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Pattern Susceptibility of Antibiotics against an Aerobic Bacterial Isolated from Ear Infection in Khartoum Ear, Nose, and Throat Hospital

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Nadir Abuzeid [ID1*].Hanifa Mohammed [1] Mawada Abaker[1] Noora Mahmoud [1] Ohood Mohammed[1], Aymen Mudawe Nurain[2]. Pattern Susceptibility of Antibiotics against an Aerobic Bacterial Isolated from Ear Infection in Khartoum Ear, Nose, and Throat Hospital

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Abstract

The main causalities of ear diseases are bacterial infection. This cross-sectional study desired to select the antibiotic susceptibility test pattern of an aerobic bacteria isolated from ear infections in Khartoum Ear, Nose, and Throat hospital between December and May 2016-2017. The study involved fifty ear swabs were collected from patients and cultivated. Bacterial isolates were determined using standard methods, including Gram stain and biochemical test according to CLSI Standards. Then Chromogen agar was employed as verification for identification. Antibiotic susceptibility Testing was conducted on

bacterial isolates. According to Kirby-Bauer, the antimicrobial vulnerability testing was performed using the agar diffusion method. The study showed that 11(50%) of the bacterial isolate were resistant to Ampicillin, followed by 6 (27.3%) Cefotaxime and 3(13.6%) Cefalexin. While *Pseudomonas spp* were 18(100%) susceptible to Merponeme and Ciprofloxacin, followed by 17 (94.4%) Gentamicin and 16 (88.9%) Cefatoxime. The frequency of bacterial isolation was moderately high. The predominant bacteria were *Pseudomonas* spp, followed by *Proteus* spp. The isolates were highly resistant to Ampicillin, followed by Amoxicillin, Cefalixinm, Ciprofloxacin, and Gentamicin were found to be diligent against all bacteria.

Keywords: Antibiotics, Ear infections, Pathogenic bacteria, Resistance

Introduction

An ear infection is an ear inflammation, and layoff is one of the most typical signs of ear infection [1]. The numerous ordinary type of ear ailment affects the alien canal (otitis externa) or the central ear hollow (otitis media) [2]. External and middle ear infections are moderately typical, particularly in children, because their acoustical tubes are shorter and more comprehensive, enabling the dispatch of microbes. Because of the close accessibility of the internal ear to pathogens, inner ear infections are rare [3]. Otitis media can exist either acute or chronic [4]. It can induce mild to moderate hearing defeat due to the fluid impeding sound transmission to the inner ear [5]. The primary reasons for otitis media are infections, allergy, blockage of the Eustachian tube, and nutritional depletion [6]. Viruses, bacteria, and fungi can provoke ear infections; the principal causes of ear infections are bacterial isolates such as Pseudomonas species (Pseudomonas spp), *Staphylococcus aureus* (S. aureus), *Proteus species* (Proteus spp), *Klebsiella* species and *Escherichia coli* (E.coli) which are encountered in the skin of the outer ear and penetrate the middle ear through a chronic perforation [1]. Microorganisms have existed on the earth for more than 3.8 billion years and exhibit the greatest

hereditary and metabolic assortment and resistance. Over the years, the expanded prevalence of antimicrobial resistance has been reported in multiple pathogens in different territories worldwide. Although antimicrobial resistance is a natural biological phenomenon, it often enhances consequently adaptation of infectious agents to exposure to antimicrobials used in humans or husbandry [7]

Materials and Methods

Study area

Ear, nose, and throat (ENT) hospital, at Khartoum state, between December and May 2016-2017.

Study subject

Inclusion criteria

All patients presented in the hospital with a clinical diagnosis of ear infections.

Exclusion criteria

Patients with ear disease (congenital, accident, etc.) other than

ear infections.

Data collection and sample processing

Intimate, direct consultations gathered the data. Fifty ear swabs were inoculated on Blood agar, Chocolate agar, and MacConkey agar at 37℃ overnight. Blended bacteria were purified on Nutrient agar. Biochemical tests for Gram-positive bacteria (Catalse, coagulase, DNAase, mannitol salt agar, and Novobiocin sensitivity tests) and Gram-negative (Kligler iron agar, Citrate, Urease, Indole, Methyl red and Motility tests. Susceptibility tests were done by using the Kirby-Baure disc diffusion method.

Results

The study included 50 patients. The mean of age was 19.1 ±17.7 years, most of them 27(54%) belonged to 1-15 years of age group 27(54%) showed in (Table3.1). The bacterial growth was yielded from 33 (66%) ear swabs. From these isolates, 26(78.8%) had a single organism isolated from the ear discharge, while the remaining 7 (21.2%) had two organisms isolated. Seventeen samples (34%) showed no growth (Figure 3.2).

