Media

Age group	Modes of Feeding			Total
	Self feeder	Breast/bottle feeder	Spoons/cups	
≤1-3	9	131	4	150
4-6	27	-	76	103
7-9	37	-	29	66
10-12	13	-	-	13
Total	86(25.90%)	13(39.46%)	99(29.82%)	332 (100%)

p < 0.01

Table 4: Distribution of Otitis Media in relation to age and energy generation process

Age group	Types of energy generation				Total
	Wood smoke	kerosene	Both	Electricity	
≤1-3	86	19	23	20	150
4-6	49	31	16	8	103
7-9	27	14	16	5	66
10-12	10	5	2	1	13
Total	172(51.8%)	69(20.8%)	57(17.2%)	34(10.2%)	332 (100%)

p < 0.05

Fig. 1: Occurrence of otitis media in children with and without underlying infections

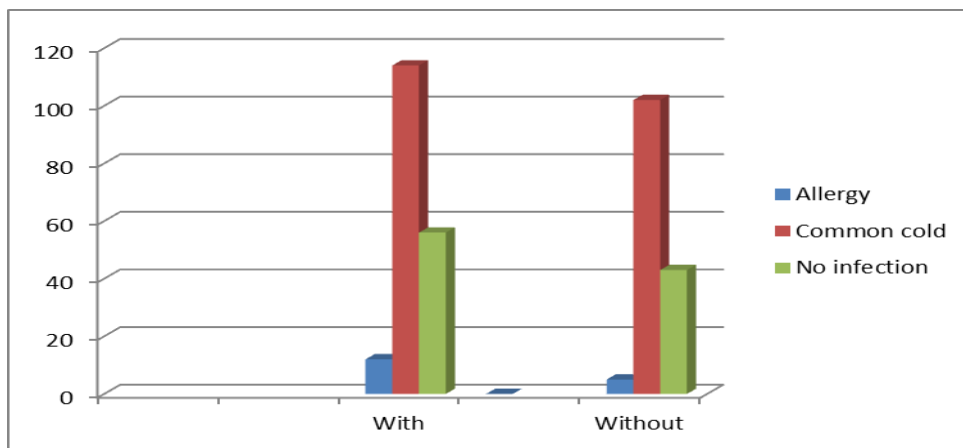


Fig. 2: Occurrence of unilateral and bilateral otitis media in children of various age groups

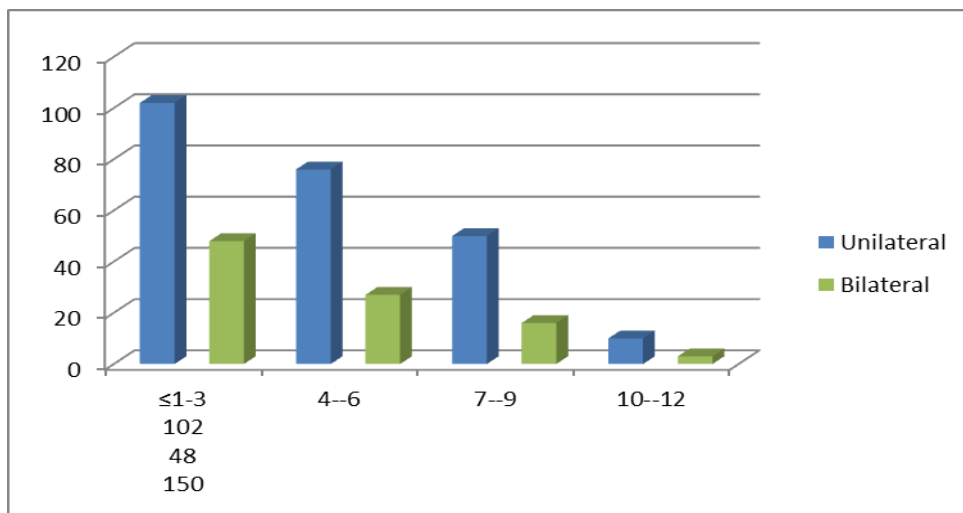


Fig.3: Occurrence of children otitis media in relation to parental occupational status

