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Full Length Research Paper

Antimicrobial susceptibilty of potentially pathogenic halophilic *Vibrio* species isolated from seafoods in Lagos, Nigeria

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Surveillance of antimicrobial resistance is indispensable for empirical treatment of infections and in preventing the spread of antimicrobial resistant microorganisms. This study is aimed at determining the antibiotic susceptibility of potentially pathogenic halophylic *Vibrio* species isolated in Lagos, Nigeria. Susceptibility patterns to ten (10) antibiotics were investigated in 44 potentially pathogenic halophilic *Vibrio* species isolated from sea foods in Lagos. Antimicrobial susceptibility tests showed that all the isolates (100%) were resistant to amoxicillin, augmentin, chloramphenicol and nitroforantoin. They also showed multiple resistance patterns to Gentamycin, Nitrofurantoin, Tetracycline, Augmentin, Chloramphenicol, Amoxycilin, Ofloxacin, Cotrimozazole, Ceftriazone, and Ciprofloxacin. Resistance to all ten antibiotics occurs in 8 (18%) of the isolates. Among individual sp., *Vibrio harvey*i was found to be most resistant to the antibiotics screened. Infection caused by *Vibrio* contaminating sea foods in this envinronment will be difficult to treat because of their high antibiotic resistant nature.

Key words: *Vibrio* species, antibiotic resistance, Lagos.

INTRODUCTION

Vibrio species are ubiquitous in aquatic environment. They appear at particularly high densities in and/or on marine organisms including corals, fish, mollusks, sea grass, sponges, shrimps and zooplankton (Thompson et al., 1997). Some species are pathogens of fishes, eels, frogs as well as other vertebrates and invertebrates (Todar, 2005). At least twelve human pathogens are known within the genera of *Vibrio*. Some of these include *Vibrio cholerae* O1, *Vibrio cholerae* non O1, *Vibrio mimicus*, *Vibrio fluvialis*, *Vibrio parahaemolyticus*, *Vibrio vulnificus*, *Vibrio hollisae*, *Vibrio furnissii*, *Vibrio alginolyticus*, *Vibrio damsela*, *Vibrio metschnovii* and *Vibrio carchariae* (Elliot et al., 1998). *V. parahaemolyticus, V. alginolyticus* and *V. vulnificus* are known to cause seafood borne infections such as septicemia and wound infections. *V. vulnificus* is responsible for 95% of sea foods related death (Todar, 2005). Among the major disease causes by *Vibrio* spp. is cholera which occurs when *V. cholerae* colonizes the small intestine and releases enterotoxin (Gopal et al., 2005). Antimicrobial therapy has been shown to reduce the duration and severity of symptoms of *Vibrio* infections in severe cases (Janda et al., 1998).

Bacterial resistance to antibiotics has become an emerging medical issue threatening the public health because of wide availability of antibiotics and sometimes misuse of drugs without proper prescription (Davies and Amabiles-Cuevas, 2003). More and more pathogenic bacteria have shown resistance to one or many of the antibiotics. It has been observed that antibiotic susceptibility of *Vibrio* spp. is dynamic and varies with the environment (Ottaviani et al., 2001; Jun et al., 2003). The present study was embarked upon to determine the antimicrobial susceptibility patterns of *vibrio* spp. isolated from seafoods consumed in Lagos.

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Table 1. Antibiotic susceptibility patterns of *Vibrio* species isolated from samples collected from the fishing companies and the local fishermen in Agboyi-Odo and Oworonsoki areas of Lagos.

Antibiotics tested (ug)	Number of resistant strains (%)					Number of sensitive strains (%)				
	VA	VP	VM	VH	VC	VA	VP	VM	VH	VC
Amoxycilin (25)	14 (100)	5 (100)	10 (100)	12 (100)	3 (100)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Augumentin(30)	14 (100)	5 (100)	10 (100)	12 (100)	3 (100)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Chloramphenicol (10)	14 (100)	5 (100)	10 (100)	12 (100)	3 (100)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Nitrofuranoin(200)	14 (100)	5 (100)	10 (100)	12 (100)	3 (100)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Ciprofloxacin(10)	8 (57.1)	2 (40)	0 (0)	7 (58.3)	1 (33.7)	6 (42.9)	3 (60)	10 (100)	5 (41.7)	2 (66.7)
Tetracyclin (50)	14 (100)	5 (100)	7 (70)	12 (100)	0 (0)	0 (0)	0 (0)	3 (30)	0 (0)	0 (0)
Ofloxacin (5)	8 (57.1)	2 (40)	0 (0)	12 (100)	0 (0)	6 (42.9)	3 (60)	10 (100)	0 (0)	3 (100)
Gentamycin (10)	14 (100)	5 (100)	8 (80)	12 (100)	3 (100)	3 (100)	0 (0)	3 (60)	2 (20)	0 (0)
Cotrimoxazole (25)	9 (64.3)	5 (100)	1 (10)	12 (100)	1 (133.3)	5 (35.7)	0 (0)	9 (90)	0 (0)	2 (66.7)
Ceftriazone (30)	2 (14.3)	1 (20)	2 (20)	11 (91.7)	1 (133.3)	12 (85.7)	4 (80)	8 (80)	1 (8.3)	2 (66.7)