The predominant bacterial isolates *Pseudomonas* spp 18(45%), followed by *Proteus* spp 12(30%), *Klebsiella* spp 4(10%), *Staphylococcus aureus* 4(10%), *Escherichia coli* 2(5%) showed in (table 3.2). The bacterial biochemical test results are shown in (table3.3) and (table3.4).

Of the eight antibiotics that are commonly used and available as eardrops or oral antimicrobial at Khartoum ENT Hospital, 11(50%) of bacterial isolates was resistant to Ampicillin, followed by 6 (27.3%) Cefotaxime and 3(13.6%) Cefalexin Showing that in table (3.5). In contrast, *Pseudomonas* was 18(100%) sensitive to Merponeme and ciprofloxacin, followed by 17 (94.4%**)** Gentamicin and 16 (88. 9%) Cefatoxime.

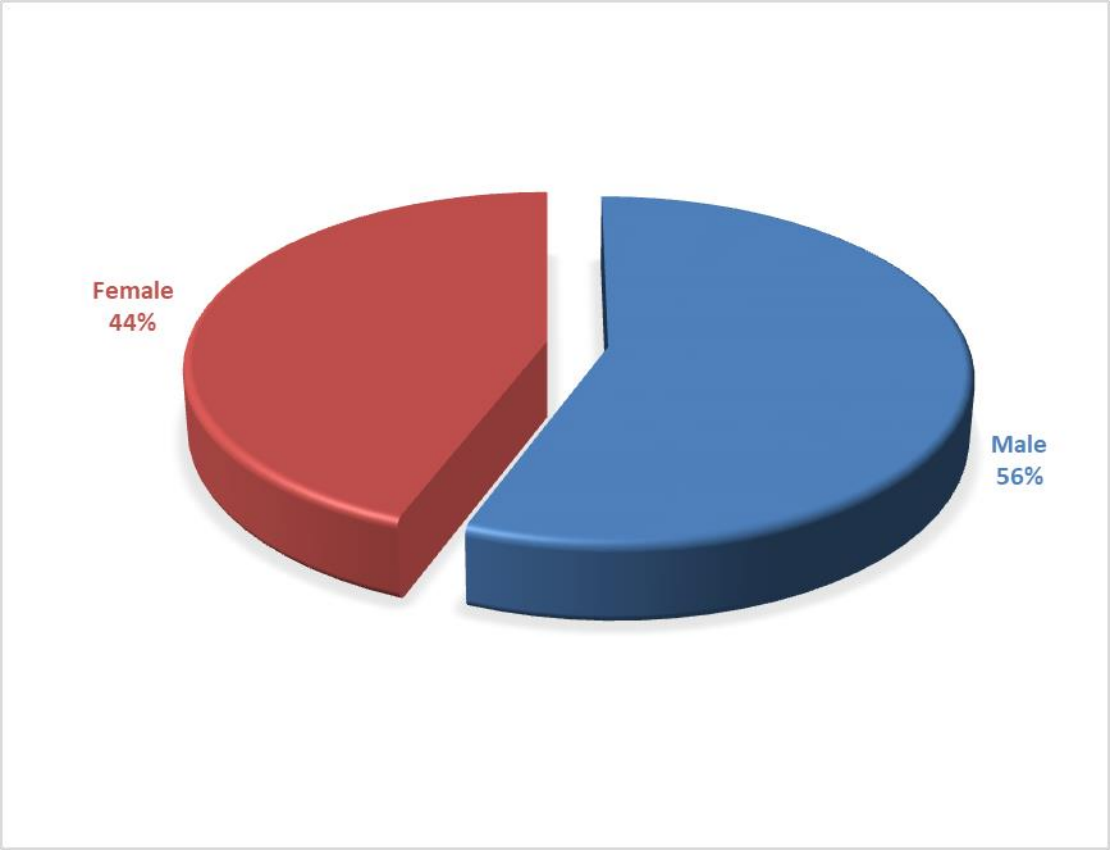

Figure (3.1): The frequency of patients' sex from whom ear swabs were collected in (the ENT) hospital.

P value = 0.361

Table (3.1): Frequency of bacterial growth among patients age group whom ear swabs were collected in (ENT) hospital.

