



## **Retrospective Studies on the Incidence of Ear Infections among Patients at National Ear Care Centre, Kaduna, North Central Nigeria**

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### **Authors' contributions**

*This work was carried out in collaboration between both authors. Authors BRD and MB designed the study, performed the statistical analysis, wrote the protocol and wrote the first draft of the manuscript.*

*Authors BRD and MB managed the analyses of the study. Author BRD managed the literature searches. Both authors read and approved the final manuscript.*

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### **ABSTRACT**

Ear infection is one of the commonest symptoms which are caused by trauma to any part of the ear components. The retrospective analysis of the incidence of ear infection was carried out using patients' medical records from the period of February to October 2011. Results of this study showed that ear discharge infection was on the high side in patients' aged 20 years and below and the incidence rate reduces with the age of patients. The patients' medical record showed that 13.4% had unilateral ear discharge with an incidence rate of 83.5% of the total two hundred and ninety-one (291) records. *Pseudomonas species* (45.10%) were the most prevalent bacteria isolated, followed by *Staphylococcus aureus* (41.25%), *Streptococcus pneumoniae* (4.55%), *Klebsiella species* (3.85%), *Candida species* (2.10%), *Haemophilis species* (1.75%) and *Proteus species* (1.40%). The bacterial isolates exhibited the least resistance to Ciprofloxacin (17.79%) followed by Gentamycin (32.74%), while Cotrimoxazole, Chloramphenicol, and Amoxicillin were ineffective against the bacterial isolates. Long-term follow-up and education or continuous sensitization of patients on ear infections is needed.

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## 1. INTRODUCTION

Ear infection is an inflammation of the ear and one of the commonest symptoms of ear infection is ear discharge [1]. Not all ear discharges are as a result of ear infections, some are caused by trauma to any part of the ear components [2]. About 65 – 330 million people suffer from ear infections worldwide and 60% of these people had significant hearing impairment [3,4]. The health economic burden of ear infection is also severe especially in Africa and other developing countries where the disease prevalence is estimated to be as high as 11% [5] which can probably be due to lack of awareness, sensitization or funds for hospitality bills. Hearing loss among people in developing countries has been recognised as a major source of disability, especially in northern Nigeria where they tend to result to begging which constitutes a nuisance to the society at large. Many of these cases are preventable, and others to some extent are curable [5]. Hearing impairment is a hidden handicap that often elicits no sympathy from unaffected individuals. It is among the ten most common burdens, and they have been projected to become even more common by 2030 [6]. The World Health Organization (WHO) estimates that each year 51,000 children aged below 5 years die from complications of the otitis media in developing countries [7].

Ear discharging infection is a common problem for both children and adults but the magnitude varies in different countries. Anatomically, the children's Eustachian tube is shorter, more horizontal with more fluid cartilage which can easily impair its opening and hence ear infection is a major health problem to them especially in those with poor socio-economic status [8]. Ear infections such as chronic otitis media are of great concern especially in developing countries which can lead to serious morbidity and debility such as retarded language development and progress in school among children [9]. According to the World Health Organization record, 80% of all children have ear infections before the age of three, which represents 16 million annual episodes. In the US alone 20-30% of children have an average of 6 recurrences before the age of seven. Ear infections are the most common cause of a sick child visit to the doctor and accounts for half of all pediatric antibiotics. The World Health Organization attributes 28,000 annual deaths to complications resulting from ear

infections [3]. In a study by Heidi et al. [10] *H. Influenzae* was the dominant otopathogen detected in ear discharge swabs collected from children. In another study carried out in Karachi, Pakistan, *Pseudomonas aeruginosa* was the most common bacteria isolated from chronic discharging ears followed by *Staphylococcus aureus* [11].

Chronic suppurative otitis media constitutes a major cause of Otorhinolaryngological clinic visits in Nigeria, therefore, it is pertinent to determine the local pattern of presentation in order to achieve adequate treatment, avoid complications and provide records for future references [12]. A lot of researches have been carried out in different parts of Nigeria, for example, Uyo in Akwa Ibom State [13] Illorin in Kwara State [14] Benin City in Edo State [15] Ile Ife in Osun State [16] Abakiliki in Ebonyi State [7] and about three to four studies at the National Ear Care Centre, Kaduna, for example [9,12] these studies showed that chronic suppurative otitis media is a course for serious concern in Nigeria.

Since the introduction of antibiotics, the complications have become less common. However, due to increased and irrational use of wide-spectrum antibiotics, the resistance in the bacterial isolates has become very common. Therefore, the microbial culture and sensitivity will help inappropriate management of otitis media and its complications and thus preventing the emergence of resistant bacterial strains [17].