*VA = *Vibrio aginolyticus*; VM = *Vibrio mimicus*; VH = *Vibrio harveyi*; VC = *Vibrio cholerae*; VA = *Vibrio paraheamolyticus.*

Table 2. Antimicrobial resistance profile (Antibiograms) of *Vibrio* species isolated from seafood in Lagos.

Antimicrobial resistance profile	Number of strains showing profile				
	VA	VP	VM	VH	VC
Amx Aug Cl Nit Cip Tet Ofl Gen Cot Cro	2	1	0	5	0
Amx Aug Cl Nit Cip Tet Ofl Gen Cot	2	0	0	2	0
Amx Aug Cl Nit Tet Ofl Gen Cot Cro	0	1	0	5	0
Amx Aug Cl Nit Tet Ofl Gen Cot	3	0	0	0	0
Amx Aug Cl Nit Cip Tet Gen Cot	0	0	0	0	0
Amx Aug Cl Nit Cip Tet Gen Cro	1	0	0	0	0
Amx Aug Cl Nit Tet Gen Cot Cro	1	2	1	0	0
Amx Aug Cl Nit Cip Tet Ofl Gen	2	0	0	0	0
Amx Aug Cl Nit Tet Gen Cro	1	0	1	0	1
Amx Aug Cl Nit Tet Gen Cot	1	1	1	0	0
Amx Aug Cl Nit Tet Gen	1	0	7	0	1
Amx Aug Cl Nit	14	5	10	12	3

Amx = Amoxycillin; Aug = Augumentin; Cl = Chloramphenicol; Ofl = Ofloxacin; Nit = Nitrofurantoin; Cot = Cotrimozazole; Cro =Ceftriazone; Gen = Gentamycin; Cip = Ciprofloxacin.
VA = *Vibrio alginolyticus*; VP = *Vibrio parahaemolyticus*; VC = *Vibrio cholerae*; VM = *Vibrio mimicus*; VH =*Vibrio harveyi*.

MATERIALS AND METHODS

Twenty-five sea foods samples comprising Shrimps, Crabs and Cuttle fish collected from seven different fishing companies in Lagos and ten other samples from local fisherman between January and April 2007 were screened for the presence of *Vibrio* spp. using conventional biochemical characterization methods and API 20E systems as previously described (Adeleye and Enyinia, 2008).

Antimicrobial susceptibility of the isolates were tested using disks diffusion methods on Mueller Hinton agar against the following ten antibiotics; Tetracycline (50 µg), Ofloxacin (5 µg), Cotrimozazole (25 µg), Gentamycin (10 µg), Ceftriazone (30 µg), Amoxillin (25 µg), Chloramphenicol (10 µg), Nitrofuratoin (200 µg), Ciprofloxacin (10 µg), Augumentin (25 µg). The sensitivity tests were controlled using *Staphylococcus aureus* (NCTC no.6571) and *E. coli* (NCTC No.10418). Inhibition zones were interpreted using NCCLS recommendations (NCCLS, 1990).

RESULTS AND DISCUSSION

The antimicrobial susceptibility of the *Vibrio* isolates to individual antibiotic is shown in Table 1. All the isolates 44 (100%) were resistant to Amoxicillin, Augmentin, Chloramphenicol and Nitrofurantoin. 42 (95%) and 41 (93%) of them were resistant to Gentamicin and Tetracycline respectively. 28 (64%) to Cotrimoxazole while 22 (50%) were equally resistant to Ofloxacin. Multiple drug resistance was prevalent among the Vibrio isolates (Tables 2 and 3). Quadriple resistance (Amx- Aug-Cl-Nit) was detected in all 44 isolates while resistance to all the ten drugs was observed in 8(18%) of the isolates. Similarly resistance to six, seven, eight and nine antibiotics were also prominent.