Age group	Positive for bacterial growth	Negative for bacteria growth	Total	P. value
1 – 15	19 70.4%	8 29.6%	27 100%	
16 – 30	9 69.2%	4 30.8%	13 100%	

31 – 45	3 60%	2 40%	5 100%	
46 – 60	0 0%	3 100%	3 100%	
61 – 75	2 100%	0 0%	2 100%	
Total	33 66%	17 34%	50 100%	0.124

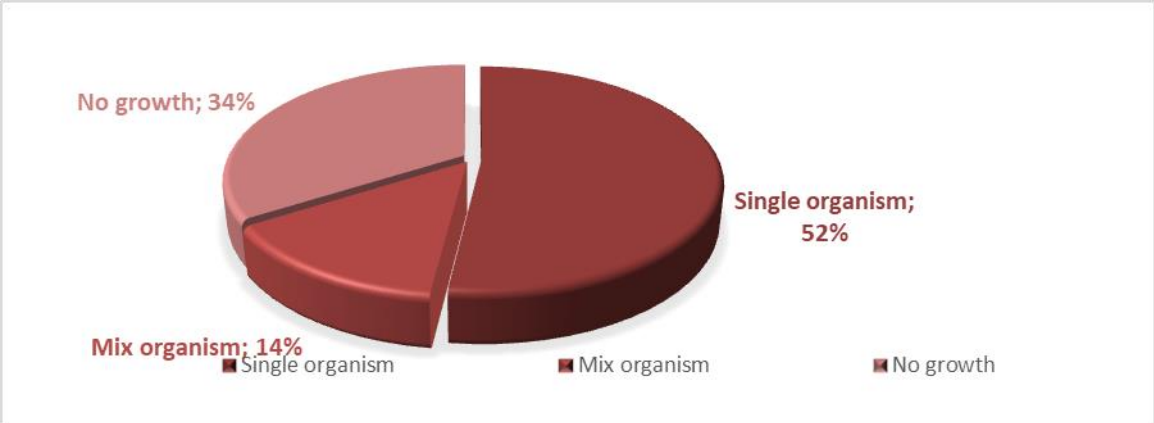

Figure (3.2): The result of bacterial growth on culture media from ear discharge in (ENT) hospital.

Table (3.2): Gram-positive and Gram-negative bacteria isolated from ear swabs collected from patients in (ENT) hospital

Isolates	**Mix Organism**	**Single organism**	**Total**
Pseudomonas spp	6 15%	12 30%	18 45%
P. mirabilis	6 15%	5 12.5%	11 27.5%
p. vulgaris	1 2.5%	0 0%	1 2.5%
K.pneumoniae	0 0%	3 7.5%	3 7.5%
K.oxytoca	0 0%	1 2.5%	1 2.5%
E.coli	1 2.5%	1 2.5%	2 5%
S.aureus	0 0%	4 10%	4 10%
Total	14 35%	26 65%	40 100%

Table (3.3): Characters and biochemical test of Gram-positive bacteria isolated from ear swabs collected from patients in (ENT) hospital.

Character	***S.aureus***
Shape	Cocci
Gram reaction	+
Spore formation	-

Aerobic growth	+
Catalase test	+
Coagulase test	+
Novobiocin sensitivity test	S
Mannitol fermentation test	F

Key: + = positive

- = Negative

S = sensitive

F= Fermentative

Table (3.4): Characters and biochemical test of Gram-negative isolated from ear swabs collected from Khartoum (ENT) hospital patients.

Character		***Pseudomonas.* spp**	***P. mirabilis***	***P. vulgaris***	***K. pneumoniae***	***K. Oxytoca***	***E.coli***
Shape		Rod	Rod	Rod	Rod	Rod	Rod
Pigmentation		+ (13/18)	-	-	-	-	-
Oxidase		+	-	-	-	-	-
KIA	Butt	R	Y	Y	Y	Y	Y
	Slop	R	R	R	Y	Y	Y
	Gas	-	+(5/11)	+	+	+	+
	H_2S	-	+	+	-	-	-
Indole test		-	-	+	-	+	+
MR test		-	+	+	+	+	+
Citrate test		+	+	+	+	+	-
Urease test		-	+	+	+	+	-
Motility test		Motile	Motile	Motile	Non Motile	Non motile	Motile

Key: R: red, Y: yellow

Table (3.5): antibiotics susceptibility pattern of bacterial isolates from ear swabs collected from patients in (ENT) hospitals.