## 2. MATERIALS AND METHODS

### 2.1 Description of Sample Collection Center

The National Ear Centre is the only ENT Specialist Centre in Nigeria. It is a specialist hospital located along Golf Course Road by Independence Way, Kaduna, Kaduna State.

The National Ear Centre was established in 1999 as part of the World Health Organisation (WHO) resolution of 1995 that recognised hearing impairment as a major health issue in Africa. The Centre was operating at the Yusuf Dantsoho General Hospital on borrowed facilities before it was relocated to its permanent site. The new site (the former Psychiatric School of the Ahmadu Bello University Teaching Hospital, Kaduna) is

currently operating with three consultants, two senior registrars, three physicians, ten ENT nurses, two anesthetic and one theatre nurses. The Centre sources external ENT physicians and consultants to perform most of the Centre's activities that include surgeries, audiology, endoscopy, school hearing screening services, speech therapy, hearing aid services and industrial hearing conversation services.

## 2.2 Study Population

The records taken were for only those with discharging ear cases from February 2011 to October 2011. A total of two hundred and ninety-one (291) records were taken. Ethical approval was obtained from the ethical committee of the National Ear Centre, Kaduna.

## 2.3 Methodology

A retrospective study was conducted from the records of patients with discharging ears cases from February 2011 to October 2011 of the National Ear Centre, Kaduna, North Central Nigeria. Laboratory results which contain different bacterial isolates and drug susceptibility patterns of patients who had ear discharges were collected from the Hospital's Microbiology Laboratory unit registration books by using standard data collection format.

## 3. RESULTS

### 3.1 Distribution of Ear Discharge Infections

The distribution of the ear discharge infection was found to be highest from ages 0 – 20 years and lowest at ages ≥ 81, as shown in Table 1, for the retrospective data collected from patients with ear infections in the National

Ear Centre, Kaduna from February to October, 2011.

### 3.2 Incidence Rate of Discharging Ear Infections

Out of the two hundred and ninety-one (291) records taken from February to October, 2011, two hundred and forty-three (83.5%) patients had discharging ear infection as shown in Table 2.

### 3.3 Rate of Organisms Isolated

The rate of organisms isolated were two hundred and thirty-four (234) patients with the single organism and eighty-nine (89) patients with multiple organisms for retrospective data taken from February to October, 2011 as shown in Table 3.

### 3.4 Distribution of Organisms Isolated

*Pseudomonas earuginosa* was the most commonly isolated pathogen with the frequency rate of 45.10% while *Proteus spp* was the least with a frequency of 1.40% for the recorded data from February to October, 2011 as shown in Table 4.

### 3.5 Monthly Frequency of Discharging Ear Infection Cases

Tables 5 shows the monthly rate of discharging ear infection cases at National Ear Centre, from February to October, 2011. The record taken showed that August had the highest number of cases (57) and the lowest being October with only 3 cases, which may be due to the weather condition during that period because discharging ear condition is believed to be rampant during the wet season and in humid and damp conditions.

**Table 1. Age and gender distribution of patients with ear infections in the national ear centre, Kaduna from February to October, 2011**

Age	Gender		Number of patients	Percentage (%)
	Male	Female		
0 – 20	108	77	185	63.57
21 – 40	24	53	77	26.46
41 – 60	10	11	21	7.22
61 – 80	5	2	7	2.41
≥ 81	1	0	1	0.34
Total	148	143	291	100

**Table 2. Incidence rate of discharging ear infection in the national ear centre, Kaduna from February to October, 2011**

Description	Percentage (n = 291)
Patients with ear discharge	100.0
Patients with no infection	16.5
Patients with one ear infected	70.1
Patients with both ear infected	13.4

**Table 3. The rate of organisms isolated from the samples of ear discharge cases managed and recorded at the national ear centre, Kaduna from February to October, 2011**

Description	Percentage (n=291)
Total number of patients with ear discharge	100.0
Total number of patients with a single organism	80.4
Total number of patients with multiple organisms	3.1
Total number of patients with no infection	16.5

**Table 4. Distribution of organisms isolated from discharging ear infection at the national ear centre, Kaduna from February to October, 2011**

Organisms	Occurrence(s)	Frequency (%)
<i>Pseudomonas spp</i>	129	45.10
<i>Staphylococcus aureus</i>	118	41.25
<i>Klebsiella spp</i>	11	3.85
<i>Streptococcus pneumonia</i>	13	4.55
<i>Haemophilus spp</i>	5	1.75
<i>Candida spp</i>	6	2.10
<i>Proteus spp</i>	4	1.40
Total	286	100

**Table 5. Monthly frequency of discharging ear infection cases at the national ear centre, Kaduna from February to October, 2011.**

Month	Number of patients	Number of patients with infections (%)
February	9	8 (88.9)
March	24	19 (79.2)
April	21	16 (76.2)
May	37	33 (89.2)
June	49	37 (75.5)
July	46	35 (76.1)
August	57	48 (84.2)
September	45	43 (95.8)
October	3	2 (66.7)
Total	291	241 (82.8)

### 3.5 Antimicrobial Resistance Profile of Isolates

The organisms isolated for the records managed by the hospital from February to October, 2011 showed that the organisms were more resistant to Cotrimoxazole (98.22%) while minimum resistant (17.79% ) to Ciprofloxacin was recorded as shown in Table 6.