Table 3. Summary of antimicrobial resistance profiles (antibigrams) of *Vibrio* species isolated from seafoods in Lagos.

Number of antibiotics resistant to:	Number of strains showing pattern				
	VA	VP	VM	VH	VC
Six antibiotics	1 (7.1%)	0 (0%)	7 (70%)	0 (0%)	1 (133.3%)
Seven antibiotics	2 (14.3%)	1 (20%)	2 (20%)	0 (0%)	1 (133.3%)
Eight antibiotics	7 (50%)	2 (40%)	1 (10%)	0 (0%)	1 (133.3%)
Nine antibiotics	2 (14.3%)	1 (20%)	0 (0%)	7 (58.3%)	0 (0%)
Ten antibiotics	2 (14.3%)	1 (20%)	0 (0%)	5 (41.7%)	0 (0%)

VA = *Vibrio alginolyticus;* VP = *Vibrio parahaemolyticus;* VC = *Vibrio cholerae;* VM = *Vibrio mimicus;* VH = *Vibrio harveyi*.

Among individual sp., *V. haveyi* showed the highest resistances pattern in this study as all the 12 (100%) strains were resistant to Amoxicillin, Augmentin, Chloramphenicol, Nitrofurantoin, Tetracycline, Ofloxacin, Gentamycin and Cotrimoxazole (Amx-Aug-Ci-Nit-Tet-Ofl-Gent-Cot). Similarly, *V. parahaemolyticus*, *V. alginolyticus* and *V. cholerae* was resistance to at least six drugs while *V. mimicus* strains were susceptible to Ciprofloxacin and Ofloxacin but resistant to Amoxycillin, Augmentin, Chloramphenicol and Nitrofurantoin.

Epidemiological surveillance of antimicrobial resistance is indispensable for empirical treatment of infections and in preventing the spread of antimicrobial resistant microorganisms. This study revealed a high prevalence of antibiotic resistances in the *Vibrio* isolates. The resistance patterns detected vary between four to ten drugs respectively with all isolates being resistant to Amoxicillin, Augmentin, Chloramphenicol and Citrofurantoin. Studies carried out in the Horns of Africa had established the presence of multiple drug resistant *Vibrio* spp. (Coppo et al., 1995). Elsewhere in Italy, Ottaviani et al. (2001) studied the susceptibility patterns of pathogenic halophytic *Vibrio* species isolated from sea foods and observed that while some were sensitive to Trimethoprim, Sulphamethozazole, Cefotamime, Ciprofloaxin, others were resistant to Lincomycin and other antibiotics screened.

Similarly, Jun et al. (2003) detected multiple drug resistance to ampicillin, Cefuroxime, Amikacin, Kanamycin and Trimethoprim among fifty-one pathogenic *Vibrio* species from sea fishes in Hong Kong. Comparatively, however, the multi drug resistance observed in our isolates is far higher than those reported elsewhere. This may be due to the uncontrolled use of antibiotics in this environment. Among the individual sp., *V. harveyi* resistance to eight antibiotics as observed in this study is in line with earlier investigations carried out by Chiari and Dubey (2006). Both workers observed that environmental strains of *V. harveyi* from sea water samples in Western India showed multiple resistances to several antibiotics including Chloramphenicol and Tetracycline. However, our findings on the multidrug resistance nature of *V. alginolyticus, V. cholerae* and *V. mimicus* is at variance with reports from several studies. For example Melitoris et al. (1985) reported that environmental strains of *V. alginolyticus* showed high sensitivity (94.6 and 75.1%, respectively) to chloramphenicol and gentamycin. Similarly, Chowdy et al. (1986) observed that 25 environmental strains of *V. mimicus* in Bangladesh were all sensitive to Chloramphenicol and Gentamycin. In the same vein, Wang et al. (2006) reported that *V. cholerae* from water and sediment samples in Hong Kong were sensitive to Tetracycline and Chloramphenicol as opposed to our findings. These observed differences may be due to the fact that first generation antibiotics including Ampicillin, Chloramphenicol and Tetracycline have been thoroughly abused in this environment (Adeleye and Adetosoye, 1992). Resistant strains may have found their way into the Lagoons harbouring these sea foods because raw sewage is sometimes discharged into them without any form of treatment.

Overall, we reasoned that the infection that may be caused by *Vibrio* contaminating sea foods in this environment will be difficult to treat because of their very high antibiotic resistant nature. Therefore, adequate cooking of sea foods before consumption is strongly recommended.

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