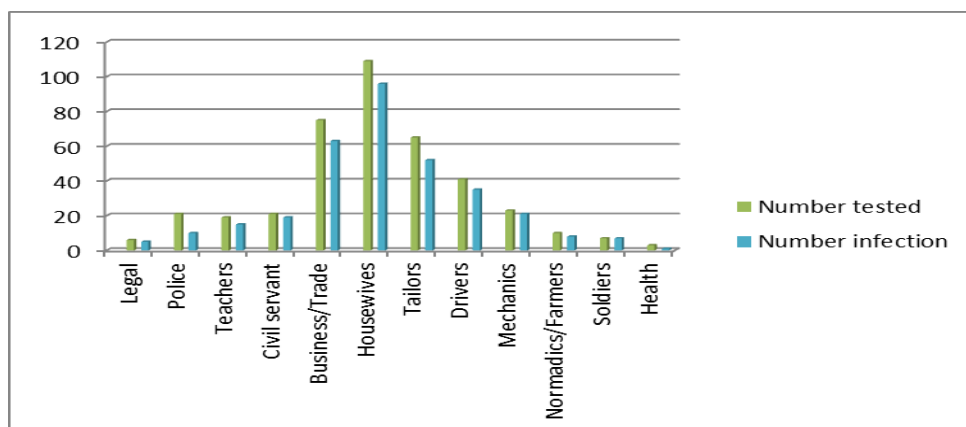


Fig. 4: Occurrence of children otitis media in relation to parental education

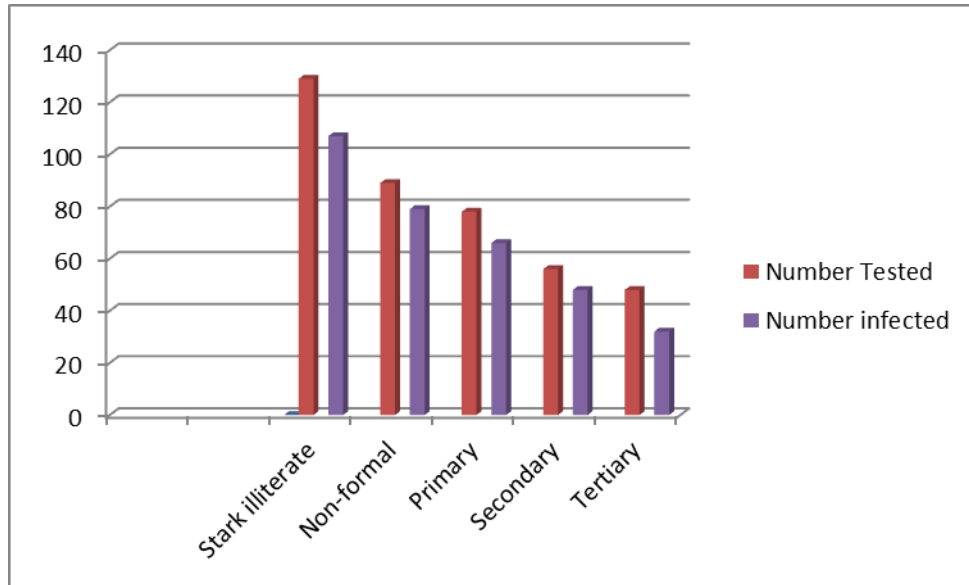
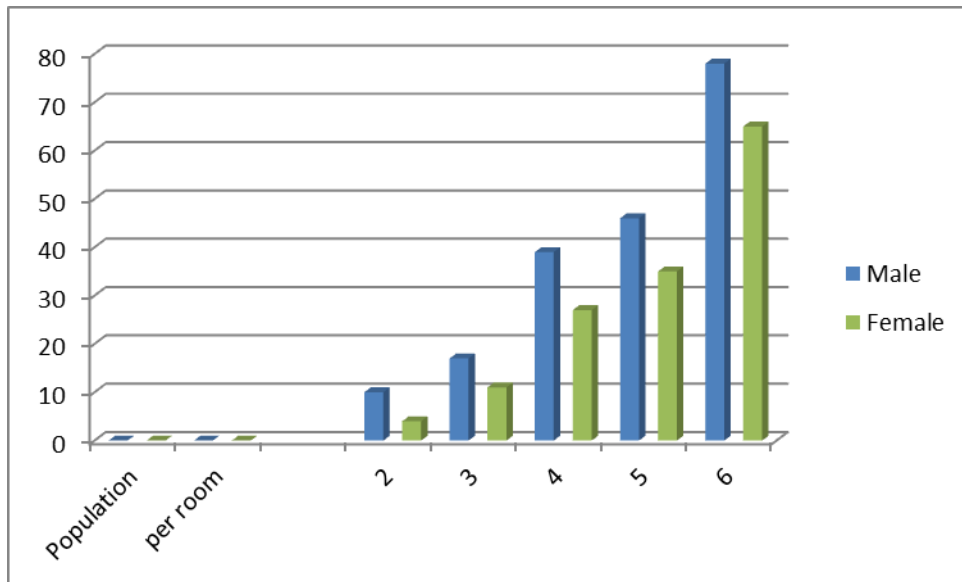


Fig. 5: Occurrence of children otitis media in relation to the number and sex of population per room



Discussion

The overall assessment of infection relationship with sex and infection type (Table 1) shows Acute Otitis Media (AOM) occurred most commonly. However, there was no statistical significant relationship between sex and the types of OM at $p \geq 0.01$. This agrees with the reports of prevalence of AOM (6) but contrary to the findings which reported CSOM as most common infection type (10) in Osun and Kwara State respectively. It was also observed that more male were infected than the female as earlier documented (3, 11) and this is similar to reports of ratio 1.6:1 for boy to girl infection (12). This finding could perhaps be as a result of increased aliment reporting frequency and specimen collection from male than female.