Isolates		***S.aureus***	***Proteus Spp***	***Klebsiella spp***	***E.coli***	***Total***
No(%)		**4(18.2%)**	**12(54.5%)**	**4(18.2%)**	**2(9.1%)**	**22(100%)**
CIP	S	**4(100%)**	**12(100%)**	**4(100%)**	**2(100%)**	**22(100%)**
	I	**0(0%)**	**0(0%)**	**0(0%)**	**0(0%)**	**0(0%)**
	R	**0(0%)**	**0(0%)**	**0(0%)**	**0(0%)**	**0(0%)**
GEN	S	**4(100%)**	**12(100%)**	**4(100%)**	**2(100%)**	**22(100%)**
	I	**0(0%)**	**0(0%)**	**0(0%)**	**0(%)**	**0(0%)**
	R	**0(0%)**	**0(0%)**	**0(0%)**	**0(0%)**	**0(0%)**
CTX	S	**4(100%)**	**6(50%)**	**4(100%)**	**2(100%)**	**16(72.7%)**
	I	**0(0%)**	**0(0%)**	**0(0%)**	**0(0%)**	**0(0%)**
	R	**0(0%)**	**6(50%)**	**0(0%)**	**0(0%)**	**6(27.3%)**
AMP	S	**0(0%)**	**9(75%)**	**0(0%)**	**2(100%)**	**11(50%)**
	I	**0(0%)**	**0(0%)**	**0(0%)**	**0(0%)**	**0(0%)**
	R	**4(100%)**	**3(25%)**	**4(100%)**	**0(0%)**	**11(50%)**
E	S	**4(100%)**	-	-	-	**4(18.2%)**
	I	**0(0%)**	-	-	-	**0(0%)**
	R	**0(0%)**	-	-	-	**0(0%)**
CN	S	-	**10(83%)**	**3(75%)**	**2(100%)**	**15(68.2%)**
	I	-	**0(0%)**	**0(0%)**	**0(0%)**	**0(0%)**
	R	-	**2(17%)**	**1(25%)**	**0(%)**	**3(13.6%)**

Key: CIP: Ciprofloxacin, GEN: Gentamicin, CTX: Cefotaxime, AMP: Ampicillin, CN: Cefalexin, E: Erythromycin S: sensitive, I: intermediate, R: resistance.

Table (3.6): Antibiotics susceptibility pattern of Pseudomonas isolated from ear swabs collected from patients in (ENT) hospitals.

Isolate		*Pseudomonas*. Spp
Total		18(45%)
CIP	S	18(100%)
	I	0(0%)
	R	0(0%)
GEN	S	17(94.4%)
	I	0(0%)
	R	1(5.6%)
CTX	S	16(88. 9%)
	I	0(0%)
	R	2(11.1%)
MEM	S	18(100%)
	I	0(0%)
	R	0(0%)

Key: PY: Carbenicillin, MEM: Meropenem, S: Sensitive, I: intermediate, R: resistance.

Discussion

Ear swab is one of the most often requested samplings for microbiological investigation in the Khartoum hospital for ear, nose, and throat (ENT). Our present study reveals that ear infection is of ordinary trouble in this area. The present study revealed that infections were increased in the age group 1-15 years, equivalent to

the study in Ethiopia [8]. Era and coupling insignificantly impact the commonness of ear infections. P-value (0.124) for age and (0.361) for sex, which is identical to the introspection in Nigeria [9]. However, disagree with a study in Ethiopia reported that gender significantly affects the frequency of infections [1]. These differences may be attributed to differences in environment and hygiene. The frequency of Gram-negative was more than Gram-positive. This is in line with the study in Nigeria[10]. The predominant bacterial isolates were *Pseudomonas* spp, *Proteus* spp, *Klebsiella* spp, *S. aureus*, and *E. coli*. That differs from other studies carried out in Sudan [12]. This variation may be due to our small sample size. Our study found that Ciprofloxacin and Gentamicin were highly sensitive for all isolates, according to a study in India [13].

Nevertheless, differ from the result reported in Sudan [12]. This variation may be due to differences in the concentration of antibiotics. On the other hand, Ampicillin showed resistance for all isolates. Cefalexin revealed moderate sensitivity for Enterobacteriaceae, and Erythromycin is highly sensitive for Gram-positive, in line with the study carried out in Ethiopia [1]. The Meropenem manifested highly sensitive for *Pseudomonas* spp agree with study in Pakistan. However, this differs from our study in Cefotaxime, which showed moderate sensitivity for all isolates [14]. This variation may be due to differences in antibiotic concentration or to different strains isolated by the other study. However, there was a limitation in the study sample size, and needing more studies on the molecular level of genetic resistance of antibiotics to understand the resistance mechanism.

Conclusion

The majority of bacterial isolates were relatively elevated. The dominant isolates were *Pseudomonas aeruginosa* followed by Proteus spp. The isolates were

positively resistant to Ampicillin, observed by Amoxicillin, Cefotaxime, and Cefalixin. Ciprofloxacin and Gentamicin were considerably diligent against all bacterial isolates.

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