### 4. DISCUSSION

The result of this study showed that discharging ear infection was common in the study area and unilateral in 70.1% of the cases, bilateral in 13.4% of the cases. The predominance of *Pseudomonas aeruginosa* (45.1%) and *Staphylococcus aureus* (41.25%) among the isolates tallied with the work of Agrawal et al. [17] in Agra, India, Obiajuru and Chukuezi [18] in Imo State, Nigeria, and Iseh and Abubakar [19] in Sokoto State, Nigeria. It, however, contrast with the study of Muluye et al. [20] that showed the dominant organisms were *Proteus spp* (27.5%) and *Staphylococcus aureus* (26.5%), and that of Madana et al. [21] that reported *Pseudomonas aeruginosa* (32%) and *Proteus mirabilis* (20%) as the most common isolates.

All the isolated Gram-positive organisms showed in vitro sensitivity to Ciprofloxacin, Streptomycin, and Gentamycin, and most isolates were resistant to Ampiclox<sup>R</sup>, Tarivid<sup>R</sup> and Ofloxacin. It also showed that ciprofloxacin is preferred to aminoglycosides as an important tool in the treatment of infectious ear discharge which is in line with the observations of Renukananda et al. [22]. While the sensitivity result is in contrast with the study of Agrawal et al. [17] that stated that the susceptibility of *Staphylococcus species* was high (80-85%) with moxifloxacin, levofloxacin and doxycycline while low (<50%) with beta-lactam drugs, whereas erythromycin, ciprofloxacin, gentamicin, pefloxacin and augmentin were more effective against Gram-negative isolates. Obiajuru and Chukuezi [18] also reported that the most susceptible antibiotic was Sparfloxacin, which inhibited 89.3% of the bacterial isolates while the least sensitive antibiotic was chloramphenicol, which inhibited the growth of 14.7% of the bacterial isolates. The observed multiple drug resistance agrees with the work of Muluye et al. [20] that showed that 94.1% of the isolates had multiple antibiotic resistant patterns with 4.9% of isolates resistant to at least one antibiotic and only 1% bacterial isolates were

**Table 6. Antibiotic resistance profile of isolated organism from discharging ear infection cases at the national ear centre, Kaduna from February to October, 2011. (n=281)**

Antibiotic	Resistance (R)	Intermediate sensitivity (I/S)	Susceptibility (s)	Resistance %
Amoxicillin	255	24	2	90.75
Amoxiclav	245	6	30	87.19
Cefuroxime	190	1	90	67.62
Ceftariaxone	176	14	91	62.63
Gentamycin	92	5	184	32.74
Ciprofloxacin	50	40	191	17.79
Ofloxacin	137	11	133	48.75
Erythromycin	178	56	47	63.35
Chloramphenicol	255	2	24	90.75
Cotrimoxazole	276	0	5	98.22

susceptible to all antibiotics. In contrast, Iseh and Abubakar [19] showed that Gentamicin (65.72%) was the most effective antibiotic. The work of Madana et al. [21] also showed that the Gram-negative organisms were susceptible to Ceftazidime, Ciprofloxacin, and Amikacin, while the Gram-positive organisms were sensitive to Vancomycin, Erythromycin and Ciprofloxacin.

**5. CONCLUSION AND RECOMMENDATIONS**

An overall prevalence of 83.5% culture positive ear discharge infection was recorded with high bacterial isolates and the majority being Gram-negative bacteria. The predominant isolates were *Pseudomonas spp* and *Staphylococcus aureus*. Most of the isolates showed a high level of antibiotic resistance and majority had multiple antibiotic resistant patterns. Long-term follow-up and education/ continuous sensitization of patients on ear infections is needed. Continuous and periodic evaluation of microbiological pattern and antibiotic sensitivity of ear discharge infection is necessary to prevent the emergence of resistant strains.

**ETHICAL APPROVAL**

Ethical approval was obtained from the ethical committee of the National Ear Centre, Kaduna.

**CONSENT**

It is not applicable.

**COMPETING INTERESTS**

Authors have declared that no competing interests exist.

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