OM occurrence in relation to sex and age (Table 2) indicates the peak age of OM was observed in the age group of 0-3 years (88.76%) and the least in the age group of 10-12 years (46.43%). These similar findings (6,10) connotes the reports of the National Institute on Deafness and other Communication Disorder (NIDCD), which stated that ear infection is more frequent in children below the ages of 3 years as a result of the Eustachian tube being shorter, straight and more horizontal in nature in children than in adults as well as the result of their weak and developing immune system (13). This finding also shows that as age increases infection decrease. This could be due to the more vertical nature of Eustachian tube as age increases. Association between age and sex with the onset of OM was significant ($p < 0.05$) as earlier reported (3) that boys were more infected than girls.

OM in relation to family history and other underlying infection (Fig. 1) indicates peak occurrence of OM in children with or without family history of OM in association with common cold (65.06%) and the least in patients with

Allergy with or without family history of OM (5.12%). Statistically, there is no significant relationship between underlying infection and family history at $p \geq 0.01$. This agrees with the findings (4, 14), but contrary to that of CDC, which strongly believes that children with allergies are more likely to suffer episodes of OM caused by multiple *Haemophilus influenzae* than children without allergies. This is because the upper respiratory mucosal swelling during the allergic episode may cause the Eustachian tube dysfunction similar to that observed during an upper respiratory viral infection (15). OM in relation to its different forms and age group (Fig. 2) shows that the most common form of OM is the unilateral type (71.69%) recorded mostly in children below 3 years of the age. Statistically, it showed no relationship between the forms of OM with age of patients. This is similar finding was earlier reported as in 79.5% prevalence rate of unilateral type OM (16).

The distribution of OM in relation to age and the different mode of feeding (Table 3) shows that most infections occurred amongst age group less or equal to three ($\leq 1-3$) who feed on breast and or use of bottle feeders. This agrees with the findings which states that most OM occurs in bottle and breast fed infant due to the greater intra-oral pressure generated during breast and bottle feeding and which increases likelihood that the food may get into the middle ear when feeding (17-18). Statistically, there is high significant relationship between age and different mode of feeding in children ($p < 0.01$).

This is in accordance with the reports of the International Association of Infant Food Manufacturers (IFM) which suggests cup feeding is beneficial (19).

It was also observed that high occurrence of OM in children whose parents were full time housewives 96 (28.9%), traders (19.0%) and Tailors (15.7%) as shown by occupational status

of parent/guardian (Fig. 3). This connotes reports which states OM is a socio-economic issue (21). While the educational levels parents and guardians indicated most infections occurred in children whose parents were stark-illiterate with no formal type of education 107(32.2%) and the least in mothers with tertiary level of education (9.6%) represented in Fig. 4. This is a clear indication that OM infection occurs in children whose mothers had little or no knowledge about child and health tips. This finding is similar to reports (3,6). However, disagrees with reports that maternal level of education is not associated with the onset of OM (4).

OM in relation with the number of person per habitant reveals that co-habiting population increases the frequency of infection with the highest occurrence in 6 (six) children co-habiting per room 143(43.10%) as shown in Fig.5. Statistically, there was no significant relationship in the number co-habiting a room and sex at $p \geq 0.01$. This is closely similar to the finding which states that OM is more prevalent in number of children greater than 4 sleeping in the same room(6), however, it contrasts reports that states size and standard of housing are not associated with the onset of OM (4).

In Table 4, OM distribution in relation to different type of energy generation methods/exposure to wood smoke and age of children shows that the highest occurrence was recorded in wood smoke users (51.8%), both wood smoke and kerosene users (17.2%) and the least in electricity users (10.2%) which was statistically significant ($p < 0.05$). This connotes with the findings (3,6,15). The high occurrence amongst wood smoke users could be associated with the damaged done to the muco-ciliary clearance making it easy for pathogenic organism to adhere to the surface which may degenerates to OM. (20)

In conclusion, the evaluation of risk factors associated with OM in this study confirms that it is a highly multi-factorial disease determined by a number of environmental factors based on the significant relationships observed between age, sex, mode of feeding and means of energy generation (exposure to smoke) with the recorded occurrence. Hence, the need for routine check-up amongst all children below and or ≥ 5 years old, as well as those with previous history of ear surgery, speech or language disabilities and other related identified risk factors to reduce the burden of hearing loss. In addition, lifestyles that minimize the risk of developing ear infection is hereby advocated such as encouraging breast feeding and bottle feeding of children in upright posture and avoidance of exposure to passive smoke. Finally, further studies should be encouraged to monitor and maintain active surveillance in the changing trends of causative agents, antibiotic susceptibility, laboratory diagnostic method and associated risk factors.

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